KING EDWARD VI
HANDSWORTH GRAMMAR
SCHOOL FOR BOYS

KING EDWARD VI
ACADEMY TRUST
BIRMINGHAM

Year 8

2023 Mathematics 2024

Unit 10 Tasks – Part 1

DO NOT WRITE INSIDE

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Unit 10 Tasks – Part 2

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Contents

1 Estimation

2 Circles

3 Angles in Parallel Lines

1 Estimation

Fluency Practice

significant figures

learn by heart

The first significant figure is the highest value digit that is not zero

'Trapped' zeroes are significant

0.703

This number has 3 significant figures.
7 is the first significant figure.

examples

Round 209.345 to
2 significant figures
= 210

the 2nd significant figure is in the tens column, so round it to the nearest 10

questions

1. Round each of these numbers to the number of significant figures shown:

   a) 45 (1 s.f.)
   b) 0.956 (2 s.f.)
   c) 3005 (3 s.f.)
   d) 551.8 (2 s.f.)
   e) 0.0507 (2 s.f.)
   f) 503 (1 s.f.)
   g) 900 (2.s.f)
   h) 0.56 (1 s.f.)
   i) 9607 (2 s.f.)
   j) 8.099 (3 s.f.)
   k) 609 (2 s.f.)
   l) 800 (3 s.f)

2. Which of the following numbers has two significant figures?

   a) 0.08 b) 108 c) 0.080 d) 1.08

3. How many significant figures does the number 1.900 have?

4. What is the value of π to 4 significant figures?

5. What is the value of $\sqrt[3]{9}$ to 3 significant figures?

6. What is the value of 7.904×10^4 to 3 significant figures?

7. True or false: 42.389 (3 s.f.) > 42.389 (2 d.p.) ?

Intelligent Practice

Estimate:

1) $211 + 317 \approx$

2) $317 + 211 \approx$

3) $317 + 21.1 \approx$

4) $317 + 2.11 \approx$

5) $317 + 0.211 \approx$

6) $317 \times 0.211 \approx$

7) $317 \times 0.47 \approx$

8) $317 \div 0.47 \approx$

9) $\frac{317}{0.47} \approx$

10) $\frac{317+211}{0.47} \approx$

11) $\frac{317+211}{0.47-0.29} \approx$

12) $\frac{3.17+2.11}{0.47-0.29} \approx$

13) $\frac{0.47-0.29}{3.17+2.11} \approx$

14) $\frac{0.29-0.47}{3.17+2.11} \approx$

Fluency Practice

Problem	*Problem rounded to 1 sf*	*Estimate*	*Actual answer to 3 sf from calculator*
$\mathbf{3.2 \times 5.8}$	$\mathbf{3 \times 6}$	**18**	$\mathbf{18.6}$
6.8×4.3			
$\dfrac{8.2 \times 9.6}{2.1}$			
$\dfrac{9.8 \times 7.45}{3.5 + 6.42}$			
$\dfrac{116 \times 3461}{884 - 623}$			
$\dfrac{3.4 + 9.2}{9.61 - 3.68}$			

Fluency Practice

Work out an estimate by rounding each number to 1 significant figure.

(a) $39.3 + 43.2$ (b) $213 - 108$

(c) $\frac{876}{29}$ (d) $\frac{53-11.2}{4.97-1.1}$

(e) $\frac{4.9\times8.2}{3.91}$ (f) $\frac{4.05}{2.1^2}$

Work out an estimate by rounding each number to 1 significant figure.

(a) $2110 - 893$ (b) $4.6109 + 3.401$

(c) $\frac{15.2+84.7}{3.97}$ (d) $\frac{8.49}{1.7}$

(e) $\frac{9.03\times6.2}{2.5^2}$ (f) $\frac{5.02^3}{4.865}$

1 litre of paint can cover approximately 11 m^2 of wall. Frank wants to paint two walls each of which are 2.15 m high and 6.89 m wide. Estimate how many 1 litre tins Frank will need.

Amir chooses two numbers from the list.

44.37 44.44 44.48 44.53

44.55 44.63 44.67 44.71

When he rounds the two numbers to 1 decimal place, they are equal.

When he rounds the two numbers to 2 significant figures, they are not equal.

Which two numbers did Amir choose?

Fluency Practice

Calculations

Part A – For each calculation, estimate the answer using a suitable method, then work out the actual answer in your books.

487 + 892 Estimate: _____ Answer: _____	756 – 219 Estimate: _____ Answer: _____	57 x 45 Estimate: _____ Answer: _____
208 ÷ 52 Estimate: _____ Answer: _____	442 + 1355 Estimate: _____ Answer: _____	3554 - 1413 Estimate: _____ Answer: _____
329 x 87 Estimate: _____ Answer: _____	330 ÷ 66 Estimate: _____ Answer: _____	156 x 47 Estimate: _____ Answer: _____

Part B – Use the answers from above to complete these calculations.

1. 2565 ÷ 57 =
2. 28623 ÷ 87 =
3. 208 ÷ 4 =
4. 66 x 5 =
5. 756 – 537 =
6. 7332 ÷ 156 =
7. 2141 + 1413 =
8. 4 x 52 =
9. 330 ÷ 5 =
10. 1379 – 892 =
11. 28623 ÷ 329 =
12. 1797 – 442 =
13. 7332 ÷ 47 =
14. 537 + 219 =

Calculations - Decimals

Part A – For each calculation, estimate the answer using a suitable method, then work out the actual answer in your books.

5.23 + 6.74 Estimate: _____ Answer: _____	4.8 – 1.43 Estimate: _____ Answer: _____	2.4 x 6.8 Estimate: _____ Answer: _____
27.2 ÷ 4 Estimate: _____ Answer: _____	54.87 + 32.41 Estimate: _____ Answer: _____	98.56 – 23.25 Estimate: _____ Answer: _____
12.2 x 8.6 Estimate: _____ Answer: _____	28.2 ÷ 6 Estimate: _____ Answer: _____	2.16 x 8.5 Estimate: _____ Answer: _____

Part B – Use the answers from above to complete these calculations.

1. 18.36 ÷ 2.16 =
2. 87.28 – 54.87 =
3. 27.2 ÷ 6.8 =
4. 4.7 x 6 =
5. 98.56 – 75.31 =
6. 16.32 ÷ 6.8 =
7. 104.92 ÷ 12.2 =
8. 28.2 ÷ 4.7 =
9. 75.31 + 23.25 =
10. 4.8 – 3.37 =
11. 18.36 ÷ 8.5 =
12. 11.97 – 6.74 =
13. 3.37 + 1.43 =
14. 6.8 x 4 =

Fluency Practice

Estimate:

1) $681 \times 42 \approx$

2) $78 \times 722 \approx$

3) $232 \times 494 \approx$

4) $722 \div 9.3 \approx$

5) $6344 \div 7.21 \approx$

6) $1421 \div 72.3 \approx$

7) $\sqrt{17} \times \sqrt{24} \approx$

8) $\sqrt{142} \times \sqrt{99} \approx$

9) $\sqrt{121} \times 5.23 \approx$

10) $2.345 \times 9.873 \approx$

11) $5.745 \times 0.9873 \approx$

12) $4.796 \times 0.56 \approx$

13) $12 \times 34 \times 56 \approx$

14) $29 \times 41 \times 79 \approx$

15) $13 \times 4.7 \times 0.42 \approx$

16) $\frac{84 \times 91}{2.3} \approx$

17) $\frac{67}{0.52} \approx$

18) $\frac{55 \times 31}{5.3 \times 3.78} \approx$

Fluency Practice

Ex1. Which of these estimates are sensible?
For each, please explain your thinking.

$(a)\ \sqrt{15} \approx 4.2$	$(b)\ \sqrt{85} \approx 8.5$	$(c)\ \sqrt{92} \approx 9.6$
$(d)\ \sqrt{5} \approx 2.2$	$(e)\ \sqrt{101} \approx 10.7$	$(f)\ \sqrt{10} \approx 3.1$

Ex2. Estimate the following square roots.

$(a)\ \sqrt{32}$	$(b)\ \sqrt{75}$	$(c)\ \sqrt{6}$
$(d)\ \sqrt{110}$	$(e)\ \sqrt{135}$	$(f)\ \sqrt{90}$

Ex3. Which of these estimates are sensible?
For each, please explain your thinking.

$(a)\ \sqrt[3]{9} \approx 1.9$	$(b)\ \sqrt[3]{25} \approx 2.9$	$(c)\ \sqrt[3]{60} \approx 3.9$
$(d)\ \sqrt[3]{75} \approx 4.1$	$(e)\ \sqrt[3]{120} \approx 4.9$	$(f)\ \sqrt[3]{150} \approx 5.3$

Ex4. Estimate the following cube roots.

$(a)\ \sqrt[3]{50}$	$(b)\ \sqrt[3]{80}$	$(c)\ \sqrt[3]{-15}$
$(d)\ \sqrt[3]{4}$	$(e)\ \sqrt[3]{150}$	$(f)\ \sqrt[3]{-400}$

Fluency Practice

Question 1: Work out an estimate to each of the following

(a) $906 + 397$ (b) $578 + 720$ (c) $912 - 114$ (d) $4998 - 592$

(e) $1965 - 370$ (f) $8.31 + 9.74$ (g) $50.6 - 5.25$ (h) $44.34 + 98.101$

Question 2: Estimate the answers to the following

(a) 2.1×6.8 (b) 5.7×7.2 (c) 38×22 (d) 41×79

(e) 56.2×11.52 (f) 5.84×32.02 (g) 27×304 (h) 195×92

(i) 3625×2.3 (j) 1.79×8311 (k) $48.55 \times 5.3 \times 7.6$

Question 3: Work out an estimate to each division

(a) $61.2 \div 10.13$ (b) $59.62 \div 3.93$ (c) $6.87 \div 9.79$ (d) $403.8 \div 21.51$

(e) $900.41 \div 59.75$ (f) $7018.3 \div 5.281$ (g) $\frac{703}{2.04}$ (h) $\frac{9850}{38.6}$ (i) $\frac{314}{2008}$

Question 4: Work out estimates to the following

(a) $\frac{291 + 602}{102}$ (b) $\frac{8019}{711 - 508}$ (c) $\frac{7.14 + 16.88}{10.96 - 4.85}$

(d) $\frac{132 + 291}{31 - 12}$ (e) $\frac{3890}{9.8 \times 51}$ (f) $\frac{42 \times 194}{10.3 \times 7.8}$

(g) $\frac{18.5 \times 51.9}{4.69 + 20.01}$ (h) $\frac{19.2 \times 41.3}{9.9 \times 5.1}$

Question 5: Estimate the answers to the following

(a) $\frac{3}{10}$ *of* 68.9 (b) $\frac{7}{20}$ *of* 83 (c) $\frac{1}{5}$ *of* 414.7

(d) $\frac{1}{3}$ *of* 551 (e) $\frac{6}{11}$ *of* 91 (f) $\frac{2}{15}$ *of* 103

Question 6: Work out an estimate to each of the following

(a) 8.9^2 (b) 6.02^2 (c) 7.1^2 (d) 11.95^2 (e) 21^2 (f) 49^2

(g) 81.72^2 (h) 597^2 (i) 3.2^3 (j) 1.95^3 (k) 9.88^3 (l) 20.4^3

Fluency Practice

Question 9: Find the approximate answer to each of the following multiplications

(a) 40×0.19 (b) 0.497×600 (c) 0.81×5000

(d) 18×0.72 (e) 0.889×303 (f) 209×0.379

(g) 0.052×1984

Question 10: Work out an estimation to each of the following divisions.

(a) $20.15 \div 0.49$ (b) $69.8 \div 0.204$ (c) $307 \div 0.614$

(d) $43.4 \div 0.123$ (e) $88.7 \div 0.31$ (f) $709.1 \div 0.533$

(g) $199.7 \div 0.022$

Question 11: Work out estimations to each of the following.

(a) $\dfrac{52 \times 6.78}{0.51}$ (b) $\dfrac{801 \times 10.04}{0.49}$ (c) $\dfrac{9.8 - 2.9}{0.53}$

(d) $\dfrac{58.46}{6.13 \times 0.505}$ (e) $\dfrac{291 \times 3.95}{0.197}$ (f) $\dfrac{403 \times 3.91}{0.104}$

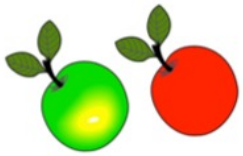
(g) $\dfrac{7985}{51.28 \times 0.42}$ (h) $\dfrac{304 \times 9.79}{0.602}$

Question 12: Use approximations to estimate the value of the following

(a) $6.98 + 3.05 \times 29.09$ (b) $\dfrac{4.94 \times \sqrt{99.78}}{2.03^2}$ (c) $6.1 + 4.9 \times 3.1 - 9.7$

(d) $(1.89 + 9.72 \times 0.51)^2$ (e) $\dfrac{6.12^2}{0.398}$

Fluency Practice



Question 1: Suzie buys 53 apples at 38p each.
Estimate the total cost.

Question 2: A rectangular flowerbed has a length of 8.03 metres and a width of 2.93 metres.

(a) Work out an estimate of the area of the flower bed.
(b) Work out an estimate of the perimeter of the flower bed.

Question 3: A roll of wallpaper cost £7.85.
Richard buys 29 rolls of wallpaper.
Work out an estimate for the total cost.

Question 4: The scientist Robert Boyle was born in 1627.
Work out an estimate for how many years ago he was born.

Question 5: Estimate the total cost of 32 printers at £198 each and 58 ink cartridges at £31.15 each.

Question 6: In a cinema there are 28 rows and in each row there are 22 seats.
Each ticket costs £8.10

Work out an estimate for the total income from the ticket sales.

Question 7: Estimate how many books costing $5.95 can be bought from $305

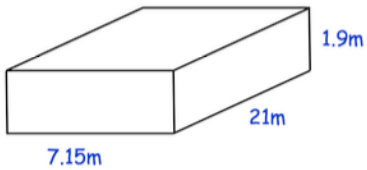
Question 8: Lauren is given two job offers

Job A: £785 a week
Job B: £1950 a month

Which job is offering the greatest pay?

Question 9: A buzzer beeps every 1,111 seconds.
Work out an estimate for the number of times the buzzer beeps in 1 week.

Question 10: Andrew is going to fill an empty swimming pool.



Andrew fills the swimming pool with water at a constant rate of 2.1 litres per second.

Given $1m^3 = 1000$ litres, estimate how long it takes to fill the pool.

Fluency Practice

learn by heart

To estimate: *try rounding numbers to 1 significant figure before calculating*

Dividing by 0.5: *is the same as multiplying by 2*

≈ *means 'is approximately'*

remember dividing by a number is the same as multiplying by its reciprocal

examples

Estimate $\frac{4.2 \times 9.8}{0.488}$

$\approx \frac{4 \times 10}{0.5} \approx \frac{40}{0.5} \approx 80$

Estimate $\sqrt{42}$

$\sqrt{36} = 6, \sqrt{49} = 7,$ so $\sqrt{42} \approx 6.5$

questions

1. Estimate the following:

a) 8.2×19.5

b) 0.477×12.6

c) 8.2^2

d) $\sqrt{103}$

e) $\frac{423}{9.8}$

f) $\frac{8.9 \times 4.12}{1.8}$

g) $\sqrt[3]{220}$

h) 11.1×401.5

i) $\frac{5.01 \times 4.7}{0.542}$

j) $\frac{1.08 + 18.57}{2.01}$

k) 0.046×9.99

l) $(-0.98)^3$

2. Which of the following are integers?

a) $\sqrt{33}$ b) $\sqrt{40}$ c) $\sqrt{-1}$ d) $\sqrt[3]{-1}$ e) $\sqrt{9}$

3. Why is 1^6 not a good estimate for the value of $(0.82)^6$?

4. If Sarah travels 9.2km every hour for 32 hours, approximately how far does she travel?

Fluency Practice

questions

5. Estimate the value of $6.809 \times 10^4 \times 5.2$

6. Estimate the value of $\sqrt{8.9 \times 4.03}$

7. Estimate the number of days in a decade.

8. Estimate $\frac{5.82}{0.488}$

9. Anya spends £50,106 on 4 adverts.
   Estimate the cost of each advert.

10. Estimate $\frac{9.02}{0.23}$

11. Estimate $\sqrt{1002 \div 9.05}$

12. Which of the following is largest? Use estimations to decide:

    a) $\frac{8.3}{0.4}$ b) $\frac{9.2}{0.1}$ c) $\frac{4.01}{0.52}$ d) $\frac{7.9}{0.21}$

a good estimate?

Which of these estimates are clearly wrong?

A $492 \times 8 \approx 500$	E $\frac{42.6}{0.489} \approx 20$	I $(0.62)^2 \approx 3.6$
B $9.79 \times 0.44 \approx 5$	F $2.02^3 \approx 8$	J $\frac{4.8 \times 9.6}{2.51} \approx 20$
C $\sqrt{8.2 \times 8.1} \approx 8$	G $\sqrt{396} \approx 20$	K $1208.6 - 49.66 \approx 700$
D $\frac{2799.2}{10.04} \approx 280$	H $20.19 \times 4.99^2 \approx 1000$	L $\sqrt[3]{64.8} \approx 20$

Fluency Practice

estimation

1. Estimate the answers to these calculations:

a. 493 x 19

b. $\frac{40.8 - 4.23}{5.97}$

c. 2.87 x 42.9

d. 19.2^2

e. 1209 ÷ 589

f. $\frac{11.6 \times 2.83}{9.01}$

g. 38 x 43

h. 11.1 + 8.02 x 3.9

i. 6.8×1.9^2

j. $\frac{50.89 - 9.23}{1.99 \times 1.91}$

k. 0.22 x 59.8

2. Use approximations to estimate:

a. The cost of 19 lamps each costing £7.89

b. The number of buses required to transport 642 pupils, if each bus can carry 18 pupils

c. The cost of 41 tickets at £3.96 each

d. The number of classrooms required for 899 pupils, if there should be 29 pupils in each classroom.

3. True or False:

a. 14.89 x 15.6 ≈ 225

b. 6.8 x 48 ≈ 3500

c. 1830 ÷ 48 ≈ 40

square roots

1. Complete the following:

..... < $\sqrt{8}$ < .....

..... < $\sqrt{17}$ < .....

..... < $\sqrt{27}$ < .....

..... < $\sqrt{42}$ < .....

..... < $\sqrt{90}$ < .....

2. Estimate these square roots:

a. $\sqrt{14}$

b. $\sqrt{31}$

c. $\sqrt{40}$

d. $\sqrt{80}$

e. $\sqrt{91}$

Fluency Practice

Section A

Work out the exact answer to the following questions ***without using a calculator.***

1) 0.5 x 5 = **2)** 60 x 0.3 = **3)** 0.02 x 7 = **4)** 11 x 0.08 =

5) 8 ÷ 0.2 = **6)** 3.5 ÷ 0.5 = **7)** 24 ÷ 0.04 = **8)** 36 ÷ 0.9 =

Section B

	Working out	Approximate Answer	Actual Answer
$\frac{\sqrt{17}}{2}$			
$\frac{\sqrt{65}}{\sqrt{3}}$			
$\frac{39\times 21}{4}$			
$\frac{77\times 19}{9}$			
$\frac{\sqrt{5}+3}{5}$			
$\frac{\sqrt{80}-1}{4}$			
$\frac{38+\sqrt{141}}{4+\sqrt{35}}$			
$\frac{\sqrt{8}+4}{0.48}$			
$\frac{\sqrt{50}+4}{0.51}$			
$\frac{\sqrt{24}+7}{0.18}$			

Section C

1) *Estimate the value of fifty seven divided by zero point three five.*

2) *Ryan does the calculation* $\sqrt{(2.07\div 0.043)}$ *on the calculator, and gets 69.38265.*
Give an approximate answer to this question to show that he is wrong.

3) *Roshni does the calculation* $\frac{62.1\times 1.9^2}{0.841}$ *on the calculator, and gets 26.65648038.*
Give an approximate answer to this question to show that she is wrong.

Q1 Work out an estimate for the value of:

(a) $\dfrac{48.1 \times 11.2}{4.75}$

(b) $\dfrac{5.23 \times 630.1}{3.34 - 2.12}$

(c) $\dfrac{3.51 \times 16.12}{28.14 \div 6.412}$

(d) $\dfrac{23.11 \times 6.4 - 17.54}{9.32 - 1.76^2}$

(e) $\sqrt{\dfrac{84.16 + 0.965}{27.54 - 5.21}}$

(f) $\dfrac{1.54^{3.87} + (0.12 \times 43.11)}{\sqrt{99.423}}$

Q2 Martha has estimated answers to the following questions but has made some mistakes as she didn't show her working. Show the calculation Martha should have used and find which of her estimates were wrong.

Question	Martha's Estimate	Calculation	Right or Wrong?
23% of 486	150		
£0.52 × 67	£70		
11.242 × 7.65	80		
67% of 323.42	210		
$(3.2^2 \times 1.87^3) \times 0.48$	36		
217.12 ÷ 0.1086	20		

Fluency Practice

Q3 Kasim wants to estimate the number of words in a book which has 534 pages. He selects a page at random and finds that it has 28 lines. He selects one of those lines at random and counts 12 words.

Use this information to estimate the number of words in the book.

Q4 Paddy estimates the square root of 75 as being around 8.6.

Explain whether this a sensible estimate.

Q5 Light travels at 299,792,458 m/s in a vacuum. It takes approximately 497 seconds for light to reach Earth from the Sun. Estimate the distance from the Earth to the Sun and explain whether this is an overestimate or an underestimate.

Q6 Estimate the total weight of two million pounds worth of two pence coins in kilograms. A two pence coin weighs 7.1g.

Explain whether your answer is an overestimate or an underestimate.

Q7 Michael has organised a musical evening at his school. He sold 186 tickets costing £4.50 each and paid costs of £82 on the refreshments he provided.

(a) Estimate the total profit Michael made at the musical evening.

(b) Explain whether your answer to (a) is an underestimate or an overestimate?

Q8 Estimate how many hours of television an average person in the UK will watch by the time they are 15 years old.

You must state all your assumptions.

Explain whether your answer is an overestimate or underestimate based on your assumptions.

Fluency Practice

estimating answers to multiplication and division sums

ten of these answers are correct and the other ten are wrong
use approximation and estimation to mark each answer right or wrong

1.) 68 × 59 = 4,012

2.) 495 ÷ 55 = 90

3.) 359 × 64 = 22,976

4.) 589 × 31 = 1,589

5.) 562 × 63 = 30,406

6.) 306 × 7,235 = 2,213,910

7.) 986 ÷ 184 = 17

8.) 3,591 ÷ 63 = 47

9.) 26^3 = 27,576

10.) 1,645 ÷ 235 = 82.5

11.) 0.48 × 365 = 175.2

12.) 5.6 × 8.2 × 0.24 = 9.0208

13.) 14.76 ÷ 3.6 = 4.1

14.) 30.4 ÷ 0.32 = 95

15.) 52,640.1 ÷ 254.3 = 187

16.) 17.1 ÷ 67.819 = 0.232141…

17.) 55.38 ÷ 7.8 = 71

18.) 11.16 ÷ 3.1 = 3.6

19.) 35.8 × 6.95 = 24.881

20.) 23.6 × 2.58 = 60.888

estimating answers to multiplication and division sums

work out estimated answers by approximating the numbers to 1 significant figure
when dividing, approximate the divisor to a (closer) convenient number

1.) 781 × 23 ≈

2.) 36 × 412 ≈

3.) 2,826 × 52 ≈

4.) 34 × 4,872 ≈

5.) 7,536 × 5,256 ≈

6.) 17,827 × 2,387 ≈

7.) 674, 698 × 8,132 ≈

8.) 23,562 × 1,784 ≈

9.) 265 × 345 × 9,556 ≈

10.) 5846 × 29 × 4,764 ≈

11.) 6845 ÷ 362 ≈

12.) 31,889 ÷ 1456 ≈

13.) 531,624 ÷ 261 ≈

14.) 8,554,239 ÷ 4,456 ≈

15.) 7,223,865 ÷ 3,512 ≈

16.) 384 × 6,231 ÷ 238 ≈

17.) 346 × 8,724 ÷ 441 ≈

18.) 685 × 1,243 ÷ 354 ≈

19.) 3,245 × 2,108 ÷ 146 ≈

20.) 7,545 × 7,208 ÷ 1,435 ≈

Fluency Practice

Sammy's Square Fields

Sammy wants to build **square** fields for her livestock.
She will use 1 metre long pieces of fence.

1 metre

To the **nearest integer**, how long should the sides of each field be?

A

about
17 m^2

? metres

B

around
27 m^2

? metres

C

approximately
98 m^2

? metres

D

close to
5 m^2

? metres

E

roughly
66 m^2

? m

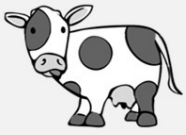
F

nearly
39 m^2

? metres

G

about
111 m^2



? metres

H

approximately
90 m^2

? metres

I

around
154 m^2

? metres

Exam Questions

Estimate the value of

$$\frac{68\times 401}{198}$$

Work out an estimate for

$$\frac{10.1\times 29.7}{5.9-3.1}$$

Work out an estimate for the value of

$$\frac{5.79\times 312}{0.523}$$

Work out an estimate for the value of

$$\frac{6.8\times 191}{0.051}$$

Without calculating, is

$$15.99 \div 3.99$$

A little more than 4, a little less than 4 or exactly 4?

Show that by estimating answers, all of these calculations have roughly the same answer.

21.3 x 5.03	$\frac{213}{1.93}$
50.4 x 1.95	**19.7 x 4.89**

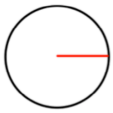
Without using a calculator, decide on the order of biggest to smallest.

2 Circles

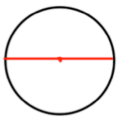
Fluency Practice

Question 1: Name the parts of the circle shown in each diagram

(a)

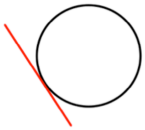
(b) 

(c)

(d) 

(e)

(f)

(g) 

(h)

(i)

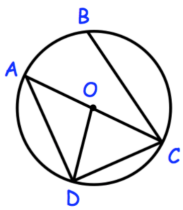
Question 2: Draw a diagram to show each of these parts of the circle

(a) Radius (b) Diameter (c) Circumference

(d) Chord (e) Segment (f) Tangent

(g) Sector (h) Arc

Question 4: Shown is a circle, centre O. What is the name given to each of the following straight lines.

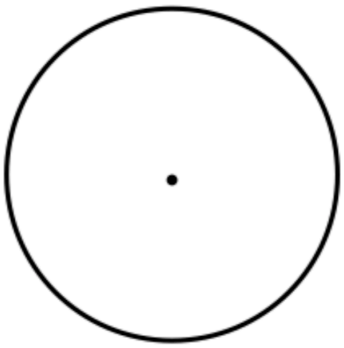


(a) OA (b) AC (c) CO (d) CD

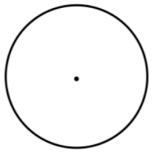
(e) CA (f) OD (g) AD (h) BC

Question 5: Measure the radius of each these circles.

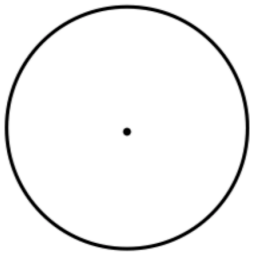
(a)



(b)

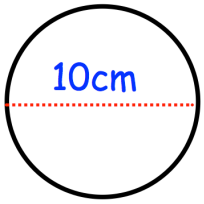


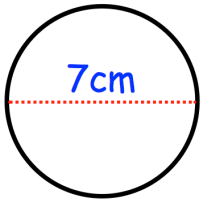
(c)

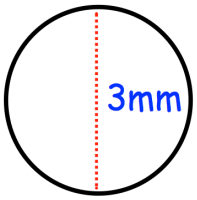


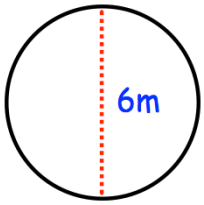
Fluency Practice

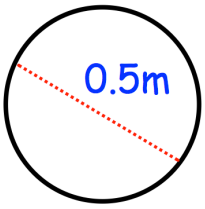
Question 1: Calculate the circumference of the following circles.
Give your answers to 1 decimal place.

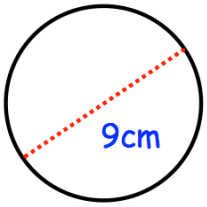
(a) 

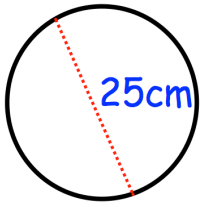
(b) 

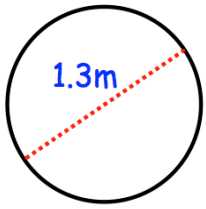
(c) 

(d) 

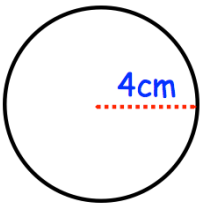
(e) 

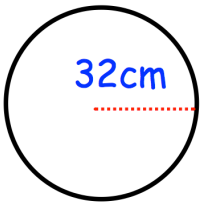
(f) 

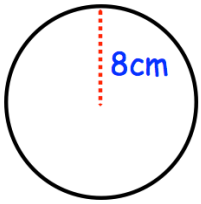
(g) 

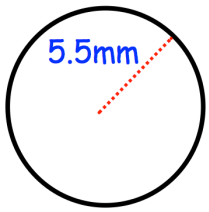
(h) 

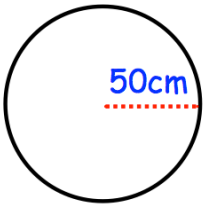
Question 2: Calculate the circumference of the following circles.
Give your answers to 1 decimal place.

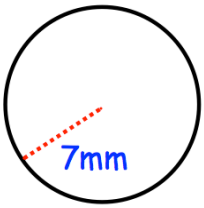
(a) 

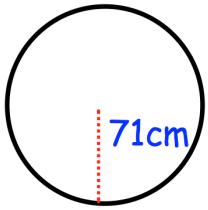
(b) 

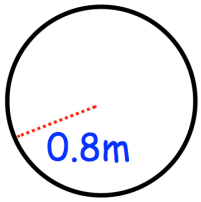
(c) 

(d) 

(e) 

(f) 

(g) 

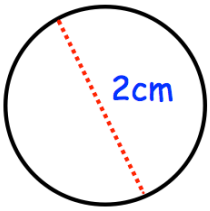
(h) 

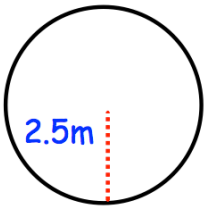
Question 3: Work out the circumference of the following circles.
Give your answers to 1 decimal place.

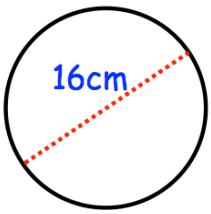
(a) A circle with diameter 2cm
(b) A circle with diameter 14m
(c) A circle with radius 3cm
(d) A circle with radius 0.15km
(e) A circle with diameter 90 inches
(f) A circle with radius 5.7 yards

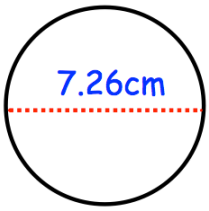
Fluency Practice

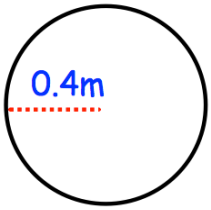
Question 4: Calculate the circumference of the following circles.
Give your answers to 1 decimal place.

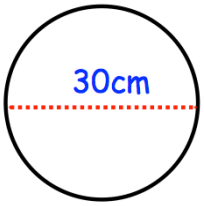
(a) 

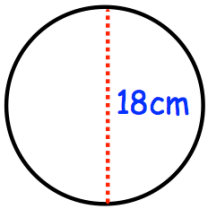
(b) 

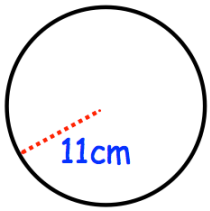
(c) 

(d) 

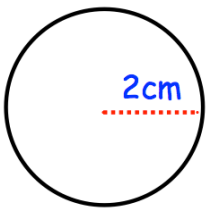
(e) 

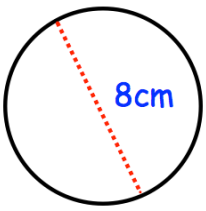
(f) 

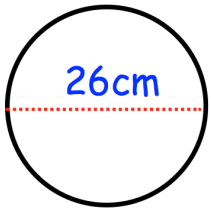
(g) 

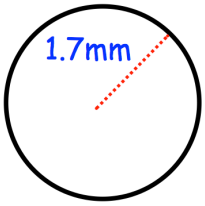
(h) 

Question 5: Calculate the circumference of the following circles.
Leave your answer in terms of π

(a) 

(b) 

(c) 

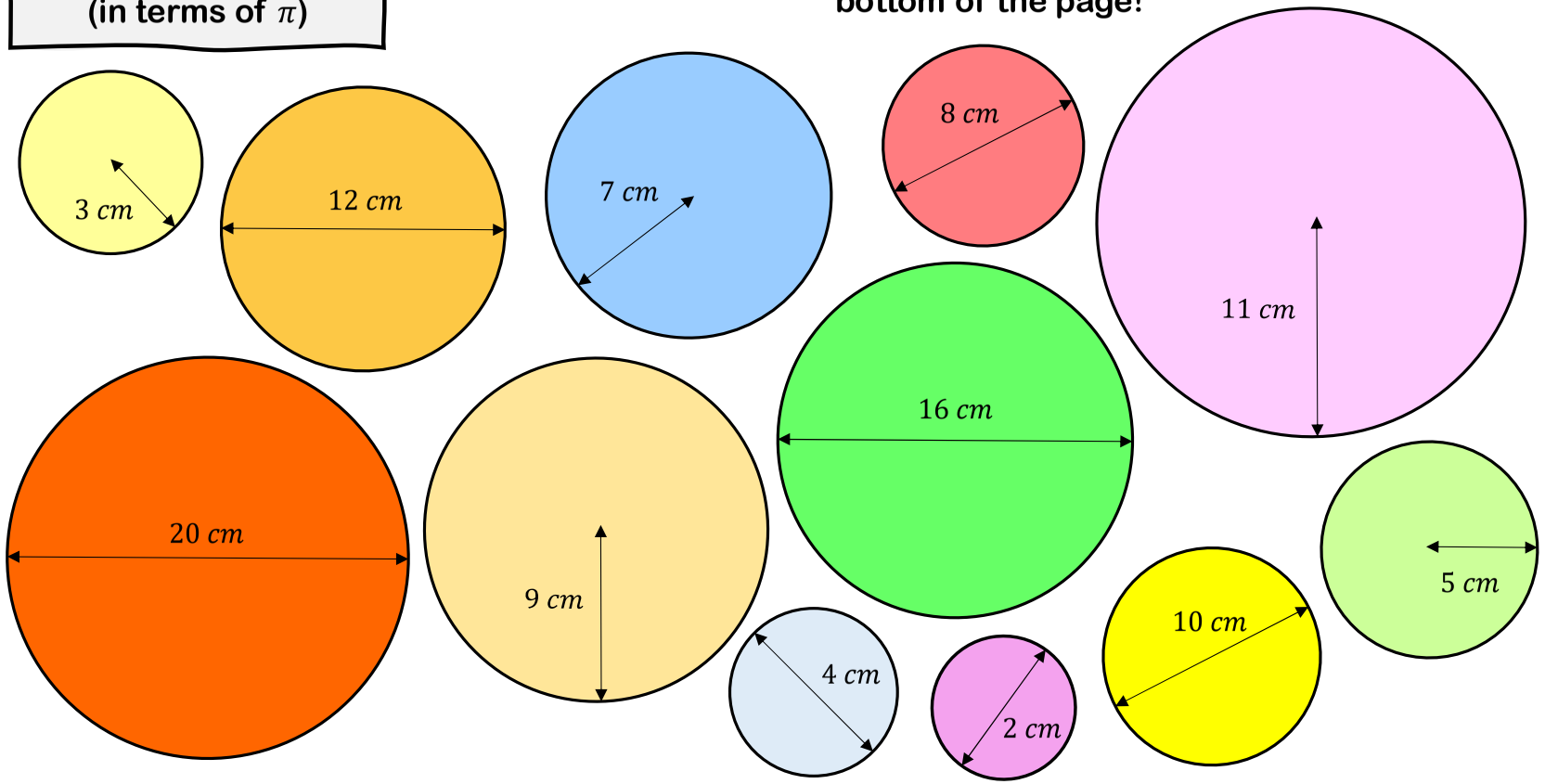
(d) 

Question 6: Work out the circumference of the following circles.
Leave your answer in terms of π

(a) A circle with diameter 12cm
(b) A circle with diameter 52cm
(c) A circle with radius 10cm
(d) A circle with diameter 3cm
(e) A circle with radius 4km

Area of a Circle
(in terms of π)

Calculate the area of each circle, and look for your answer at the bottom of the page!

