KING EDWARD VI
HANDSWORTH GRAMMAR
SCHOOL FOR BOYS

KING EDWARD VI
ACADEMY TRUST
BIRMINGHAM

Year 8

2023 Mathematics 2024

Unit 8 Tasks – Part 1

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Unit 8 Tasks – Part 2

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Contents

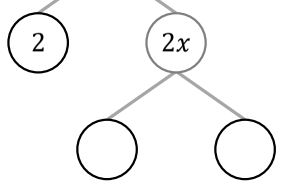
1 Factorising to a Single Bracket

Intelligent Practice

Term	Product of Factors
$2p$	
$4p$	
$6p$	
$9p$	
$12p$	
$12pr$	
$12p^2$	
$12p^2r$	
$20p^2r$	
$20p^2r^2$	
$20p^3r^2$	
$20p^2r^3$	
$30p^4r^7$	

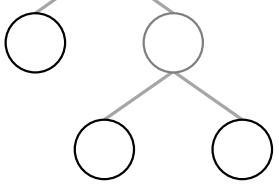
Prime Factorisation... with Algebra! Complete each **Prime Factorisation Tree**, then write the expression as a product of prime factors.

1) $4x$



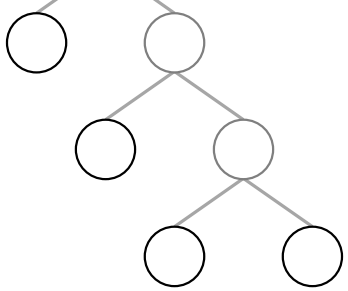
$4x = 2 \times 2 \times x$

2) $6y$



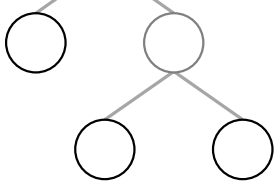
$6y =$ _____

3) $20a$



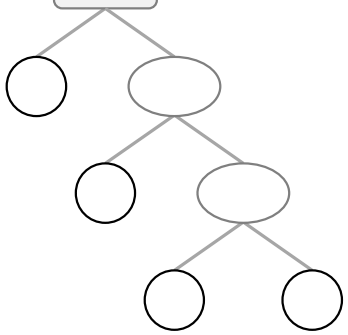
$20a =$ _____

4) $3b^2$



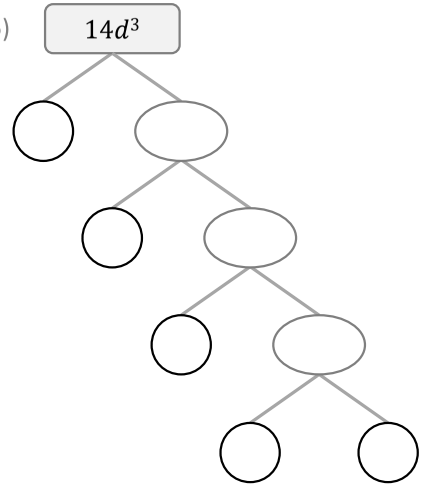
$3b^2 =$ _____

5) $3xy^2$



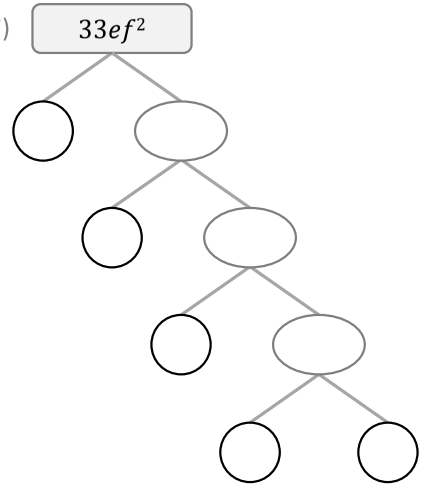
$3xy^2 =$ _____

6) $14d^3$



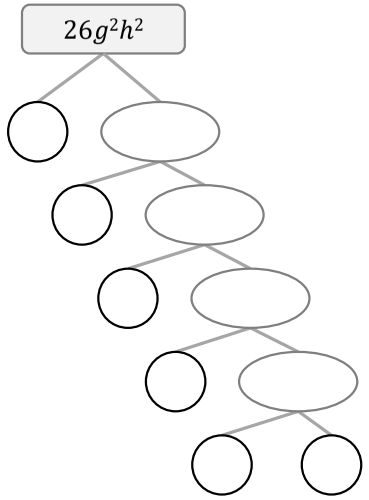
$14d^3 =$ _____

7) $33ef^2$



$33ef^2 =$ _____

8) $26g^2h^2$



$26g^2h^2$

$=$ _____

9) $49i^2 =$

10) $34j^4 =$

11) $121kl^2m =$

12) $550n^3p^2 =$

Intelligent Practice

Term	Term	Highest Common Factor
$2p$	$3p$	
$2p$	$5p$	
$2p$	$6p$	
$3p$	$9p$	
$3p$	$12p$	
$3pr$	$12pr$	
$6pr$	$12pr$	
$9pr$	$12pr$	
$12pr$	$20pr$	
$12r$	$20pr$	
$12p^2r$	$20pr$	
$12p^2r^2$	$20pr$	
$12p^2r^2$	$20p^3r^2$	

Fluency Practice

1) Find the Highest Common Factor (HCF) of $36y^5z^2$ and $182x^2y^2$

2) Find the Highest Common Factor (HCF) of $200x^3y^2z$ and $144x^6yz^2$

3) Find the Highest Common Factor (HCF) of $200xy^6z^3$ and $28x^3yz^3$

4) Find the Highest Common Factor (HCF) of $52ab^5c^4$ and $10a^3b^3c$

5) Find the Highest Common Factor (HCF) of $225p^2q^3r^2$ and $117p^6q^4r^5$

6) Find the Highest Common Factor (HCF) of $225a^4bc$ and $55a^5b^6c$

7) Find the Highest Common Factor (HCF) of $18x^3y^4z^3$ and $24x^5y^5z^4$

8) Find the Highest Common Factor (HCF) of $15x^2z^2$ and $33x^5y^5z$

9) Find the Highest Common Factor (HCF) of $54x^3y^6$ and $48x^3y^5z^4$

10) Find the Highest Common Factor (HCF) of $33a^2c^4$ and $63abc^5$

Question 1: Factorise the following expressions

(a) $4x + 6$	(b) $15x + 20$	(c) $9y - 12$	(d) $5x + 15$
(e) $6x - 3$	(f) $4x + 8$	(g) $5y - 25$	(h) $8w + 24$
(i) $10y + 15$	(j) $14w + 21$	(k) $20y - 30$	(l) $27x + 18$
(m) $6 - 4x$	(n) $9 + 12y$	(o) $45 + 60x$	(p) $16y - 32$
(q) $22a + 55$	(r) $100 - 40y$	(s) $6x + 9y$	(t) $4w - 2a$
(u) $25y - 35z$	(v) $8x^2 + 20$	(w) $30y^3 - 15$	(x) $42y + 28x - 56c$

Fluency Practice

Question 2: Factorise the following expressions

(a) $x^2 + 7x$ (b) $x^2 - 3x$ (c) $y^2 + y$ (d) $w^2 + 9w$

(e) $x^2 - 7x$ (f) $4w^2 + 10w$ (g) $6x^2 - 8x$ (h) $9y^2 - 6y$

(i) $10c + c^2$ (j) $5g - g^2$ (k) $14x^2 + 35x$ (l) $40x^2 - 50x$

(m) $12x^2 + 18x$ (n) $24x^2 - 18x$ (o) $45y^2 + 60y$ (p) $7w^2 + 2w$

Question 3: Factorise the following expressions

(a) $x^2 + xy$ (b) $a^2 - ab$ (c) $xy + xz$ (d) $ab + ac - ad$

(e) $6c^2 - 4cd$ (f) $10x^2 + 15xy$ (g) $12ab + 18bc$ (h) $8xy + 4y^2$

(i) $8cdf + 10cde$ (j) $7w^2 + 6w + wy$ (k) $8ab^2 - 10ab$ (l) $4xy^2 + 6xy + 2x^2y$

(m) $6mn - 7m^2n$ (n) $11g^2h + 22h^2$

Question 4: Factorise the following expressions

(a) $x^3 + 2x^2$ (b) $5x^3 - x^2$ (c) $8c^3 + 12c$ (d) $10w^2 - 15w^3$

(e) $32y^3 + 24y^2$ (f) $12x^4 + 15x$ (g) $4a^5 - 12a^2$ (h) $8w^9 + w^7$

Factorising by Taking Out a Common Factor				
(a)	**(b)**	**(c)**	**(d)**	**(e)**
Factorise $2x + 10$	Factorise $5x - 15$	Factorise $3x + 18$	Factorise $21 - 7x$	Factorise $11x + 44$
(f)	**(g)**	**(h)**	**(i)**	**(j)**
Factorise $3x + 3$	Factorise $6x - 3$	Factorise $9x - 12$	Factorise $25 + 30x$	Factorise $28 - 21x$
(k)	**(l)**	**(m)**	**(n)**	**(o)**
Factorise $4x - 12$	Factorise $30x + 50$	Factorise $8 - 12x$	Factorise $6x - 24$	Factorise $35x + 21$
(p)	**(q)**	**(r)**	**(s)**	**(t)**
Factorise $5x + 15y$	Factorise $16y - 12x$	Factorise $12x + 20y$	Factorise $60x^2 - 24$	Factorise $36 + 144y$
(u)	**(v)**	**(w)**	**(x)**	**(y)**
Factorise $-3x - 9$	Factorise $-7 - 7x$	Factorise $5x + 10y + 25$	Factorise $-80x - 40y$	Factorise $12x^2 - 18x + 9$

More Factorising by Taking Out a Common Factor				
(a)	**(b)**	**(c)**	**(d)**	**(e)**
Factorise $ab + ac$	Factorise $xy + 2x$	Factorise $4x - xy$	Factorise $3b + ab$	Factorise $2xy + 3x$
(f)	**(g)**	**(h)**	**(i)**	**(j)**
Factorise $x^2 + 3x$	Factorise $x^2 - 2x$	Factorise $x^2 + xy$	Factorise $6a - a^2$	Factorise $a^2 - ab$
(k)	**(l)**	**(m)**	**(n)**	**(o)**
Factorise $2x^2 + 5x$	Factorise $3x^2 - x$	Factorise $7a + 2a^2$	Factorise $5b^2 - bc$	Factorise $x + 8x^2$
(p)	**(q)**	**(r)**	**(s)**	**(t)**
Factorise $2x^2 + 4x$	Factorise $5xy + 20x$	Factorise $10ab - 2ac$	Factorise $6x^2 + 9xy$	Factorise $24x - 18x^2$
(u)	**(v)**	**(w)**	**(x)**	**(y)**
Factorise $10a^2b + 15ab$	Factorise $35y^2 - 21y^3$	Factorise $10xy + 25x^2y - 5xy^2$	Factorise $36abc - 24bcd$	Factorise $16x^2y + 8x^3 - 12x^4$

	A		B		C
1)	$6x + 20$	1)	$30x^2 - 9xy$	1)	$3x + 3y + 3z$
2)	$20 + 6x$	2)	$30x^2y - 9xy$	2)	$3x + 6y + 3z$
3)	$6x - 20$	3)	$30x^2y^2 - 9xy$	3)	$3x + 6y + 15z$
4)	$12x - 30$	4)	$50 - 45g$	4)	$21x^2y^2 - 35xy^3$
5)	$12x - 60$	5)	$30x^2y^2 - 9x^2y$	5)	$3x + 6xy + 15z$
6)	$6x - 30$	6)	$30x^4y^2 - 9x^2y$	6)	$3x + 6xy + 15xz$
7)	$30x - 6$	7)	$30x^4y^2 + 9x^2y$	7)	$3x^2 + 6xy + 15xz$
8)	$30x - 9$	8)	$x^4y^2 + x^2y$	8)	$x^2 + xy + xz$
9)	$30x - 9x$	9)	$x^4y^2 - x^2y$	9)	$45f + 81$
10)	$30x^2 - 9x$	10)	$21v - 35$	10)	$7w + 9xy + 15xz$

Extension

Question 1: Explain why 8x + 3y cannot be factorised.

Question 2: James has factorised an expression correctly.
His answer is 2(7y – 3).
What was the expression that he factorised?

Question 3: Alexandra is trying to factorise fully 15y + 30.
Rebecca says the answer is 3(5y + 10)
Victoria says the answer is 5(3y + 6)
Alexandra says both Rebecca and Victoria are incorrect, why?

Question 4: Can you spot any mistakes?

Factorise

$w^2 - 5w$

$w(w + 5)$

.....

(1)

Question 5: Can you spot any mistakes?

Factorise completely

$24x^2 + 20x$

$4(6x^2 + 5x)$

.....

(2)

Question 6: Can you spot any mistakes?

Factorise completely

$20a^2c + 30ac$

$5ac(4a^2 + 6)$

.....

(2)

Extension

- $2(x+5) = \square x + \square$
- $\square(x+6) = 3x + \square$
- $\square(x-5) = \square x - 25$
- $4(\square x + \square) = 28x + 12$
- $x(x + \square) = \square^2 + 4x$
- $\square(\square - 5) = 6x^2 - 10x$
- $\square(\square - \square) = 6x - 21$
- $\square(\square + \square) = 20x^2 + 24x$

Fluency Practice

Factorise:

1) $3a^3b^2c^5 + 12b^3c^2$

2) $8q^3r^4 - 4p^4q^2$

3) $6p^4q^5r^2 - 20pq^2r^5$

4) $16a^4b^2c - 14a^2b^4c^2$

5) $18p^4q^4 + 3q^4r^3$

6) $9pq^4r + 3pq^3r^3$

7) $8a^3b + 18a^3bc$

8) $10x^5y^2z^2 - 2x^2y^4$

9) $14x^2y^2z^4 + 4x^5y^2z^2$

10) $11p^4qr^5 - 11p^4q^3r$

Intelligent Practice

Where possible, finish factorising:

1) $2(3x + 9)$

2) $2(6x + 9)$

3) $2(6x + 10)$

4) $2(6x + 11)$

5) $2(6x + 12)$

6) $2(6x - 12)$

7) $4(12 - 6x)$

8) $4(12 - 6x + 2y)$

9) $4(12 - 6x + 3y)$

10) $4(12 - 6x + 4y)$

11) $4(12 - 6x + 4y)$

12) $4(12 - 6x + 5y)$

13) $4(12x - 6x^2 + 5xy)$

14) $4(12x - 6x^2 + 4xy)$

15) $4(12x^2 - 6x^2 + 4x^2y)$

Fluency Practice

Factorise

(a) $7x + 21$ (b) $3x - 12$

(c) $5y - 25$ (d) $27x + 18$

(e) $8y + 24$ (f) $12 - 9x$

(g) $6y - 5$ (h) $6 + 4x$

(i) $8y - 12$ (j) $6x + 3y$

Factorise

(a) $x^2 + 5x$ (b) $x^2 - 12x$

(c) $6x + x^2$ (d) $2y + 5y^2$

(e) $4x^2 + 7x$ (f) $4x^2 + 8x$

(g) $12y + 4y^2$ (h) $6x^2 - 9x$

(i) $40x^2 + 50x$ (j) $22y^2 - 4y$

Factorise

(a) $x^2 + xy$ (b) $x^2 - 2xy$

(c) $xy + x^2y$ (d) $2xy + 5y$

(e) $4x^2y - xy$ (f) $3xy + 12y$

(g) $45xy - 60y$ (h) $4x^2 - 6y$

(i) $2x^2 - 10y^2$ (j) $24x^2 - 18x$

Factorise

(a) $4ab + 6abc + 8ac$

(b) $9x^2y + 6xy - 15xy^2$

(c) $10ab^2 - 8ab + 2a^2b$

(d) $6xy - 7x^2y + 3xy^2$

Factorise

(a) $20x^2 - 30x^3$

(b) $4x^5 + 6x^2$

(c) $10y^2 - 15y + 25y^3$

(d) $12x^4 + 15x^2 - 9x^3$

Fill in the Gaps

	Factorised	Expanded
a	$4(x-6)$	
b		$4x-6$
c	$x(x-6)$	
d		x^2+6x
e	$4(2x-6)$	
f		$42x-6$
g	$x(2x-6)$	
h	$2x(x-6)$	
i		$6x^2+10x$
j		$6x^3+10x^2$
k	$x(x^2+3x+4)$	
l		$2x^2+6x+8$
m	$2x(x^2+3x+4)$	

	Factorised	Expanded
n		$2x^4+6x^3+8x^2$
o		$2x^2+6x^3+8x^4$
p	$x(y+3)$	
q	$2x(y+4)$	
r		$12xy+15x$
s		$12x^2+15xy$
t		$12x^2y+15xy$
u	$5x(x-3y+2z)$	
v		$18z^2-12yz$
w		$6pq-5p^2q^2$
x		$5x^2y-xy^2$
y		$x^3y^3-x^2y^2+xy$
z		$91x^2y-119xy^2$

Extension

Factorise fully the following expressions:

(a) $6x - 8$.

(b) $10z^2 + 5z$.

(c) $5x^2 - 20xy$.

(d) $36x^3y + 30xy^2$.

(e) $8ab^2c - 16a^2b^2c$.

(f) $6d^3e - d^4e$.

(g) $\pi r^3 - 2\pi r^2 h$.

(h) $120l^3h - 100h^2l^4$.

(i) $y(2x + 4y) - 6y$.

(j) $8xy(x^2 + y^2) + 2x(yx^3 + y^3)$.

(k) $30d^3e^4 - 15d^2e^3$.

(l) $14b^3c + 28b^3c^2 + 7a^2b^3c$.

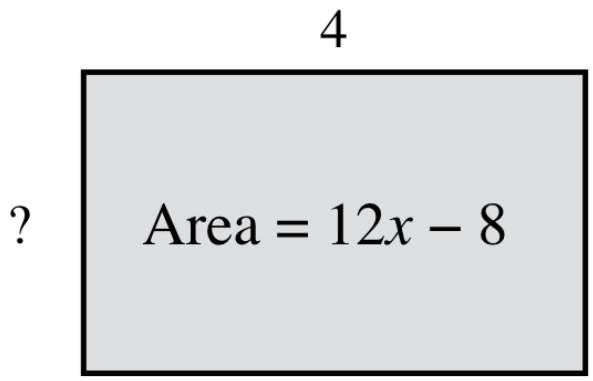
(m) $6x^5y^2 - 8y^3x^3 - 10x^8y$.

(n) $5a^{20}b^{17} + 20a^{30}b^{14} - 15a^{20}b^{15}$.

1. $3x + 12$
2. $x^2 + x$
3. $3x^2 + 12x$
4. $x^3 - x$
5. $x^3 + x^2$
6. $7x^3 + 21x^2$
7. $x^3y - x^2$
8. $x^3y + x^2y^2$
9. $2x^3y + 10x^2y^2$
10. $2x^3y^5 - 10x^2y^2$
11. $-2x^3y^5 - 20x^2y^2$
12. $2hx^3y^5 + 10x^2y^2$
13. $15h^4x^3y^5 - 20h^7x^2y^2$
14. $15\pi h^4x^3y^5z + 20\pi h^7x^2y^2$

Extension

The length of this rectangle is 4 units.
Its area is $(12x - 8)$ square units.
Find the width of the rectangle.



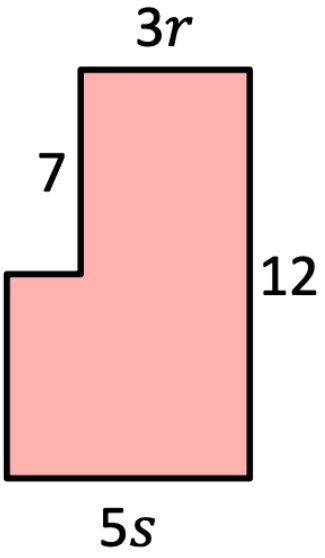
Q5 Simplify and then factorise the following expressions.

[a] $5a - 8b + 13a - 4b$

[b] $7r - 8s + 20s + 8r$

[c] $11m - 4t + 14m - 6t$

Q6 Find and factorise the expression for the area of the following compound shape.



2 Solving Linear Equations 2

Intelligent Practice

Solve the following equations using the balancing method:

1) $2(x+8)=41$

2) $2(x+8)=43$

3) $2(x-8)=43$

4) $3(x-8)=43$

5) $3(2x-8)=43$

6) $6(x-4)=43$

7) $6(x-4)=44$

8) $6(x-4)=48$

9) $6(4-x)=48$

10) $6(4-x)=50$

11) $3(4-x)=25$

12) $3(4-2x)=25$

13) $-3(2x-4)=25$

14) $-3(2x-4)=-25$

15) $-5(2x-4)=-25$

16) $-5(-2x-4)=-25$

17) $5(-2x-4)=-25$

18) $6(-2x-4)=-26$

Fluency Practice

Solve the following equations using the balancing method:

1) $2(x+3)+4(x+1)=22$

2) $7(x-3)+5(x+2)=37$

3) $3(x-2)+2(x-5)=14$

4) $2(2x-1)-4(3x-1)=18$

5) $5(2x+3)-6(x-1)=29$

6) $4(5x-2)-6(3x-1)=12$

Extension

Solve the following equations:

1. $3x + 2(x - 1) = 7$
2. $6 - 3\big(2 - 3(x + 1)\big) = 18$
3. $r\big(6 - 2(r - 1)\big) + 2r^2 + 8 = 0$
4. $x\big(3 - 2(x - 1)\big) + 2\big(x^2 - 3\big) = 0$
5. $4\big(x - 5(x - 3)\big) = 0$
6. $y\big(6 - (y - 3)\big) + \big(y(y - 1) + 2\big) = 0$
7. $4x\big((x + 2) - 3\big) = 4\big(x(x - 2) - 1\big)$
8. $6 - \Big(3 - 2\big((x - 1) + 3\big)\Big) = 0$
9. $4 = 2\big(2 - 3(4x - 3 + x)\big)$
10. $5 = 6\Big(7 - 2\big(3 - (x - 1)\big)\Big)$
11. $3\Big(5 - \big(2x - 3(x - 2)\big)\Big) = 15$
12. $2\Big(3x + 2\big(2x - 3(x - 1)\big)\Big) = 3x - 2(x - 1)$
13. $7\Big(3x + 2\big(2x - 3(x - 1)\big)\Big) - 42 = 0$

Intelligent Practice

Which side do you eliminate the variable from?
How would you balance both sides?