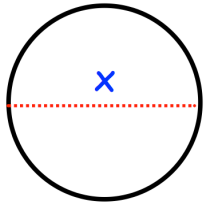


Answers!

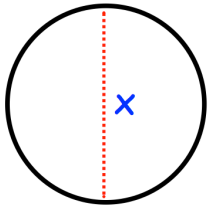
49π	121π	81π	25π	9π	π
25π	100π	36π	4π	16π	64π

Question 7: Find the size of the diameter for each of the following circles.
Give your answer to 2 decimal places.

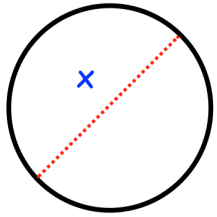
(a) Circumference = 12cm



(b) Circumference = 50cm

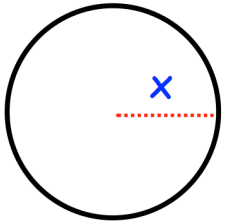


(c) Circumference = 3m

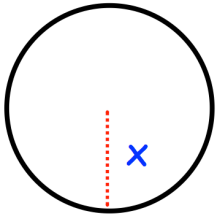


Question 8: Find the size of the radius for each of the following circles.
Give your answer to 2 decimal places.

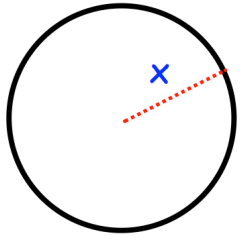
(a) Circumference = 80cm



(b) Circumference = 42m

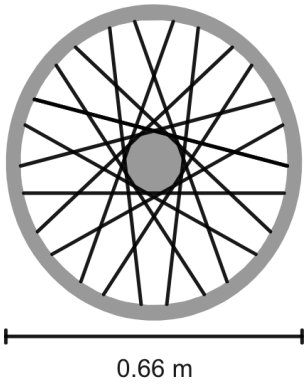


(c) Circumference = 2m



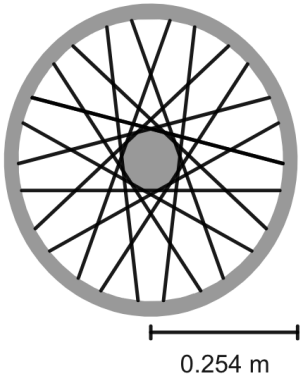
Fluency Practice

Logan has a bicycle with a wheel diameter of 0.66 m.



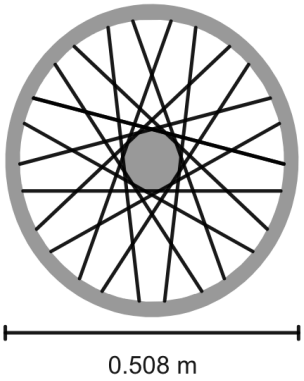
He rides for 700 metres.
Calculate how many full turns the wheel makes during his ride.

Mohammed has a bicycle with a wheel radius of 0.254 m.



He rides for 1200 metres.
Work out how many full turns the wheel needs to make to cover the whole distance.

Ewan has a bicycle with a wheel diameter of 0.508 m.



He rides for 2000 metres.
Work out how many full turns the wheel makes during his ride.

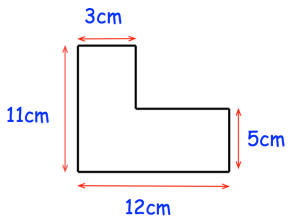
Fluency Practice

Question 1: A circular table top has a diameter of 85cm. Work out the circumference of the table top.

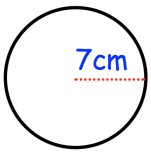
Question 2: A pizza has a circumference of 50cm. Work out the diameter of the pizza.

Question 3: A bicycle wheel has a diameter of 62cm. The wheel makes 80 complete revolutions.
How far has the bicycle travelled?
Give your answer in metres.

Question 4: Which shape has the greatest perimeter?



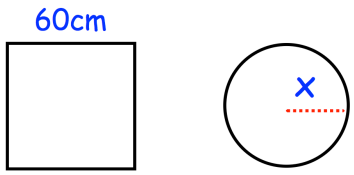
Shape A



Shape B

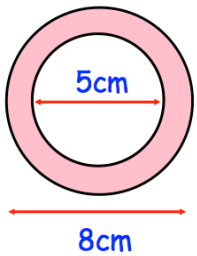
Fluency Practice

Question 5: The circle and the square have the same perimeter.
Calculate the value of x.

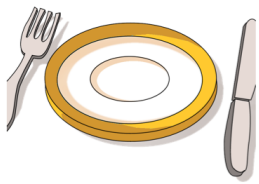


Question 6: A wheel has a diameter of 15cm.
The wheel travels 50 metres.
How many complete revolutions does the wheel complete?

Question 7: Calculate the perimeter of the pink shape.

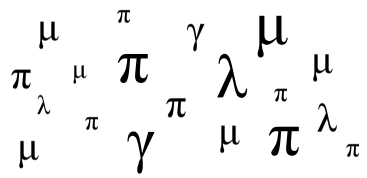
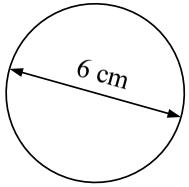
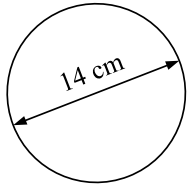
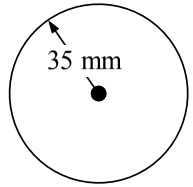
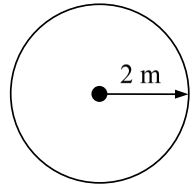


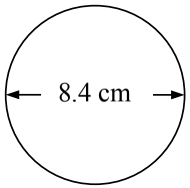
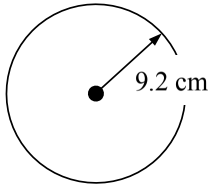
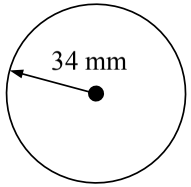
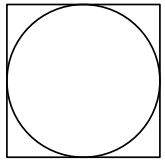
Question 8: Nicole is a wedding organiser.
The guests are to sit at circular tables with a diameter of 180cm.
Each guest needs 70cm around the circumference of the table.
There are 18 tables at the venue.
A total of 145 guests are attending the wedding.
Are there enough tables?



Question 9: The area of a circle is 40cm.
Calculate the circumference of the circle.

Question 10: The circumference of a circle is 1m.
Calculate the area of the circle.

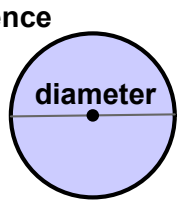
A1 Draw circles around the symbols for pi 	**A2** Write the value of pi correct to six decimal places.	**A3** Write the value of pi that your calculator displays.	**A4** Which of these fractions is the best approximation for pi? $\frac{10}{3}$ $\frac{22}{7}$ $\frac{55}{17}$ $\frac{355}{113}$ $\frac{333}{106}$ $\frac{555}{177}$
B1 Work out the length of the circumference. 	**B2** Work out the length of the circumference. 	**B3** Work out the length of the circumference. 	**B4** Work out the length of the circumference. 
C1 The circumference of a circle is 26 cm. Work out the length of the diameter.	**C2** The circumference of a circle is 28 m. Work out the length of the radius	**C3** The diameter of the London Eye is 120 metres. Work out the distance that a pod travels in one revolution.	**C4** A bicycle has a wheel with a diameter of 66 cm. How far will the bicycle travel if the wheel turns 50 complete revolutions. Give your answer to the nearest metre.

A1 Find the length of the circumference.  	**A2** A dinner plate has a diameter of 27 cm. Calculate the circumference of the plate.	**A3** The circumference of a circle is 74 cm. Calculate the length of the diameter of the circle.	**A4** Calculate the circumference of a 14-inch pizza.
B1 The diameter of a 10-pence coin is 24.5 mm. Calculate the circumference of the coin.	**B2** Find the length of the circumference.  	**B3** The distance between the pencil-tip and the point of a pair of compasses is set to 4.5 cm. Calculate the circumference of the circle that will be drawn.	**B4** The distance around a circular pond is 22 metres. Work out the diameter of the pond.
C1 Find the length of the circumference.  	**C2** The circumference of the earth is approximately 40 000 km. Calculate the distance from the surface to the centre of the earth.	**C3** A square has an area of 40 cm^2. Work out the circumference of the circle. 	**C4** Work out: $\frac{22}{7} - \pi$ Give you answer correct to 3 significant figures.

A1 The button on Keith's coat has a diameter of 14 millimetres. Find the button's circumference.	**A2** An igloo has a circular floor with a radius of 2.8 metres. Calculate the floor's circumference.	**A3** The circumference of an underground gas pipe is measured to be 145 cm. Calculate the diameter of the gas pipe.	**A4** A cylindrical tin has a diameter of 8.7 cm. The tin has a label which goes all the way round and has a 1 cm overlap. Calculate the length of the label.
B1 Tess makes a circular flower bed of diameter 4 metres. She puts a single line of paving blocks around the outside of the flower bed. Each block is 20 cm in length. How many blocks does she need to go around the whole flower bed?	**B2** The minute-hand of a clock is 18 cm long. Find the distance travelled by the tip of the minute-hand in 24 hours. Give your answer correct to the nearest metre.	**B3** The diameter of a car wheel is 62 cm. Work out the number of times the wheel rotates in a journey of 20 km.	**B4** An old oak tree has a diameter of 65 cm. Dawn wants to wrap yellow ribbon around the tree. How many metres of ribbon will she need if she wants the ribbon to go around the tree 100 times?
C1 A penny-farthing is a bicycle that has a large front wheel of diameter 132 cm and a much smaller rear wheel. During a journey, the front wheel makes 200 revolutions. How many metres does the penny-farthing travel?	**C2** Maggie has a marble with a diameter of 14 mm. She rolls her marble towards another marble that is 160 cm away. How many revolutions will Maggie's marble make before hitting the second one?	**C3** Two wire circles of diameters 15 cm and 10 cm are cut and then joined to make one large circle. Calculate the diameter of this larger circle.	**C4** It takes Pat 6 minutes to jog once around a circular track that has a diameter of 500 meters. Find Pat's average speed in metres per second.

Fluency Practice

learn by heart



The distance around a circle is called its **circumference**.

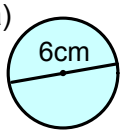
The circumference of a circle is π *times its diameter*, where π = 3.14159...

Formulas for circumference are $C = \pi d$ and $C = 2\pi r$

examples

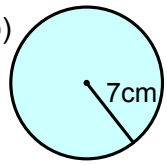
Work out the circumference of these circles both in terms of π and correct to the nearest 0.1cm.

a)



The **diameter** is 6cm
$C = \pi \times$ diamter
$C = \pi \times 6 = 6\pi$ **cm**
$C = 18.84955...$
$C = 18.8$**cm** (nearest 0.1 cm)

b)



The **radius** is 7cm
$C = 2 \times \pi \times$ radius
$C = 2 \times \pi \times 7 = 14\pi$ **cm**
$C = 43.98229...$
$C = 44.0$**cm** (nearest 0.1 cm)

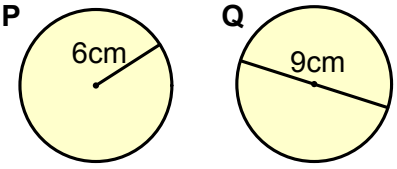
exercise

1. A circle has a radius of 8cm. What is its diameter?

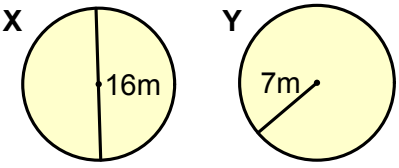
2. A circle has a diameter of 5cm. What is its radius?

3. For each pair of circles, which has the **largest diameter**?
   The circles are not drawn to scale.

   a)

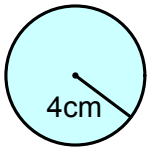
   

   b)

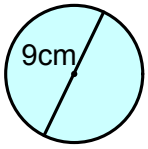
   

4. Work out the length of the circumference of these circles.
   Give your answers both in terms of π, and correct to the nearest 0.1cm.

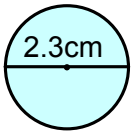
   a)

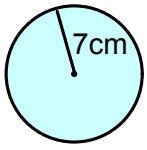
   b)

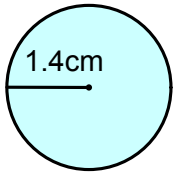
   c)

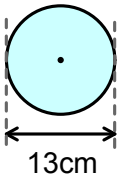
   d)

   e)

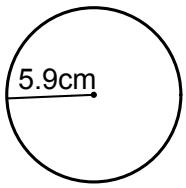
   

   f)

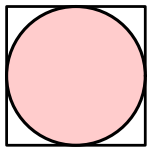
Fluency Practice

5. Jared **does not have a calculator**. Which calculation could Jared use to estimate the circumference of the circle?



A 3×6	**B** $2\times3\times6$	**C** $2\times3\times12$	**D** 3×3

6. The diagram shows a circle inside a square. The circle touches the square at four points. The area of the square is $36cm^2$.



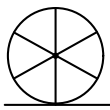
Work out the circumference of the circle correct to the nearest 0.1cm.

7. A group of people hold hands and form a circle.
Each person has an armspan of about 170cm.

Work out an estimate for the number of people required to form a circle with a diameter of 7m.

example

A wheel has a diameter of 40cm.
Work out how far the wheel travels in one full turn, correct to the nearest 1cm.



For a circular wheel, the distance travelled in a full turn equals its circumference.

Distance travelled $= \pi d$
$= \pi \times 40$
$= 126cm$ (nearest 1cm)

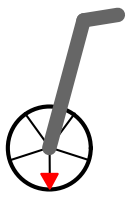
8. A wheel has a diameter of 25cm.

a) Work out how far the wheel travels in one complete turn correct to the nearest 0.1cm.

b) Work out how many complete turns the wheel makes if it travels 30 metres.

9. The wheels on Richard's bicycle each have a radius of 65cm.
Richard moves the bicycle forwards so that the wheels have completed five full turns.
Work out how far the bicycle has moved, **in metres**, correct to the nearest 10cm.

10. A trundle wheel measures the distance through which it is pushed. Each full turn of the wheel corresponds to a distance of 1m travelled.

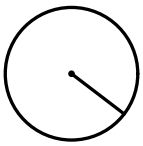


Work out the radius of the wheel, correct to the nearest cm.

Fluency Practice

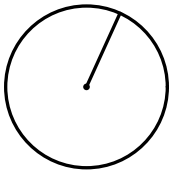
1. The circumference of each circle is given.
Work out the radius, correct to the nearest 0.1cm.

a)



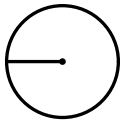
Circumference = 12.2cm

b)



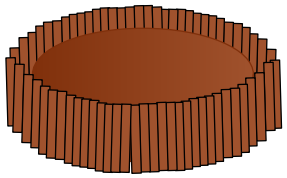
Circumference = 28cm

c)



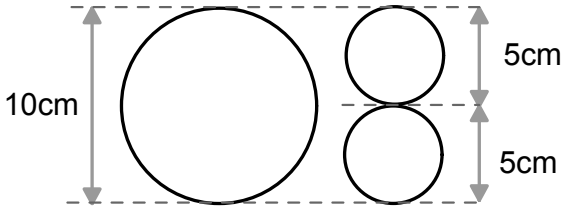
Circumference = 1.4cm

2. Deanna has a circular cake with a diameter of 20cm.
She is going to place chocolate fingers upright around the edge of the cake, as shown in the diagram.
Each chocolate finger has a thickness of 0.7cm.



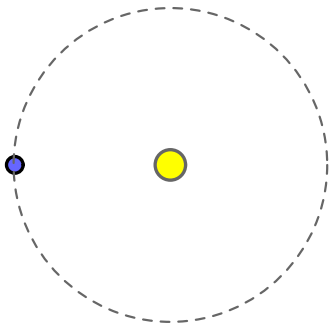
Approximately how many chocolate fingers will Deanna need?

3. The diagram shows three circles. The larger circle has a diameter of 10cm and the smaller circles each have a diameter of 5cm.



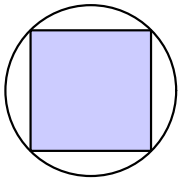
Which is larger: the circumference of the large circle, or the *total* circumference of the two smaller circles?

4. a) The distance from the earth to the sun is approximately (1.5×10^8) km. Assuming the earth's orbit is a circle, work out the distance travelled by the earth in one year.
Answer in standard form correct to 2 significant figures.



b) The distance from the earth to the moon is approximately (3.8×10^5) km. Work out the distance travelled by the moon each time it orbits the earth.
Answer in standard form correct to 2 significant figures.

5. Each vertex of a square lies on a circle.
The square has a perimeter of 12cm.
Work out the circumference of the circle correct to the nearest 0.1cm.

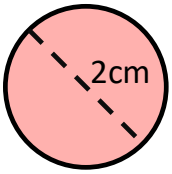


Fluency Practice

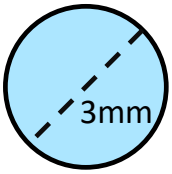
Q1

Work out the circumference of each of the following circles.

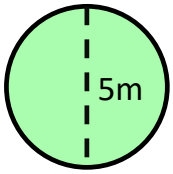
[a]



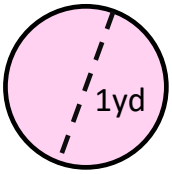
[b]



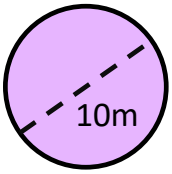
[c]



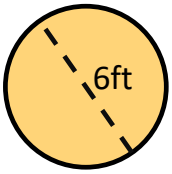
[d]



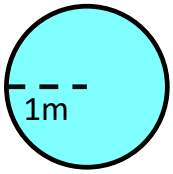
[e]



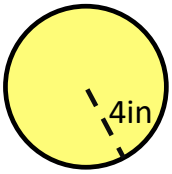
[f]



[g]



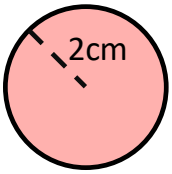
[h]



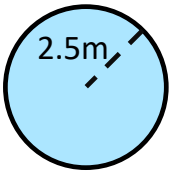
Q2

Work out the circumference of each of the following circles.

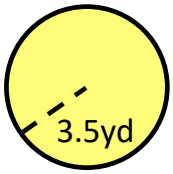
[a]



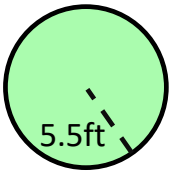
[b]



[c]

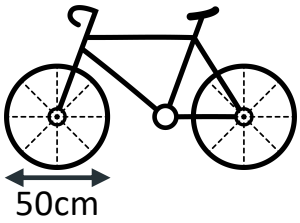


[d]



Q3

The diameter of a bicycle wheel is 50 cm.
How many complete rotations does it make over a distance of 3km?

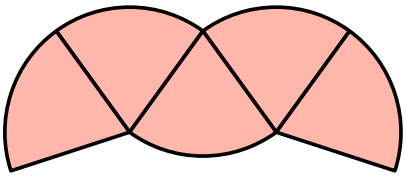


Q4

A rope is laid flat on the ground all around the Earth so that it is connected at both ends. The Earth's circumference is approximately 40,000km long. If the rope was lifted to one metre above the surface, how much more rope would you need to connect it up again?

Q4

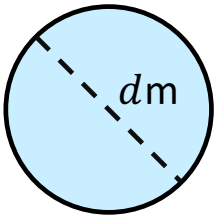
The following pattern has been formed from a circle, with diameter 6cm, that has been broken up into five congruent sectors.
Calculate the perimeter of the pattern to four decimal places.



Fluency Practice

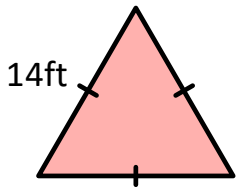
Ex3

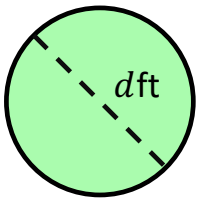
Find the diameter of the circle given that the circumference is 30m, giving your answer to two decimal places.



Q1

The following triangle and circle have the same perimeter. Find the diameter, $d$ft, of the circle to one decimal place.

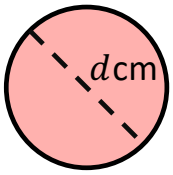




Q2

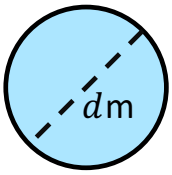
Work out the diameter of each of the following circles, given their circumference.

[a]



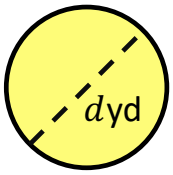
Circumference 50cm

[b]



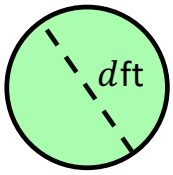
Circumference 12m

[c]



Circumference 60πyd

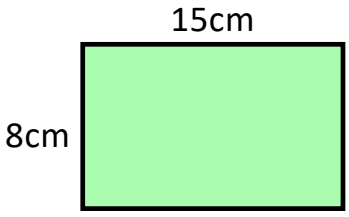
[d]

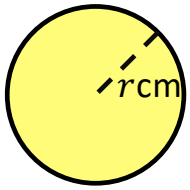


Circumference 15πft

Q3

The rectangle and the circle have the same perimeter. Calculate the value of r, correct to two decimal places.





Q4

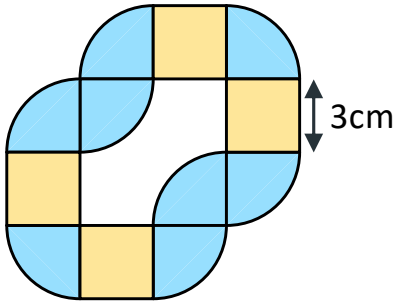
A lighthouse has circumference 47.1m. Workout the diameter of the lighthouse.

Q5

A square and a circle have the same perimeter. The area of the square is 49cm2. Find the radius of the circle.

Q6

The following pattern is made up of quarter-circles and squares.
Calculate the total length of both the outside and inside perimeters of the pattern, giving your answer in terms of π.

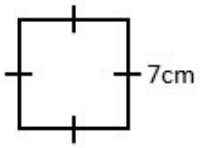


Areas of Circles

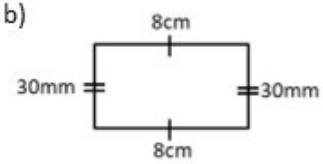
1. Factual recall

Calculate the area of these shapes:

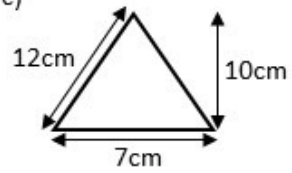
a)



b)



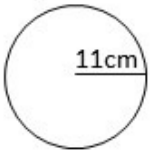
c)



2. Carry out a routine procedure

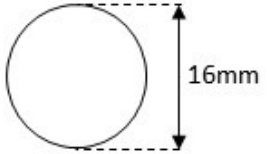
Calculate the area.
Leave your answer to 2 d.p.

a)



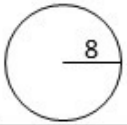
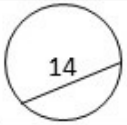
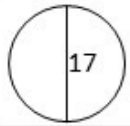
b)

c)



3. Classify some mathematical object

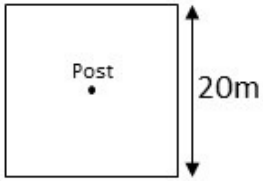
State whether the following calculations for the area are true or false.

Circle	Calculation
	$A = \pi \times 8^2$ $A = \pi \times 16$ ⋮
	$A = \pi \times 7^2$ ⋮
	$A = \pi \times 17^2$ ⋮

4. Interpret a situation or answer

A sheep is tethered to a post by a rope of length 9m, at the centre of a square field. (See the diagram below).

What percentage of the field can the sheep graze on?



5. Prove, show, justify

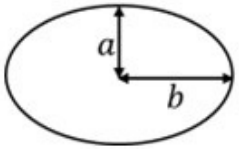
The circumference of a circle has a length of $56.549cm$.

Show that the area of this same circle is $254.47cm^2$ when rounded to 2 d.p.

6. Extend a concept

The area of an ellipse is given by the formula:

$$A = \pi ab$$



Assuming the earth takes an elliptical orbit around the sun, with the sun at the centre of the ellipse. Calculate the area bounded by the earth's orbit.

Maximum distance from the sun:
$= 1.52 \times 10^8$ Km
Minimum distance from the sun:
$= 1.47 \times 10^8$ Km

7. Construct an instance

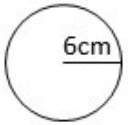
The area of a circle is $452.39\ cm^2$ rounded to 2 d.p.

Sketch the circle and label it with the radius.

8. Criticise a fallacy

A student attempted the following question:

> Calculate the area of the circle. Leave your answer to 2 d.p.



$A = \pi r^2$
$= \pi \times 6^2$
$= 113.09733\ldots$
$= 113.09\ cm^2$

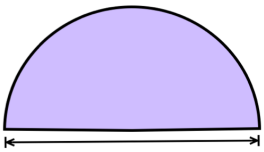
Are they correct? Explain.

Fluency Practice

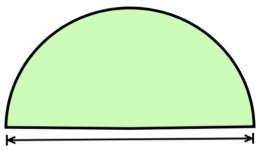
Fluency Practice

Question 1: Calculate the perimeter of each of these semi-circles.
Give your answers to 1 decimal place and include suitable units.

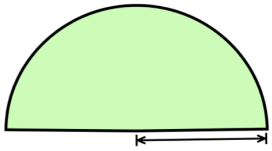
(a)



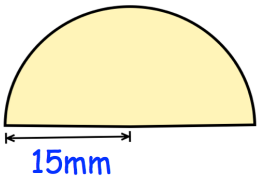
(b)



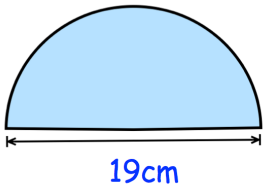
(c)



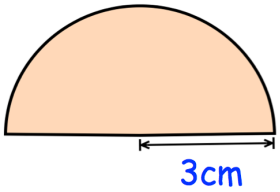
(d)



(e)

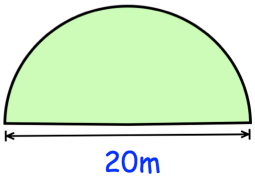


(f)

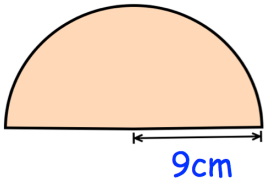


Question 2: Work out the perimeter of each of these semi-circles.
Give your answers in terms of **π** and include suitable units.

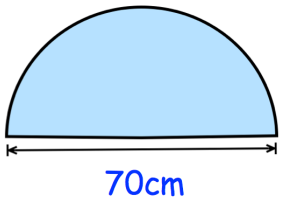
(a)



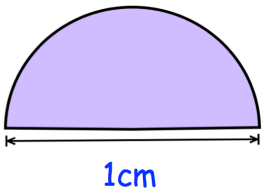
(b)



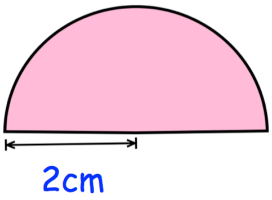
(c)



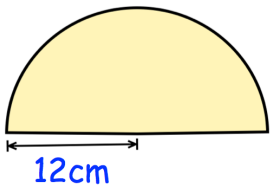
(d)



(e)

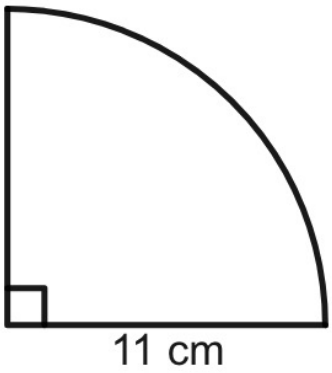


(f)



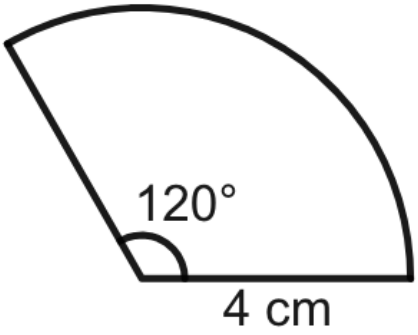
Fluency Practice

Work out the perimeter of the shape drawn below.



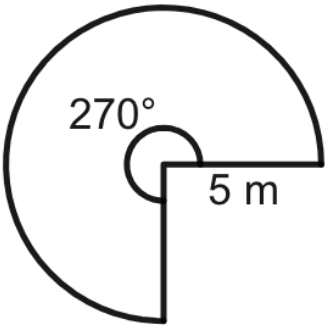
Give your answer correct to 1 decimal place.

Work out the perimeter of the shape drawn below.



Give your answer correct to 1 decimal place.

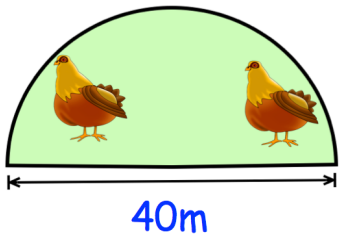
Find the perimeter of the shape drawn below.



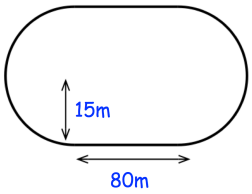
Give your answer correct to 1 decimal place.

Fluency Practice

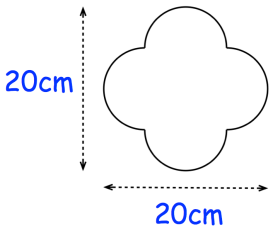
Question 1: Farmer Jones is building a pen for his chickens.
Each metre of fencing costs £3
Work out the total cost of building the pen.



Question 2: Newtown Primary School has a running track.
Calculate the distance around the running track.

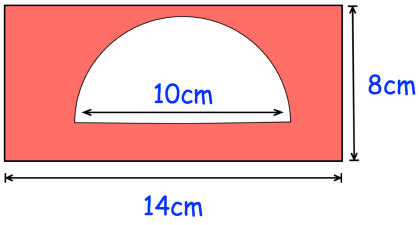


Question 3: Calculate the perimeter of this shape

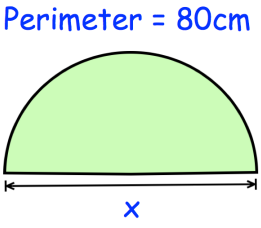


Question 4: Jamie makes a picture frame by cutting a semi-circle out of a rectangular piece of wood. The picture will be placed in the semi-circular region.

Jamie wants to put gold trim around entire picture frame and also around the picture. What length of gold trim does Jamie need?



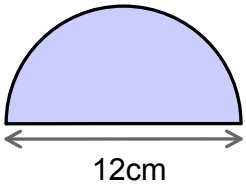
Question 5: A semi-circle has a perimeter of 80cm.
Calculate x



Fluency Practice

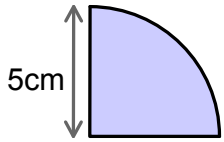
examples

Work out the perimeter of each shape in terms of π.



Curved length $= \frac{\pi \times 12}{2} = \frac{12\pi}{2} = 6\pi$

Perimeter $= (6\pi + 12)$ cm

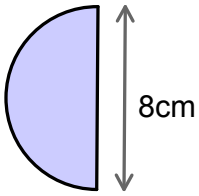


Curved length $= \frac{2 \times \pi \times 5}{4} = \frac{10\pi}{4} = \frac{5\pi}{2}$

Perimeter $= \frac{5\pi}{2} + 2 \times 5 = \left(\frac{5\pi}{2} + 10\right)$ cm

1. Work out the perimeter of each shape, giving your answers in terms of π.

a)



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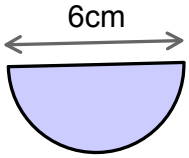

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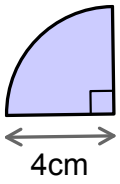
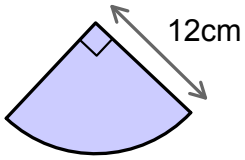


d)



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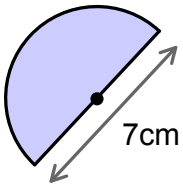
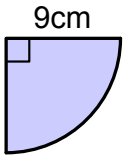
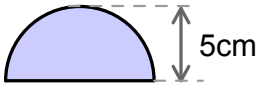


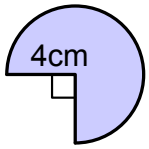
f)



g)

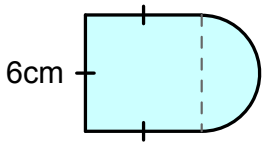


h)



2 The following shapes are formed from squares, semicircles and quarter circles.
Work out the perimeter of each shape in terms of π.

a)



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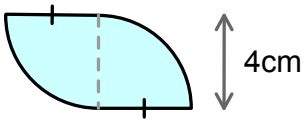

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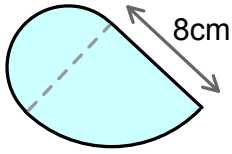
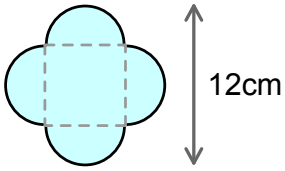
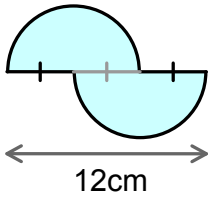


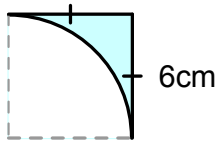
d)



e)



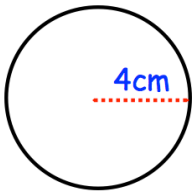
f)



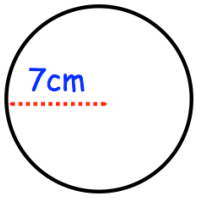
Fluency Practice

Question 1: Calculate the area of the following circles. Give your answers to 1 decimal place.

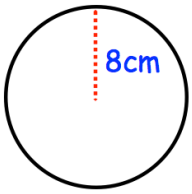
(a)



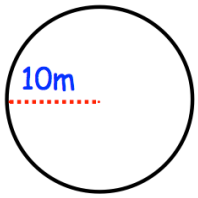
(b)



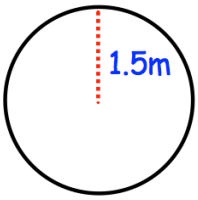
(c)



(d)



(e)



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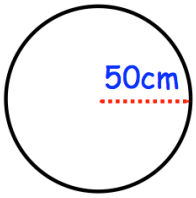
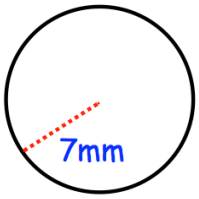
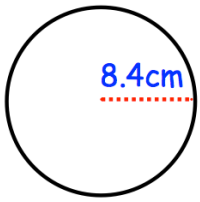


(g)

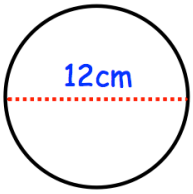


(h)

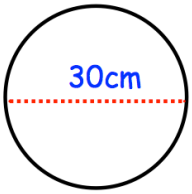


Question 2: Calculate the area of the following circles. Give your answers to 1 decimal place.