1) $2x + 5 = x + 8$

2) $x + 8 = 2x + 5$

3) $8 - x = 2x + 5$

4) $8 - x = 2x - 5$

5) $x + 8 = 2x - 5$

6) $2x + 8 = 4x + 5$

7) $2x + 8 = 5 - 4x$

8) $8 - 2x = 5 - 4x$

9) $8 - 2x = -4x + 5$

10) $8 - 2x = 4x + 5$

Backwards Faded

1 $5x + 3 = 2x + 7$

$(-3) \quad (-3)$

$5x = 2x + 4$

$(-2x) \quad (-2x)$

$\frac{3x}{3} = \frac{4}{3}$

$x = \frac{4}{3}$

2 $7x + 4 = 3x + 9$

$7x = 3x + 5$

$4x = 5$

3 $3x + 12 = x + 15$

$3x = x + 3$

4 $2x + 11 = x + 13$

5 $5x - 3 = 2x + 7$

$5x = 2x + 10$

$3x = 10$

$x = \frac{10}{3}$

6 $7x - 6 = 3x + 9$

$7x = 3x + 15$

$4x = 15$

7 $3x - 12 = x - 15$

$3x = x - 3$

8 $2x + 11 = x - 13$

9 $5x + 3 = -2x + 7$

$5x = -2x + 4$

$7x = 4$

$x = \frac{4}{7}$

10 $7x + 6 = -3x + 9$

$7x = -3x + 3$

$10x = 3$

11 $3x + 12 = -x + 15$

$3x = -x + 3$

12 $2x + 11 = -x - 13$

13 $-5x + 3 = -2x + 7$

$-5x = -2x + 4$

$-3x = 4$

$x = -\frac{4}{3}$

14 $-7x + 6 = -3x + 9$

$-7x = -3x + 3$

$-4x = 9$

15 $-3x + 12 = -x + 15$

$-3x = -x + 3$

16 $-2x + 11 = -x - 13$

Fluency Practice

Question 1: Solve the following equations

(a) $4x + 1 = 2x + 7$ (b) $5x + 4 = 3x + 16$ (c) $2x + 8 = x + 12$

(d) $7x + 1 = 2x + 46$ (e) $6x - 3 = 2x + 13$ (f) $9x - 10 = 7x + 24$

(g) $2x + 21 = 4x + 5$ (h) $x + 2 = 5x - 2$ (i) $6x - 9 = 4x - 1$

(j) $5x + 2 = 16 - 2x$ (k) $3x - 1 = 23 - x$ (l) $6x + 8 = 38 - 4x$

(m) $80 - x = 8x - 1$ (n) $2x + 7 = 17 - 8x$ (o) $15 - x = 27 - 3x$

(p) $12x - 20 = 15x - 38$ (q) $35x + 10 = 20x + 175$ (r) $14x = 2x + 60$

Question 2: Solve the following equations

(a) $3x + 3 = x + 8$ (b) $9x + 10 = 7x + 39$ (c) $3x + 1 = 7x - 17$

(d) $x + 4 = 13 - x$ (e) $16x + 3 = 6x + 24$ (f) $9x + 12 = 6x + 14$

(g) $7x + 24 = 12x - 12$ (h) $2x + 9 = 48 - 6x$ (i) $34 - 12x = 28x - 36$

Question 3: Solve the following equations

(a) $4x + 15 = x + 3$ (b) $8x + 40 = 3x + 5$ (c) $9x + 7 = 11x + 20$

(d) $7x + 9 = 2x - 16$ (e) $9x - 70 = 2x - 91$ (f) $4 - 5x = 3x + 28$

(g) $10x + 136 = -8 - 2x$ (h) $-6x + 2 = -4x + 10$ (i) $-11x - 4 = -3x + 60$

Intelligent Practice

Solve the following equations using the balancing method:

1) $5x + 7 = 2x + 13$

2) $9x + 5 = 7x + 15$

3) $7x + 3 = 2x + 28$

4) $10x + 19 = 9x + 9$

5) $7x + 33 = 4x + 18$

6) $3x + 85 = 12x + 4$

7) $2x + 21 = 6x + 5$

8) $6x + 11 = 3x - 4$

9) $6x + 19 = 10x - 5$

10) $8x - 7 = 3x - 32$

11) $7 - 2x = 23 - 4x$

12) $2 - 5x = 110 - 14x$

13) $3 - 6x = 7 - 2x$

14) $17 - 18x = 81 - 10x$

15) $2x + 3 = 10 + 2x$

Fluency Practice

Solve these equations.

(a) $5x = 2x + 18$

(b) $6x = x + 10$

(c) $8x = 2x + 30$

(d) $7x = 3x - 16$

(e) $5x = 3x + 11$

Solve these equations.

(a) $5x - 14 = 3x$

(b) $7x - 6 = 4x$

(c) $2x - 7 = x$

(d) $7x + 4 = 5x$

(e) $6x + 15 = 4x$

Solve these equations.

(a) $2x - 3 = 5x$

(b) $3x + 11 = 4x$

(c) $5x - 12 = 8x$

(d) $44 + 3x = 7x$

(e) $x - 9 = 2x$

Solve these equations.

(a) $25 - 2x = 3x$

(b) $4x = 7 - 3x$

(c) $-6x = 15 - x$

(d) $20 - 6x = 2x$

(e) $35 - 4.5x = 0.5x$

(f) $-4x + 11 = x$

(g) $3.5x = 16.5 - 2x$

(h) $43 - x = 3x$

(i) $7x = -5x + 6$

(j) $-9 - 4x = -2x$

Create an equation by filling the boxes with 2 of the expressions below. Solve your equation – hopefully you get one of the answers from the right hand side of the page!

$8x + 11$	$6x - 1$	$5x - 14$
$9x + 2$	$x + 9$	$3x + 16$
$7x + 5$	$8x + 10$	$5x + 4$
$4x + 17$	$3x + 14$	$9x - 6$
$2x + 10$	$4x - 9$	$5x + 7$
$5x - 3$	$5x + 1$	$2x + 11$

Try to create an equation with one of the solutions below!

$x = 1$
$x = 2$
$x = 3$
$x = 4$
$x = 5$
$x = 10$
$x = -1$
$x = -2$
$x = -3$

Purposeful Practice

Pick two expressions from the cards below and put them equal to each other. Solve.

$3x + 10$	$2x - 5$
$16 + x$	$6x$
$5x + 12$	$5 + 2x$
$4x - 4$	$-2x + 12$
$5 - x$	$10 - 3x$

Equations with integer solution:	Equations with fractional solution:

There is one pair of expressions that create an unsolvable equation. Can you find them?

Question 4: Solve the following equations

(a) $5(x+3) = 3(x+9)$ (b) $8(x-1) = 4(x+3)$ (c) $3(x+13) = 10(x-1)$

(d) $2(4x-3) = 5(2x-5)$ (e) $9(2x-5) = 3(4x+7)$ (f) $2(9-x) = 3(x+16)$

(g) $5(2x+9) + 2(x+11) = 3(3x+4) + 46$

(h) $8(x-2) - 3(1-x) = 9(x+2) + 1$

Intelligent Practice

Solve the following equations using the balancing method:

1) $3(x+3) = 3(2x-4)$

2) $2(3+x) = 3(2x-4)$

3) $-2(3+x) = 3(2x-4)$

4) $-2(3+x) = -3(2x-4)$

5) $-3(3-x) = 3(2x-4)$

6) $3(-3-x) = 6(2x-4)$

7) $3(x-5) - 5 = 5(x+6)$

8) $7(x+6) - 1 = 4(x+2)$

9) $6(x+2) = 24 - 3(x-5)$

10) $5(6-x) - 3 = 5 - 3(x-2)$

Fluency Practice

Solve the following equations using the balancing method:

1) $5(2s - 8) + 1 = 3(s + 15)$

2) $6(7 - w) - 5 = w - 40$

3) $5(d + 1) + 1 = 3(d - 3) - 1$

4) $5(q - 1) - 10 = 2(5 - q) + 3$

5) $7(y - 1) - 29 = y + 30$

6) $4(k - 2) + 4 = k - 1$

7) $3(3m - 1) - 10 = 2(2m + 1) + 5$

8) $9(k - 1) - 9 = 4(k + 2) + 4$

9) $4(t - 2) + 4 = 2(t + 2) - 2$

10) $9(p - 2) - 15 = 3(p + 3) + 18$

Intelligent Practice

Solve the following equations using the balancing method:

1) $\frac{2}{x} - 6 = 9$

2) $\frac{2}{x} - 7 = 9$

3) $\frac{3}{x} - 7 = 9$

4) $\frac{3}{x} + 7 = 9$

5) $7 + \frac{3}{x} = 9$

6) $7 - \frac{3}{x} = 9$

7) $\frac{3}{x-1} = 9$

8) $\frac{3}{2x-1} = 9$

9) $\frac{3}{2(x-1)} = 9$

10) $\frac{2}{3(x-1)} = 9$

Question 6: Solve the equations below

(a) $\frac{2x+1}{3} = x-2$

(b) $\frac{5x-3}{2} = 2x+4$

(c) $\frac{x+17}{5} = x+1$

(d) $4x-9 = \frac{2x+3}{3}$

(e) $\frac{9-x}{2} = x+3$

(f) $\frac{15-2x}{3} = 2x-3$

Question 7: Solve the equations below

(a) $\frac{2x-1}{x+3} = 9$

(b) $\frac{x+11}{2x-5} = 2$

(c) $\frac{x+1}{x+4} = 3$

(d) $\frac{5x-24}{x-4} = 3$

(e) $\frac{x+7}{x-3} = -4$

(f) $\frac{3x+8}{9-x} = -2$

Intelligent Practice

Are the following equations ready to be cross multiplied?

1) $\frac{x}{5} + 2 = \frac{4}{5}$

2) $\frac{2x}{5} + 2 = \frac{4}{5}$

3) $\frac{x}{5} = \frac{4}{5}$

4) $\frac{2x}{5} = \frac{4}{5}$

5) $\frac{x}{5} = 4$

6) $\frac{x}{5} + 2 = 4$

7) $\frac{x+2}{5} = 4$

8) $\frac{2x}{5} + 1 = \frac{4}{5}$

9) $\frac{5}{2x} + 1 = \frac{4}{5}$

10) $\frac{5}{2x+1} = \frac{4}{5}$

11) $\frac{5}{2x} + 1 = \frac{4}{5x}$

12) $\frac{5}{2x+1} = \frac{4}{5x}$

Question 1: Solve each equation below

(a) $\frac{x}{7} = \frac{3}{2}$ (b) $\frac{a}{6} = \frac{3}{10}$ (c) $\frac{c}{20} = \frac{7}{8}$ (d) $\frac{w}{13} = \frac{3}{4}$

(e) $\frac{7}{10} = \frac{c}{8}$ (f) $\frac{4}{5} = \frac{d}{9}$ (g) $\frac{2}{11} = \frac{5}{h}$ (h) $\frac{14}{p} = \frac{3}{20}$

(i) $\frac{2a}{5} = \frac{3}{2}$ (j) $\frac{5x}{11} = \frac{9}{2}$ (k) $\frac{4a}{9} = \frac{6}{5}$ (l) $\frac{7}{4} = \frac{2y}{3}$

(m) $\frac{25}{4y} = \frac{1}{10}$ (n) $\frac{35}{8} = \frac{5w}{12}$ (o) $\frac{10}{17} = \frac{9}{10w}$ (p) $\frac{1}{3y} = \frac{2}{5}$

Intelligent Practice

Solve the following equations using cross multiplication:

1) $\frac{x}{7} = \frac{3}{2}$

2) $\frac{2x}{7} = \frac{3}{2}$

3) $\frac{2x}{7} = \frac{3}{14}$

4) $\frac{2x}{14} = \frac{3}{14}$

5) $\frac{2x}{14} = \frac{3}{7}$

6) $\frac{14}{2x} = \frac{7}{3}$

7) $\frac{14}{2x+1} = \frac{7}{3}$

8) $\frac{14}{2x-1} = \frac{7}{3}$

9) $\frac{7}{2x-1} = \frac{7}{3}$

10) $\frac{2x-1}{7} = \frac{7}{3}$

11) $\frac{2x-1}{6} = \frac{7}{3}$

12) $\frac{1-2x}{6} = \frac{7}{3}$

Question 2: Solve the following equations

(a) $\frac{x+1}{5} = \frac{3}{2}$ (b) $\frac{x+3}{4} = \frac{2}{3}$ (c) $\frac{2x+1}{5} = \frac{7}{2}$

(d) $\frac{3x-1}{5} = \frac{x+11}{2}$ (e) $\frac{x+3}{4} = \frac{2x-1}{7}$ (f) $\frac{3x-4}{3} = \frac{2x-1}{4}$

(g) $\frac{2}{3x-5} = \frac{1}{x+8}$ (h) $\frac{x+2}{2x+3} = \frac{1}{5}$ (i) $\frac{9}{4} = \frac{2x+1}{x-1}$

Fluency Practice

Solve the following equations using the balancing method:

1) $\frac{3x-5}{5} = \frac{2x+4}{7}$

2) $\frac{4x-1}{3} = \frac{3x-2}{2}$

3) $\frac{2(x+3)}{5} = \frac{3x-2}{2}$

4) $\frac{14}{2x-1} = \frac{7}{3x-2}$

5) $\frac{6}{2x-1} = \frac{7}{3x-2}$

6) $\frac{6}{1-2x} = \frac{12}{7x-14}$

7) $\frac{3}{7x-1} = \frac{5}{13-14x}$

Fluency Practice

Creating & Solving

Write an equation for each description.
The first one has been done for you.
Solve to find x.

②

I think of a number… x	Equation	x =
I multiply it by 3 and add 5. The answer is 14.	$3x + 5 = 14$	
I subtract 5 from it. The answer is 8.		
I multiply it by 4 and subtract 4. The answer is 10.		
I divide it by 4. The answer is 8		
I multiply it by 5. The answer is 10.		
I subtract 5 and divide by 2. The answer is 14		
I multiply it by 4 and divide by 5. The answer is 10		
I multiply it by 2 and subtract 10. The answer is 8.		
I add 8 and divide 4. The answer is 14.		
I multiply by 3, add 6, then divide by 3. The answer is 10.		
I add 3 and multiply by 4. The answer is 8.		
I add 2, multiply by 7 and then divide by 2. The answer is 14.		
I divide by 4, then add 6. The answer is 8.		

Algebraic Ages

1)

Amy is a years old.

Zack is 5 years older than Amy.

a) Use a to describe Zack's age.
b) If Zack is 12 years old, write an equation to find a.
c) Solve the equation to find Amy's age.

2)

Bill is b years old.

Vicky is 3 times Bill's age.

a) Use b to describe Vicky's age.
b) If Vicky is 24 years old, write an equation to find b.
c) Solve the equation.

3)

Cathy is c years old.

Trey is 18 years younger than Cathy.

a) Use c to describe Trey's age.
b) If Trey is 38 years old, write an equation to find c.
c) Solve the equation.

4)

David is d years old.

Mae is a fifth as old as David.

a) Use d to describe Mae's age.
b) If Mae is 2 years old, write an equation to find d.
c) Solve the equation.

5)

Elise is e years old.

Yarik is double Elise's age.

Will is 6 years older than Yarik

a) If Will is 14 years old, write an equation to find e.
b) Solve the equation.

6)

Frey is f years old.

Henry is triple Frey's age.

Jane is 15 years younger than Henry.

a) If Jane is 21 years old, write an equation to find f.
b) Solve the equation.
c) How old is Henry?

7)

Greg is g years old.

Pete is 9 years older than Greg.

The <u>total age</u> of Greg & Pete is 57.
a) Form & solve an equation to find Greg's age.

8)

Hannah is h years old.

Jess is 5 times Hannah's age.

Kelly is 10 years younger than Jess.

a) If their total age is 45, how old is each person?

Fluency Practice

Question 1: I think of a number.
I multiply the number by 3 and then add 5.
The answer is 29.

(a) Form an equation in terms of x.
(b) Solve the equation to find the original number.

Question 2: I think of a number.
I multiply the number by 5 and then subtract 2.
The answer is 58.

(a) Form an equation in terms of x.
(b) Solve the equation to find the original number.

Question 3: I think of a number.
I divide the number by 2 and then add 1.
The answer is 7.

(a) Form an equation in terms of x.
(b) Solve the equation to find the original number.

Question 4: Gregory is x years old.
Daisy is 2 years older than Gregory
The sum of their ages is 40.

(a) Form an equation in terms of x
(b) Solve the equation and work out Gregory's and Daisy's ages.

Question 5: Robert is x years old.
Hannah is 7 years younger than Robert
The sum of their ages is 61.

(a) Form an equation in terms of x
(b) Solve the equation and work out Robert's and Hannah's ages.

Question 6: Michael is x years old.
Jenny is twice as old as Michael
The sum of their ages is 57.

(a) Form an equation in terms of x
(b) Solve the equation and work out Michael's and Jenny's ages.

Fluency Practice

Question 7: Fiona is x years old.
Thomas is 3 years older than Fiona.
Cara is twice as old as Fiona.
The sum of their ages is 51.

(a) Form an equation in terms of x
(b) Solve the equation and work out Fiona's, Thomas's and Cara's ages.

Question 8: Alan is x years old.
Barry is ten years younger than Alan.
Kevin is double Alan's age.
The sum of their ages is 54.

(a) Form an equation in terms of x
(b) Solve the equation and work out Alan's, Barry's and Kevin's ages.

Question 9: Rebecca is x years old.
Mary is 8 years older than Rebecca.
Jill is three times older than Mary.
The sum of their ages is 67.

(a) Form an equation in terms of x
(b) Solve the equation and work out Rebecca's, Mary's and Jill's ages.

Question 10: Andy has x pence.
Kelly has 7 pence more than Andy.
Georgia has 9 pence less than Andy.
The total amount of money they have is £1.48

(a) Form an equation in terms of x
(b) Solve the equation and work out how much money each has.

Question 11: Billy has x pounds.
Liam has twice as much money as Billy.
Nicola has three times as much money as Liam.
The total amount of money they have is £180

(a) Form an equation in terms of x
(b) Solve the equation and work out how much money each has.

Fluency Practice

Question 12: Farmer Jones has x sheep
Farmer Smith has 100 more sheep than Farmer Jones.
Farmer White has twice as many sheep as Farmer Jones.
In total there are 2500 sheep.

(a) Form an equation in terms of x
(b) Solve the equation and work out how many sheep each farmer has.

Question 13: The cost of a TV is £x
The cost of a DVD player is £45 less than a TV.
The total cost of the TV and DVD player is £235

(a) Form an equation in terms of x
(b) Find the cost of a TV

Question 14: The sum of three consecutive numbers is 51.

(a) Form an equation in terms of x
(b) Solve the equation and work out each number.

Hint:
Three consecutive numbers can be written as $n, n+1, n+2$

Question 15: The sum of five consecutive numbers is 110.

(a) Form an equation in terms of x
(b) Solve the equation and work out each number.

Question 16: A rectangular field is 7 metres longer than wide.
The perimeter of the field is 106m.

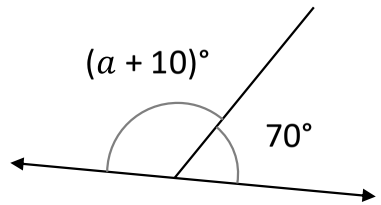
(a) Find the dimensions of the field.
(b) Find the area of the field.

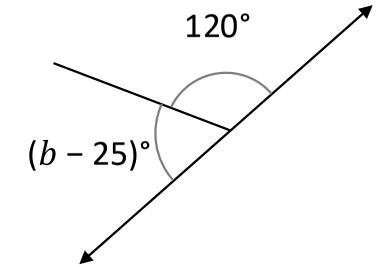
Question 17: A rectangular field is 20 metres longer than wide.
The perimeter of the field is 280m.

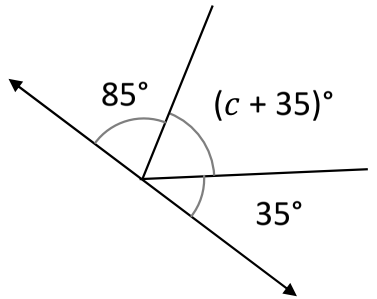
(a) Find the dimensions of the field.
(b) Find the area of the field.

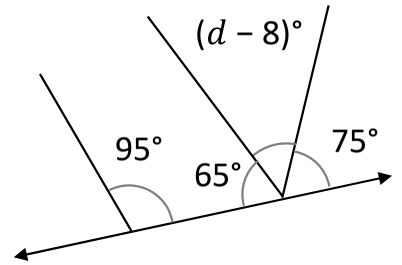
Angles on One Side of a Straight line

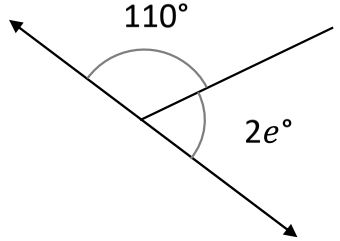
not drawn accurately

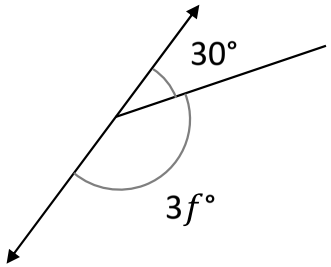
① 

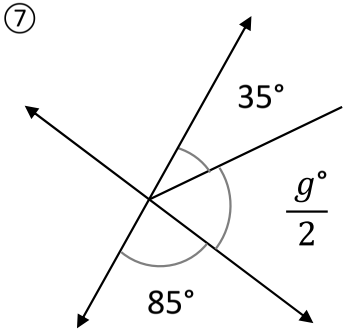
② 

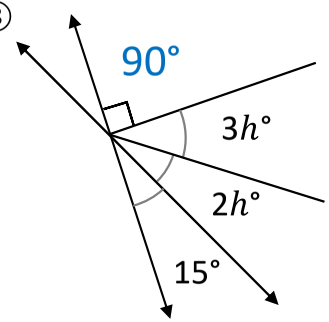
③ 

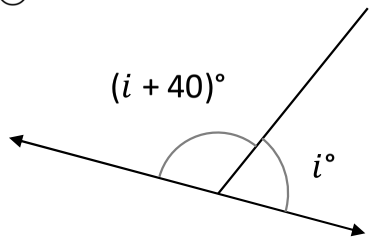
④ 

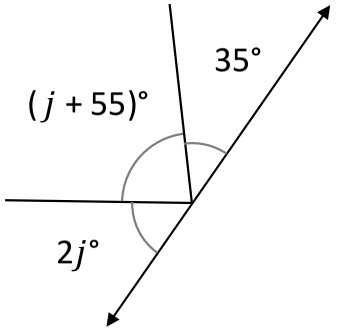
⑤ 

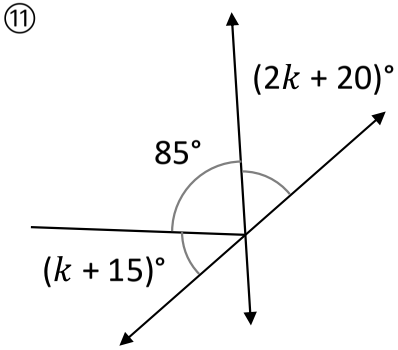
⑥ 

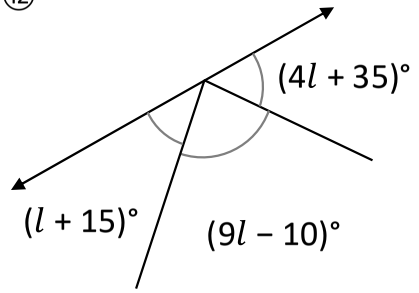
⑦ 

⑧ 

⑨ 

⑩ 

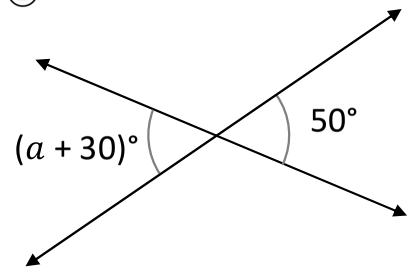
⑪ 

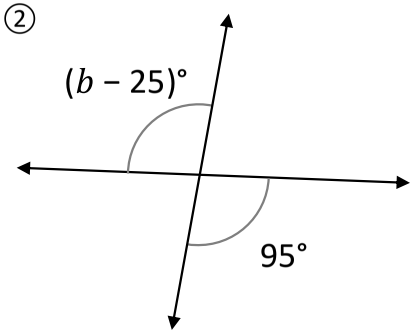
⑫ 

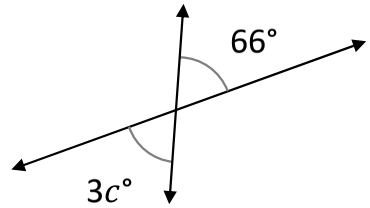
11 Answers	85	15	100	70	50	25
	30	48	20	35	120	