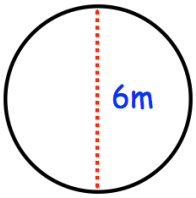
(a)



(b)



(c)



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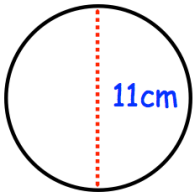

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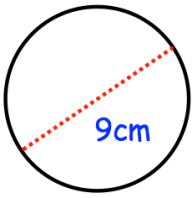

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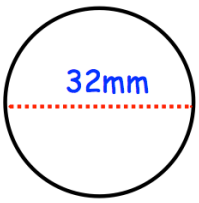

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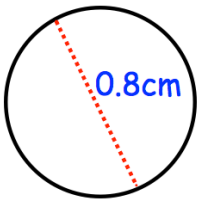

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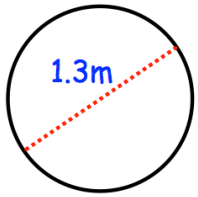


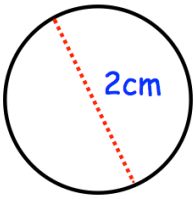
Question 3: Work out the area of the following circles. Give your answers to 1 decimal place.

(a) A circle with radius 9cm
(b) A circle with radius 12m
(c) A circle with diameter 40cm
(d) A circle with diameter 1km
(e) A circle with diameter 5 yards
(f) A circle with radius 10.5m

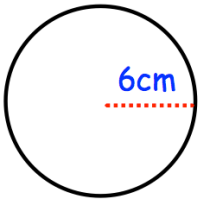
Fluency Practice

Question 4: Calculate the area of the following circles. Give your answers to 1 decimal place.

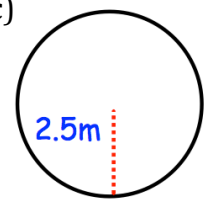
(a)



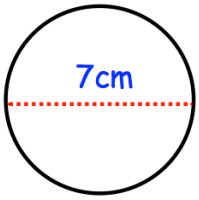
(b)



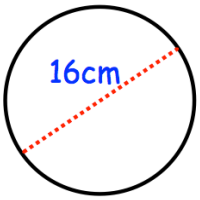
(c)



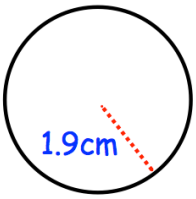
(d)



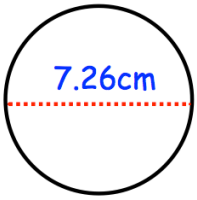
(e)



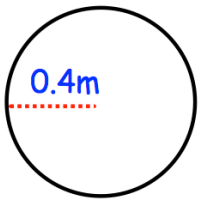
(f)



(g)

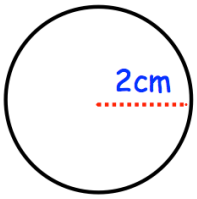


(h)

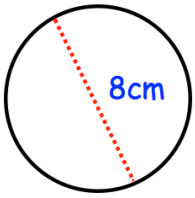


Question 5: Calculate the area of the following circles. Leave your answer in terms of π

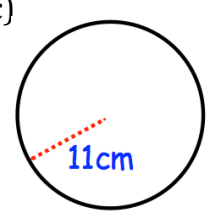
(a)



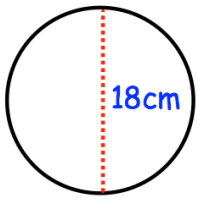
(b)



(c)



(d)



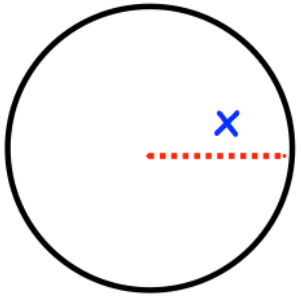
Question 6: Work out the area of the following circles. Leave your answer in terms of π

(a) A circle with radius 7cm
(b) A circle with radius 1cm
(c) A circle with diameter 10cm
(d) A circle with radius 3cm
(e) A circle with diameter 4cm

Question 7: Find the size of the radius for each of the following circles.
Give your answer to 2 decimal places.

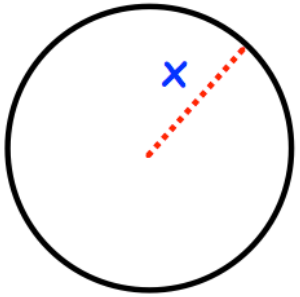
(a)

Area = $20cm^2$



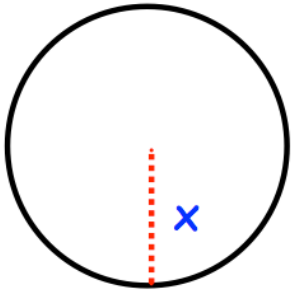
(b)

Area = $65cm^2$



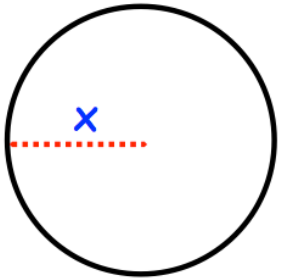
(c)

Area = $100cm^2$



(d)

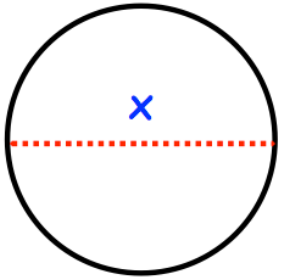
Area = $36\pi\ cm^2$



Question 8: Find the size of the diameter for each of the following circles.
Give your answer to 2 decimal places.

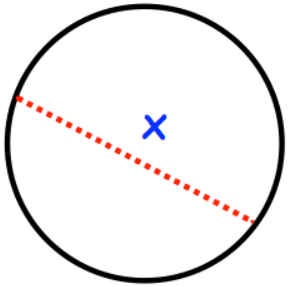
(a)

Area = $400cm^2$



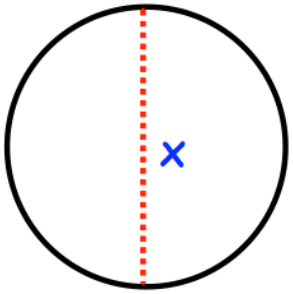
(b)

Area = $50cm^2$



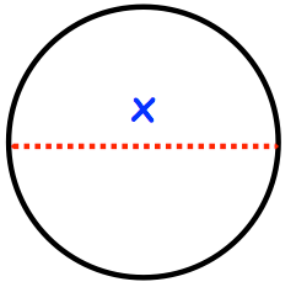
(c)

Area = $10cm^2$



(d)

Area = $16\pi\ cm^2$

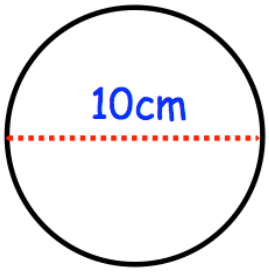


Fluency Practice

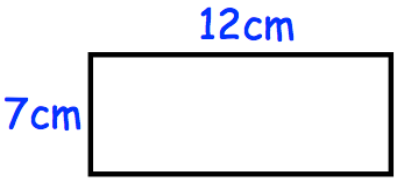
Question 1: A circular table top has a diameter of 90cm. Work out the area of the table top.

Question 2: A circular badge has radius 3cm. Calculate the area of the badge.

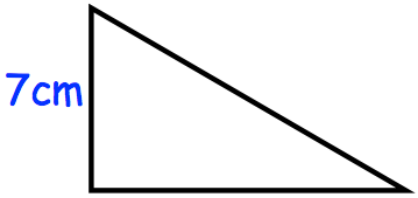
Question 3: Shown below is a circle, a rectangle and a right angled triangle.
Which shape has the greatest area?



Shape A



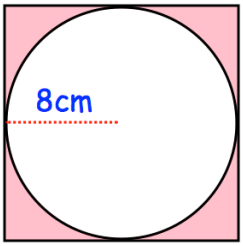
Shape B



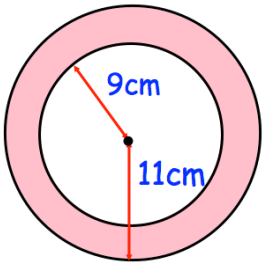
Shape C

Question 4: Calculate the shaded area for each shape below.

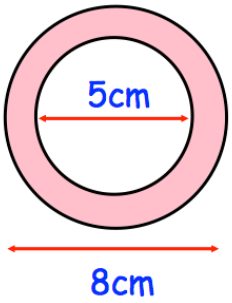
(a)



(b)

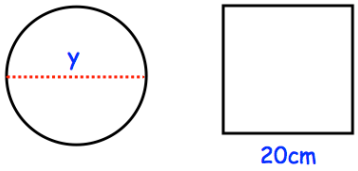


(c)



Fluency Practice

Question 5: The circle and square have the same area. Find y, the diameter of the circle.



Question 6: The circumference of a circle is 60cm.
Work out the area of the circle.

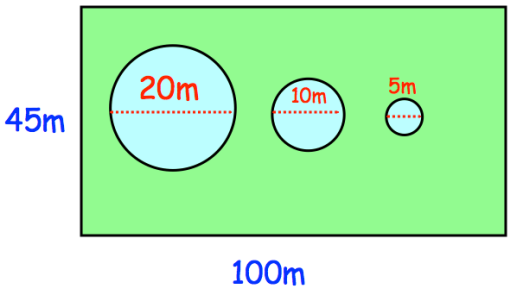
Question 7: The circumference of a circle is 1m.
Work out the area of the circle.

Question 8: The area of a circle is $80cm^2$.
Work out the circumference of the circle.

Question 9: The area of a circle is $2m^2$.
Work out the circumference of the circle.

Question 10: A rectangular lawn is 100m long and 45m wide.
There are 3 circular ponds, with diameters of 20m, 10m and 5m respectively.
Mrs Jones wants to cover the lawn with grass seed.
Each packet of grass seed covers $50m^2$ and costs £1.49

How much will it cost Mrs Jones to cover the lawn with grass seed?



Question 11: A circular plaque of diameter 6cm is cut from a square piece of metal with side length 6cm.

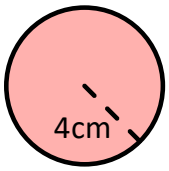
What percentage of the metal is wasted?

Fluency Practice

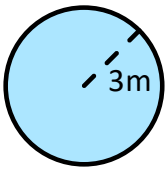
Q1

Work out the area of each of the following circles.

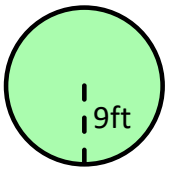
[a]



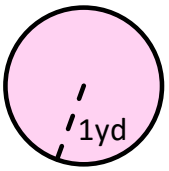
[b]



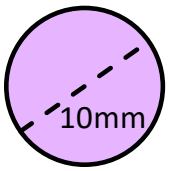
[c]



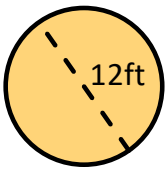
[d]



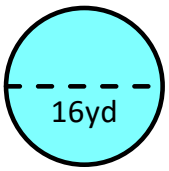
[e]



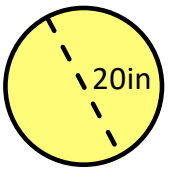
[f]



[g]



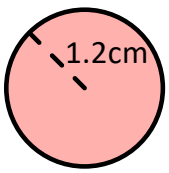
[h]



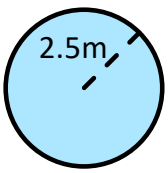
Q1

Work out the area of each of the following circles.

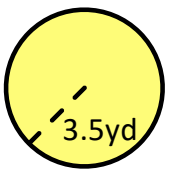
[a]



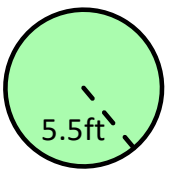
[b]



[c]



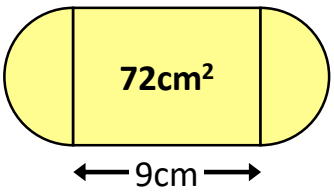
[d]



Q2

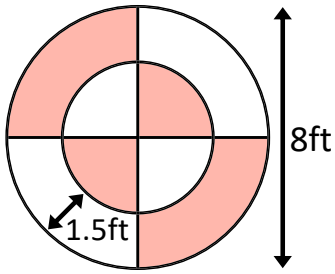
Shown below is a logo made from a rectangle and two semicircles.
The area of the rectangle is $72cm^2$.

Calculate the area of the logo.



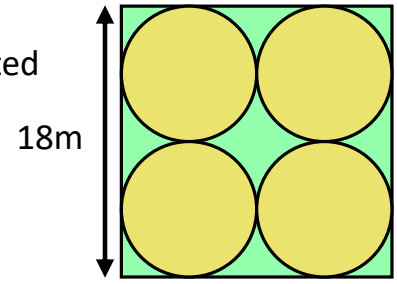
Q4

The following pattern is made from two concentric circles cut into quarters. Find the total area of the shaded regions leaving your answer in terms of π.



Q5

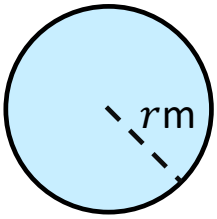
Shown below is the bird's-eye view of a square gated chicken farm with four, large, congruent circular chicken coops inside it. Each chicken requires an area of $1.5m^2$ in a coop. How many chickens can be kept in each coop?



Fluency Practice

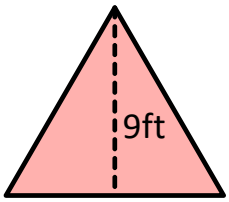
Ex3

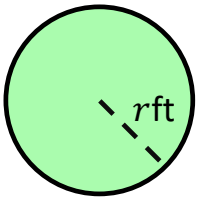
Find the radius of the circle given that the area is $121\pi m^2$, giving your answer to two decimal places.



Q1

The following triangle and circle have the same area. Find the radius, $r$ft, of the circle to one decimal place.

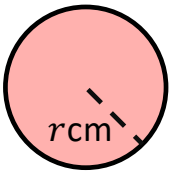




Q2

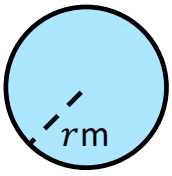
Work out the radius of each of the following circles, given their area.

[a]



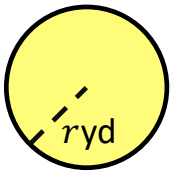
Area
$144\pi cm^2$

[b]



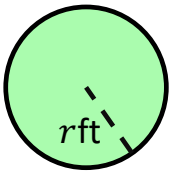
Area
$49\pi m^2$

[c]



Area
$150yd^2$

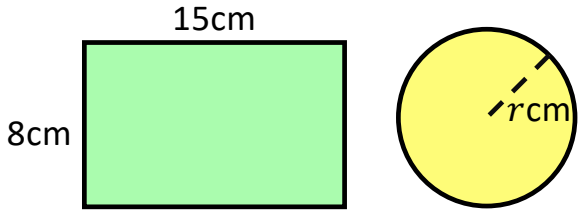
[d]



Area
$220ft^2$

Q3

The rectangle and the circle have the same area. Calculate the value of r, correct to two decimal places.



Q4

A lighthouse is in the shape of a cylinder. It's base area is $180m^2$.
Work out base diameter of the lighthouse.

Q5

A square and a circle have the same area.
The length of the square is 14cm. Find the radius of the circle.

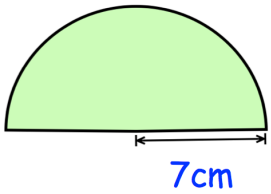
Q6

Winter hill transmitting station emits a signal in all directions covering an area of up to 8000 square miles. To the nearest mile, how far from the transmitting station does the signal reach?

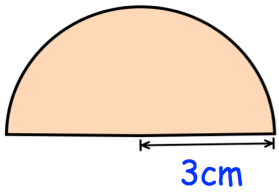
Fluency Practice

Question 1: Calculate the area of each of these semi-circles.
Give your answers to 1 decimal place and include suitable units.

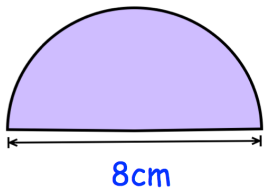
(a)



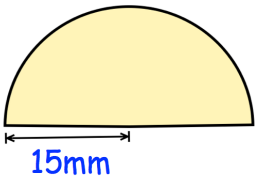
(b)



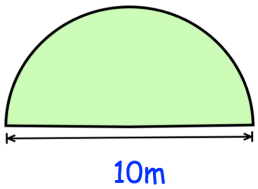
(c)



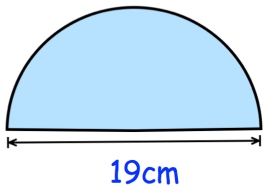
(d)



(e)

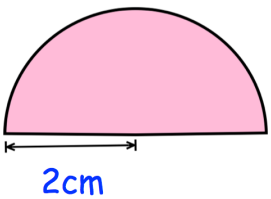


(f)

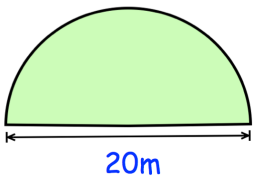


Question 2: Work out the area of each of these semi-circles.
Give your answers in terms of **π** and include suitable units.

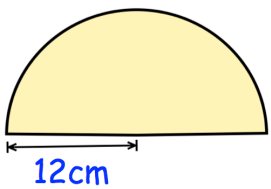
(a)



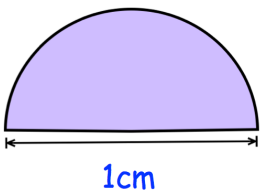
(b)



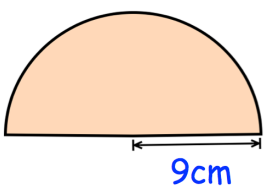
(c)



(d)



(e)



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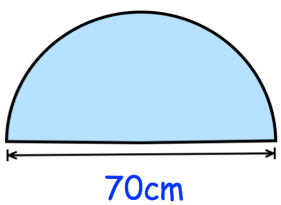
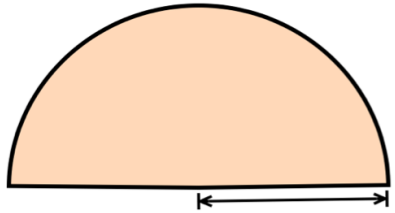


Question 3: Calculate the size of x.

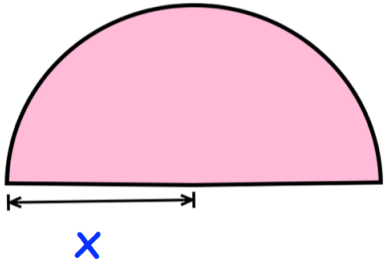
(a)

Area = 307.876cm²



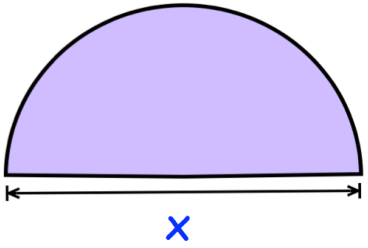
(b)

Area = 800cm²



(c)

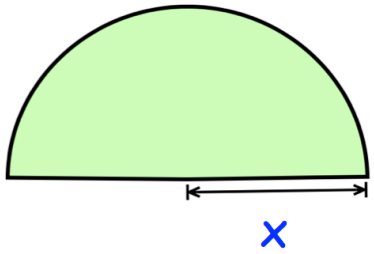
Area = 70cm²



Question 4: Work out the size of x.

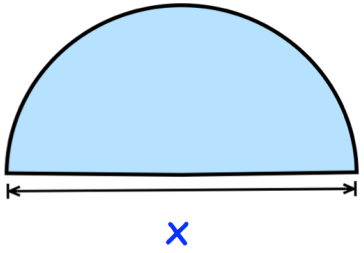
(a)

Area = 18π cm²



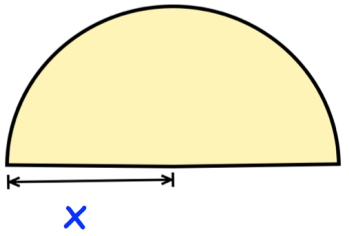
(b)

Area = 98π cm²



(c)

Area = 60.5π cm²



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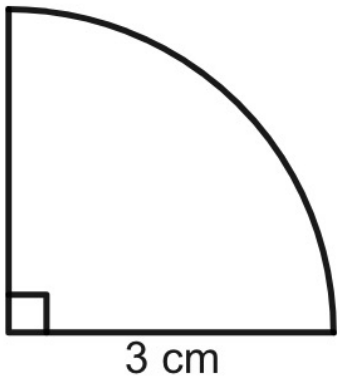
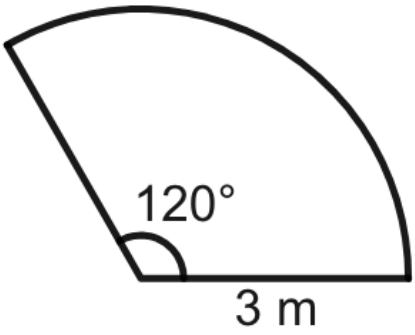
Fluency Practice

Work out the area of the shape drawn below.



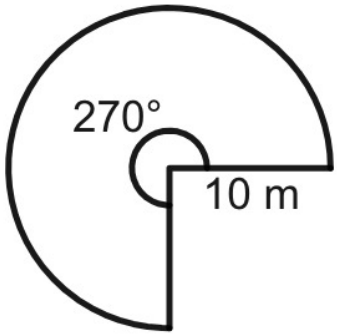
Give your answer correct to 1 decimal place.

Find the area of the shape drawn below.



Give your answer correct to 1 decimal place.

Find the area of the shape drawn below.

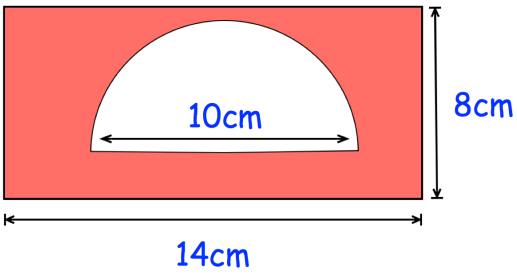


Give your answer correct to 1 decimal place.

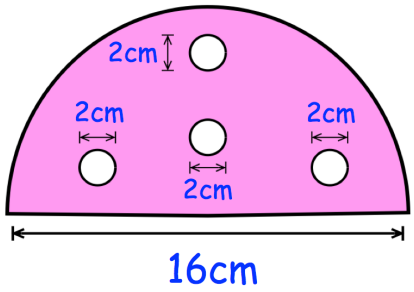
Fluency Practice

Question 1: Calculate the shaded area

(a)

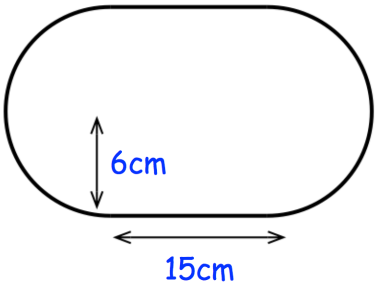


(b)

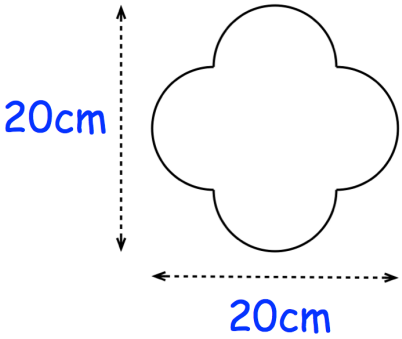


Question 2: Calculate the area

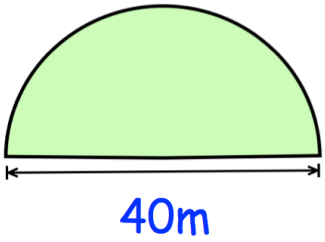
(a)



(b)



Question 3: Farmer Jenkins is planting a crop in his semi-circular field.
The seed costs £0.80 per square metre.
When fully grown, Farmer Jenkins can sell the crop from $4m^2$ for £45
Calculate the profit he should make.



Fluency Practice

learn by heart

The area of a circle is equal to π times the square of its radius, where π = 3.14159265...

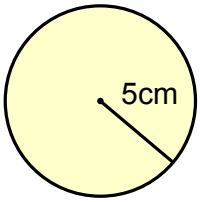
Area of a circle = πr^2

examples

If the diameter is given, first half it to find the radius

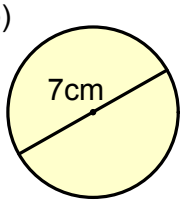
Work out the area of each circle,
Give your answers both in terms of π and correct to the nearest 0.1cm^2.

a)



$A = \pi r^2$
$A = \pi \times 5^2$
$A = 25\pi$ cm^2
$A = 78.5$cm^2
(nearest 0.1cm^2)

b)

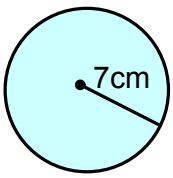


$r = \frac{7}{2}$
$A = \pi r^2$
$A = \pi \times \left(\frac{7}{2}\right)^2$
$A = \frac{49}{4}\pi$ cm^2
$A = 38.5$cm^2
(nearest 0.1cm^2)

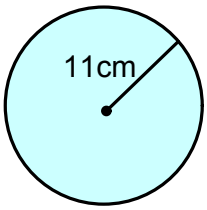
exercise

1. Work out the area of each circle.
Give your answers both in terms of π and correct to the nearest 0.1cm^2.

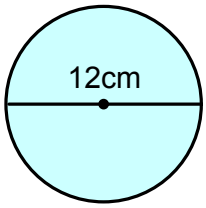
a)



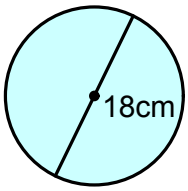
b)



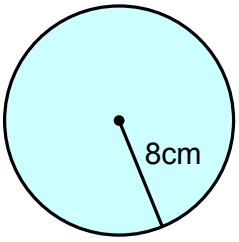
c)



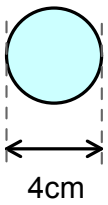
d)



e)

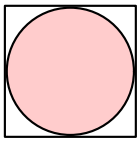


f)



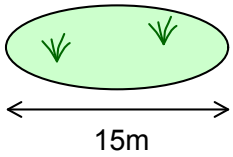
2. Work out the area of a circle with radius 3cm.
Give your answer correct to the nearest 0.01cm^2.

3. The diagram shows a circle inside a square with a **perimeter** of 36cm.
Work out the area of the circle correct to the nearest 0.1cm^2.



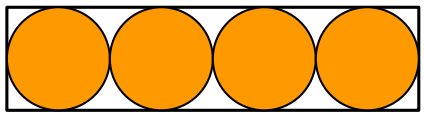
Fluency Practice

4. Anna needs to buy enough lawn seed to cover a circular lawn with a diameter of 15m.
A box of lawn seed costs £14.95 and can cover an area of 48m^2.



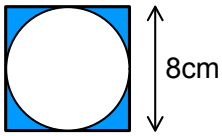
Work out how much it will cost Anna to buy enough of the lawn seed to cover the lawn.

5. The diagram shows four circles inside a rectangle.
The rectangle has a **perimeter** of 80cm.

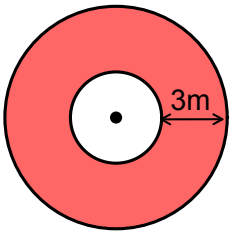


Work out the total area of the four circles in terms of π.

6. The diagram shows a circle inside a square.
The square has a side length of 8cm.
Work out the area of the shaded region correct to the nearest 0.1cm^2.



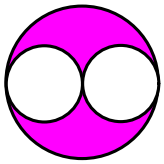
7. The diagram shows two circles with the same centre point.
The radius of the smaller circle is 2m.



a) Work out the area of the shaded region as a multiple of π.

b) Work out the percentage of the large circle that is shaded.

8. The diagram shows two identical circles inside a larger circle.
The radius of each small circle is 3cm.

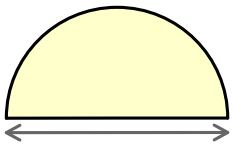


Work out the area of the shaded region in terms of π.

examples

Work out the area of each shape in terms of π.

a)



$r = 4$

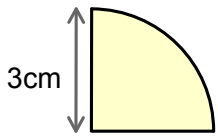
$A = \frac{\pi \times 4^2}{2}$

$A = \frac{16\pi}{2}$

$A = 8\pi \text{ cm}^2$

The area of a semicircle is half the area of a full circle.

b)



$r = 3$

$A = \frac{\pi \times 3^2}{4}$

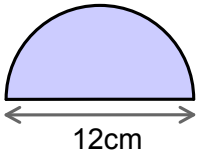
$A = \frac{9\pi}{4} \text{ cm}^2$

For a quarter circle, divide the area of the full circle by 4.

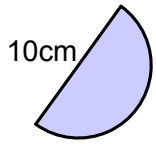
Fluency Practice

9. Work out the area of each shape in terms of π.

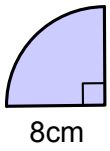
a)



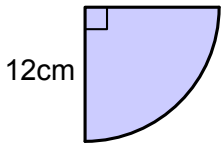
b)



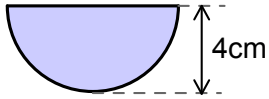
c)



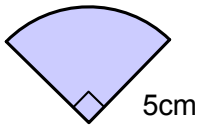
d)



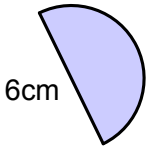
e)



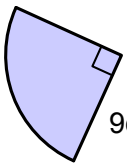
f)



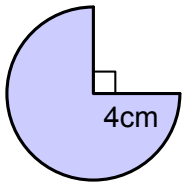
g)



h)

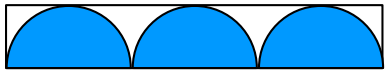


i)



10. Work out the area of a semicircle with a diameter of 40cm.
Give your answer in terms of π.

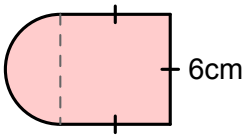
11. The 3 semicircles are arranged inside a rectangle.
The rectangle has a **perimeter** of 42cm.



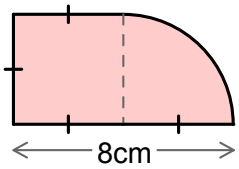
Work out the total area of the 3 semicircles in terms of π.

12. Work out the area of each shape in terms of π.

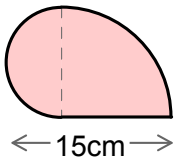
a)



b)

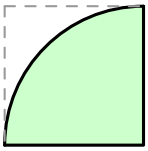


c)

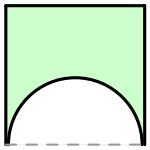


13. Work out the proportion of each square that is shaded.
Give your answers in terms of π.

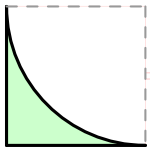
a)



b)



c)



d)

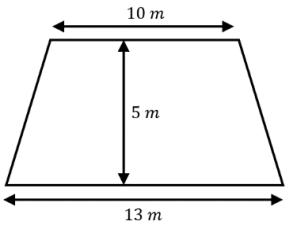
Fluency Practice

A farmer has a rectangular field of length 20 m and width 15 m. He wants to put a fence all the way around the outside of the field. Fencing is sold in 2 metre panels and costs £17.59 per panel. How much will it cost the farmer for his fence?

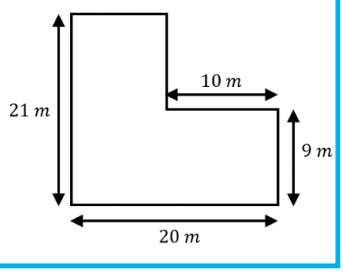
Colin has a circular pond of radius 1.3 metres. He wants to put an edging around the pond. Edging costs £12.99 per metre and is sold in one metre lengths. How much will it cost Colin to put the edging around his pond?

Layla has a semi-circular lawn with a diameter of 6.5 metres. She is going to spread fertilizer across all of the lawn. Fertilizer is sold in bags, and each bag covers an area of $5\ m^2$. How many bags of fertilizer does Layla need?

Jamal is going to paint his floor, which is in the shape of a trapezium. 1 litre of paint covers an area of $3\ m^2$ and the paint is sold in 2 litre tins for £8.99. How much will it cost Jamal to paint his floor?



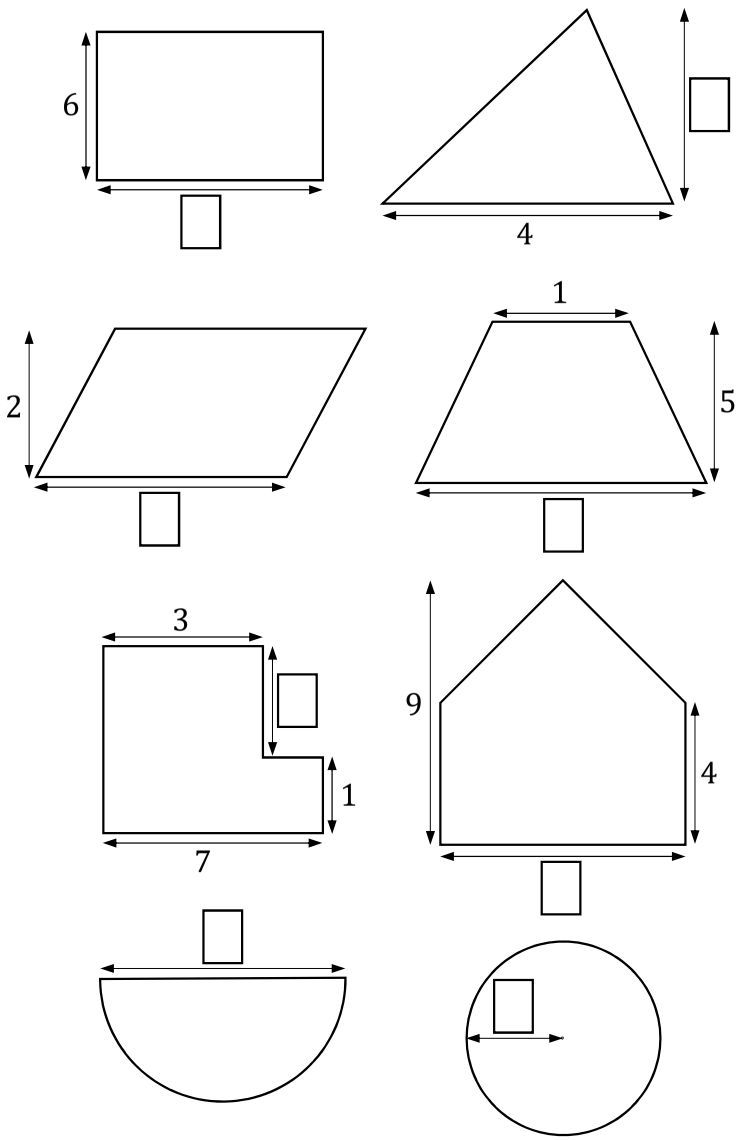
A school has an L-shaped playground, as shown. The caretaker is going to lay tarmac across the whole playground. Tarmac costs £3.12 per square metre. Work out the total cost of the tarmac the caretaker needs.



Changing Areas

- Choose a value greater than 1.
- Put the value into the boxes and calculate the areas of the shapes.
- Put the shapes in order from largest to smallest.
- Choose different values greater than 1 and repeat (you could try really large numbers, decimals or fractions).
- How does the order change each time? How does it stay the same?
- What do you notice about the areas of the triangle and the parallelogram? Explain why this may be happening.

- Pick any pair of shapes. Decide whether their areas are Always, Sometimes or Never equal, given that the values in the boxes are the same.
- Design 2 of your own shapes, each with a missing length, so that their areas are sometimes equal.



Intelligent Practice

1) A circle has a diameter of 10cm. What is its circumference?

2) A circle has a radius of 10cm. What is its circumference?

3) A circle has a radius of 10cm. What is its area?

4) A circle has an area of $10cm^2$. What is its radius?

5) A circle has an circumference of 10cm. What is its radius?

6) A circle has an circumference of 20cm. What is its radius?

7) A circle has an area of 20cm. What is its diameter?

8) A circle has an area of $40cm^2$. What is its diameter?

9) A semi-circle has an area of $40cm^2$. What is its diameter?

10) A semi-circle has an area of $40cm^2$. What is its arc length?

11) A semi-circle has an area of $40cm^2$. What is its perimeter?

12) A semi-circle has an arc length of 40cm. What is its perimeter?

13) A semi-circle has a perimeter of 40cm. What is its diameter?