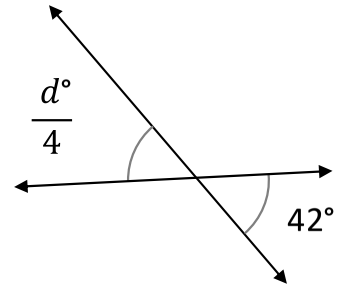
Vertically Opposite Angles: Forming Equations Find the value of each variable. not drawn accurately

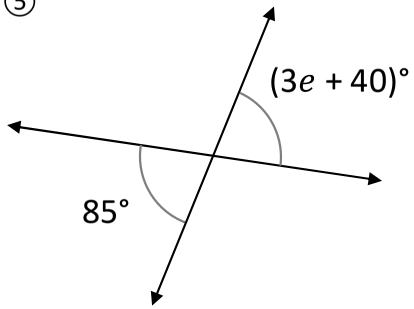
Fluency Practice

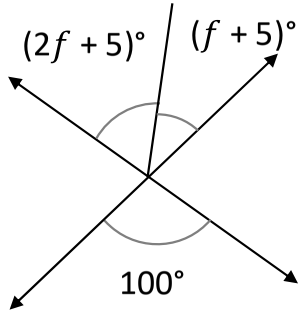
① 

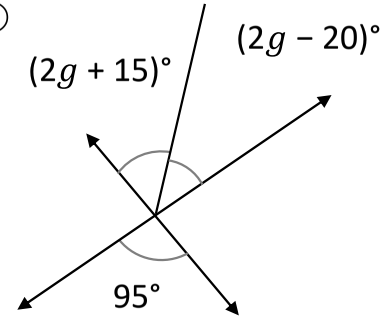
② 

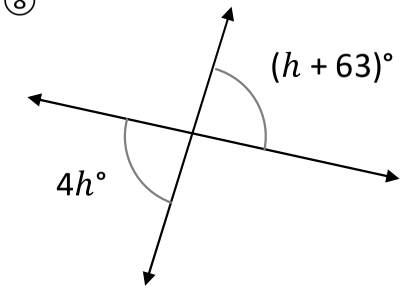
③ 

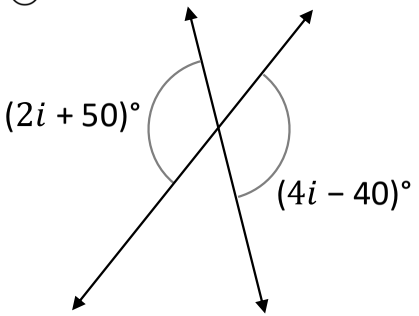
④ 

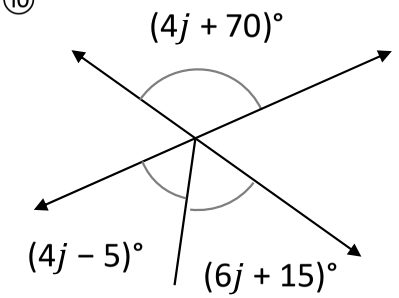
⑤ 

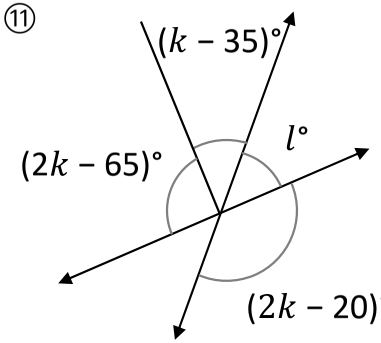
⑥ 

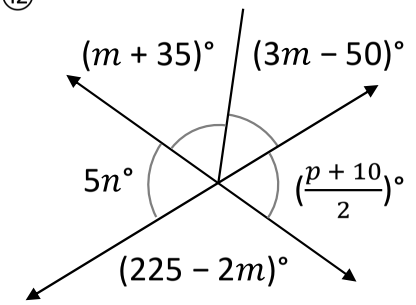
⑦ 

⑧ 

⑨ 

⑩ 

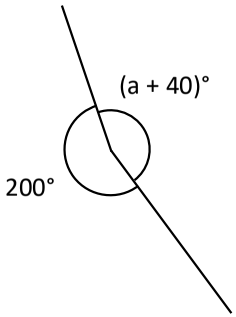
⑪ 

⑫ 

12 Answers	25	15	45	20	80	22
	120	10	168	40	30	21

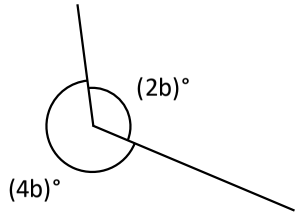
Fluency Practice

1)



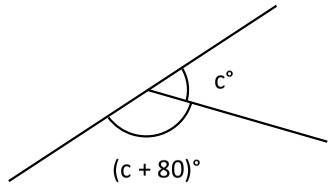
a = _____

2)



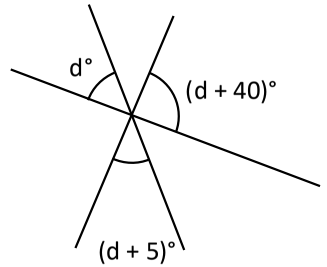
b = _____

3)



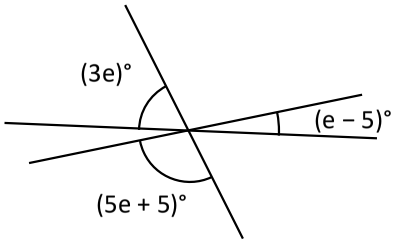
c = _____

4)



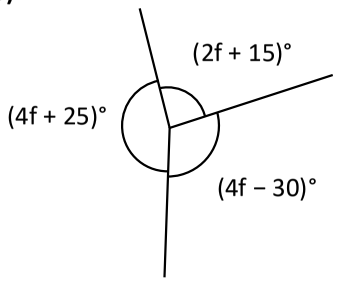
d = _____

5)



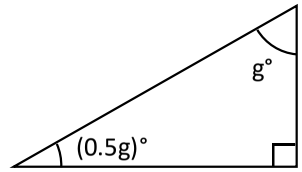
e = _____

6)



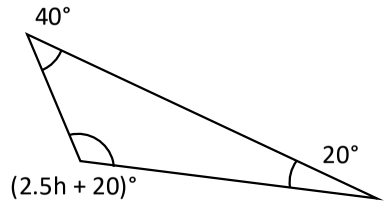
f = _____

7)



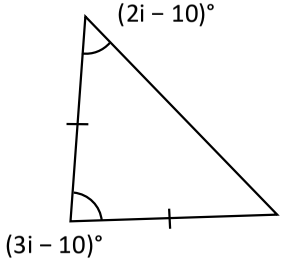
g = _____

8)



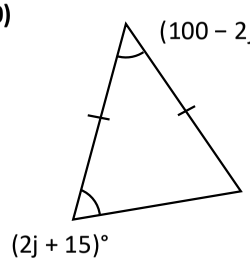
h = _____

9)



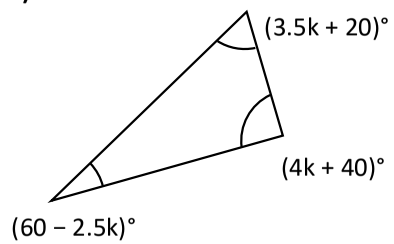
i = _____

10)



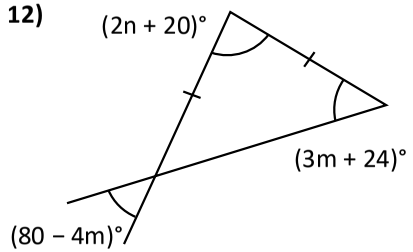
j = _____

11)



k = _____

12)

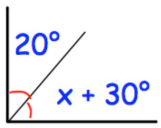


n = _____

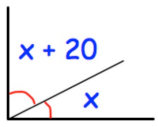
Fluency Practice

Question 4: Calculate x in each of these diagrams.

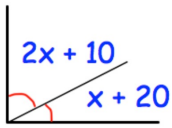
(a)



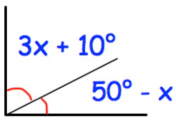
(b)



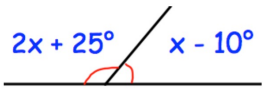
(c)



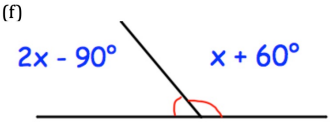
(d)



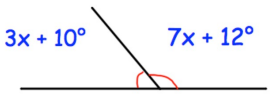
(e)



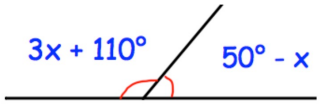
(f)



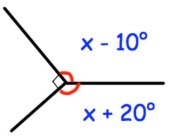
(g)



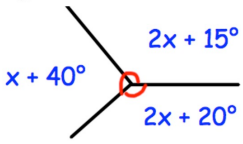
(h)



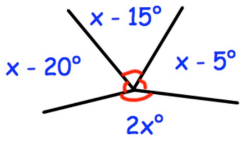
(i)



(j)

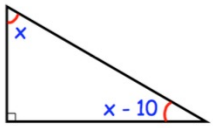


(k)

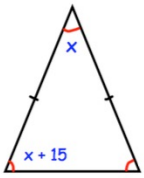


Question 5: Calculate x in each of these diagrams.

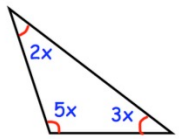
(a)



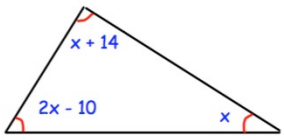
(b)



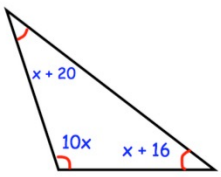
(c)



(d)

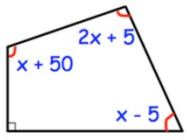


(e)

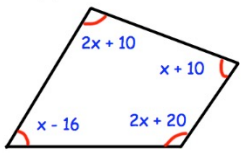


Question 6: Calculate x in each of these diagrams.

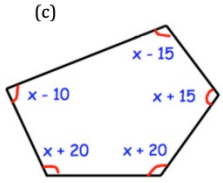
(a)



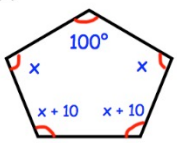
(b)



(c)



(d)

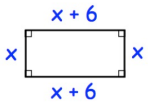


Hint:
Angles in a pentagon add up to 540°

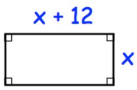
Fluency Practice

Question 1: For each rectangle below, find x. Then use x to find the length and width of each. The expressions for lengths and widths are in centimetres.

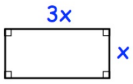
(a) Perimeter = 24cm



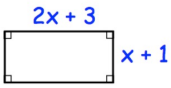
(b) Perimeter = 56cm



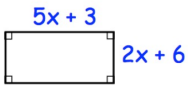
(c) Perimeter = 88cm



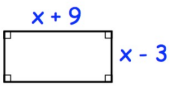
(d) Perimeter = 38cm



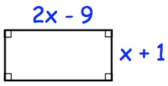
(e) Perimeter = 158cm



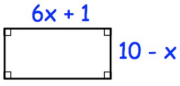
(f) Perimeter = 60cm



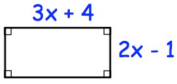
(g) Perimeter = 2m



(h) Perimeter = 82cm

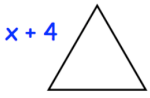


(i) Perimeter = 40cm

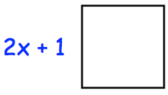


Question 2: Each shape below is regular. For each, find x and the length of each side.