14) A semi-circle has a perimeter of 40cm. What is its arc length?

15) A circle has a circumference of 40cm. What is its area?

16) A circle has an area of $40cm^2$. What is its circumference?

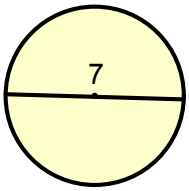
Fluency Practice

circles circumference & area matching

Match the area or circumference of each circle to its value below.

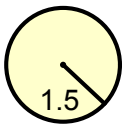
Some are in terms of π and others are rounded to 2 decimal places.

A



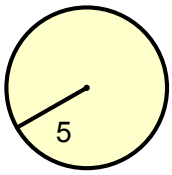
Circumference = _____

B



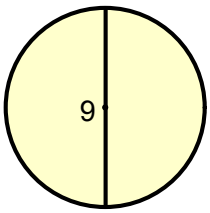
Circumference = _____

C



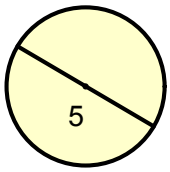
Area = _____

D



Area = _____

E

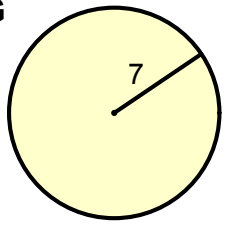


Circumference = _____

F

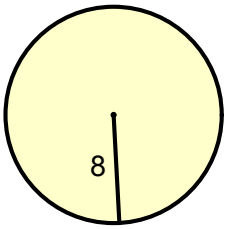
Area = _____

G



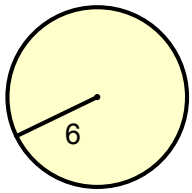
Circumference = _____

H



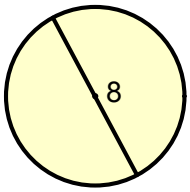
Area = _____

I



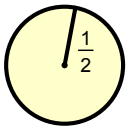
Circumference = _____

J



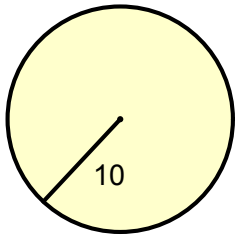
Area = _____

K



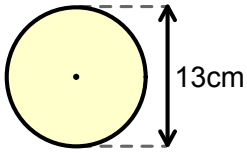
Area = _____

L



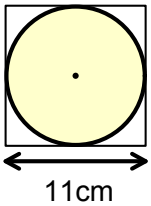
Area = _____

M



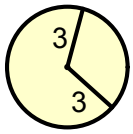
Area = _____

N



Circumference = _____

O



Circumference = _____

jumbled answers

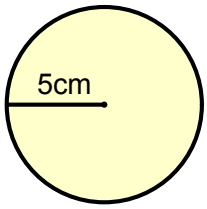
- 43.98
- 16π
- 63.62
- 3π
- 34.56
- 12π
- 18.85
- 132.73
- 7π
- π
- 0.79
- 100π
- 15.71
- 25π
- 201.06

Fluency Practice

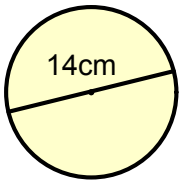
circles perimeter & area matching 2

Find the circumference / perimeter and area of each shape in terms of π.

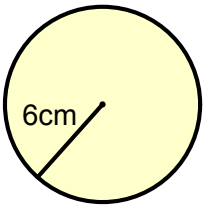
A



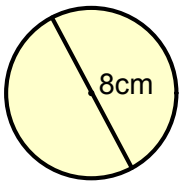
B



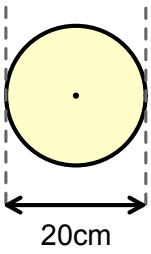
C



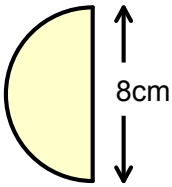
D



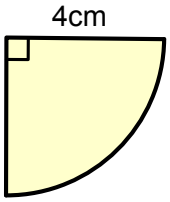
E



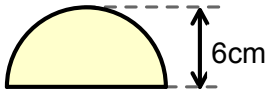
F



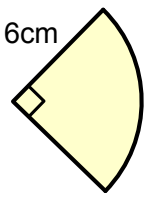
G



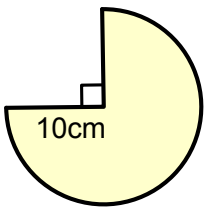
H



I



J



	Circumference or Perimeter (cm)	Area (cm^2)
A		
B		
C		
D		
E		
F		
G		
H		
I		
J		

jumbled answers

8π 8π 4π 2π + 8

6π + 12 12π 9π

100π 18π 49π 16π

25π 4π + 8 10π

3π + 12 14π 75π

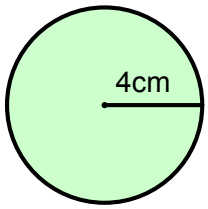
20π 36π 15π + 20

Fluency Practice

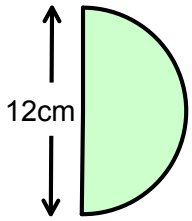
circles perimeter & area matching 3

Find the circumference / perimeter and area of each shape in terms of π.

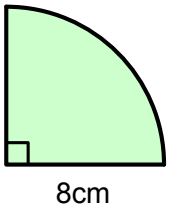
A



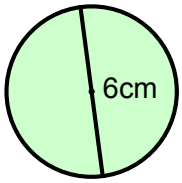
B



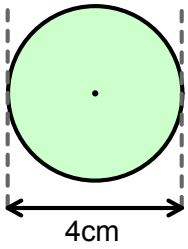
C



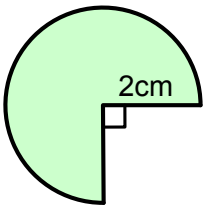
D



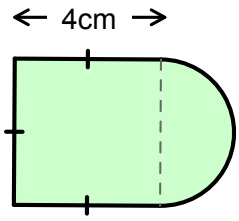
E



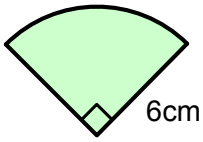
F



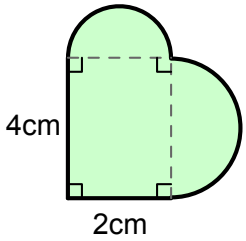
G



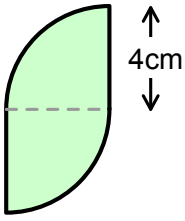
H



I



J



	Circumference or Perimeter (cm)	Area (cm^2)
A		
B		
C		
D		
E		
F		
G		
H		
I		
J		

jumbled answers

$3\pi + 6$ 8π $3\pi + 12$

9π $2\pi + 16$ $6\pi + 12$

$3\pi + 4$ 18π 4π 8π

16π 3π 6π $4\pi + 8$

9π $2\pi + 12$ 16π

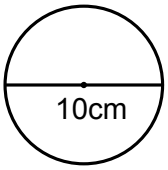
$\frac{5}{2}\pi + 8$ $4\pi + 16$ 4π

Fluency Practice

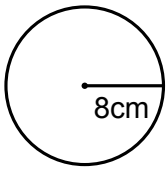
circles, semi circles, quarter circles

Give your answers in terms of π.

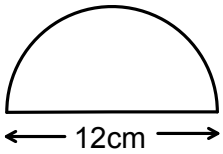
1. **Area** of a **full** circle, **diameter** given



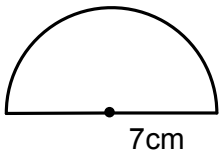
2. **Area** of a **full** circle, **radius** given



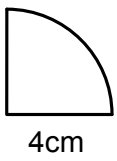
3. **Area** of a **semi**-circle, **diameter** given



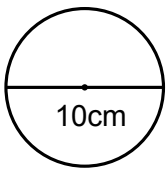
4. **Area** of a **semi**-circle, **radius** given



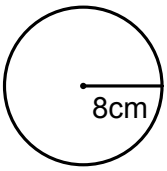
5. **Area** of a **quarter** circle, **radius** is given



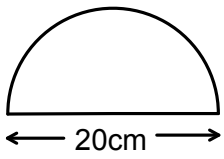
6. **Circumference** of a **full** circle, **diameter** is given



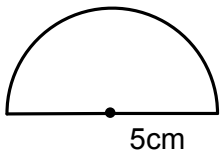
7. **Circumference** of a **full** circle, **radius** given



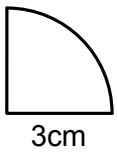
8. **Perimeter** of a **semi**-circle, **diameter** given



9. **Perimeter** of a **semi**-circle, **radius** given



10. **Perimeter** of a **quarter** circle, **radius** given



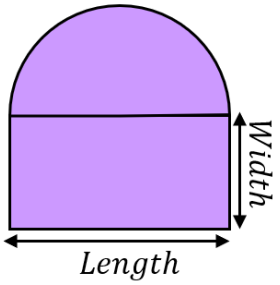
Fluency Practice

(a) A circle has a circumference of $50\ cm$. Find the diameter of the circle to 1 decimal place.
(b) A circle has a circumference of $24\pi\ cm$. Find the diameter of the circle.
(c) A circle has a circumference of $115\ mm$. Find the radius of the circle to 1 decimal place.

(a) A circle has an area of $16\pi\ cm^2$. Find the radius of the circle.
(b) A circle has an area of $82\ cm^2$. Find the radius of the circle to 1 decimal place.
(c) A circle has an area of $14.2\ m^2$. Find the diameter of the circle correct to 1 decimal place.

(a) A semi-circle has an area of $35\ cm^2$. Find the radius of the semi-circle to 1 decimal place.
(b) A semi-circle has an area of $32\pi\ cm^2$. Find the diameter of the semi-circle.
(c) A quarter circle has an area of $4\ m^2$. Find the radius of the quarter circle to 1 decimal place.

Given the total area of this compound shape is $100\ cm^2$ and the area of the rectangle is $66\ cm^2$, find length and width of the rectangle.



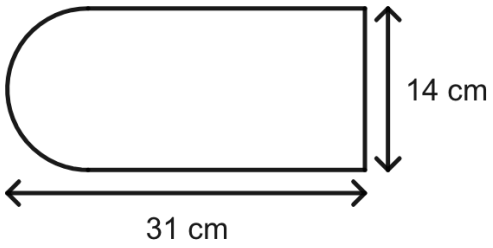
Fluency Practice

A1 A circle has a radius of 23 mm. Calculate the area of the circle.	**A2** A circle has a diameter of 21 cm. Calculate the area of the circle.	**A3** A quadrant is cut from a circle of radius 14.5 cm. Calculate the area of the quadrant.	**A4** A circle of diameter 67 mm is cut in half. Calculate the area of each of the semi-circles.
B1 A ten pence coin has a diameter of 24.5 mm Work out the area of one face of the coin.	**B2** A regulation dart board has a diameter of 451 mm. Work out the area of the dart board. Give your answer in cm^2.	**B3** A circle has a circumference of 21 cm. Calculate the area of the circle.	**B4** A circle has an area of 32 cm^2. Work out the length of the radius of the circle.
C1 A round dinner table has an area of 2.84 m^2. Work out the length of the circumference of the dinner table.	**C2** A semi-circle has an area of 20 cm^2. Work out the perimeter of the semi-circle.	**C3** Nathan eats a whole 12 inch pizza. Joshua eats half of a 10 inch pizza and half of a 14 inch pizza. Who eats the most pizza? Show clear working out.	**C4** Penny is varnishing the floor of a circular room of diameter 5 metres. One tin of varnish will cover an area of 8 m^2. Work out the number of tins of varnish Penny needs to buy to varnish the whole floor of the room.

Fluency Practice

Dave designs a new badge.

The design is based on a rectangle and a semi-circle as shown in the diagram.

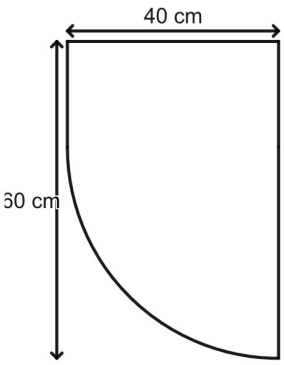


He decides to put silver thread around the badge.

Calculate the length of silver thread he needs.
Give your answer to 2 decimal places.

Sam designs a new badge.

The design is based on a rectangle and a quadrant as shown in the diagram.

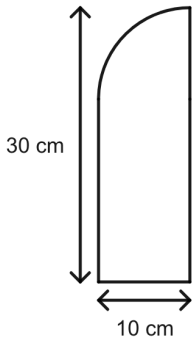


They decide to put gold edging around the badge.

Calculate the length of gold edging they need.
Give your answer to 2 decimal places.

Martina designs a new badge.

The design is based on a rectangle and a quadrant as shown in the diagram.

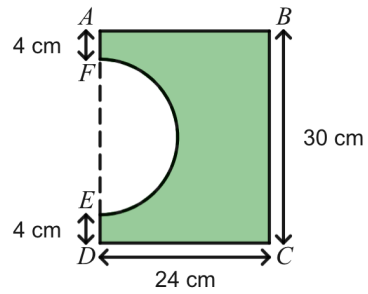


She decides to put black trim around the badge.

Calculate the length of black trim she needs.
Give your answer to 2 decimal places.

Fluency Practice

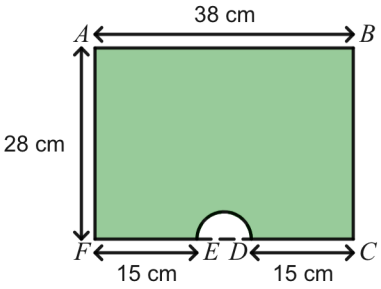
The shaded shape is made by cutting a semicircle from a rectangular piece of card, $ABCD$ as shown in the diagram.



$DEFA$ is a straight line.
The centre of the semicircle lies on EF.
$AB = CD = 24$ cm
$BC = 30$ cm
$DE = AF = 4$ cm

Work out the perimeter of the shaded shape.
Give your answer to 2 decimal places.

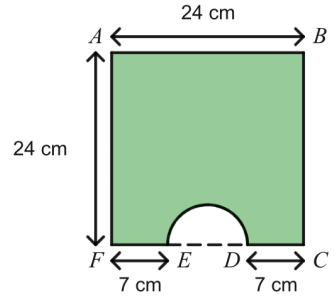
The shaded shape is made by cutting a semicircle from a rectangular piece of card, $ABCF$ as shown in the diagram.



$CDEF$ is a straight line.
The centre of the semicircle lies on DE.
$AF = BC = 28$ cm
$AB = 38$ cm
$CD = EF = 15$ cm

Work out the perimeter of the shaded shape.
Give your answer to 2 decimal places.

The shaded shape is made by cutting a semicircle from a square piece of card, $ABCF$ as shown in the diagram.



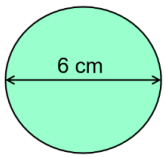
$CDEF$ is a straight line.
The centre of the semicircle lies on DE.
$AF = BC = 24$ cm
$AB = 24$ cm
$CD = EF = 7$ cm

Work out the perimeter of the shaded shape.
Give your answer to 2 decimal places.

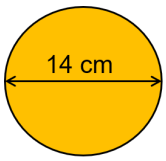
Fluency Practice

Find the circumference of each circle to 1 decimal place.

(a)



(b)

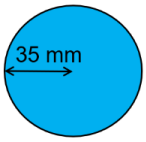


(c) A circle with a diameter of 40 mm

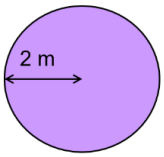
(d) A ferris wheel with diameter 30.5 m

Find the circumference of each circle to 1 decimal place

(a)



(b)

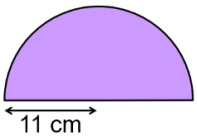


(c) A circle with radius 14 cm

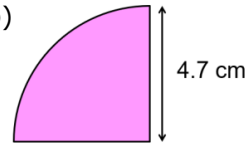
(d) A moon crater with radius 137 km

Work out the length of the arc and the perimeter of these shapes.

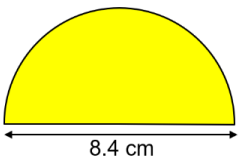
(a)



(b)

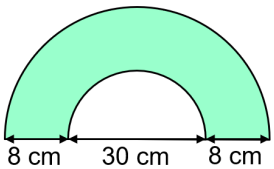


(c)

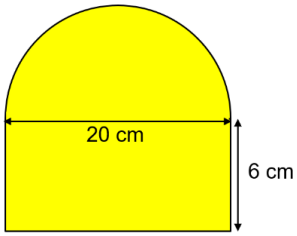


Find the perimeter of these shapes.

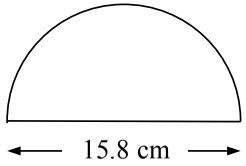
(a)



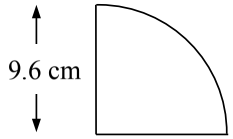
(b)



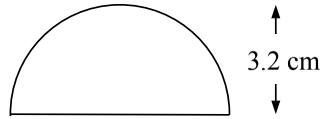
A1
Find the length of the perimeter.



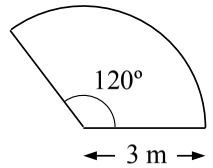
A2
Find the length of the perimeter.



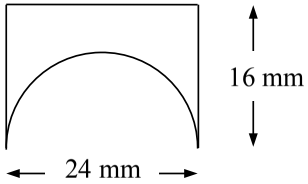
A3
Find the length of the perimeter.



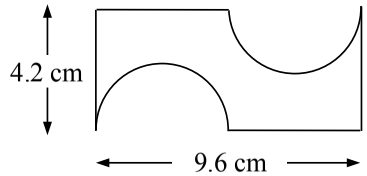
A4
Find the length of the perimeter.



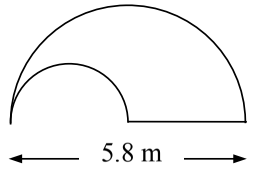
B1
Find the length of the perimeter.



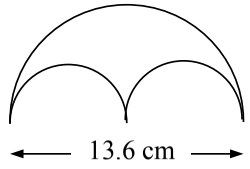
B2
Find the length of the perimeter.



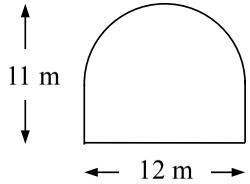
B3
Find the length of the perimeter.



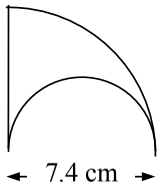
B4
Find the length of the perimeter.



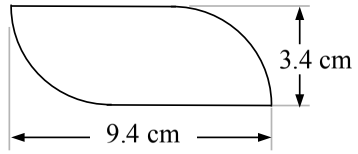
C1
Find the length of the perimeter.



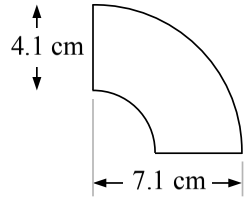
C2
Find the length of the perimeter.



C3
Find the length of the perimeter.

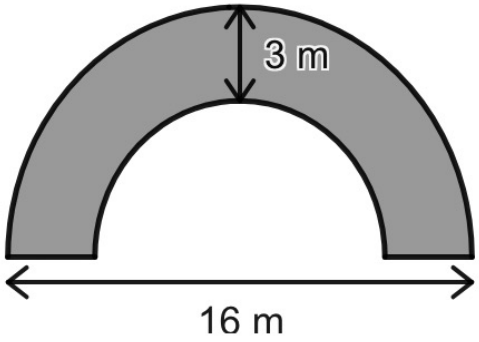


C4
Find the length of the perimeter.



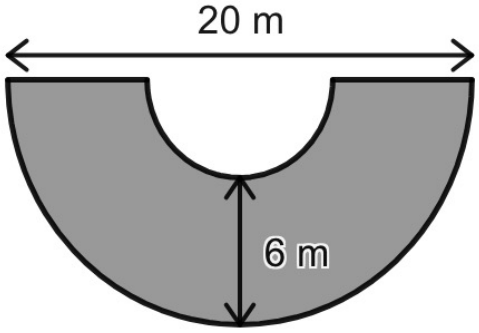
Fluency Practice

The diagram contains two concentric semi-circles.



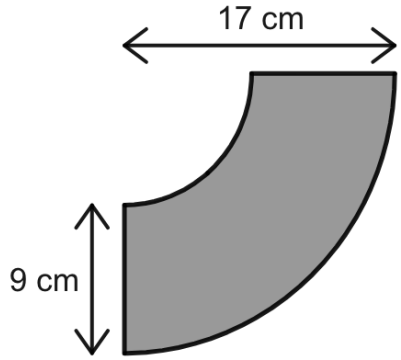
Calculate the shaded area.
Give your answer to 1 decimal place.

The diagram contains two concentric semi-circles.



Calculate the shaded area.
Give your answer to 1 decimal place.

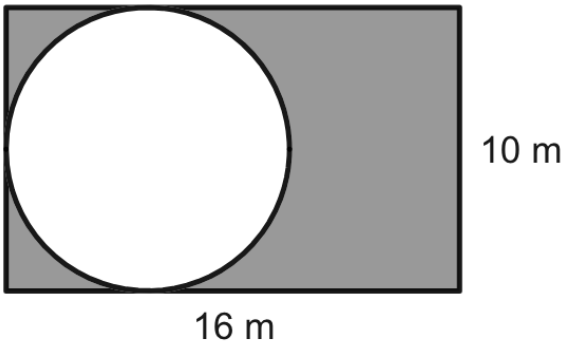
The diagram contains two concentric quarter-circles.



Calculate the shaded area.
Give your answer to 1 decimal place.

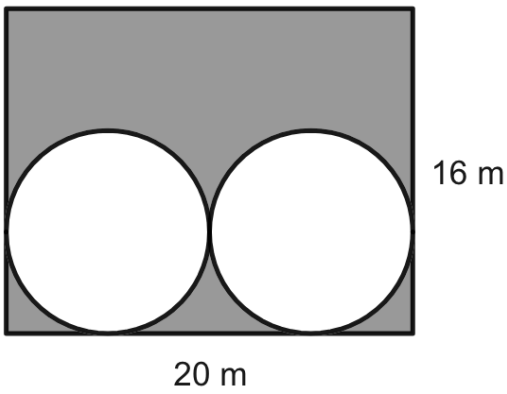
Fluency Practice

The diagram shows a circle enclosed in a rectangle.



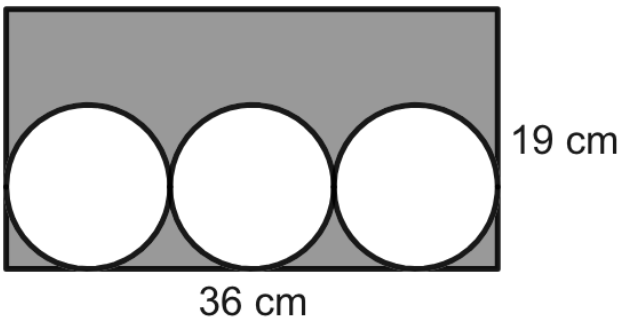
Find the shaded area.
Give your answer correct to 1 decimal place.

The diagram shows two circles enclosed in a rectangle.



Find the shaded area.
Give your answer correct to 1 decimal place.

The diagram shows three circles enclosed in a rectangle.

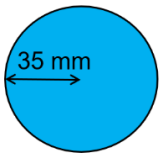


Work out the shaded area.
Give your answer correct to 1 decimal place.

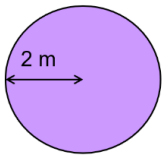
Fluency Practice

Work out the area of each circle, giving your answer to 1 decimal place.

(a)



(b)

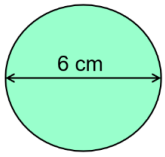


(c) A circle with radius 13 cm

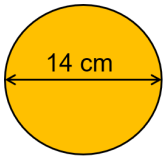
(d) A frisbee with radius 16.3 cm

Find the area of each circle, giving your answer to 1 decimal place.

(a)



(b)

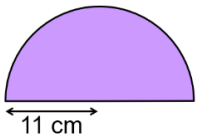


(c) A circle with a diameter of 45 mm

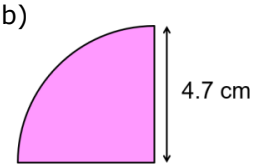
(d) A plate with diameter 18 cm

Work out the area of each of these shapes, giving your answers to 1 dp.

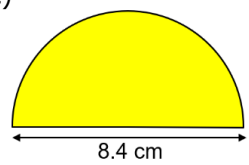
(a)



(b)

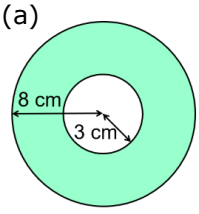


(c)

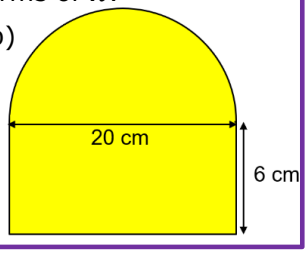


Find the areas of these shapes, leaving your answer in terms of π.

(a)

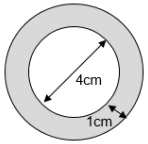
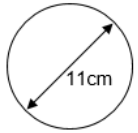
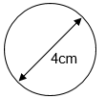
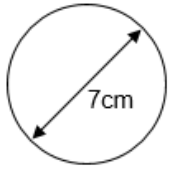
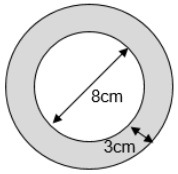


(b)



Anita says "The area of a circle with radius 8 cm is double the area of a circle with radius 4 cm." Is she right? Explain.

Fluency Practice

A circle has a radius of 8cm. Calculate its area. Give your answer to 2dp.	Calculate the perimeter of a quarter circle with radius of 3cm. Give your answer to 2dp.	A circle has an area of 75.4cm^2. Work out the circumference of the circle to 2dp.	Work out the area of a semi-circle whose radius is 8cm. Give your answer in terms of π.
Calculate the area of the annulus below. Give your answer to 2dp. 	Calculate the area of this circle. Give your answer to 3sf. 	The circumference of a circle is 50.27cm. Work out the length of the radius.	Here is a circle.  Without doing any calculations, explain how the area of a circle with diameter of 8cm would be different.
Calculate the circumference of this circle. Give your answer to 1dp. 	A circle has a circumference of 18πcm. Work out the **exact** area of the circle.	Calculate the area of the annulus below. Give your answer in terms of π. 	Work out the area of a semi-circle whose base is 14cm. Give your answer in terms of π.

Fluency Practice

A1 Find the area of the circle

A2 Find the area of the circle

A3 Find the area of the circle

A4 Find the area of the circle

B1 Find the area

B2 Find the area

B3 Find the area

B4 Find the area

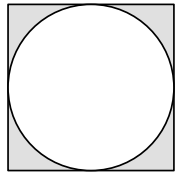
C1 Find the area

C2 Find the area

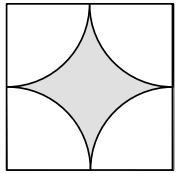
C3 Find the area

C4 Find the area

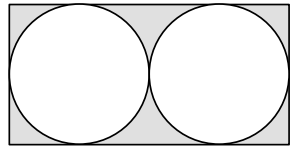
A1
Find the area of the shaded region.



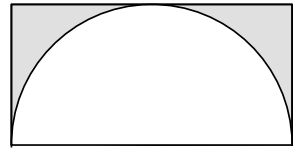
A2
Find the area of the shaded region.



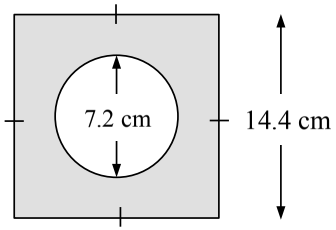
A3
Find the area of the shaded region.



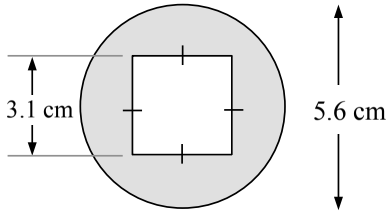
A4
Find the area of the shaded region.



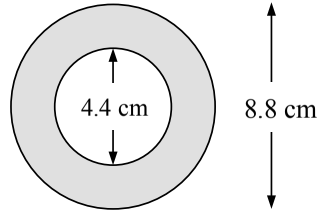
B1
Find the area of the shaded region.



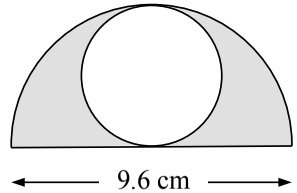
B2
Find the area of the shaded region.



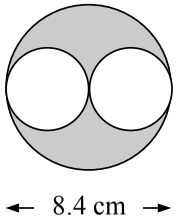
B3
Find the area of the shaded region.



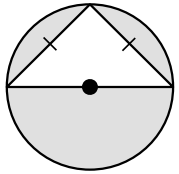
B4
Find the area of the shaded region.



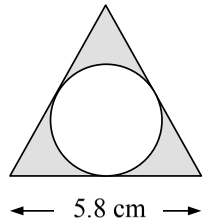
C1
Find the area of the shaded region.



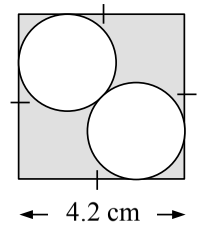
C2
Find the area of the shaded region.



C3
Find the area of the shaded region.

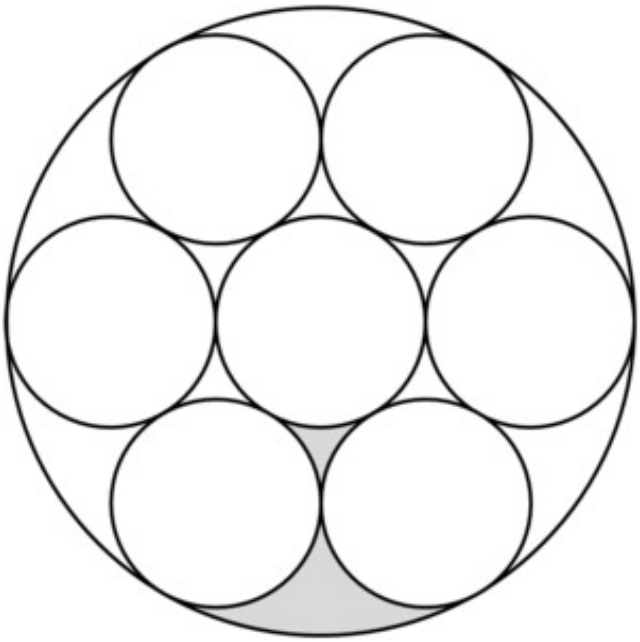


C4
Find the area of the shaded region.



Problem Solving

The figure below is composed of eight circles, seven small circles and one large circle containing them all. Neighboring circles only share one point, and two regions between the smaller circles have been shaded. Each small circle has a radius of $5\ \text{cm}$.

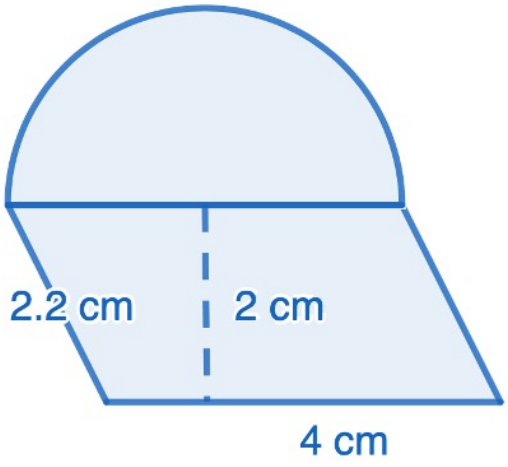


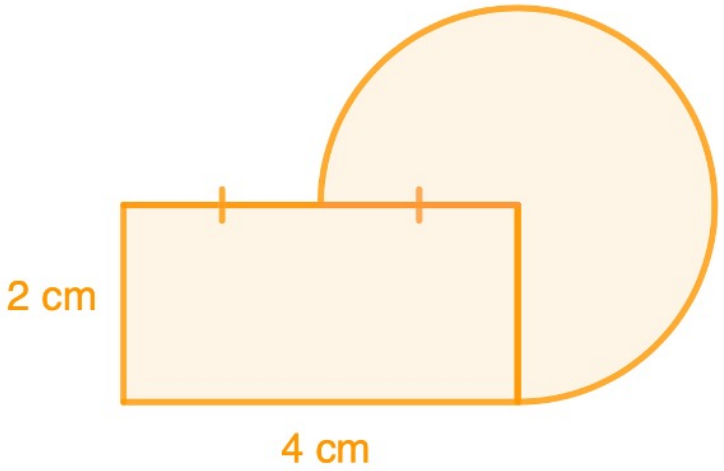
Calculate:

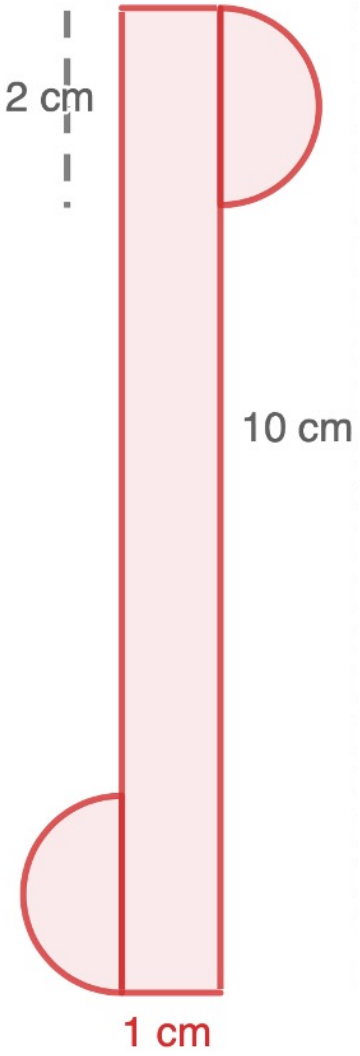
a. The area of the large circle.

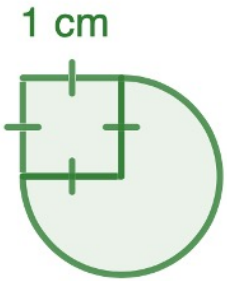
b. The area of the shaded part of the figure.

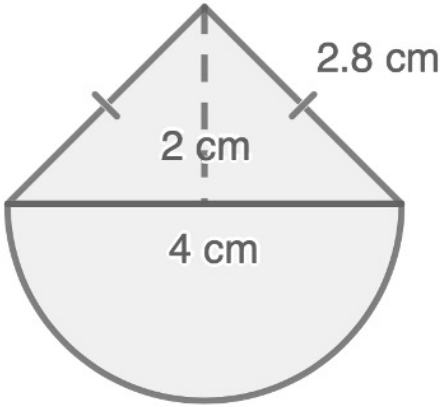
Find the area and perimeter of each shape. Round to 1 d.p.

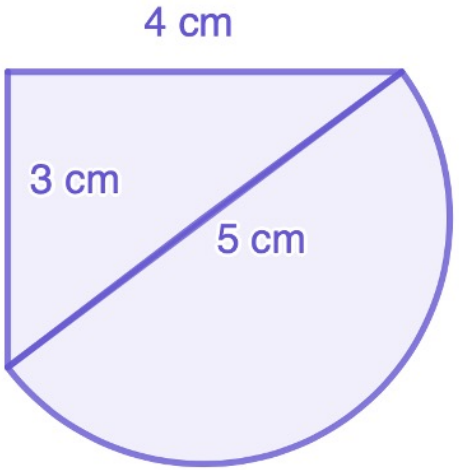






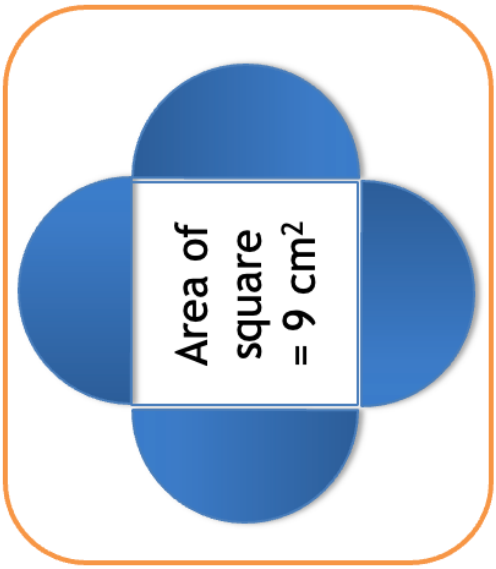


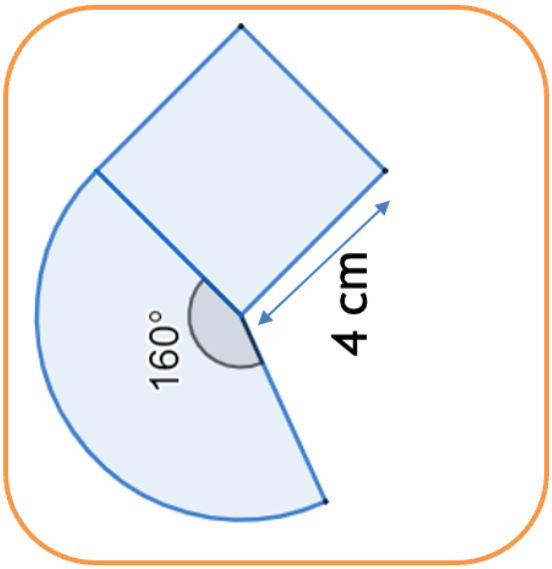


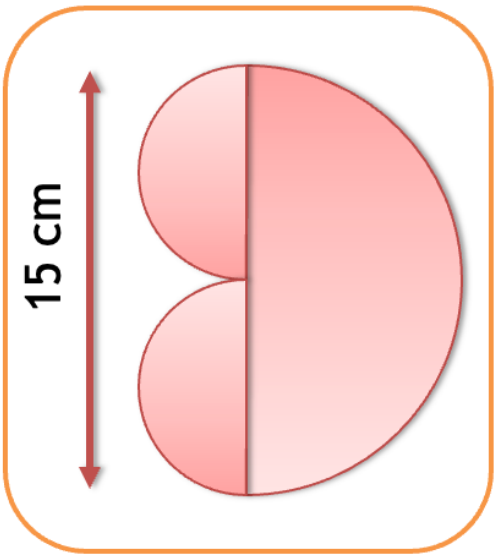


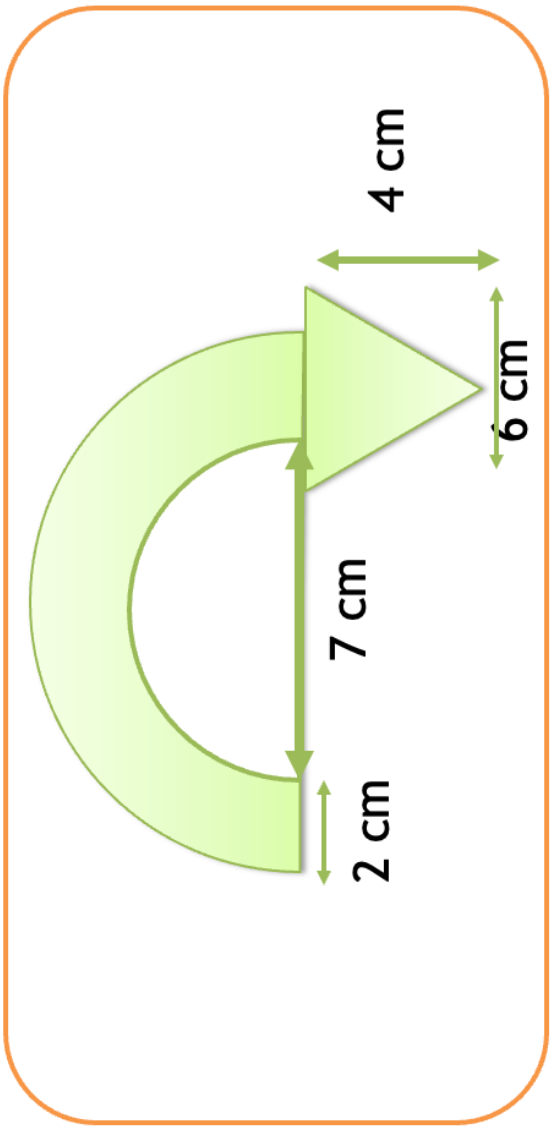
Fluency Practice

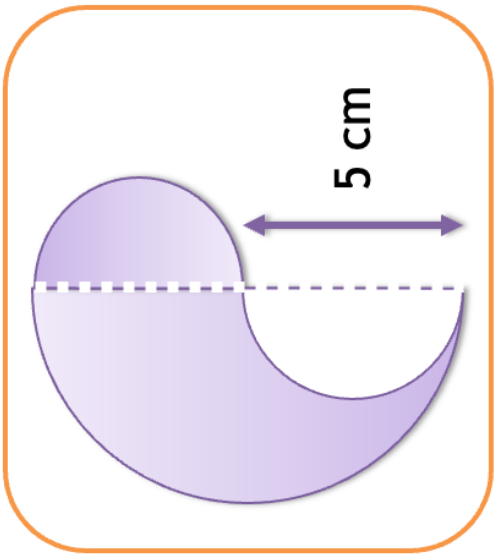
Find the perimeters and areas of these compound shapes









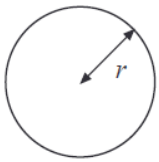


Fluency Practice

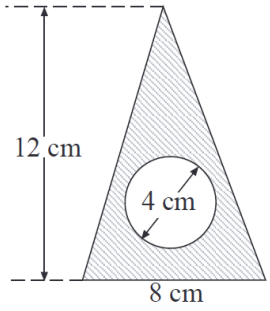
Answer the questions in your book. Mark your own work from the answers at the end. Round your answers to one decimal place unless otherwise stated.

Area of a circle = πr^2

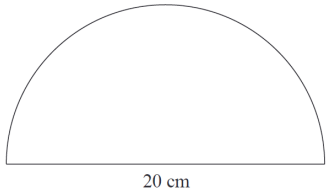
Circumference of a circle = $2\pi r$



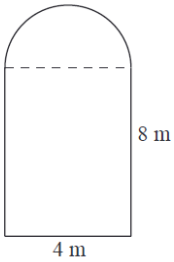
1. Work out the area of the shaded shape.



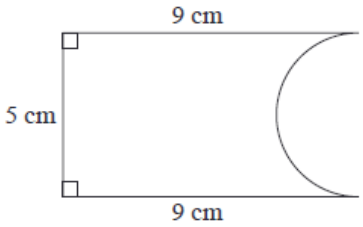
2. Work out the perimeter of the semicircle.



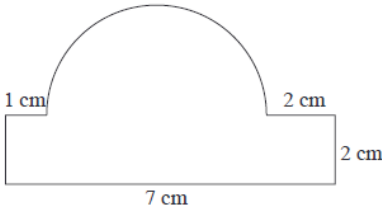
3. Work out the area of this shape.



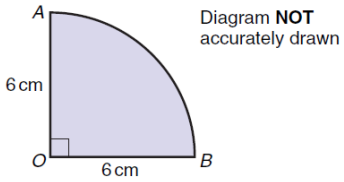
4. Find the perimeter of this shape.



5. Calculate the area of this shape.



6. Find the perimeter of this shape



7. The diameter of the London Eye is 135m.Work out its circumference. Give your answer to the nearest metre.

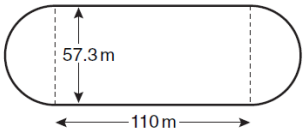
8. The tree with the greatest circumference in the world is a Montezuma cypress tree in Mexico. Its circumference is 35.8m.Work out its diameter.

9. The circumference of a circle is 70cm. Work out its radius.

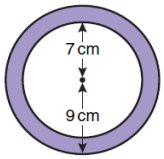
10. A reel of cotton has a radius of 1.3cm. The cotton is wrapped round it 500 times. Work out the total length of cotton. Give your answer in metres.

Fluency Practice

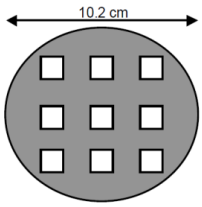
11. The diagram shows a running track. The ends are semicircles of diameter 57.3 m and the straights are 110 m long. Work out the total perimeter of the track. Give your answer correct to the nearest metre.



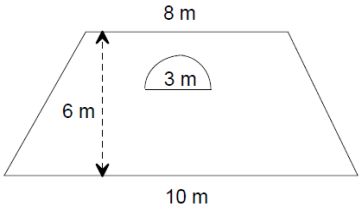
12. The big wheel of a 'penny-farthing' bicycle has a radius of 0.75m. Work out the number of complete turns the big wheel makes when the bicycle travels 1 kilometre.



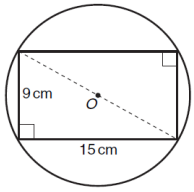
13. The diagram shows a circle of radius 7 cm inside a circle of radius 9 cm. Work out the area of the shaded part of the diagram.



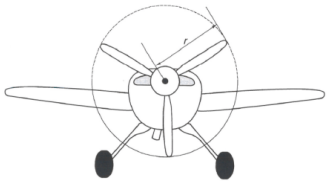
14. A circular disc of diameter 10.2 cm has 9 square holes cut from it. Each square has length of side 2.5 cm. Calculate the area of the disc after the squares have been removed.



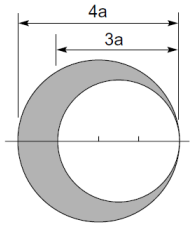
15. The diagram below shows a trapezoidal garden with a semicircular fish pond. Calculate the area of the garden not including the fish pond.



16. The diagram shows a rectangle drawn inside a circle. The centre of the circle is at *O*. The rectangle is 15 cm long and 9 cm wide. Calculate the circumference of the circle.



17. The propeller on a Red Bull racer turns 50 times each second. The tip of the propeller is travelling at 340m/s, the speed of sound. Calculate r, the radius of the propeller. Give your answer to 3 significant figures.



18. The two circles shown in the diagram have diameters of 3a and 4a. Their edges touch and their diameters are on the same line. Show that the area of the shaded part is $\frac{7}{4}\pi a^2$

Problem Solving

Circumference: $C = \pi d$ Area: $A = \pi r^2$

1. Each of these calculations would find the perimeter or area of a shape involving part of a circle.

   Sketch a fully-labelled shape that matches each calculation

   a) $A = \pi \times 2^2$

   b) $A = \frac{1}{2} \times \pi \times 3^2$

   c) $P = \frac{1}{2} \times \pi \times 6 + 6$

   d) $A = \frac{1}{2} \times \pi \times 3^2 + 8 \times 6$

   e) $P = \frac{1}{2} \times \pi \times 6 + 5 + 5$

   f) $P = \frac{1}{2} \times \pi \times 6 + 8 + 6 + 8$

   g) $P = \frac{1}{4} \times \pi \times 6 + 7 + 5$

   h) $A = \frac{1}{2} \times \pi \times 3^2 + \frac{1}{2} \times 6 \times 4$

   i) $A = 4 \times 8 - \frac{1}{4} \times \pi \times 4^2$

   j) $P = \frac{1}{4} \times \pi \times 8 + 8 + 4 + 4$

2. Draw as many possible shapes that you can with

   a) *Perimeter* of exactly $2\pi + 8$

   b) *Area* of exactly $2\pi + 8$

   Can you find any shapes that no-one else has thought of?

   Can you find any shapes that solve both?

3 Angles in Parallel Lines

Sam said that he could determine the measure of every angle in Figures A and B without actually measuring the angles if he knew just one of the angles in each of the figures. Is Sam correct?

Figure A

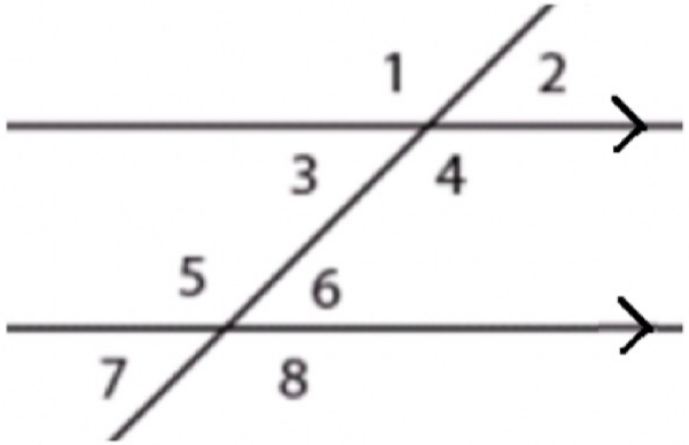
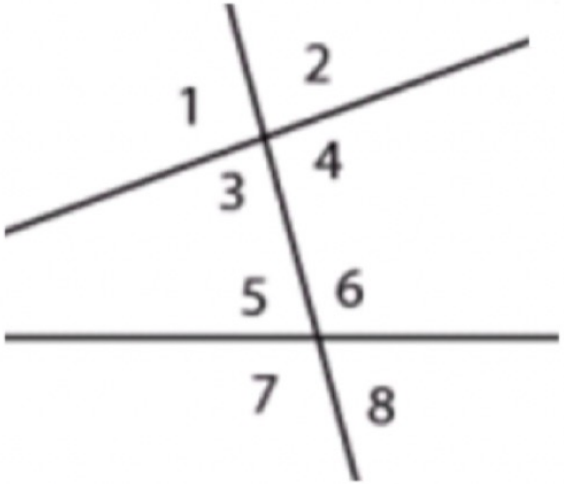
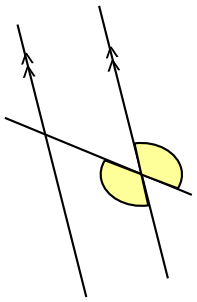
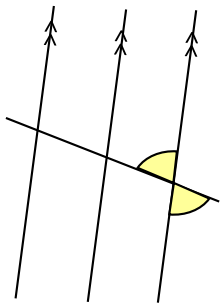
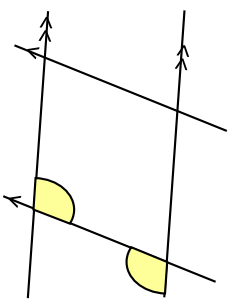
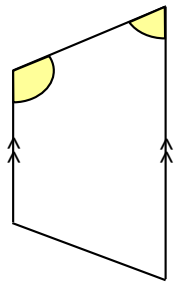
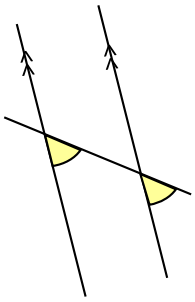
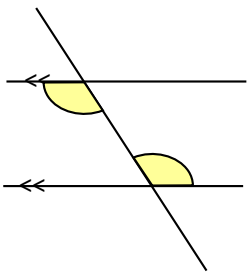
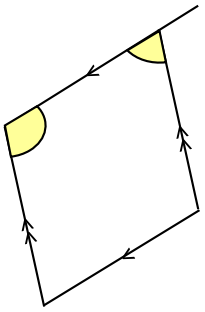
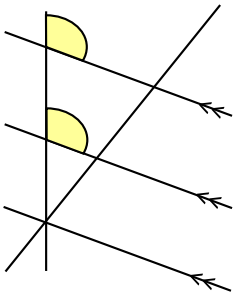
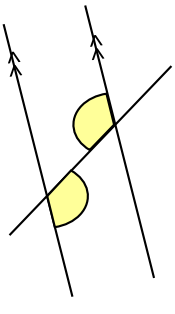
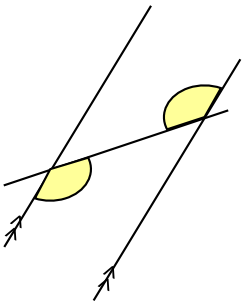
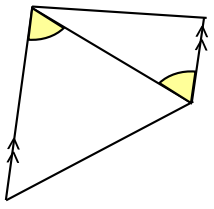
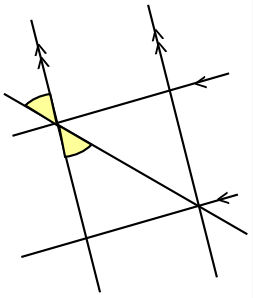
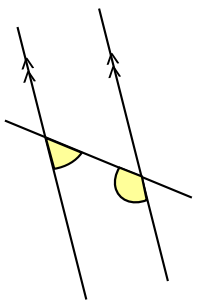
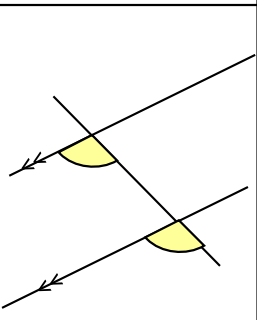
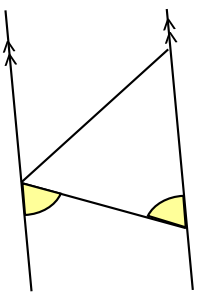
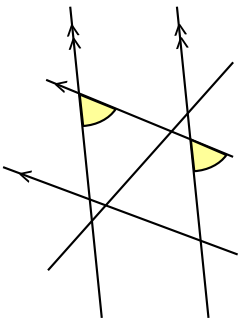


Figure B



Fluency Practice

Co-interior angles				
Corresponding angles				
Alternate angles				
Vertically opposite angles				

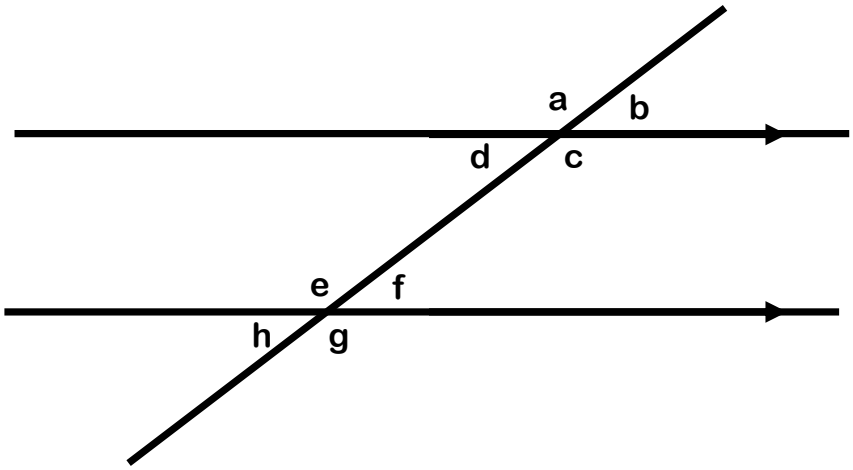
Fluency Practice

Charlie

Angles in Parallel Lines Tick or Trash

Tick one answer and trash the other!

Lola

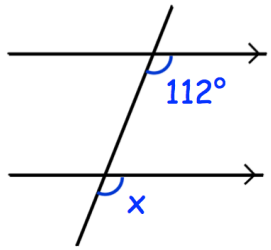


Add to 180°	a and c	Vertically Opposite
Co-interior	c and f	Corresponding
Alternate	d and f	Co-interior
Vertically Opposite	g and e	Alternate
Co-interior	a and e	Corresponding
Vertically Opposite	h and g	Add to 180°
Co-interior	c and e	Alternate
Add to 180°	b and d	Vertically Opposite
Co-interior	d and e	Corresponding
Alternate	g and a	Corresponding
Vertically Opposite	h and e	Add to 180°

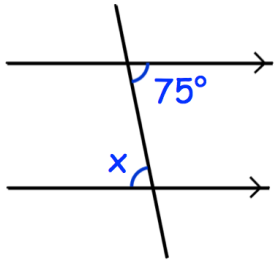
Fluency Practice

Question 1: Write down the sizes of the lettered angles.

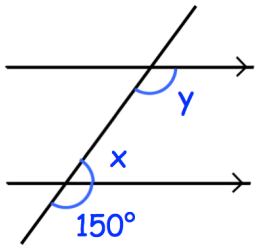
(a)



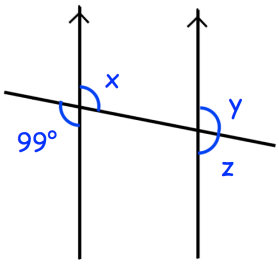
(b)



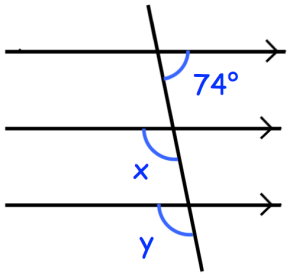
(c)



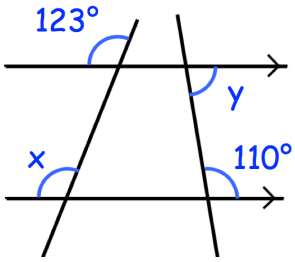
(d)



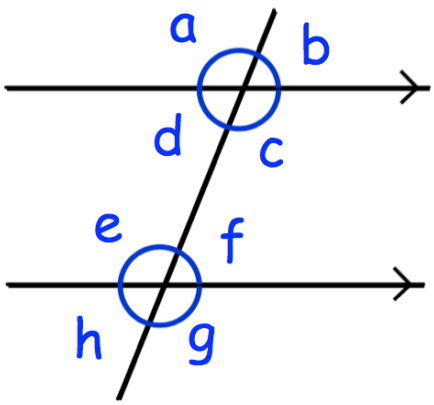
(e)



(f)



Question 2:



(a) Which angle is corresponding to angle c?

(b) Which angle is alternate to angle d?

(c) Which angle is corresponding to angle h?

(d) Which angle is vertically opposite to angle a?

(e) Which angle is alternate to angle e?

(f) Which angle is co-interior with angle c?

(g) Which angle is vertically opposite to angle h?

(h) Which angle is co-interior with angle e?

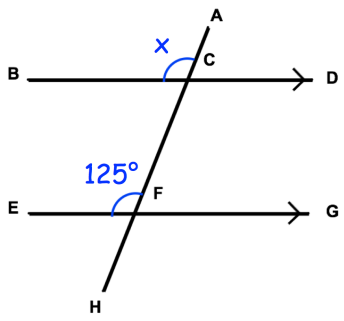
(i) Which angle is corresponding to angle a?

(j) Which angle is vertically opposite to angle g?

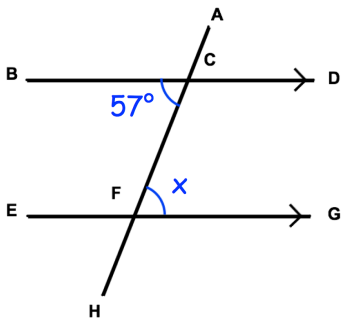
Fluency Practice

Question 3: Find the angle x in each question below.
Give reasons for your answer.

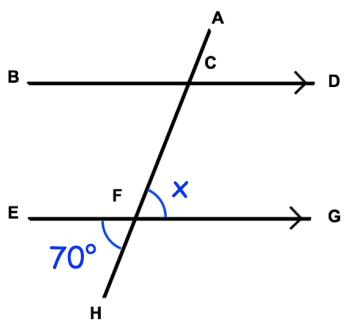
(a)



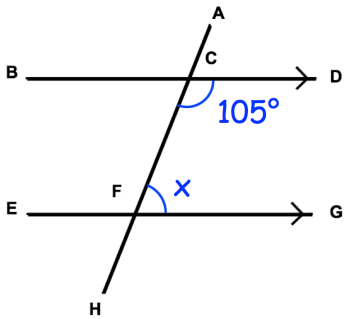
(b)



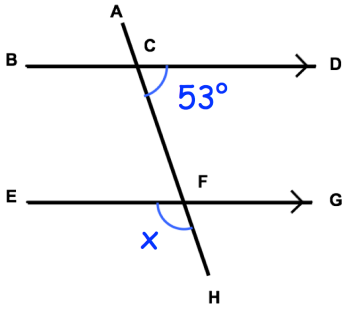
(c)



(d)



(e)



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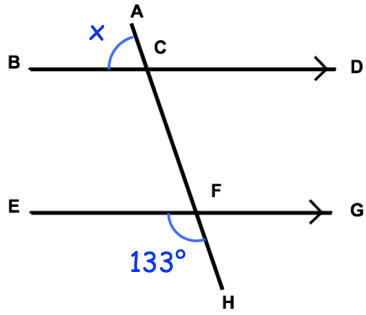
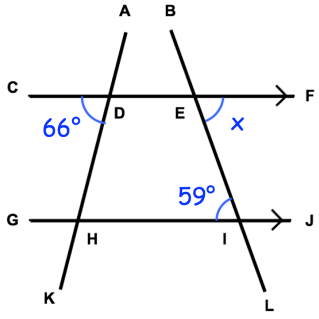
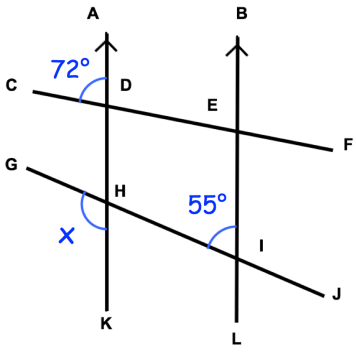


Question 4: Find the angle x in each question below.
Give reasons for your answer.

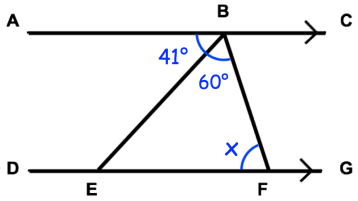
(a)



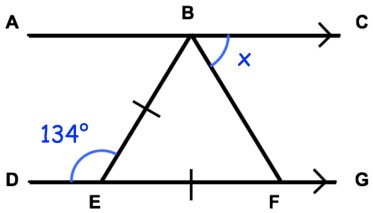
(b)



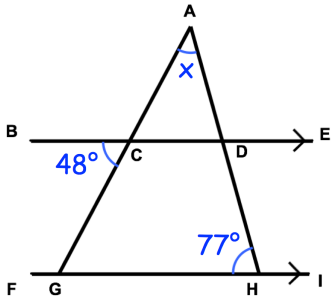
(c)



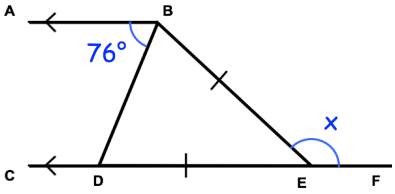
(d)



(e)

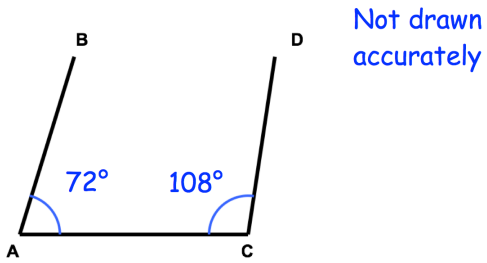


(f)

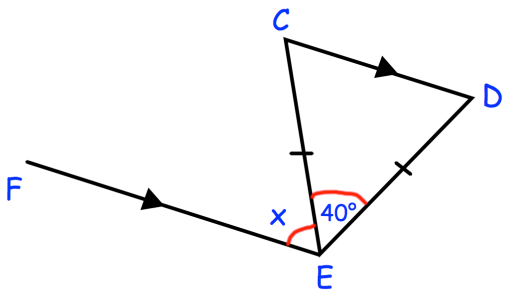


Fluency Practice

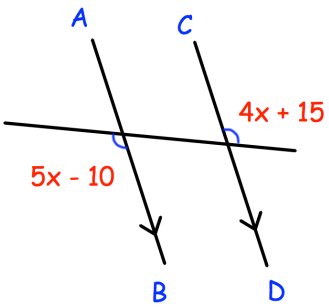
Question 1: Are the lines AB and CD parallel? Explain your answer.



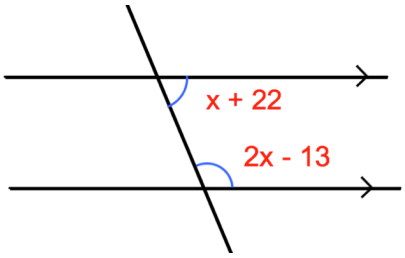
Question 2: Find the missing angle.
Give reasons for your answer.



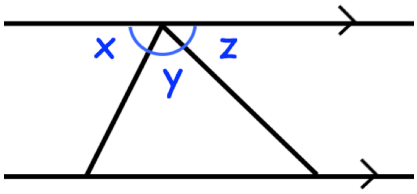
Question 3: Find x



Question 4: Find x



Question 5: Matilda is proving that the angles in a triangle add up to 180°.
She has started with this diagram.
Complete her proof.



Fluency Practice

A1 Find the values of x and y

A2 Find the values of x and y

A3 Find the values of x and y

A4 Find the values of x and y

B1 Find the values of x and y

B2 Find the values of x and y

B3 Find the values of x, y and z

B4 Find the values of x, y and z

C1 Find the values of x and y

C2 Find the values of x and y

C3 Find the values of x, y and z

C4 Find the value of x

Fluency Practice

A1 Find the values of x and y

A2 Find the values of x and y

A3 Find the values of x and y

A4 Find the values of x, y, w and z

B1 Find the value of x

B2 Find the value of x

B3 Find the value of x

B4 Find the values of x and y

C1 Find the values of x and y

C2 Find the value of x

C3 Find the value of x

C4 Find the value of x

Fluency Practice

A1 Find the value of x

A2 Find the values of x and y

A3 Find the values of x and y

A4 Find the value of x

B1 Find the values of x and y

B2 Find the values of x and y

B3 Find the values of x and y

B4 Find the values of x and y

C1 Find the values of x and y

C2 Find the value of x

C3 Find the value of x

C4 Find the value of x

Fluency Practice

1.)

2.)

3.)

4.)

5.)

6.)

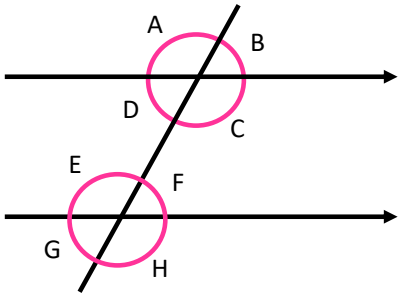
7.)

8.)

9.)

Fluency Practice

1. Complete these sentences about the angles in this diagram:



a) Angles A and …. are corresponding angles.

b) Angles F and …. are alternate angles.

c) Angles D and …. are opposite angles.

d) Angles F and …. are co-interior angles.

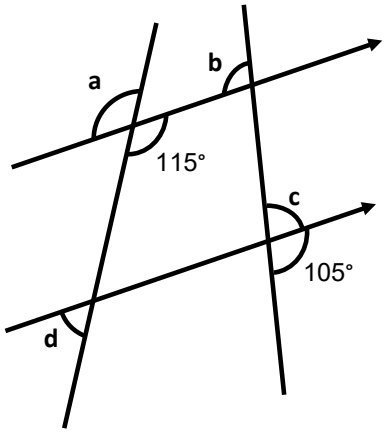
e) Angles E and C are …….... angles.

f) Angles D and E are …….... angles.

g) Angles G and D are …….... angles.

h) Angles E and H are …….... angles.