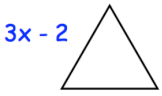
(a) Perimeter = 27cm



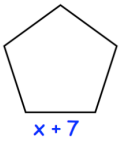
(b) Perimeter = 52cm



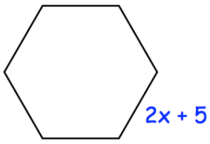
(c) Perimeter = 93cm



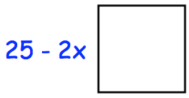
(d) Perimeter = 75cm



(e) Perimeter = 102cm

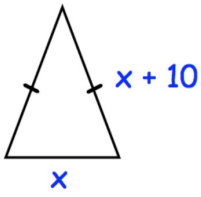


(f) Perimeter = 64cm

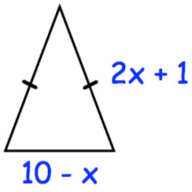


Question 3: For each shape below, find x.

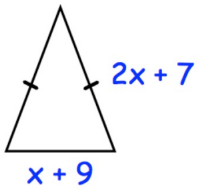
(a) Perimeter = 38cm



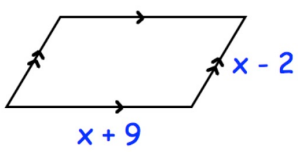
(b) Perimeter = 30cm



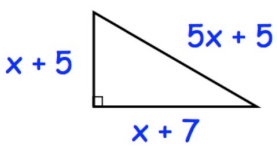
(c) Perimeter = 85.5cm



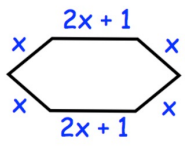
(d) Perimeter = 46cm



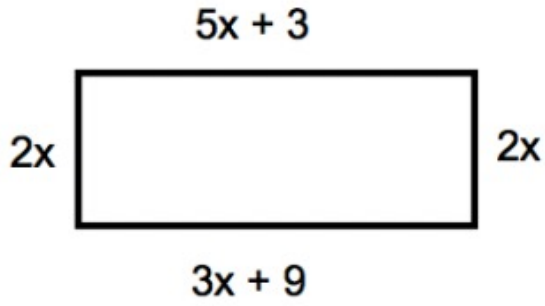
(e) Perimeter = 24cm



(f) Perimeter = 162cm



Fluency Practice



The diagram shows a rectangle. The sides are measured in centimetres.

(a) Explain why $5x + 3 = 3x + 9$

.....

.....

(1)

(b) Solve $5x + 3 = 3x + 9$

x =.....cm

(2)

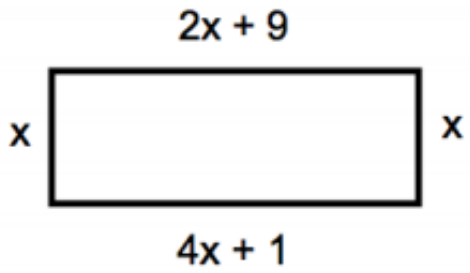
(c) Calculate the perimeter of the rectangle.

.....cm

(2)

Fluency Practice

A rectangle is shown below.



(a) Explain why $4x + 1 = 2x + 9$

.....

.....

(1)

(b) Find the size of x.

x = ...cm

(2)

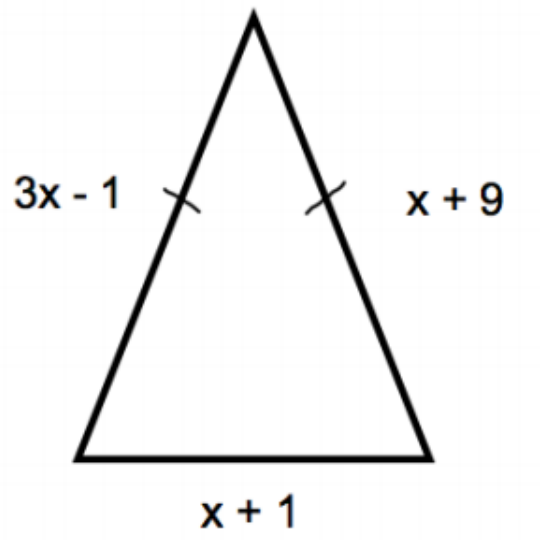
(c) Work out the area of the rectangle.

.....cm^2

(2)

Fluency Practice

Shown below is an isosceles triangle. Each side is measured in centimetres.



(a) Explain why $3x - 1 = x + 9$

.....

.....

(1)

(b) Solve the equation above.

x = ...cm

(2)

(c) Calculate the perimeter of the triangle.

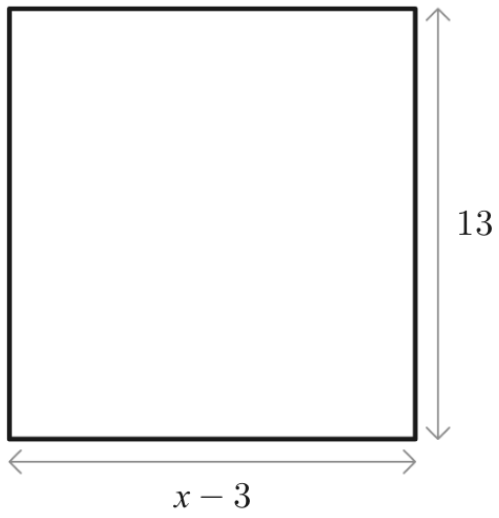
.....cm

(2)

Fluency Practice

Question 1 1 2 3 4

A rectangle is shown in the diagram below.



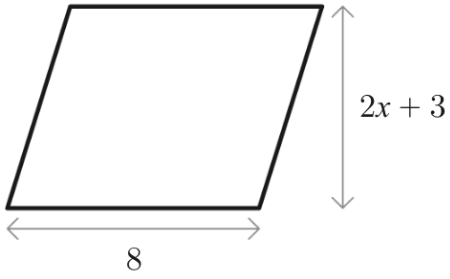
All the measurements are in centimetres.

The area of the rectangle is $91\ \text{cm}^2$.

Work out the value of x.

Question 2 1 2 3 4

A parallelogram is shown in the diagram below.



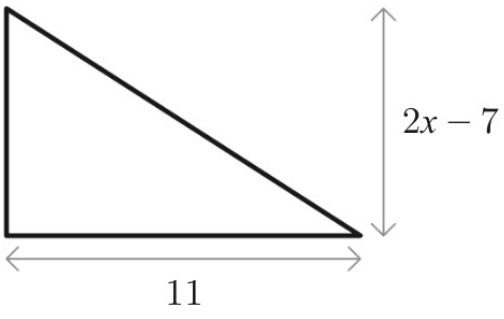
All the measurements are in centimetres.

The area of the parallelogram is $48\ \text{cm}^2$.

Work out the value of x.

Question 3 1 2 3 4

A triangle is shown in the diagram below.



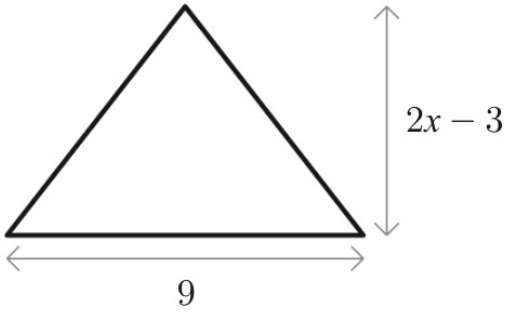
All the measurements are in centimetres.

The area of the triangle is $33\ \text{cm}^2$.

Work out the value of x.

Question 4 1 2 3 4

A triangle is shown in the diagram below.



All the measurements are in centimetres.

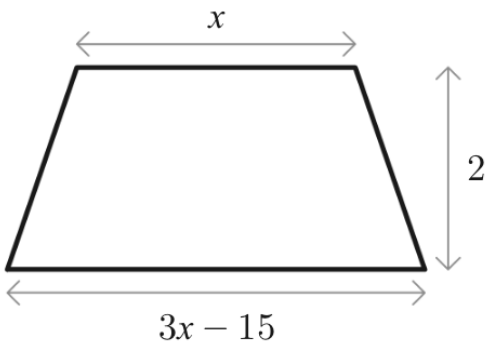
The area of the triangle is $9\ \text{cm}^2$.

Find the value of x.

Fluency Practice

Question 1 1 2 **3** 4

A is shown in the diagram below.



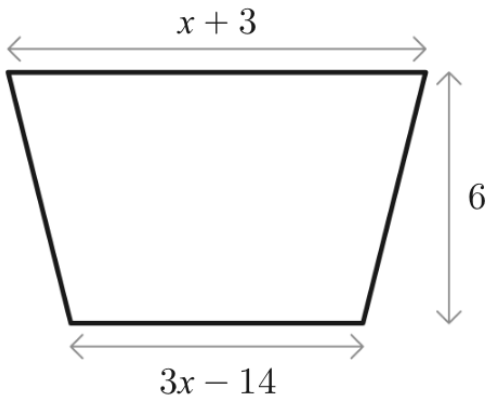
All the measurements are in centimetres.

The area of the trapezium is $25\ \text{cm}^2$.

Work out the value of x.

Question 2 1 2 **3** 4

A is shown in the diagram below.



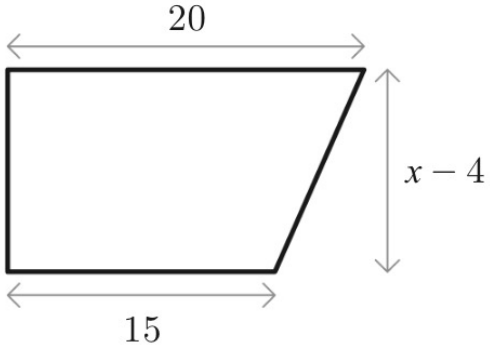
All the measurements are in centimetres.

The area of the trapezium is $51\ \text{cm}^2$.

Work out the value of x.

Question 3 1 2 **3** 4

The diagram below shows a trapezium.



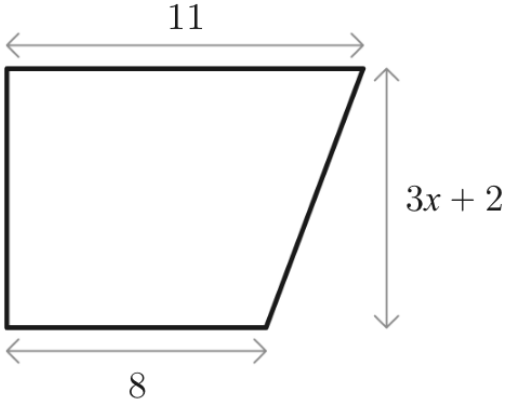
All the measurements are in centimetres.

The area of the trapezium is $70\ \text{cm}^2$.

Work out the value of x.

Question 4 1 2 **3** 4

A is shown in the diagram below.



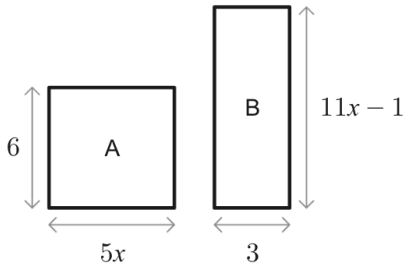
All the measurements are in centimetres.

The area of the trapezium is $76\ \text{cm}^2$.

Find the value of x.

Fluency Practice

The diagram shows two different rectangles, labelled A and B.



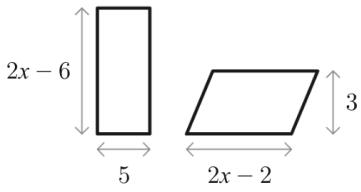
All the measurements are in centimetres.

The area of rectangle A is equal to the area of rectangle B.

Work out the value of x.

Question 2 1 2 **3** 4

The diagram shows a rectangle and a parallelogram.



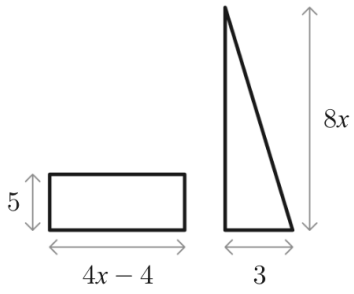
All the measurements are in centimetres.