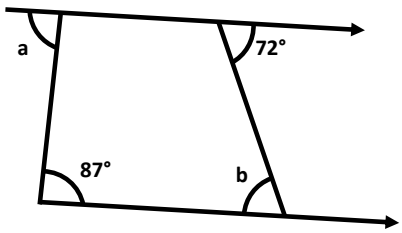
2. Calculate the size of angles **a,** b, c and **d**.



a° = ☐ **b**° = ☐

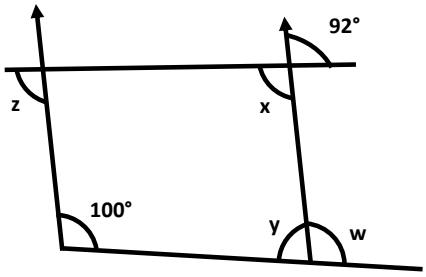
c° = ☐ **d**° = ☐

3. Calculate the missing angles:



a° = ☐ **b**° = ☐

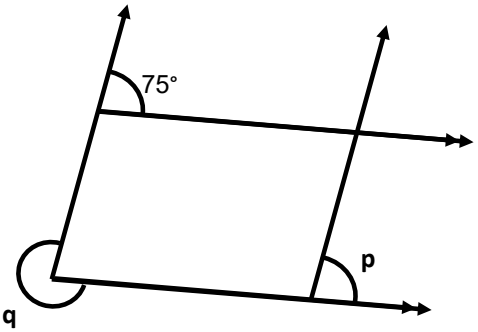
4. Calculate the missing angles:



w = ☐ **x** = ☐

y = ☐ **z** = ☐

6. Calculate the missing angles:

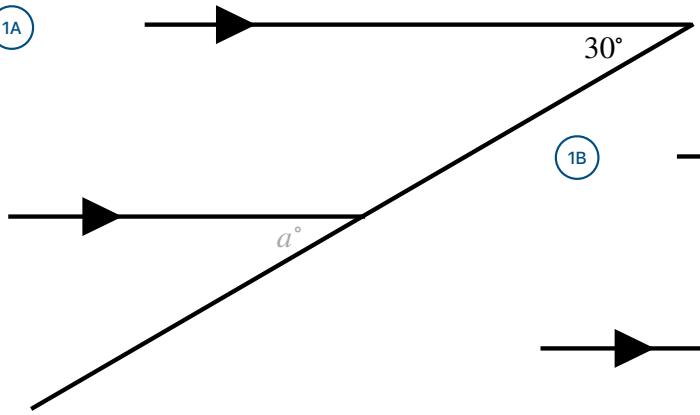


p = ☐ **q** = ☐

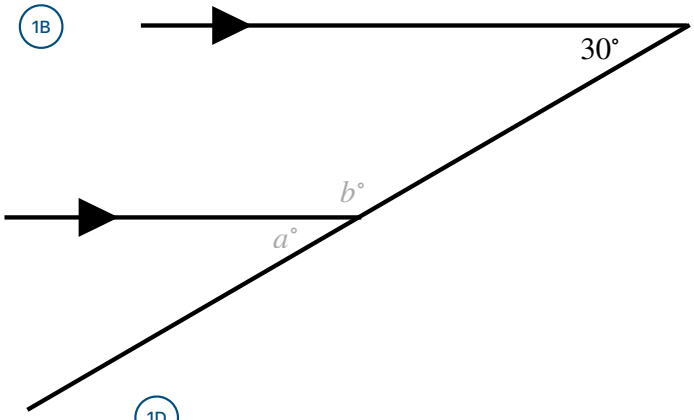
Fluency Practice

Find the marked angles in all of the diagrams:

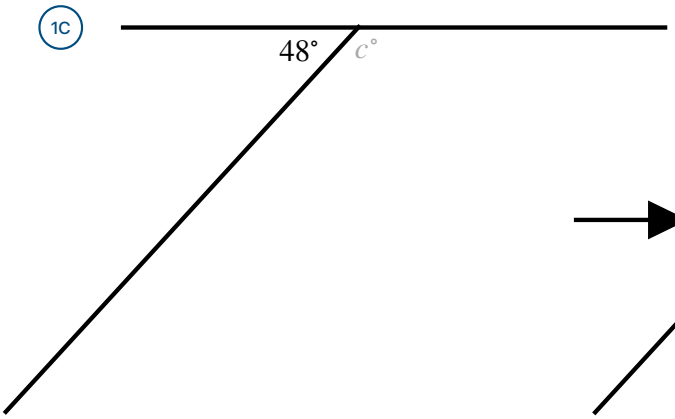
1A



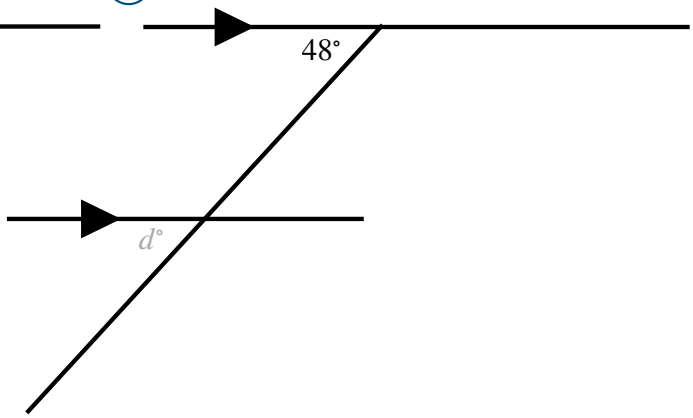
1B



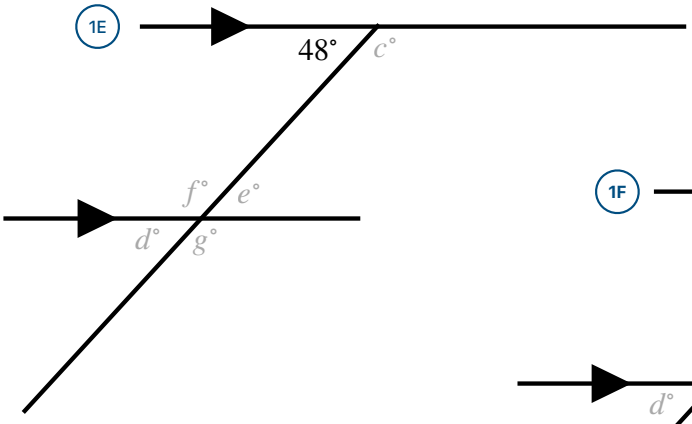
1C



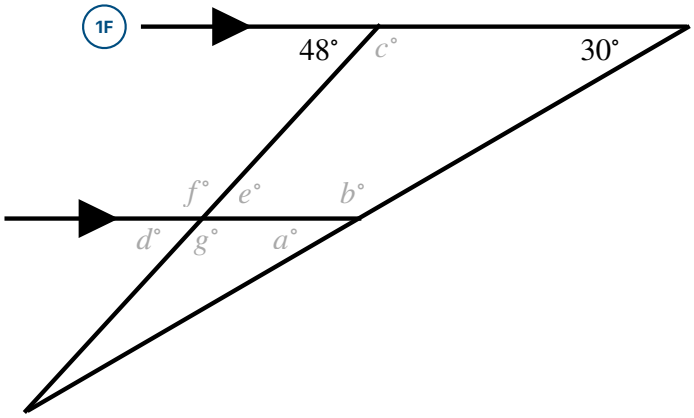
1D



1E



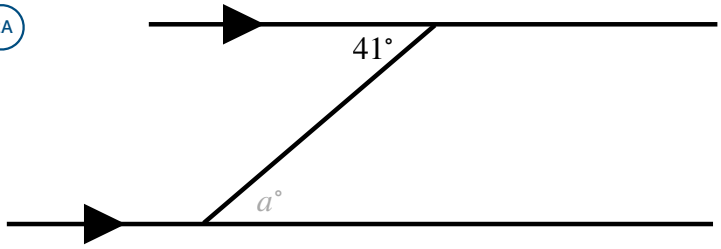
1F



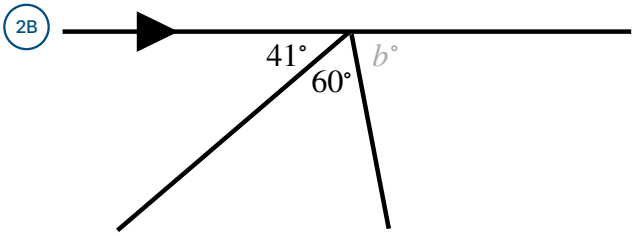
Fluency Practice

Find the marked angles in all of the diagrams:

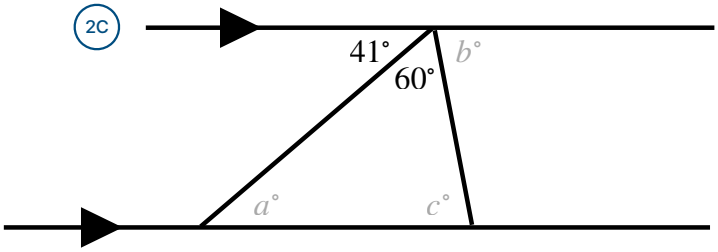
2A



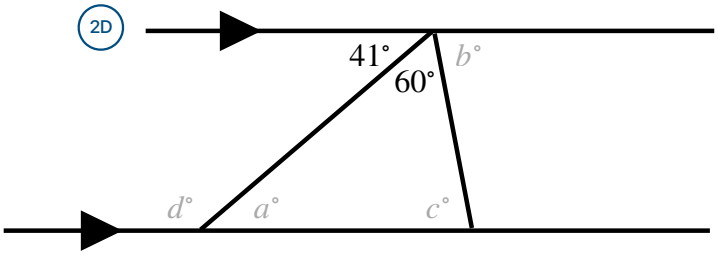
2B



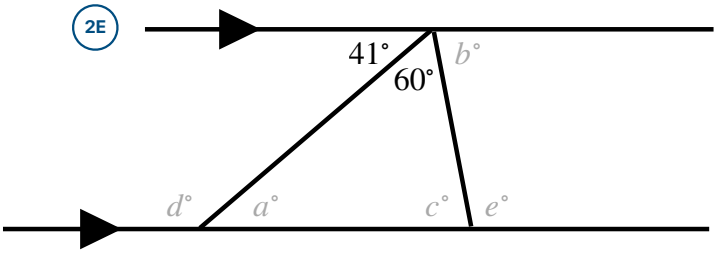
2C



2D



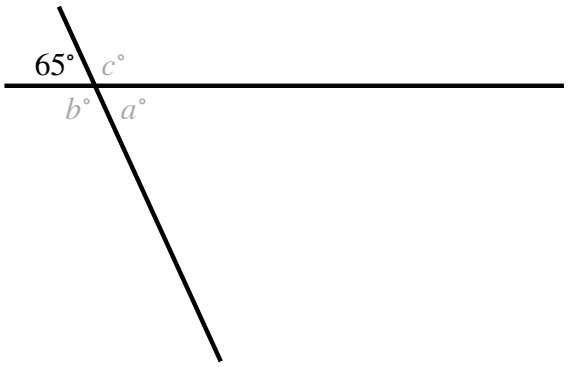
2E



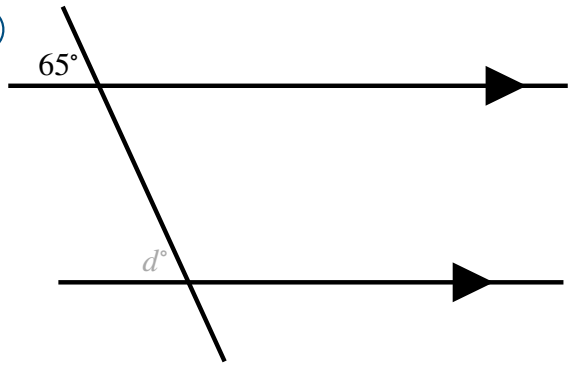
Fluency Practice

Find the marked angles in all of the diagrams:

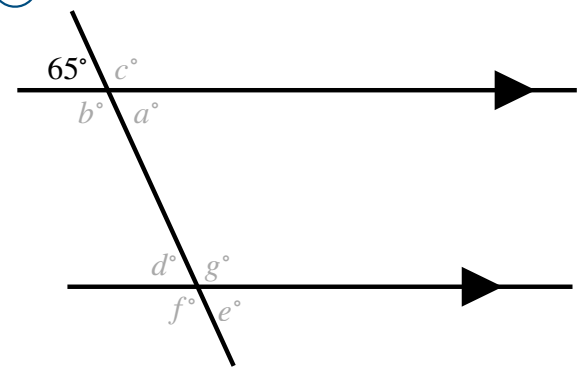
3A



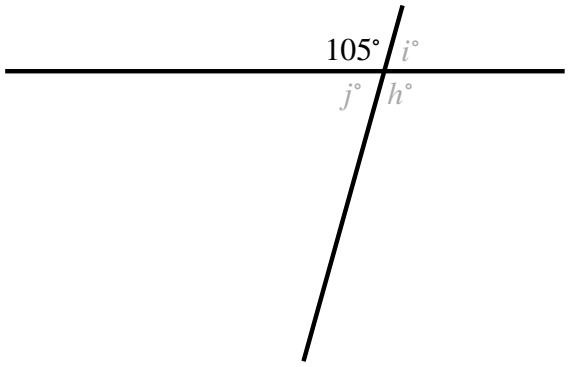
3B



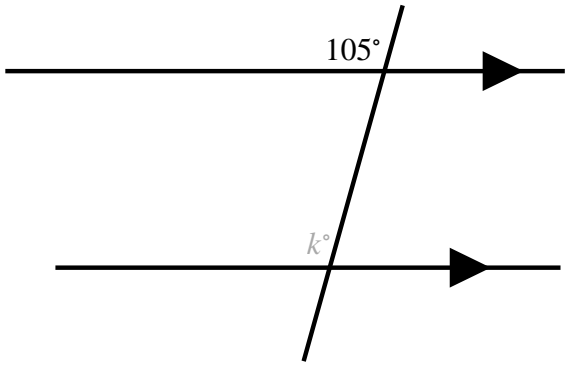
3C



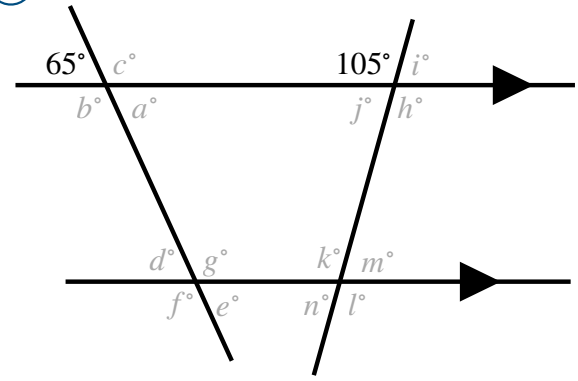
3D



3E



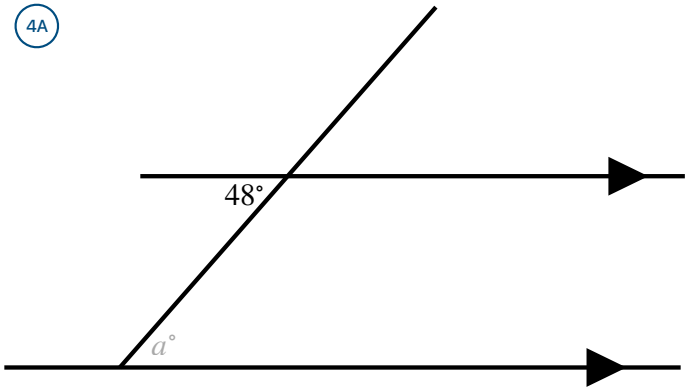
3F



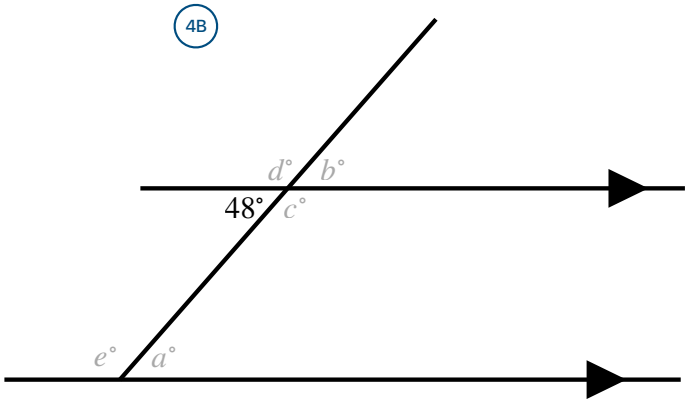
Fluency Practice

Find the marked angles in all of the diagrams:

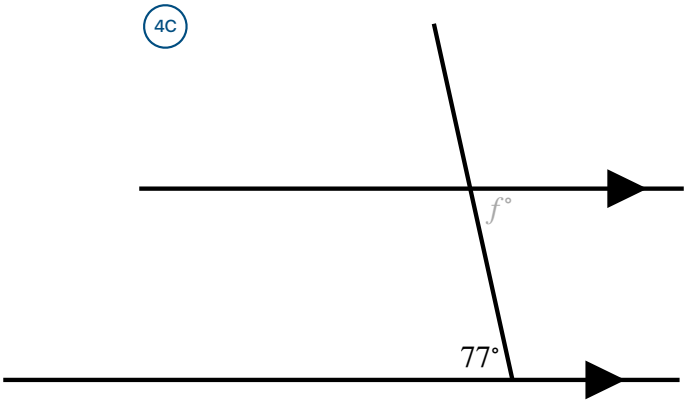
4A



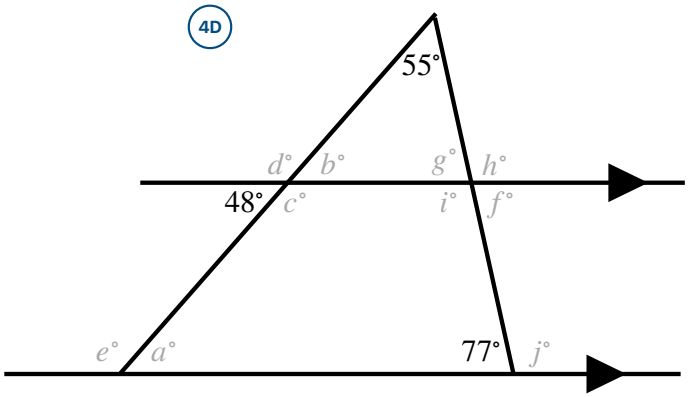
4B



4C



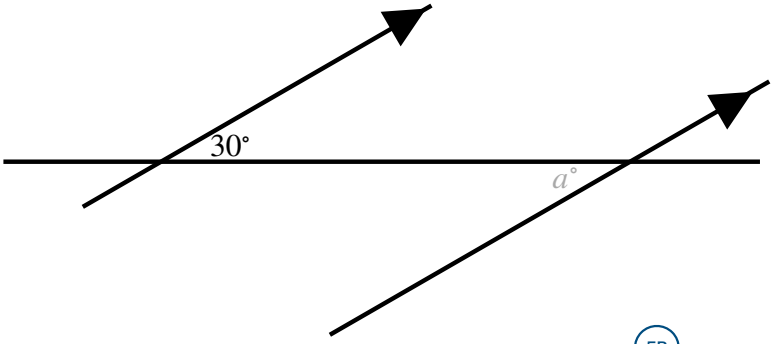
4D



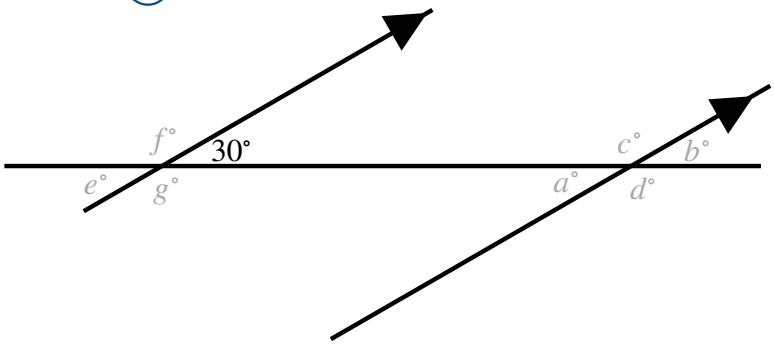
Fluency Practice

Find the marked angles in all of the diagrams:

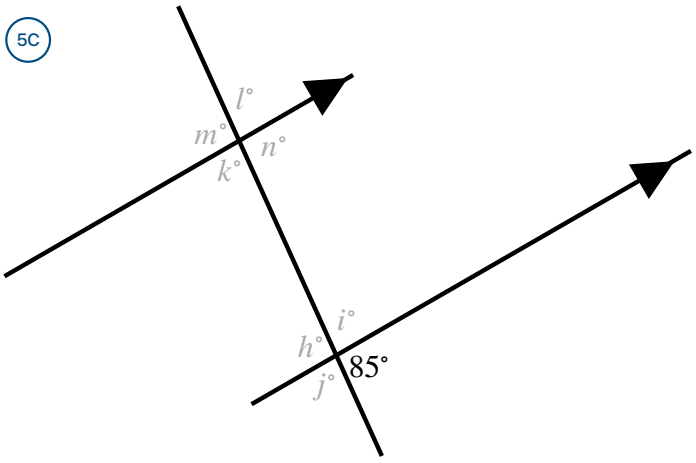
5A



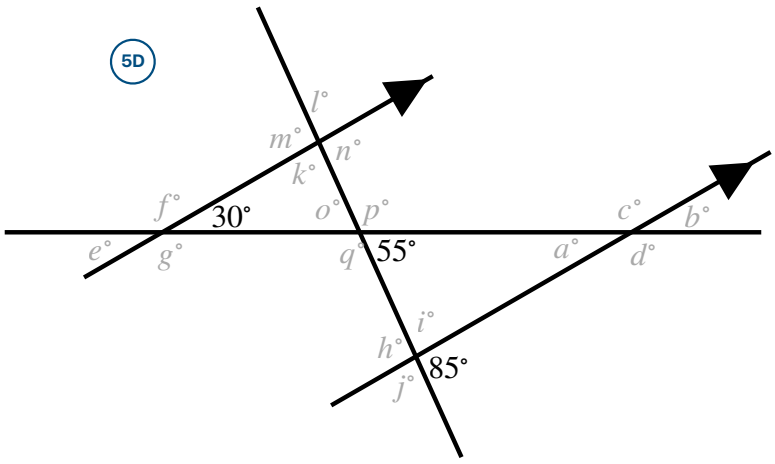
5B



5C

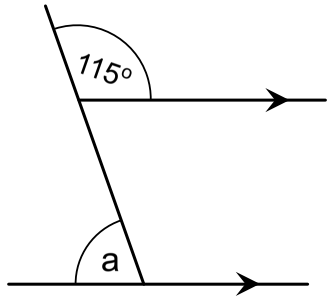


5D

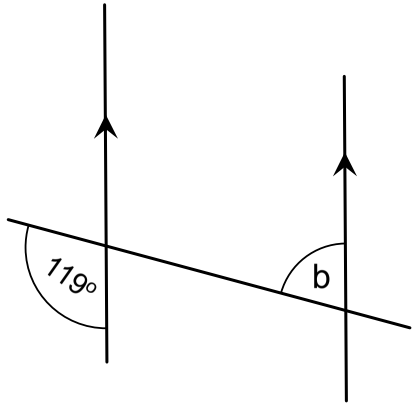


state what the angles are indicated by a letter, giving reasons for your answer

(1)



(2)



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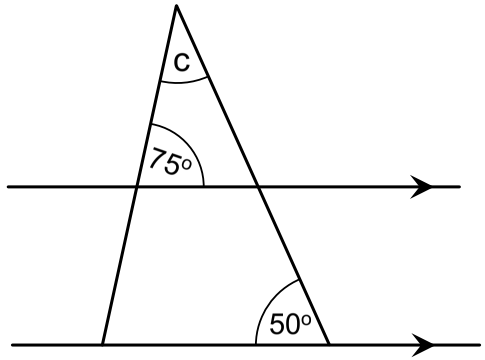

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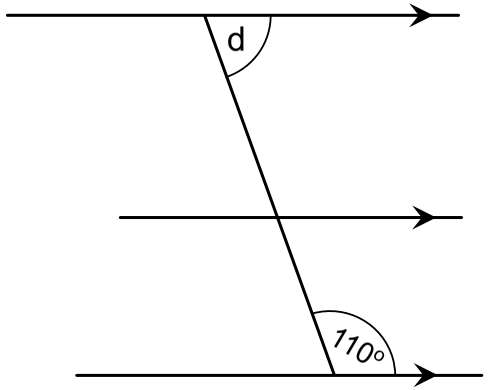

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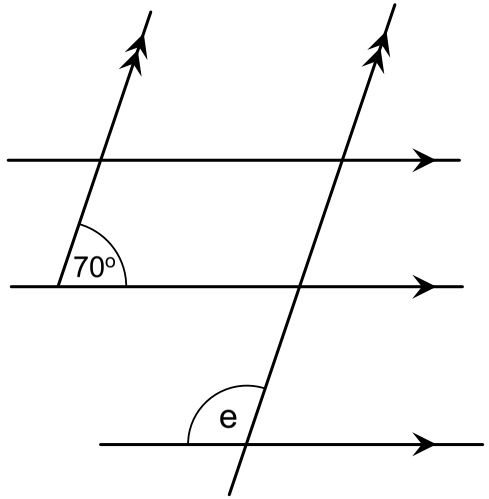
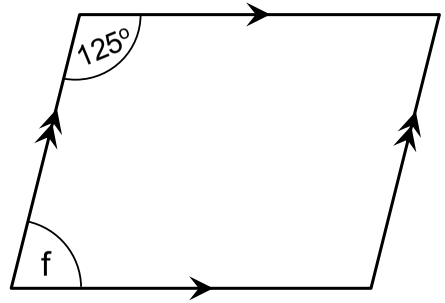
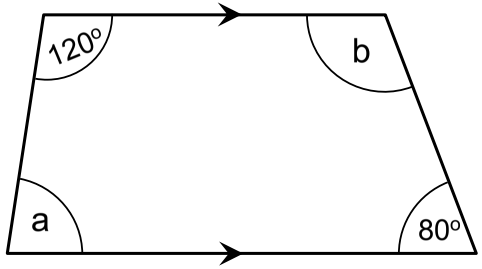


(6)



state what the angles are indicated by a letter, giving reasons for your answer

(7)



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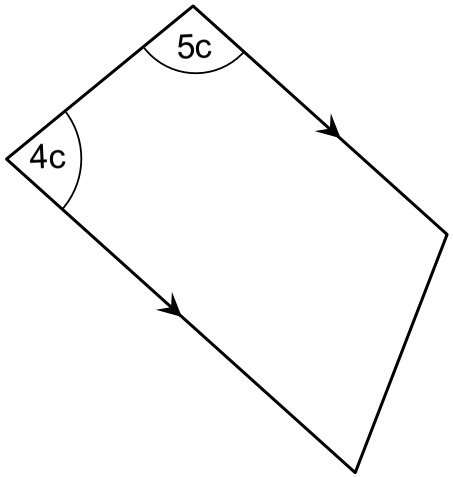

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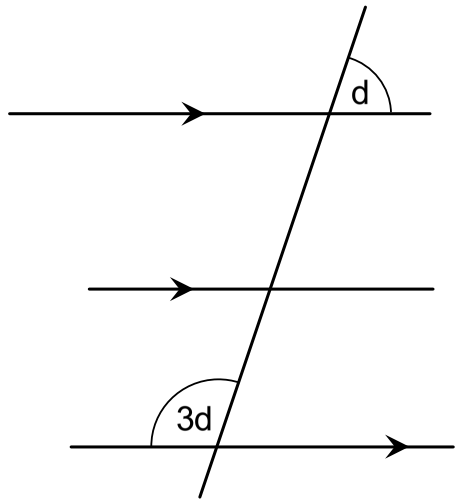

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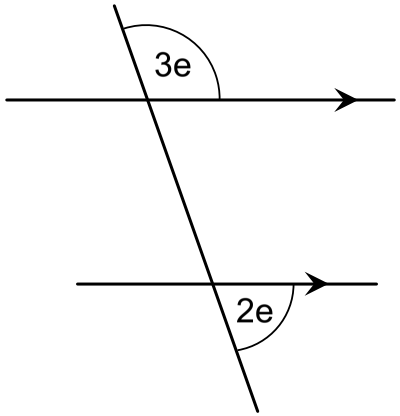
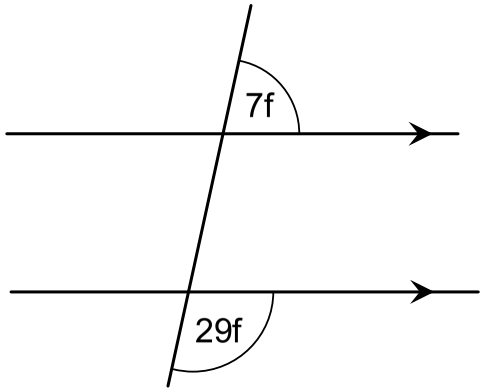


(11)



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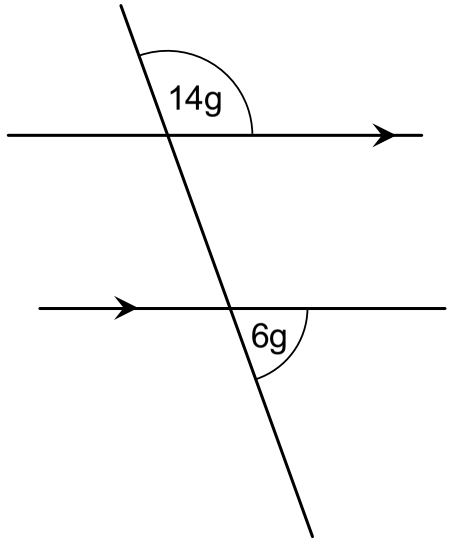
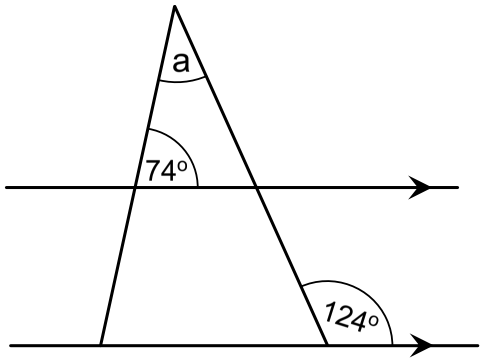


state what the angles are indicated by a letter, giving reasons for your answer

(1)



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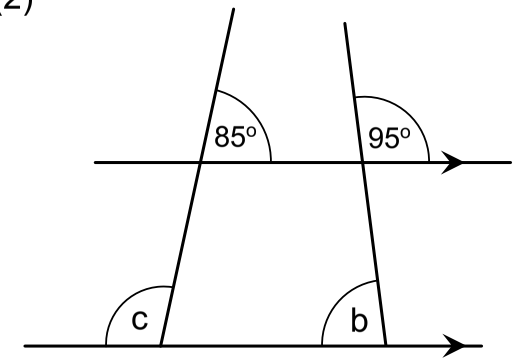

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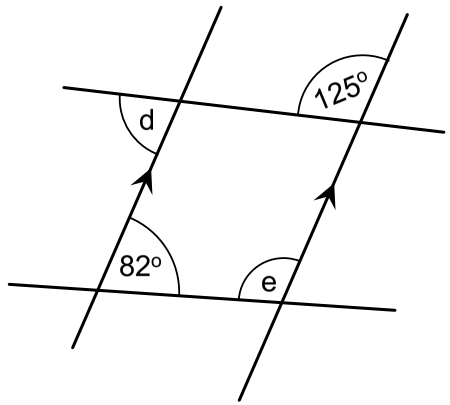

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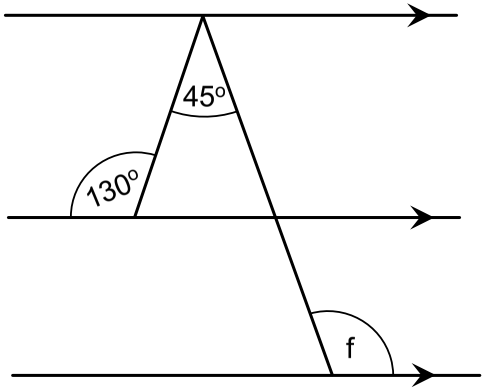

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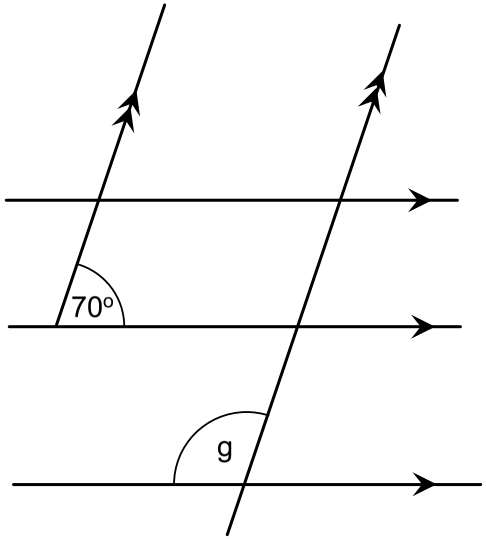

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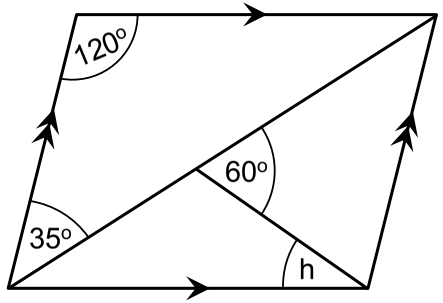
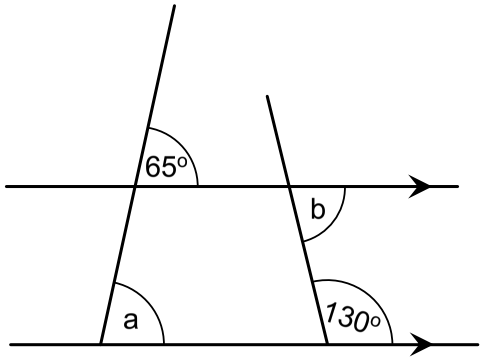


state what the angles are indicated by a letter, giving reasons for your answer

(7)



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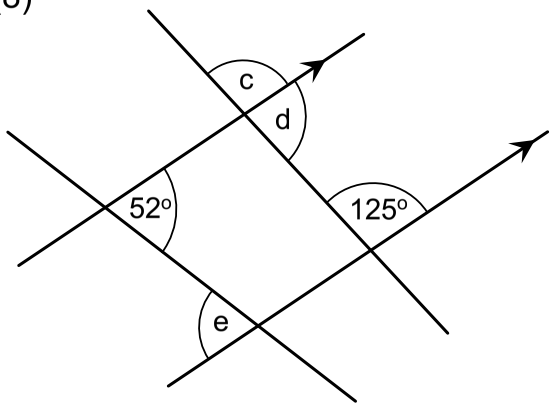

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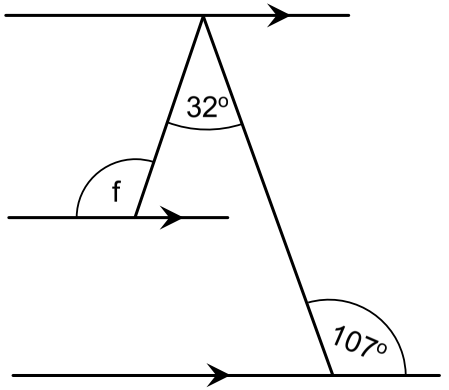
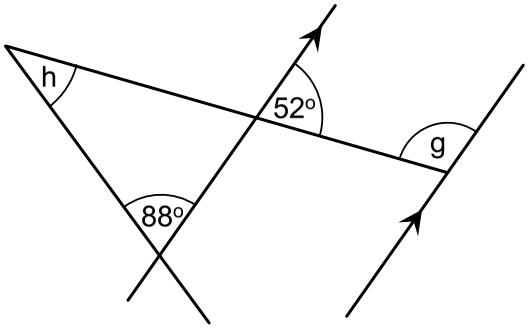
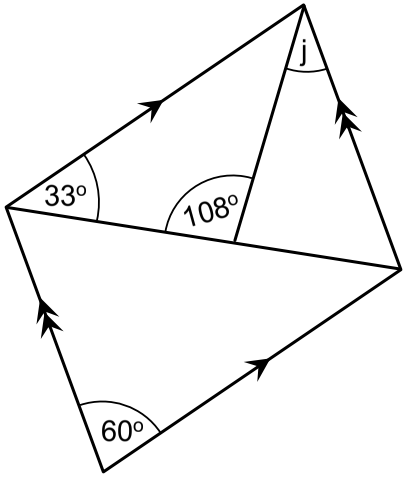


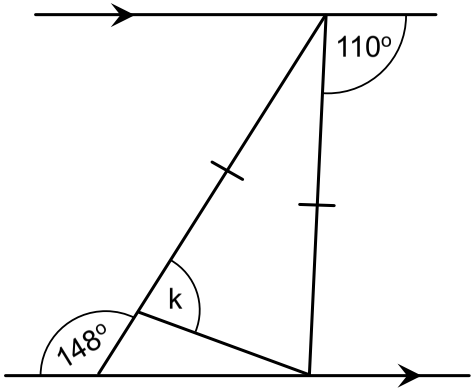
(10)



(11)

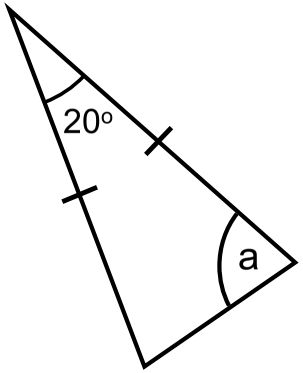


(12)

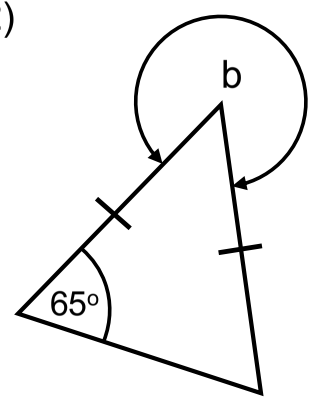


find the angle for the letters (i)

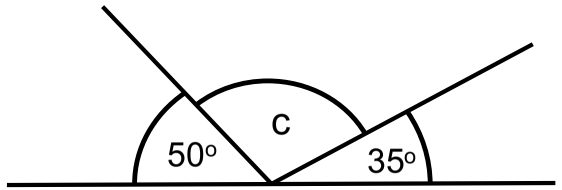
(1)



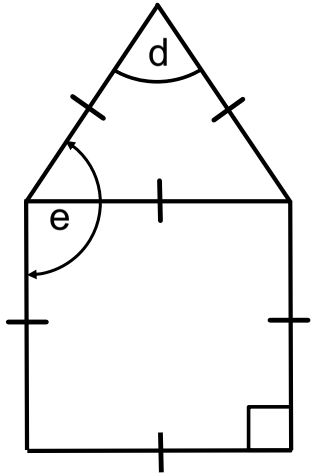
(2)



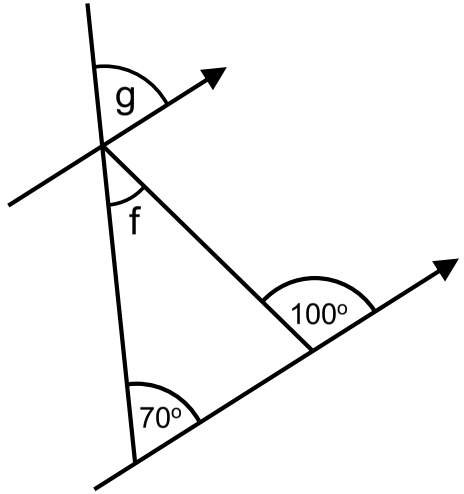
(3)



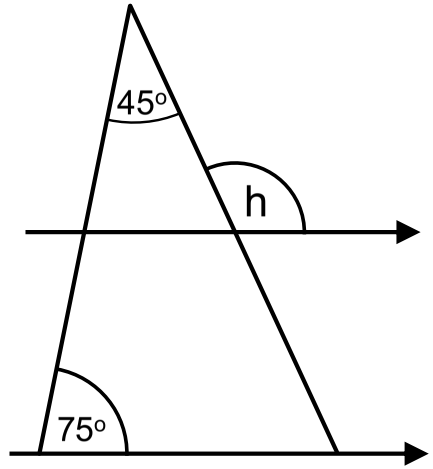
(4)



(5)

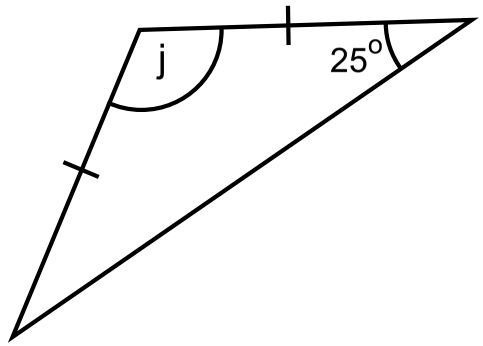


(6)

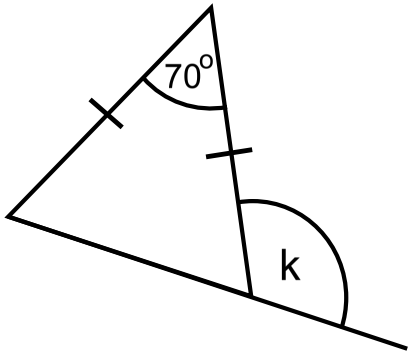


find the angle for the letters (ii)

(7)



(8)



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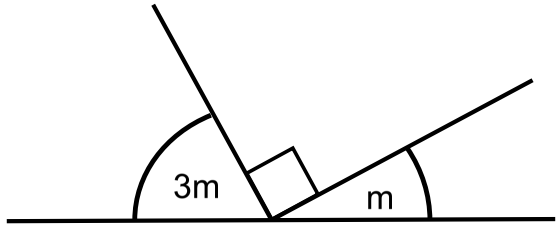

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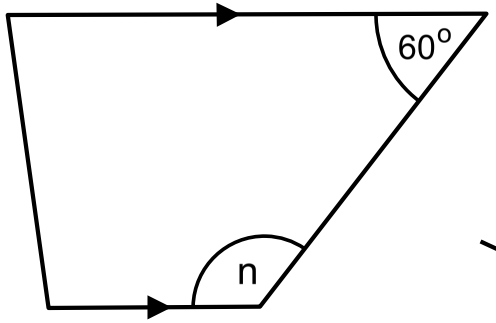

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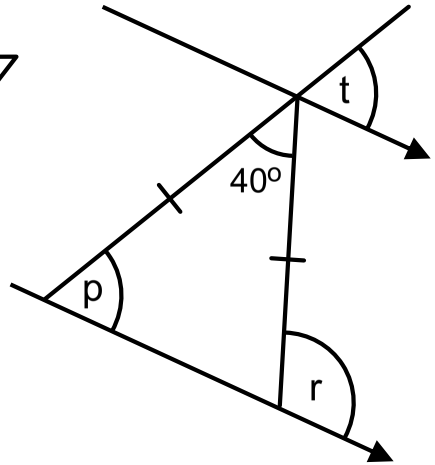

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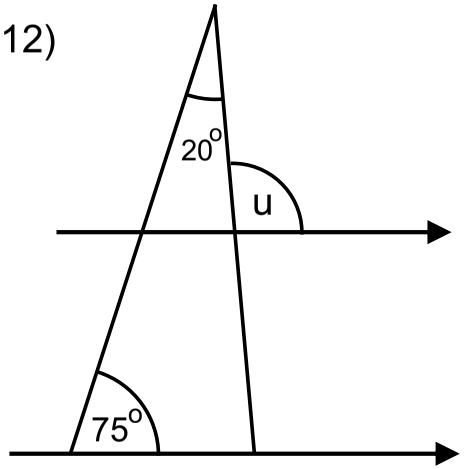
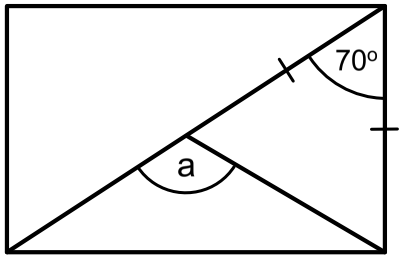


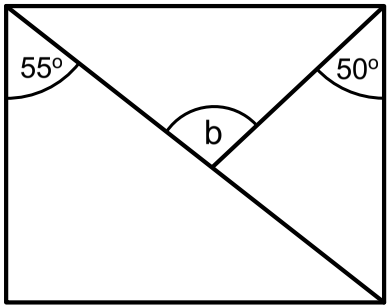
rectangles

find the angle for the letters

(1)



(2)



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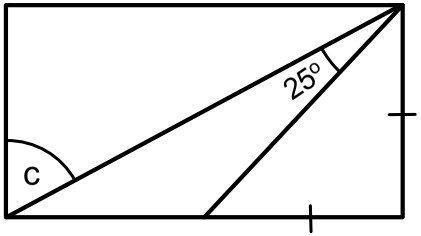

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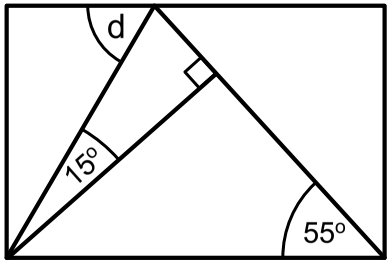

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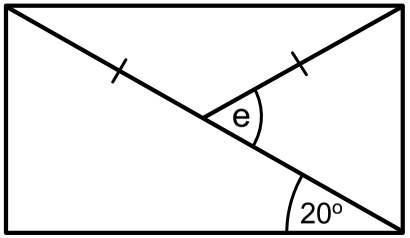

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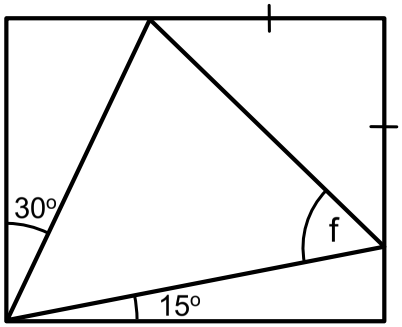
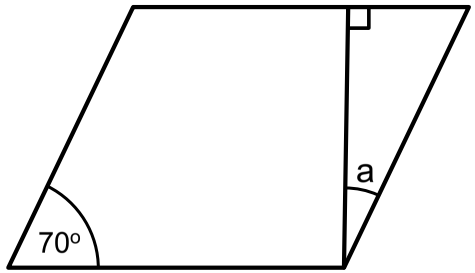


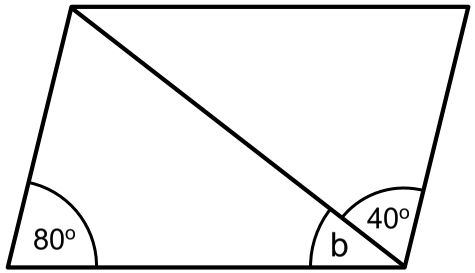
parallelograms

find the angle for the letters

(1)



(2)



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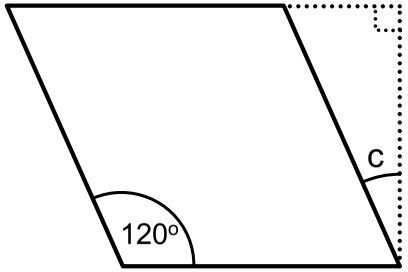

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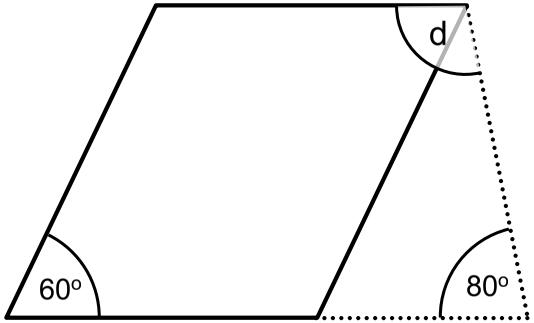

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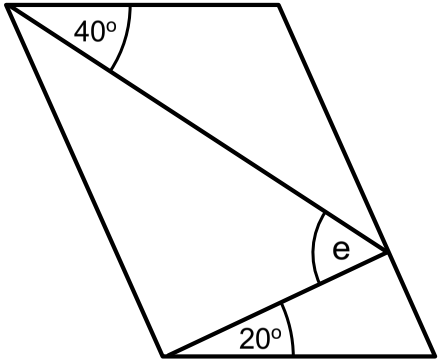

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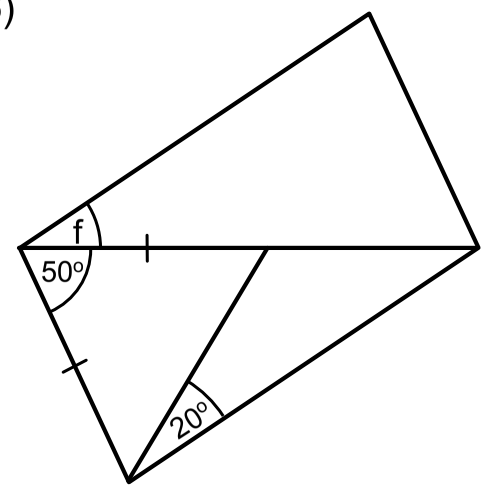
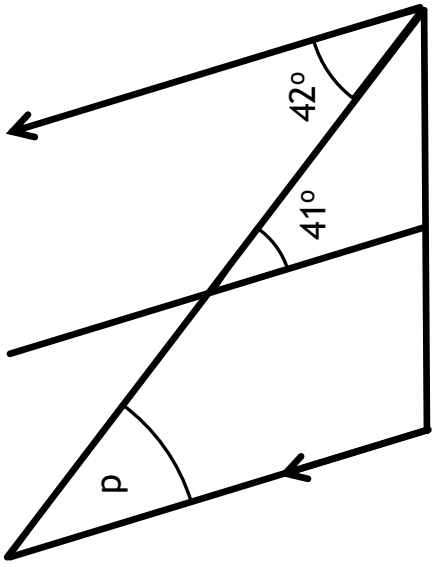


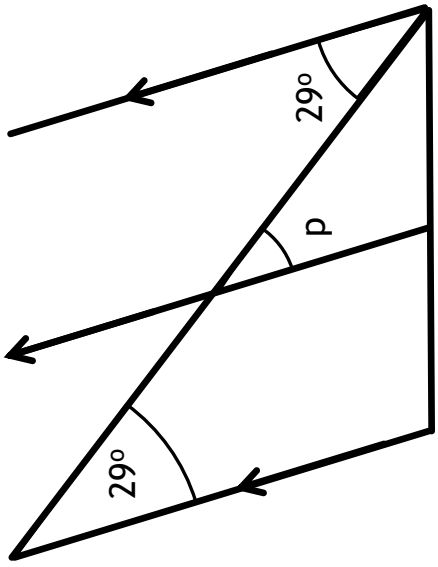
Fluency Practice

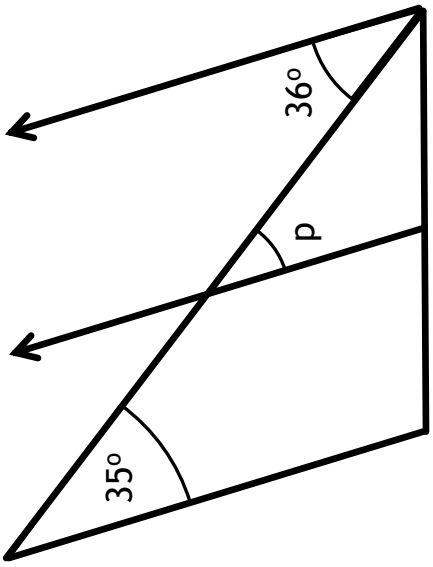
For each diagram, justify whether or not line segments AB and CD are parallel.

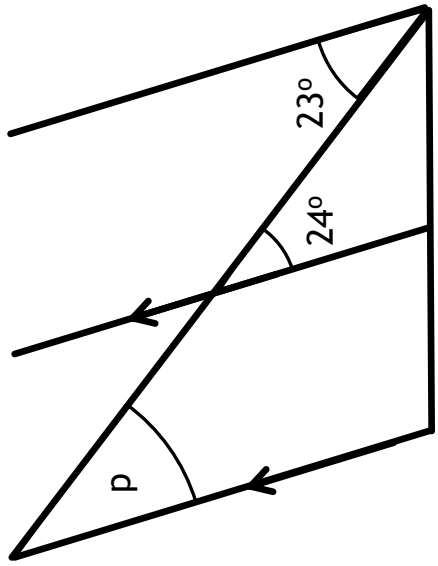
Fluency Practice

In each figure, find angle p.





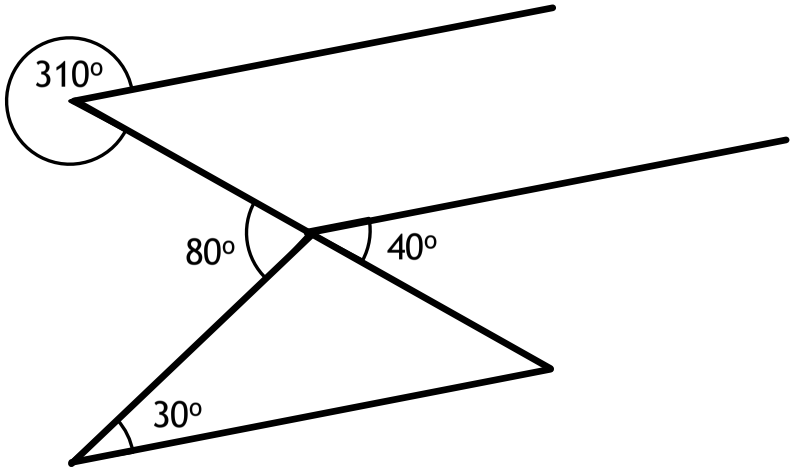


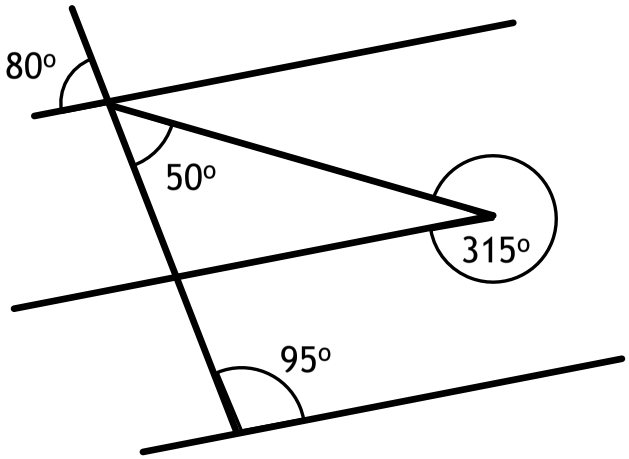


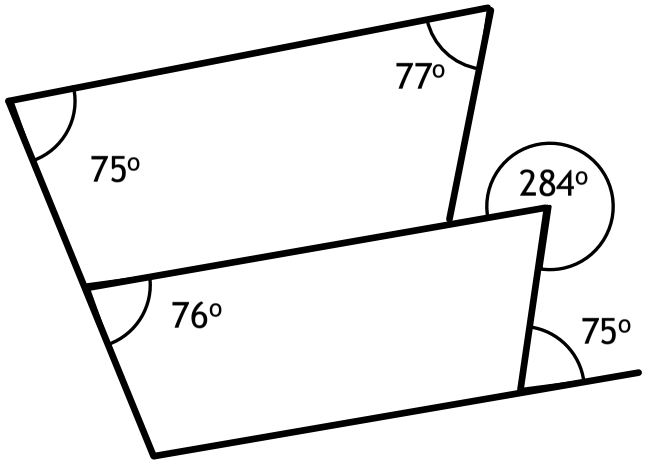
Fluency Practice

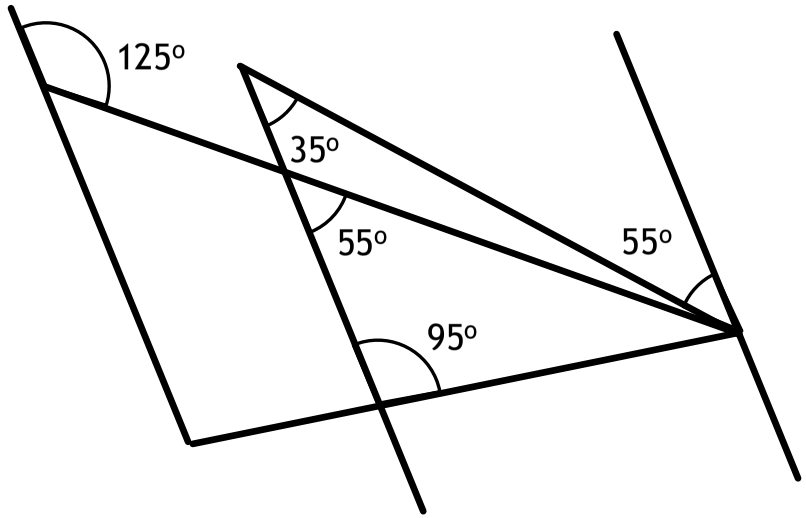
In each figure, highlight the two line segments that are parallel

In each figure, highlight the two line segments that are parallel



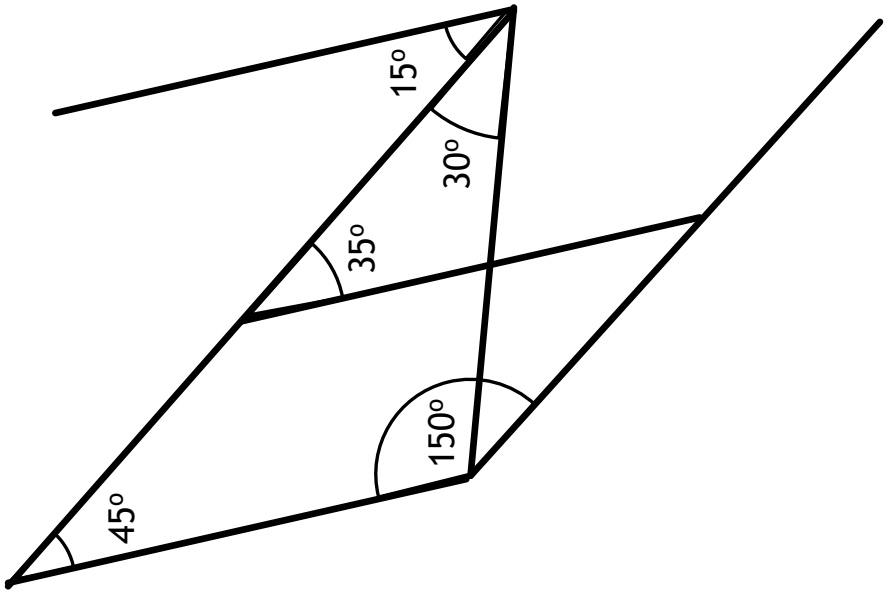


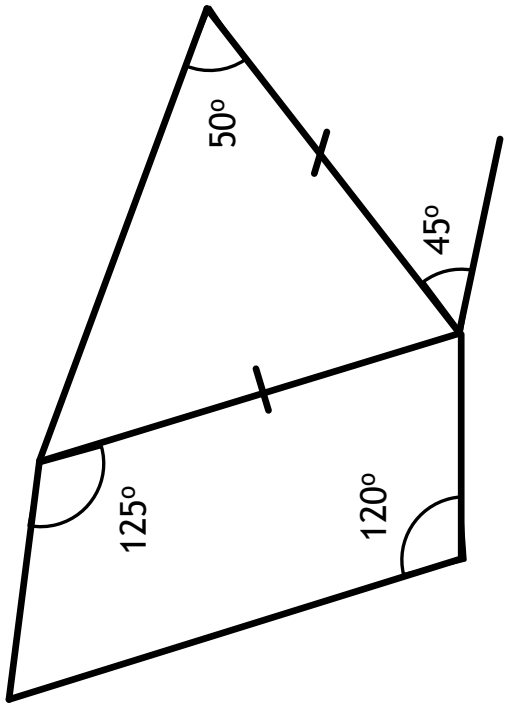




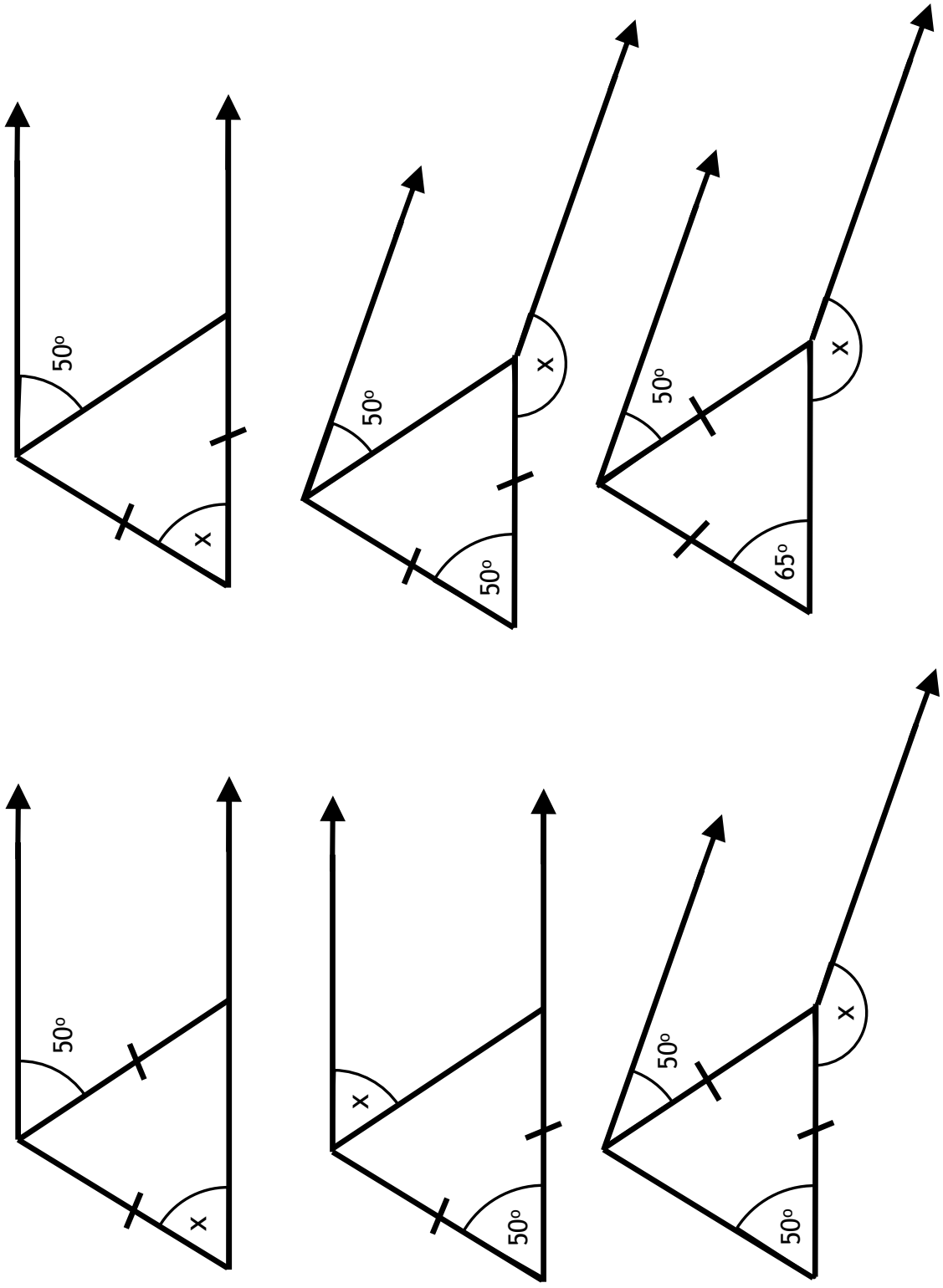
Fluency Practice

In each figure, find the line segments that are parallel.



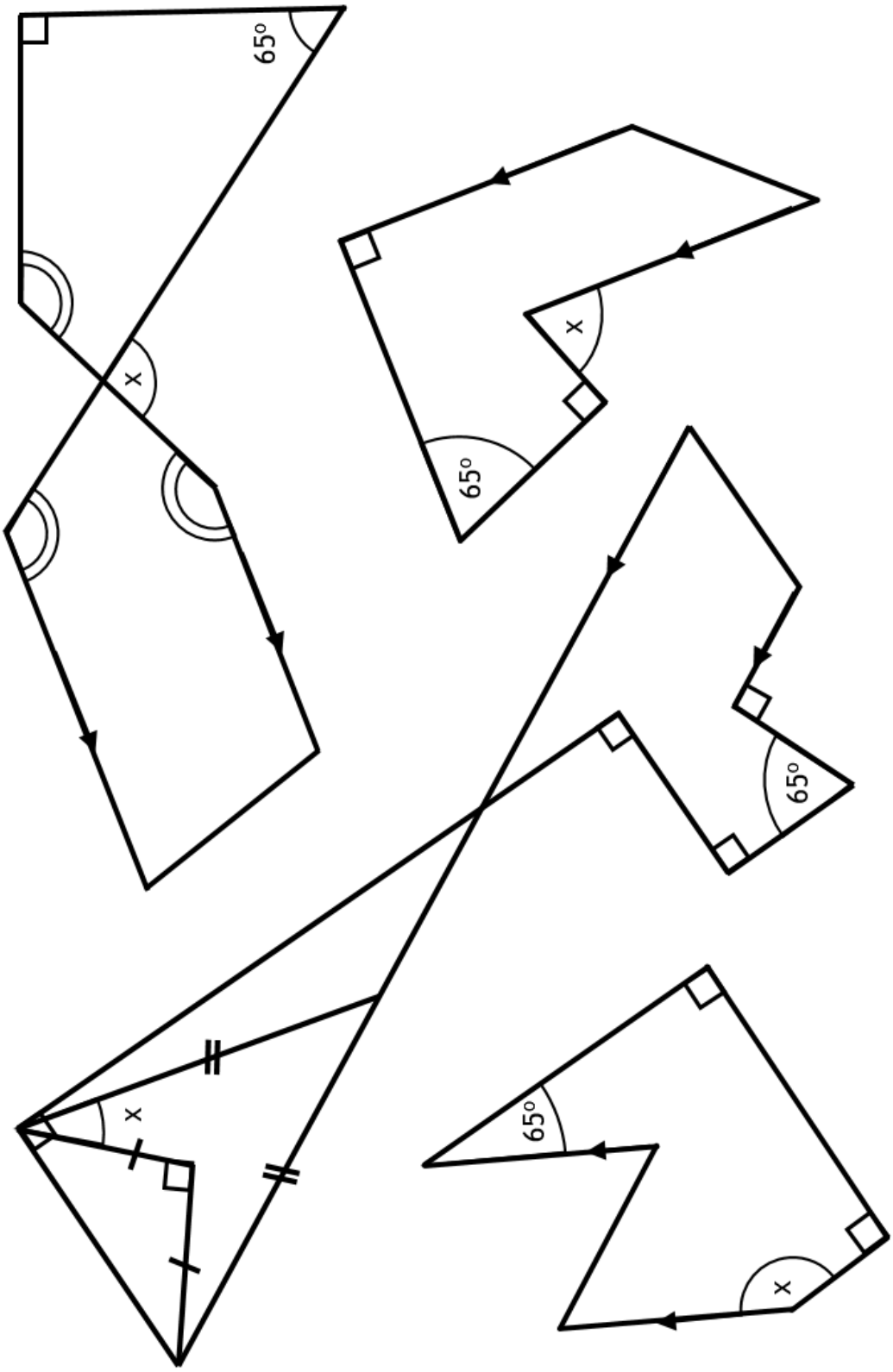


Fluency Practice

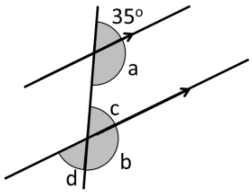
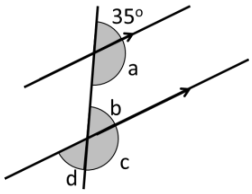
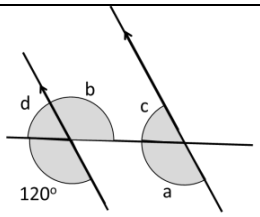
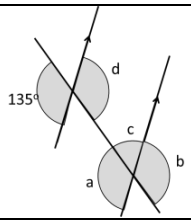
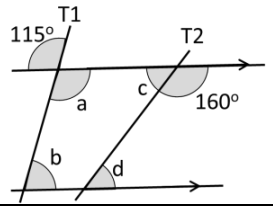
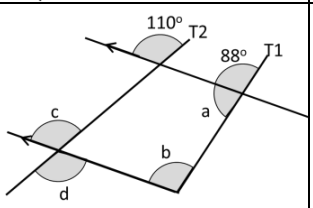
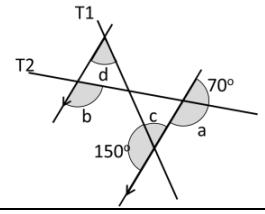


Fluency Practice

Fluency Practice

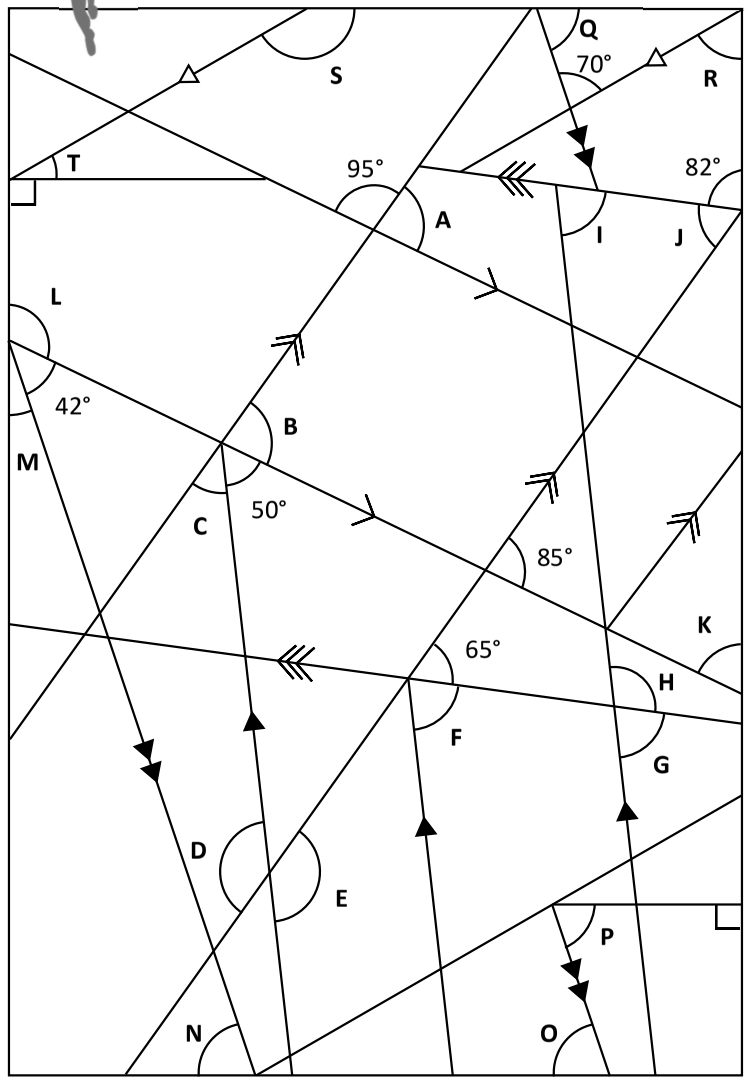


Fluency Practice

Diagram	All acute angles are …		All obtuse angles are …		**a** and **b** fact	**c** and **d** fact
	35°		145°		Corresponding angles are equal	Vertically opposite angles are equal
						
						
						
	T1	T2	T1	T2		
			115°	160°		
						
						

Parallel Parkour

Using angle rules, find angles **A** to **T**.
The outside shape is a rectangle.

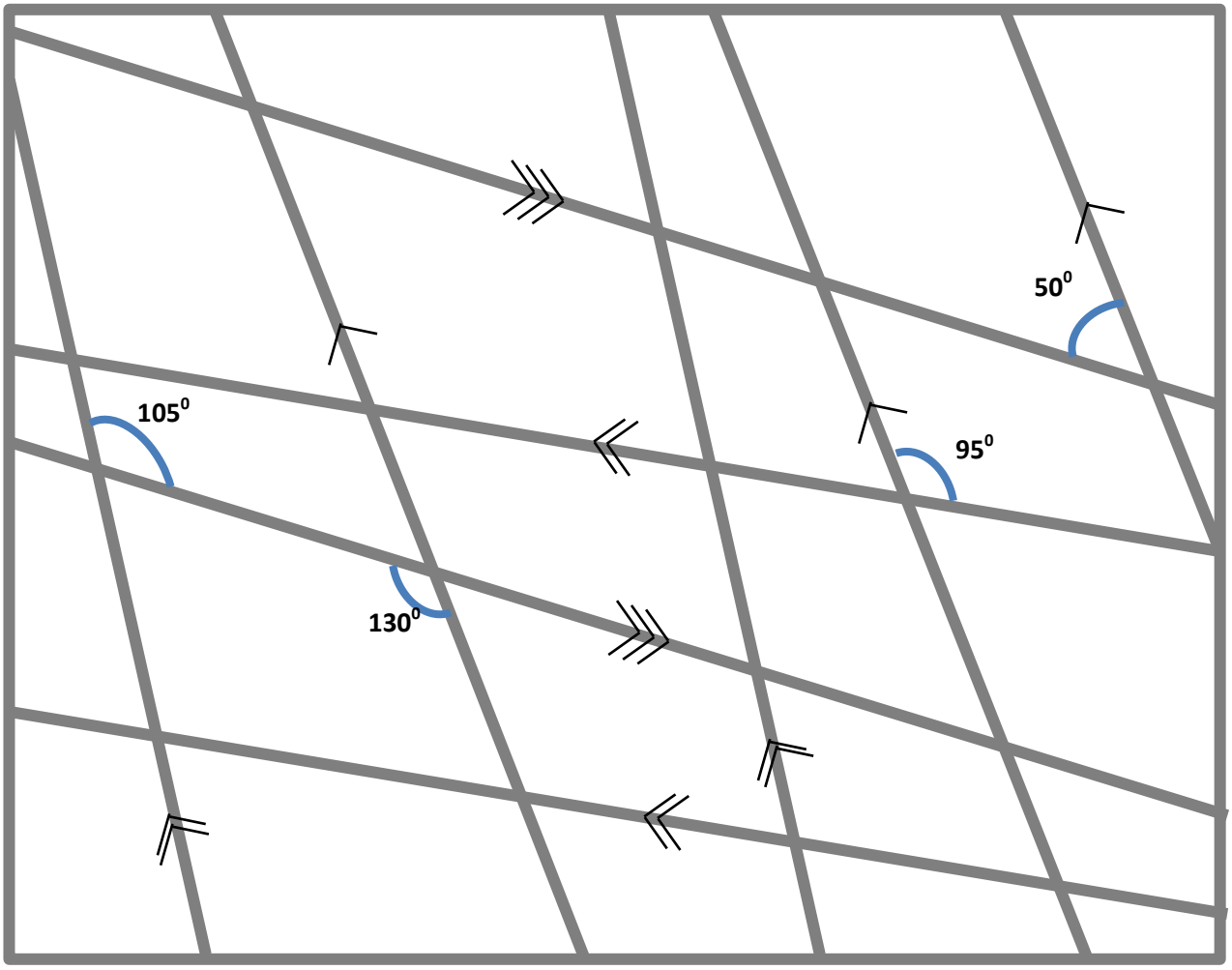


Angle Connection	Angle	Reason
→ **A**		
A → **B**		
B → **C**		
C → **D**		
D → **E**		
E → **F**		
F → **G**		
G → **H**		
H → **I**		
I → **J**		
J → **K**		
K → **L**		
L → **M**		
M → **N**		
N → **O**		
O → **P**		
P → **Q**		
Q → **R**		
R → **S**		
S → **T**		

Fluency Practice

You are given four angles. It is now possible to label all of the inside angles.

Can you find them all?



Challenges

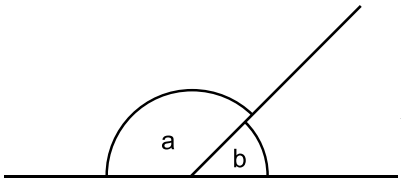
a) Can you find 3 quadrilaterals that all have the same angles?

b) Can you shade 4 pairs of alternate angles?

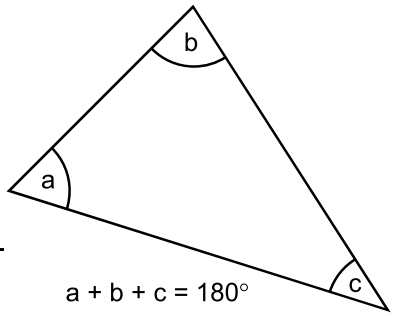
c) Can you shade 4 pairs of supplementary angles?

d) Can you make your own design like the one above? How difficult can you make it?