The area of the rectangle is equal to the area of the parallelogram.

Work out the value of x.

Question 3 1 2 **3** 4

The diagram shows a rectangle and a triangle.



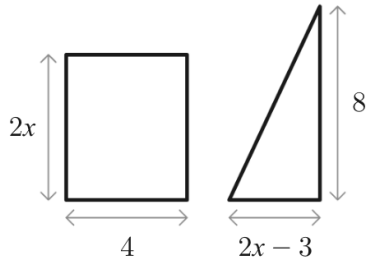
All the measurements are in centimetres.

The area of the rectangle is equal to the area of the triangle.

Work out the value of x.

Question 4 1 2 **3** 4

The diagram shows a rectangle and a triangle.



All the measurements are in centimetres.

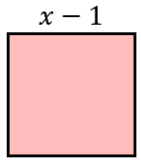
The area of the rectangle is twice the area of the triangle.

Work out the perimeter of the rectangle.

Using Algebra in Shapes

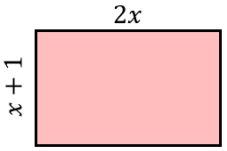
(a)

The perimeter of the square is $20\ cm$. Find the value of x.



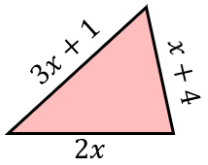
(b)

The perimeter of the rectangle is $20\ cm$. Find the value of x.



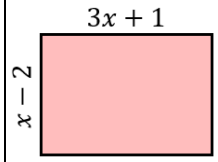
(c)

The perimeter of the triangle is $29\ cm$. Find the value of x.



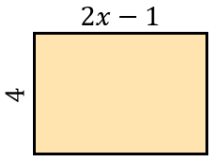
(d)

The perimeter of the rectangle is $34\ cm$. Find the value of x.



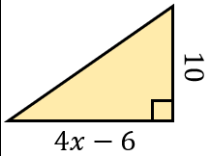
(e)

The area of the rectangle is $36\ cm^2$. Find the value of x.



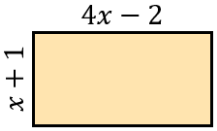
(f)

The area of the triangle is $50\ cm^2$. Find the value of x.



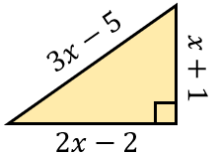
(g)

The perimeter of the rectangle is $28\ cm$. Find its area.



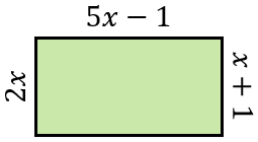
(h)

The perimeter of the triangle is $24\ cm$. Find its area.



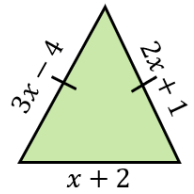
(i)

Find the perimeter of this rectangle.



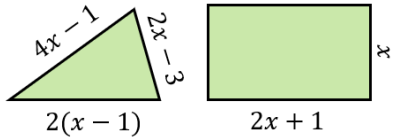
(j)

Find the perimeter of this triangle.



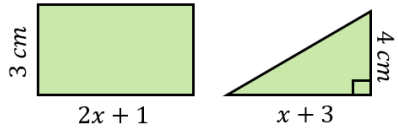
(k)

The perimeter of the triangle is equal to the perimeter of the rectangle. Find the value of x.

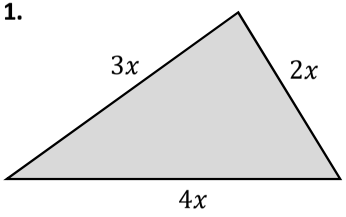


(l)

The area of the rectangle is twice the area of the triangle. Work out the value of x.



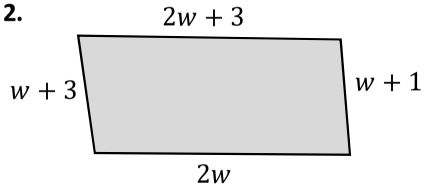
1.



Write down an expression for the perimeter of this triangle.

The perimeter is 27 cm. Create an equation and then solve it to find the value of x.

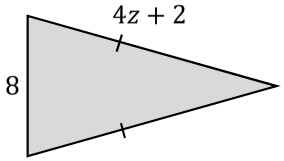
2.



The perimeter of this quadrilateral is 31 cm.

Create an equation and solve it to find the value of w.

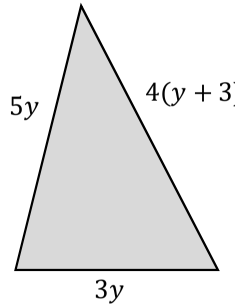
3.



The perimeter of this isosceles triangle is 28 cm.

Create an equation and solve it to find the value of z.

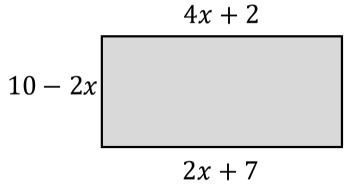
4.



The perimeter of this triangle is 30 cm.

Create an equation and solve it to find the value of y.

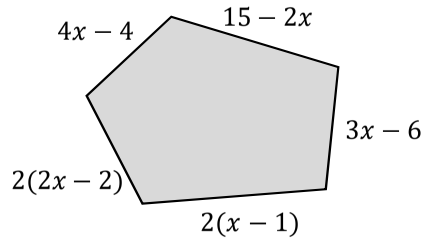
5.



Form an equation using the two corresponding lengths of this rectangle.

Solve the equation to find the value of x.
What is the perimeter of the rectangle?

6.



The perimeter of this irregular pentagon is 54 cm.

Find the value of x.

7. A quadrilateral has interior angles:

$x + 120°$, $x + 70°$, $2x + 30°$, $4x - 60°$

What is the value of x?

8. The width of a rectangle is $x + 7$
The length of the rectangle is 3 times the width.
The perimeter of the rectangle is 72 cm.

What is the area of the rectangle?

9. Rectangle **A** measures 6 cm by $(x + 1)$ cm.
Rectangle **B** measures 3 cm by $(3x + 7)$ cm.
Rectangle **B** has twice the area of Rectangle **A**.

Find the areas of **A** and **B**.

Extension

Question 1: A rectangle is 5cm longer than it is wide.
The perimeter of the rectangle is 86cm.
How long is the rectangle?

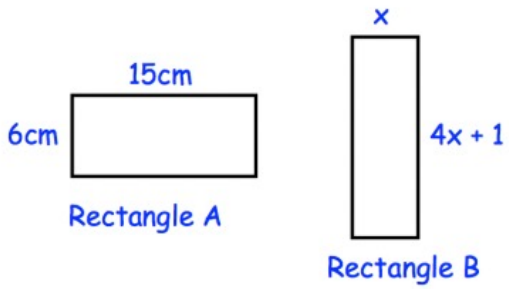
Question 2: A rectangle is 8cm longer than it is wide.
The perimeter of the rectangle is 72cm.
How wide is the rectangle?

Question 3: Each side of an isosceles triangle is 4cm longer than the base.
The perimeter of the triangle is 44cm.
How long is the base of the triangle?

Question 4: Three angles form a straight line.
The two smaller angles are equal.
The largest angle is three times larger than each of the smaller angles.
Work out the size of each of the three angles.

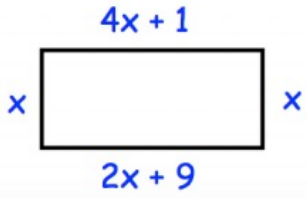
Question 5: Simon draws a right angled triangle.
One angle is 90°.
Of the other two angles, one is 22° larger than the other.
Work out the size of the smallest angle.

Question 6: Below both rectangles have the same perimeter.
Find the area of rectangle B.

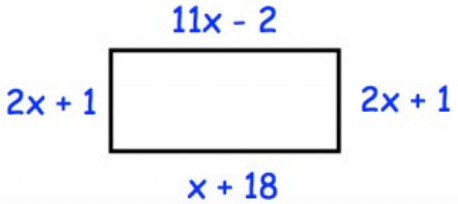


Question 7: Find the perimeters of the rectangles below.
The expressions for the lengths and widths are in centimetres.

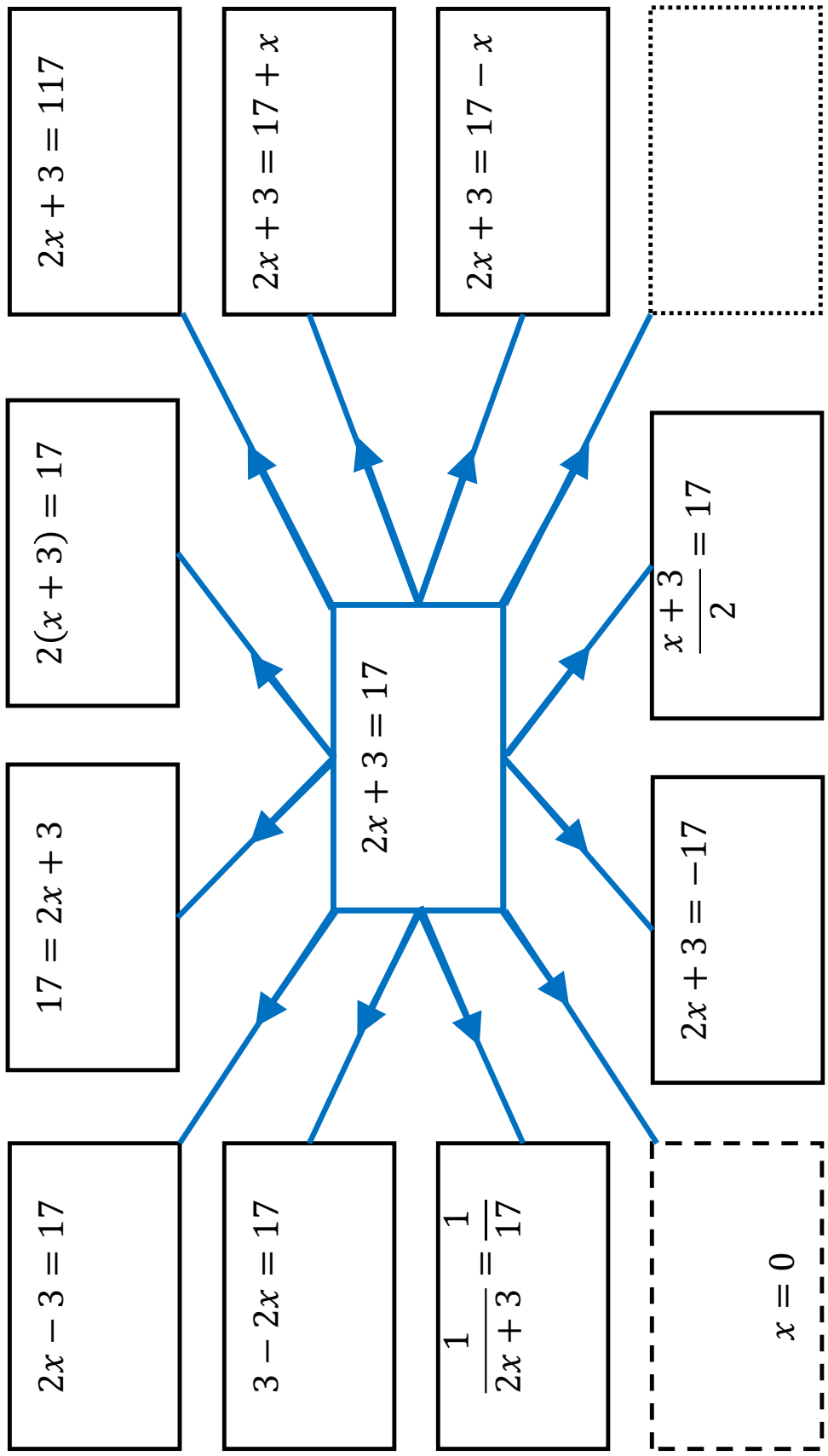
(a)



(b)



Solving Linear Equations Spider



Solving Linear Equations		
(a)	**(b)**	**(c)**
Solve $2x + 5 = 6$	Solve $4x + 5 = x + 14$	Solve $6x + 1 = 8 - x$
(d)	**(e)**	**(f)**
Solve $10 + 5x = 3x + 6$	Solve $6x + 2 = 2x + 5$	Solve $5x - 4 = 1 + 6x$
(g)	**(h)**	**(i)**
Solve $2(3x + 11) = 10$	Solve $2(x - 2) = 3(x + 4)$	Solve $4(3x - 1) + 6 = 5(2x + 4)$

Fluency Practice

Solve these equations.