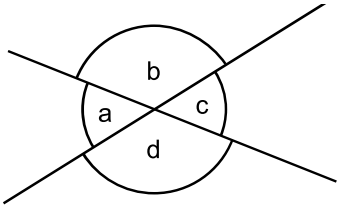
Fluency Practice



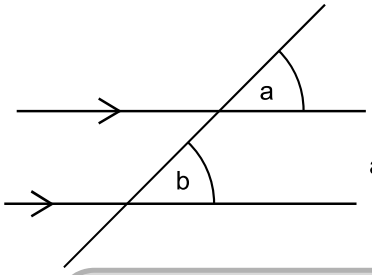
a + b = 180°



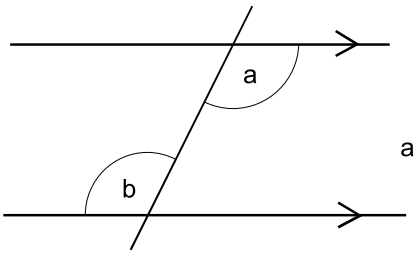
a + b + c = 180°



a = c
b = d

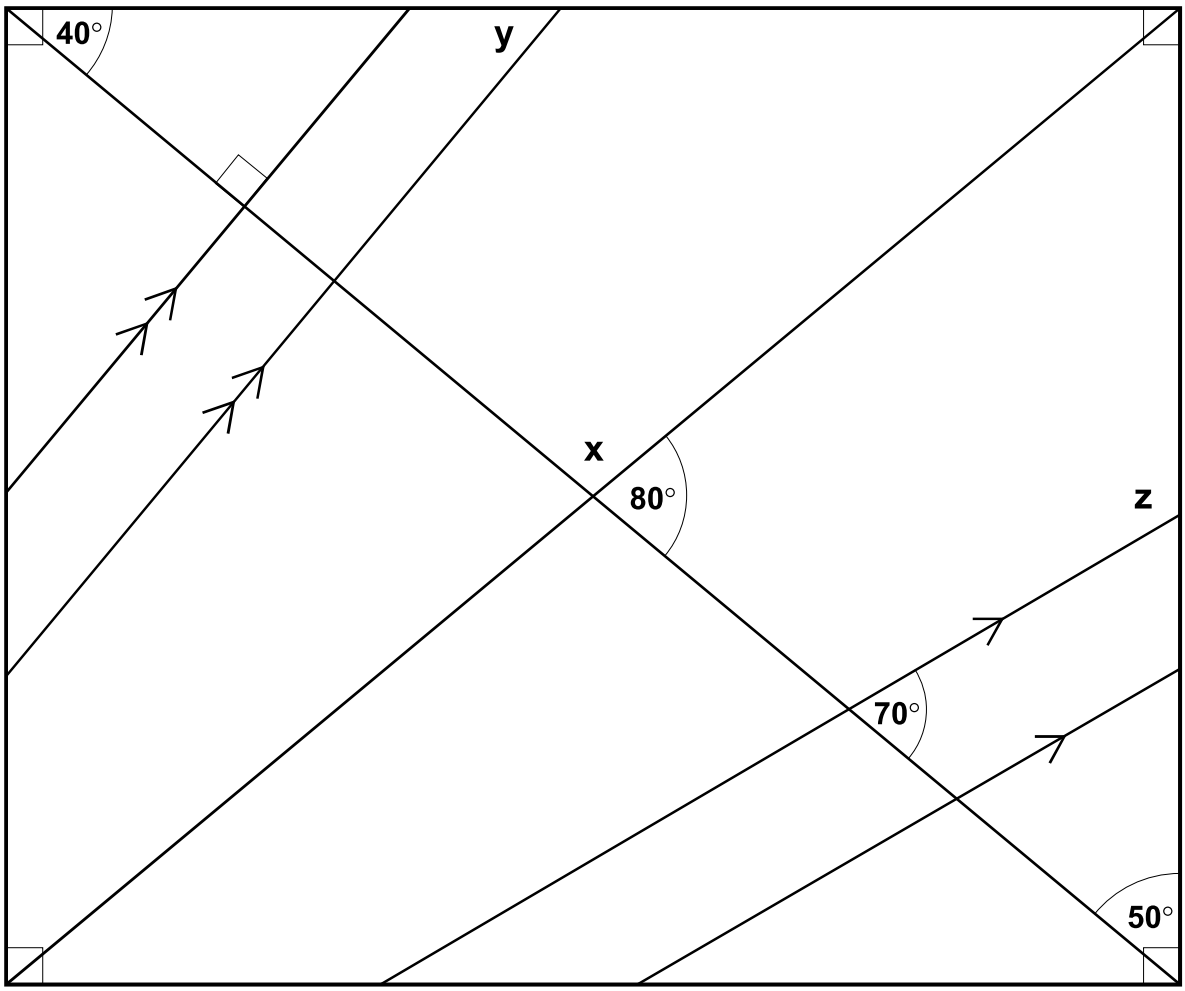


a = b



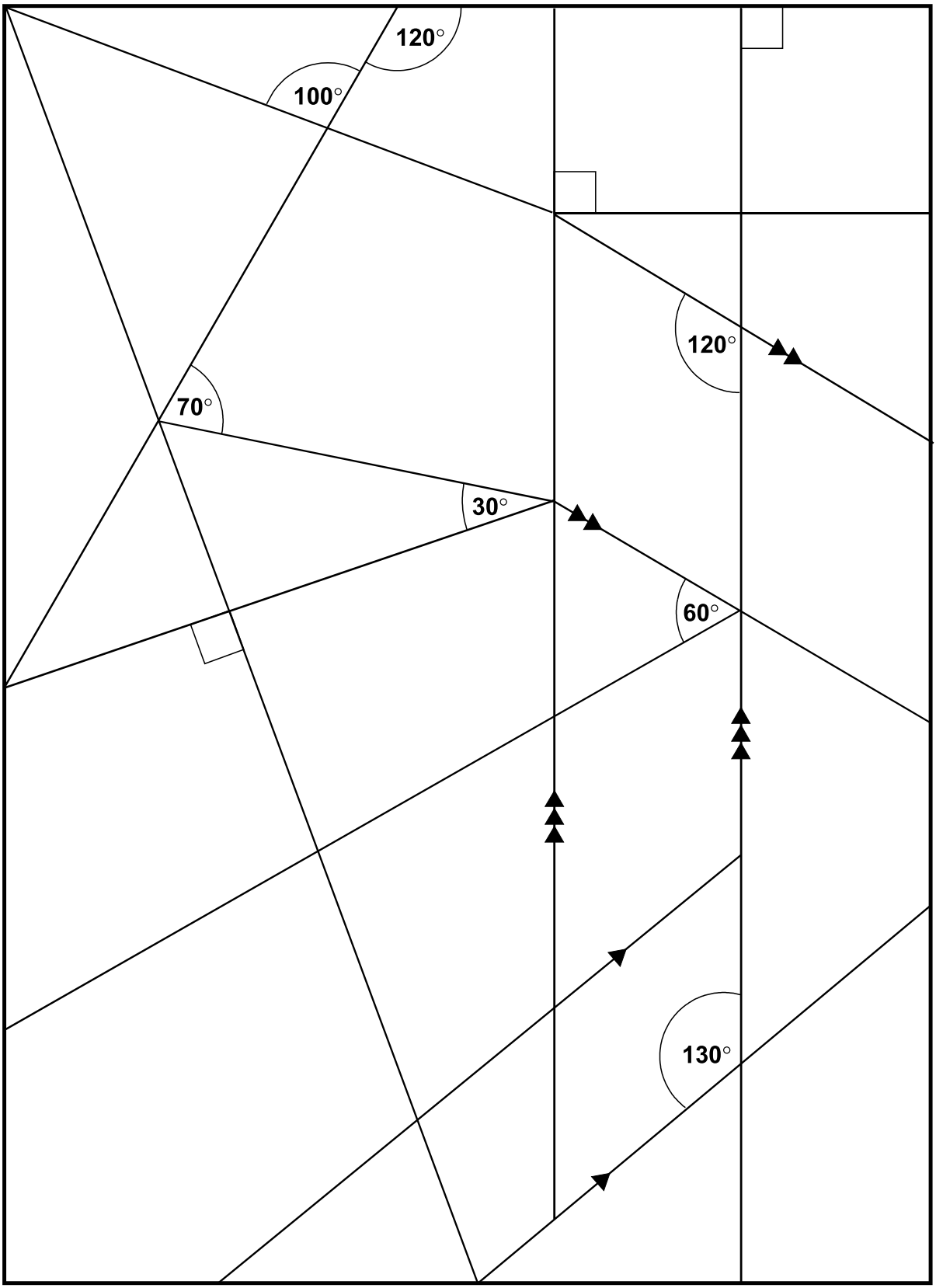
a = b

1. Calculate and mark in all the missing angles.
   Do not use an angle indicator.
2. Show how you found angle x, angle y and angle z.



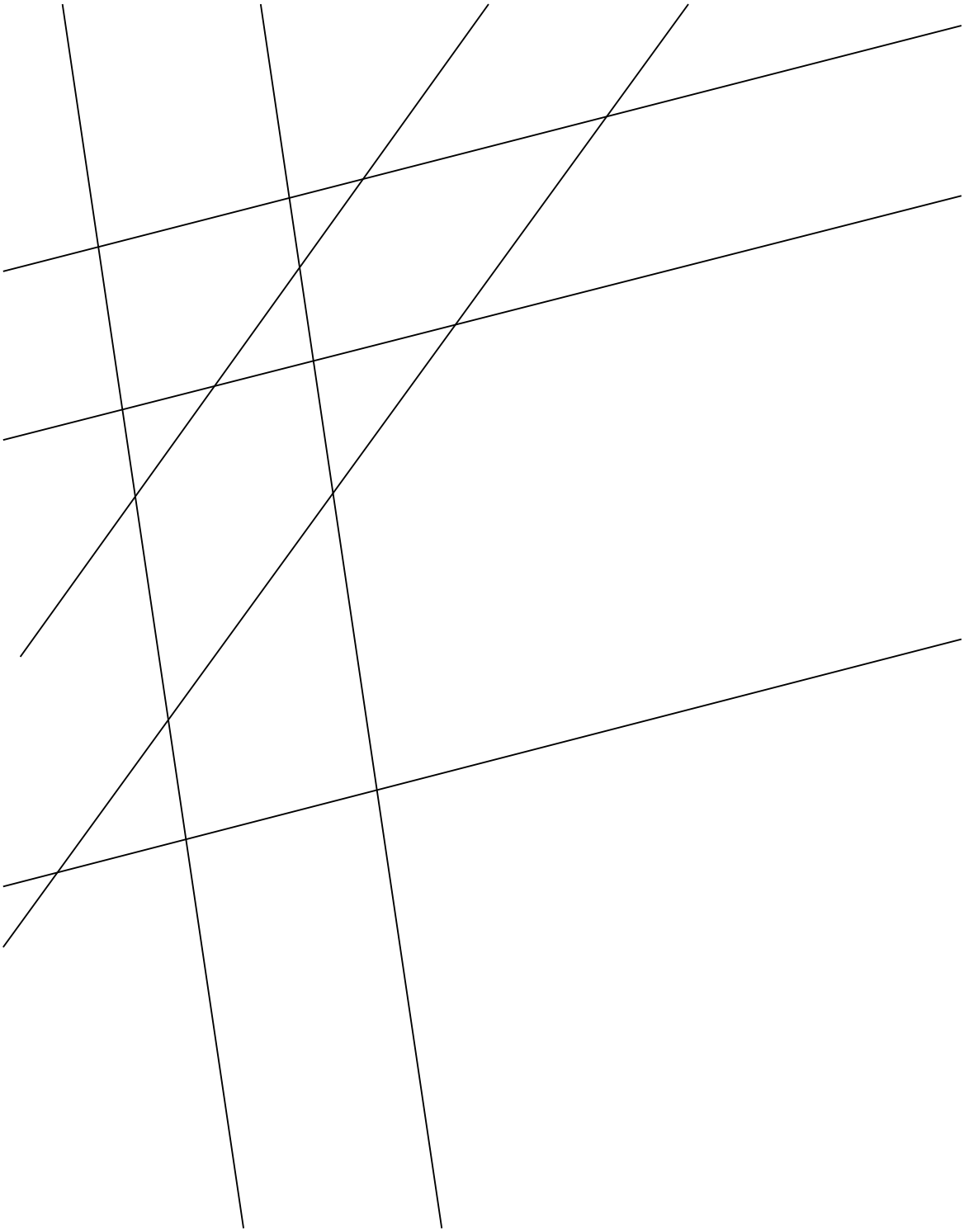
Fluency Practice

Work out the unmarked angles inside this rectangle.
(Do not use an angle indicator.)

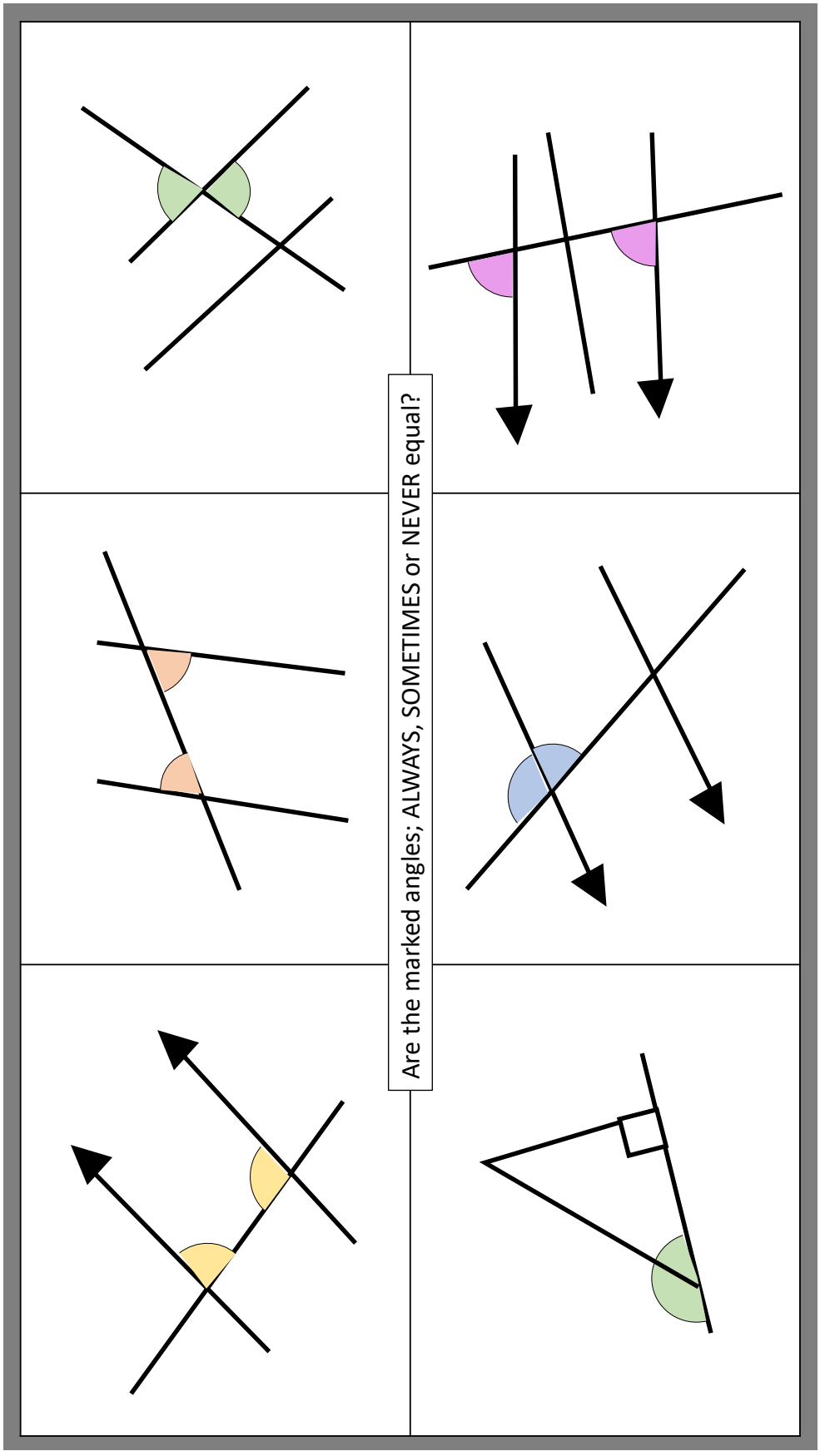


Fluency Practice

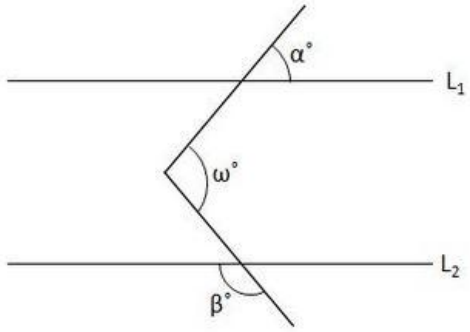
- Use arrows to show which lines below are parallel to each other.
- Every time two lines cross each other, they create four angles.
  There are 15 crossing points in the drawing below, so there are 60 angles.
  Use colour to show which angles are the same size as each other.



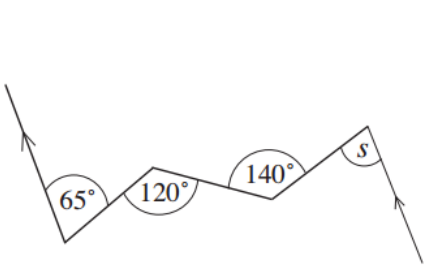
Always, Sometimes or Never

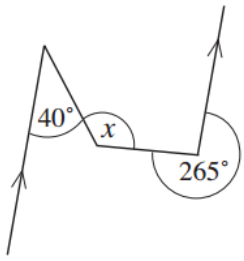


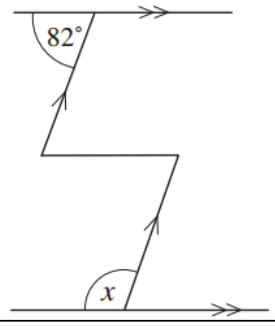
Problem Solving

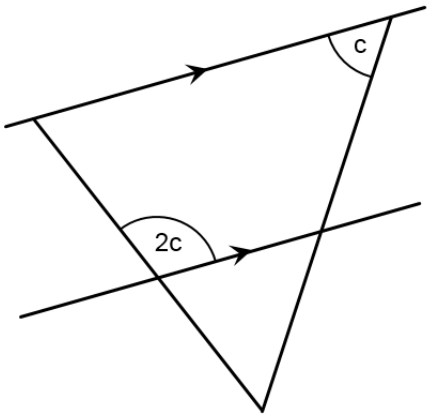


In the above diagram, two lines L_1 and L_2 are parallel. If $\alpha^\circ = 60^\circ$ and $\beta^\circ = 130^\circ$, what is the angle ω°?

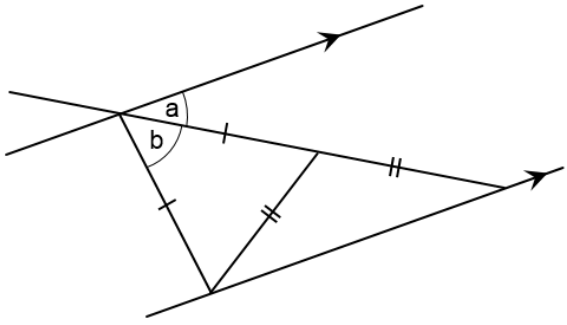








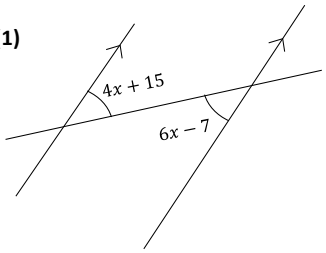
prove that the large triangle must be isosceles



prove that 4a + b = 180°

Fluency Practice

(1)



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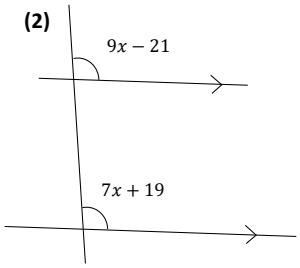

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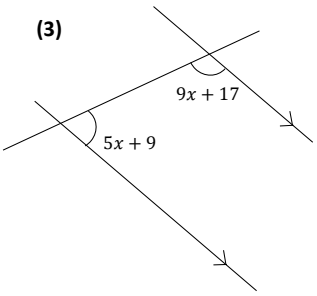

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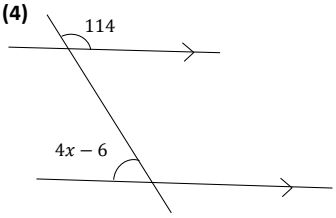

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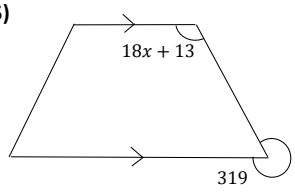
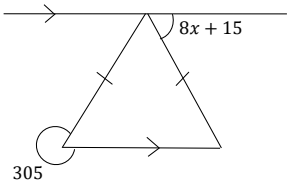
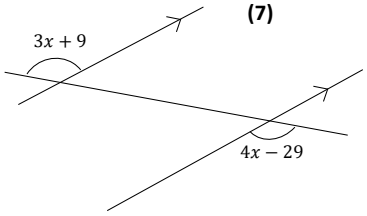


(6)



(7)



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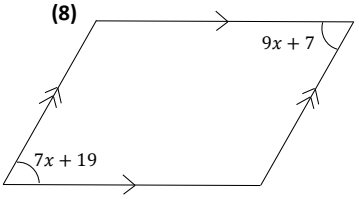

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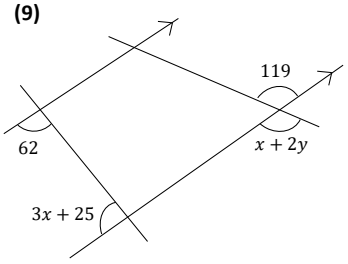
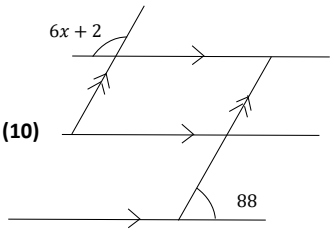


(10)



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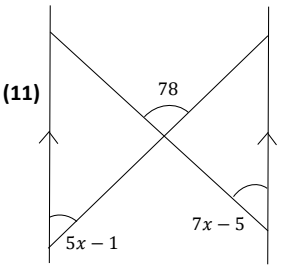
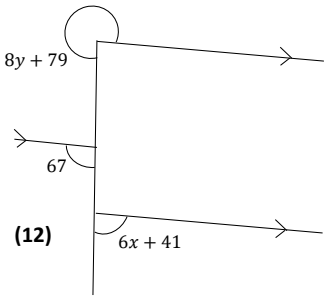
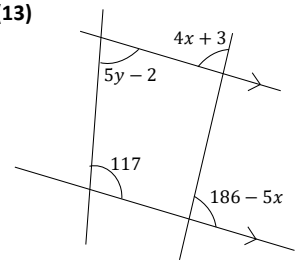


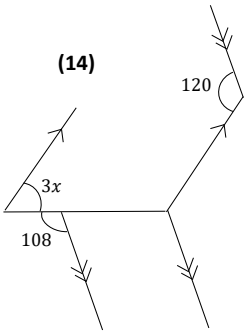
(12)



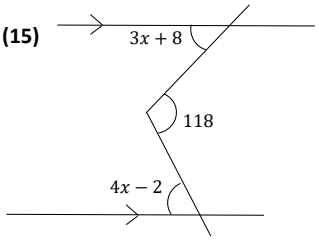
(13)



(14)

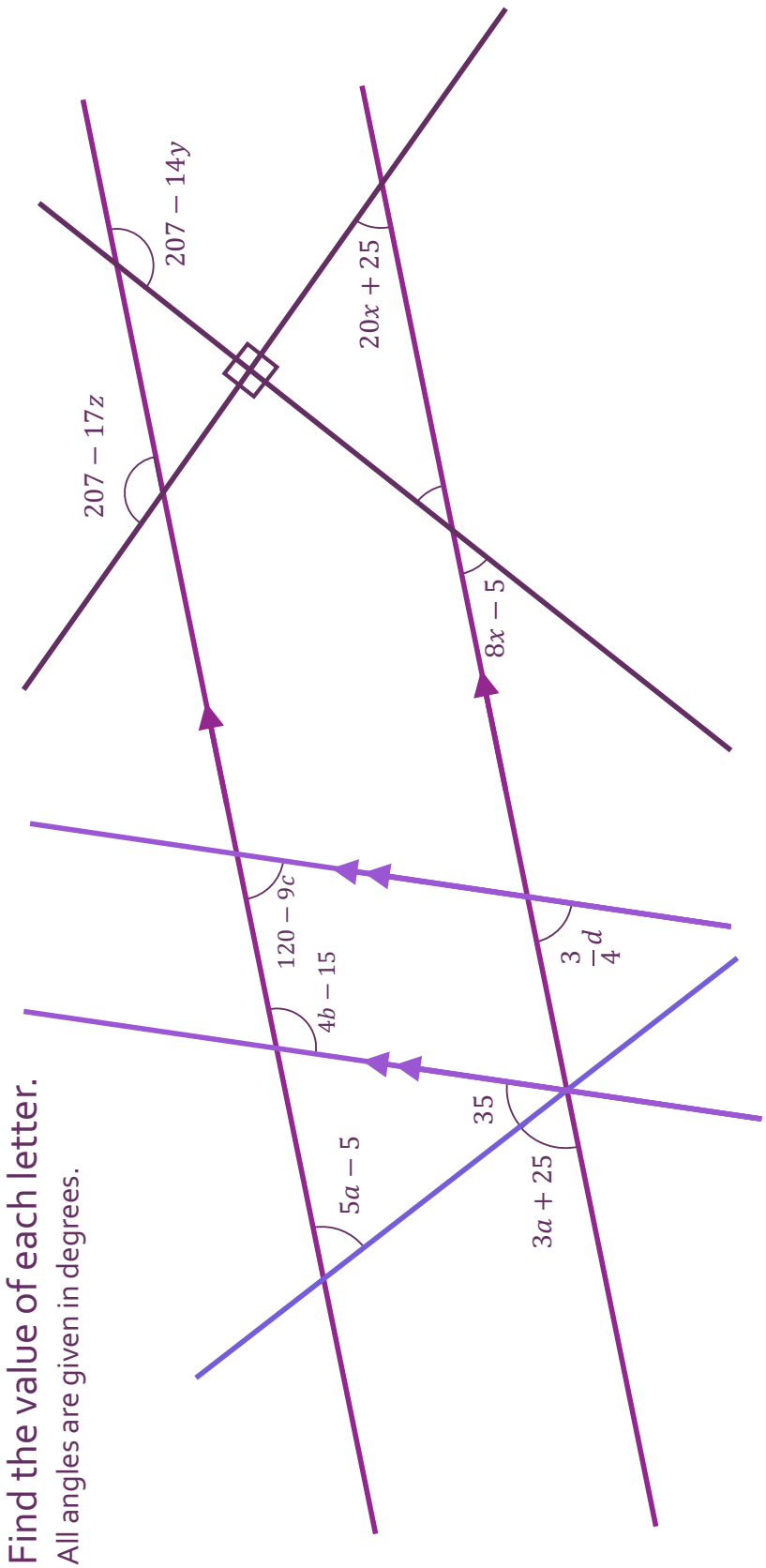


(15)



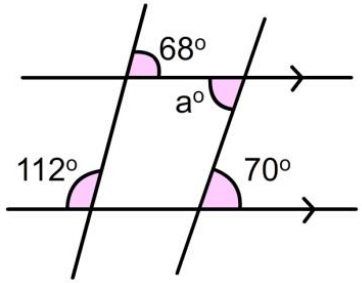
Find the value of each letter.

All angles are given in degrees.

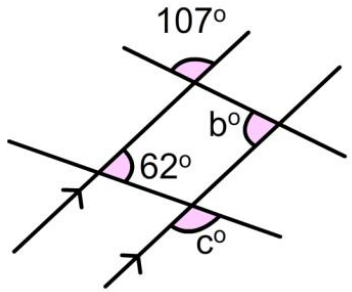


parallel lines angle problems

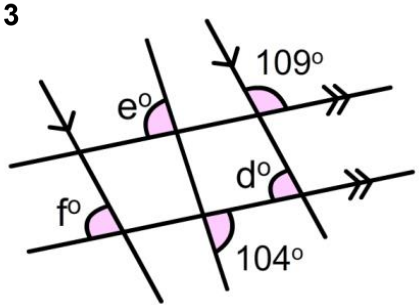
1



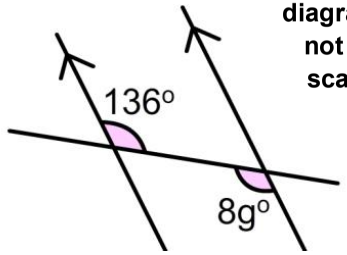
2



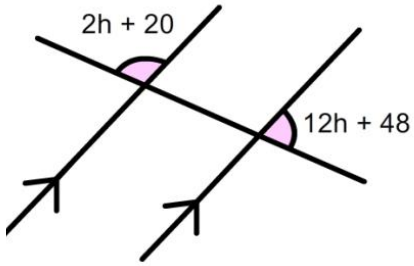
3



4 All diagrams not to scale



5



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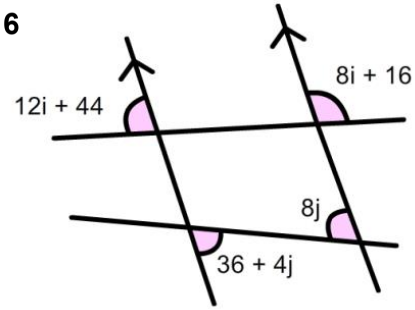
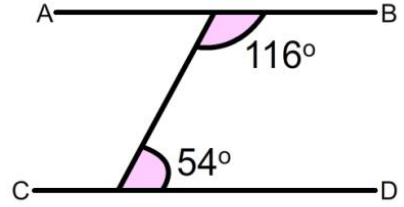
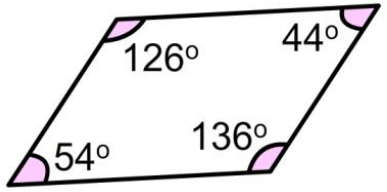


7



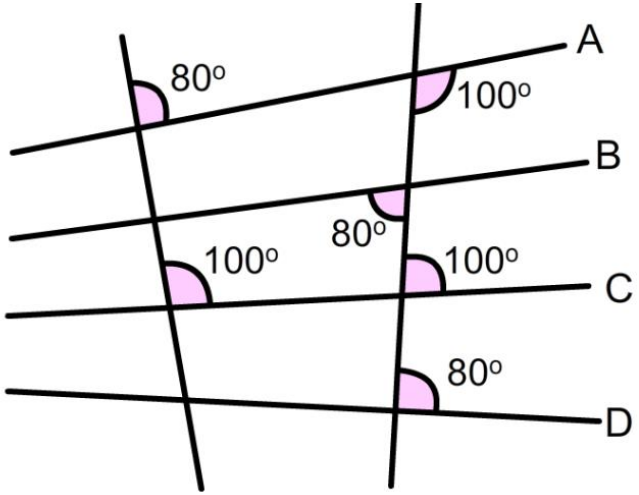
Are lines AB and CD parallel?

8



Based on its angles, how many pairs of parallel lines does this shape have?

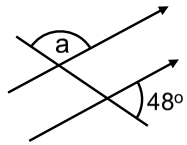
9 Use the angles here to decide which of the four lines, A, B C and D are parallel to each other.



Fluency Practice

practice makes perfect: angles on parallel lines and in quadrilaterals

1)



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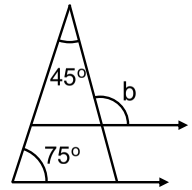

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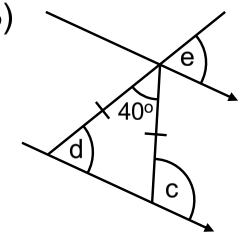
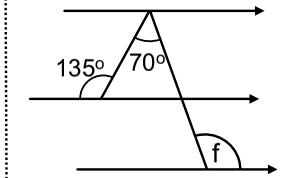
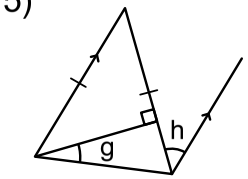


4)

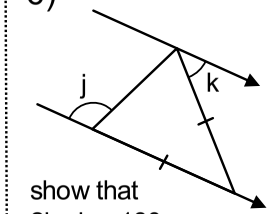


5)



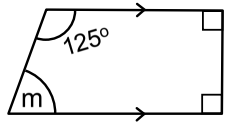
show that
h = 2g

6)

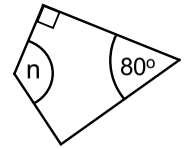


show that
2j – k = 180°

7) trapezium

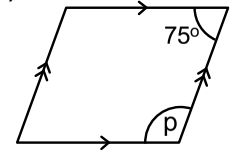


8) kite

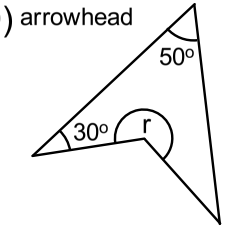


(symmetrical)

9) parallelogram

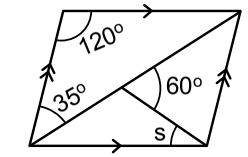


10) arrowhead

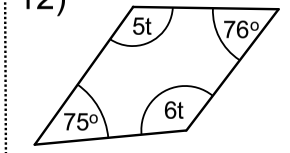


(symmetrical)

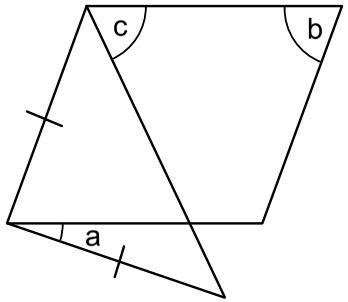
11) parallelogram



12)

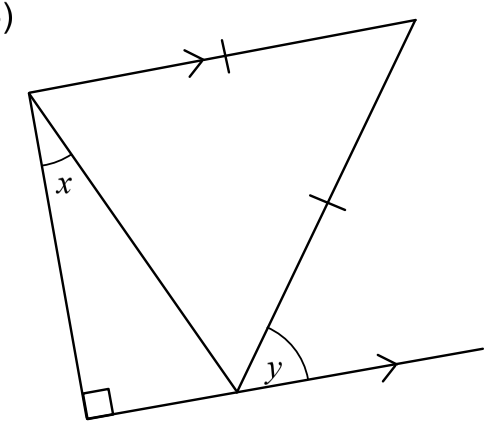


13) a parallelogram with an isosceles triangle



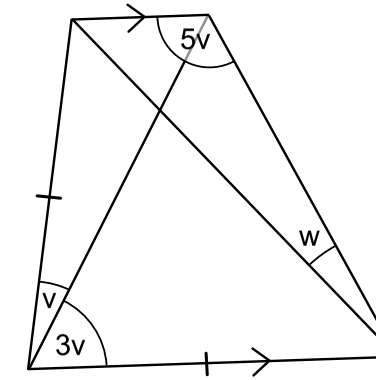
prove that b + 2c = a + 180°

14)



what is the relationship between 'y' and 'x'?

15)



find 'w' in terms of 'v'

Fluency Practice

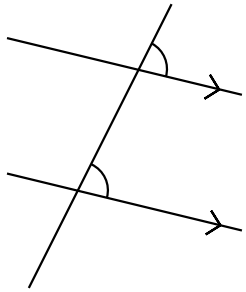
Create a Question

Draw an angle question that needs knowledge of ... to solve.

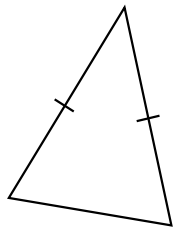
corresponding angles

alternate angles & vertically opposite angles

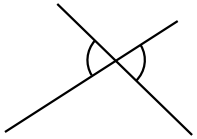
alternate angles



parallelograms



trapeziums



co-interior angles & angles around a point

co-interior angles

corresponding angles & interior angles of a triangle

alternate angles & equilateral triangles

co-exterior angles

corresponding angles & angles on one side of a straight line

co-interior angles & isosceles triangles

rhombi

Diagrams don't need to be drawn accurately!

Make a problem that **can't** be solved!