(a) $3(x+1)=18$

(b) $3(x-1)=18$

(c) $4(x-3)=8$

(d) $10=2(x+7)$

(e) $5(x-2)=8$

(f) $25=4(x+4)$

Solve these equations.

(a) $3(x+1)=2x$

(b) $4x=6(x-3)$

(c) $4(x+5)=x+2$

(d) $4(x-1)=2x+5$

(e) $2(x+5)=x-3$

(f) $3x-1=2(3x+4)$

Solve these equations.

(a) $3(x+1)=2(x+4)$

(b) $3(x-1)=2(x+4)$

(c) $4(x-1)=2(x+4)$

(d) $4(x-3)=2(x-1)$

(e) $5(x+1)=2(2x+5)$

(f) $2(x-1)=7(x+4)$

(g) $3(x-1)=4(x+2)$

(h) $3(2x-1)=8(x+2)$

Solve these equations.

(a) $3(x+1)+2(x+4)=1$

(b) $3(x-1)+2x=12$

(c) $5x+2(x+3)=41$

(d) $4(x+2)-2(x+1)=2$

(e) $5(x+3)-3(x-1)=30$

(f) $3=7(x-3)-2(x-1)$

Fluency Practice

Solve:

(a) $2(x+3)=16$ (b) $3(x-1)=9$

(c) $20=5(x+1)$ (d) $2(3+x)=8$

(e) $3(x-4)=18$ (f) $5(x-0.5)=15$

(g) $2(x+6)=-2$ (h) $4(x-1)=6$

(i) $7=2(x-5)$ (j) $-8(x+4)=16$

Solve:

(a) $\frac{2x+3}{3}=5$ (b) $\frac{3x-2}{7}=1$

(c) $6=\frac{4x+2}{3}$ (d) $\frac{5+2x}{6}=2$

(e) $\frac{3x-6}{5}=1.5$ (f) $\frac{5x-6}{4}=-3$

(g) $1=\frac{4x-2}{3}$ (h) $\frac{14+3x}{5}=2$

(i) $\frac{2x-9}{3}=\frac{1}{2}$ (j) $4.8=\frac{2x-1}{3}$

Solve:

(a) $\frac{3x}{2}+1=10$ (b) $\frac{5x}{6}-2=3$

(c) $2+\frac{3x}{4}=8$ (d) $\frac{3x}{5}+1.2=4.8$

(e) $\frac{2x}{3}+5=1$ (f) $\frac{2x}{5}-4=0$

(g) $5=\frac{2x}{9}-7$ (h) $\frac{5x}{2}+5=1.5$

(i) $\frac{1}{4}+\frac{2x}{5}=\frac{3}{4}$ (j) $2+\frac{2x}{3}=-1$

Solve:

(a) $5(4+x)=18$ (b) $\frac{5x}{4}+8=7$

(c) $\frac{3-2x}{7}=3$ (d) $0=6(x-4)$

(e) $1=\frac{0.5x-4}{5}$ (f) $2(x+3)=-1$

(g) $50=4(x-7)$ (h) $0.2=\frac{2x}{4}-6.3$

Harder Linear Equations

section (i)

(1) $20 - x = \frac{1}{3}x$

(2) $\frac{1}{2}x = 12 - x$

(3) $\frac{1}{2}x = \frac{1}{3}x + 5$

(4) $7(\frac{1}{2}x + 6) = 14x$

(5) $4(\frac{1}{3}x + 8) = 12x$

(6) $\frac{1}{2}x = 3(2x - 11)$

(7) $4(3x - 35) = \frac{1}{3}x$

(8) $\frac{1}{3}x + 2 = \frac{1}{2}x + 1$

section (ii)

(1) $\frac{1}{3}x + 5 = \frac{1}{2}x + 3$

(2) $\frac{1}{4}x + 3 = \frac{1}{2}x + 1$

(3) $\frac{1}{3}x - 2 = \frac{1}{5}x + 2$

(4) $\frac{1}{3}x - 18 = \frac{1}{4}x - 13$

(5) $20 - \frac{1}{3}x = 15 - \frac{1}{2}x$

(6) $\frac{1}{2}x - 11 = \frac{1}{11}x + 7$

(7) $\frac{1}{6}x + 4 = \frac{1}{3}x - 2$

(8) $\frac{1}{4}x - 7 = \frac{1}{5}x - 5$

section (iii)

(1) $\frac{3(2x + 3)}{5} = 3(x - 3)$

(2) $\frac{3x + 2}{4} = ½x + 3$

(3) $5(\frac{1}{3}x + 1) = 3(\frac{1}{2}x + 2) + 1$

(4) $\frac{1}{2}(\frac{1}{6}x - 1) = \frac{1}{5}(\frac{1}{3}x - 1)$

(5) $\frac{1}{2}(\frac{1}{5}x - 1) = \frac{1}{5}(\frac{1}{3}x + 2)$

(6) $\frac{2x - 1}{5} + 3 = \frac{5x - 2}{3} + 1$

Board Game

$\frac{x-8}{2}+7=4$	$\frac{3x}{2}-6=0$		$\frac{5x}{3}+6=11$		$6=\frac{x+6}{3}+5$	**LAP/FINISH!**
	$8=\frac{3x}{12}+7$		$\frac{21-5x}{4}=4$	$3=\frac{x+11}{3}-2$	$\frac{19-x}{2}+3=10$	
$\frac{14-x}{2}-8=-3$		$5=\frac{4x+7}{3}$	$\frac{5x}{2}-2=-7$		$1=\frac{24-3x}{6}$	$\frac{9-x}{4}+2=4$
	$8=\frac{7x+3}{3}$	$\frac{12-x}{2}-4=1$		$\frac{x-4}{3}+4=1$	$\frac{x+6}{4}-7=-5$	
$\frac{8-2x}{5}=0$	$\frac{x-4}{3}+6=4$		$\frac{x+14}{9}+3=5$		$-5=\frac{x-2}{3}-6$	$\frac{4x-6}{2}=15$
	$4=\frac{x+6}{5}+2$	$10=\frac{21-x}{2}+3$		$\frac{2x+7}{5}=3$	$\frac{8-x}{2}+3=6$	
$4=\frac{6x}{3}+2$		$\frac{3x}{5}-4=-7$	$5=\frac{x-10}{2}+9$	$-3=\frac{10-x}{2}-5$		$\frac{x+4}{3}+4=5$
$-2=\frac{x+13}{5}-5$	$\frac{x-10}{3}+6=5$		$-4=\frac{4x}{5}-8$	$\frac{4x+10}{2}=1$	$\frac{x-7}{2}+5=3$	
$\frac{3x-2}{5}=2$		$\frac{3x+11}{4}=2$	$\frac{x+7}{4}-5=-3$		$3=\frac{13-2x}{3}$	$2=\frac{15-x}{2}-3$
	$8=\frac{10-x}{2}+6$	$1=\frac{7-2x}{3}$		$\frac{3x}{4}+4=7$		$-2=\frac{2x-2}{3}$
START		$3=\frac{2x+6}{4}$	$6=\frac{3x}{2}+3$	$\frac{x+5}{3}+1=4$		$0=\frac{5x}{2}-5$

Equation **EXTRA**

Place your pieces on **START**. **Youngest** player goes **first** and **rolls** the **dice**.
Move that many places **forward**.
If you land on an **equation, solve** it to work out x - your ***Equation*** **EXTRA!**
You can now move that many places **further**!
First person to complete **1/2/3** laps wins!

Fluency Practice

Solve these equations.

(a) $3x + 1 = 2x + 9$

(b) $4x + 1 = 2x + 9$

(c) $1 + 4x = x + 10$

(d) $4x - 3 = x + 15$

(e) $4x + 7 = 2x - 1$

(f) $6x + 5 = 10 + 4x$

Solve these equations.

(a) $2x + 1 = 7x + 16$

(b) $3x - 2 = 9x + 10$

(c) $x - 8 = 4x + 7$

(d) $5x + 14 = 8x - 1$

(e) $9 + 4x = 6x - 2$

(f) $x - 7 = 5x - 5$

Solve these equations.

(a) $6 + 2x = 11 - 3x$

(b) $7x - 3 = 12 - 3x$

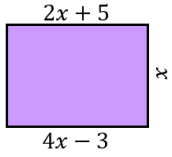
(c) $1 - 4x = 5 + 4x$

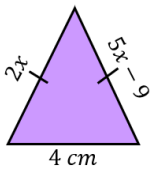
(d) $11 - x = 7 - 2x$

(e) $6.5 - 5x = 2.5x - 4$

(f) $-3x - 7 = 11 - 8x$

(a) The rectangle shown has opposite sides of length $(2x + 5)\ cm$ and $(4x - 3)\ cm$. Find the value of x and hence its area.





(b) Given that the triangle shown is isosceles, find the value of x and hence its perimeter.

Fluency Practice

Solve

(a) $\frac{x+2}{5} = 4$ (b) $\frac{x-1}{6} = 2$

(c) $\frac{6x+3}{9} = 1$ (d) $\frac{5x-6}{4} = 1$

(e) $\frac{2x+10}{5} = 4$ (f) $\frac{2x-1}{8} = 3$

(g) $1 = \frac{2x-1}{5}$ (h) $9 = \frac{5x-3}{3}$

Solve

(a) $\frac{2x+3}{5} = x$ (b) $\frac{4x-7}{2} = x$

(c) $\frac{x+3}{5} = \frac{x-1}{3}$ (d) $\frac{2x+1}{4} = \frac{3x-1}{2}$

(e) $\frac{4x}{7} = \frac{2x-1}{5}$ (f) $\frac{5x+3}{5} = \frac{x+3}{2}$

Solve

(a) $\frac{x}{5} - 2 = 3$ (b) $\frac{x}{4} + 7 = 5$

(c) $\frac{x+1}{4} - 1 = 5$ (d) $\frac{x-2}{3} + 2 = 6$

(e) $\frac{2x+8}{5} - 7 = 1$ (f) $1 = \frac{3x}{4} + 7$

Ben is x cm tall. Talia is 8 cm taller than Ben. Belle is 2cm shorter than Ben. Their mean height is 160 cm. Find Ben's height.

A triangle has base $(2x + 9)$ cm and height 4 cm. Its area is 42 cm^2. Find the value of x and hence the base of the triangle.

15 pens put into pots : forming and solving equations

1.) I want each of three pots to hold one more than the one before

2.) I want each of three pots to hold two less than the one before

3.) I want each of three pots to hold three more than the one before

4.) I want each of three pots to hold four less than the one before

5.) I want each of three pots to hold five more than the one before

6.) Now I want two pots to have the same number of pens and the third one to have 3 times as many

7.) Now I want two pots to have the same number of pens and the third one to have half as many

8.) Now I want the second pot to have 2 more than double the amount in the first pot and the third pot to have 3 more than double the amount in the first pot

9.) For four pots, I want each pot to have twice as many as the one before it

10.) For five pots, I want each pot to have one more than the one before it

Fifteen Pens

Pencils and Jars

(1)

if I put 4 pencils into each jar I will have one jar left over
if I put 3 pencils into each jar I will have one pencil left over
how many jars
how many pencils are there ?

(2)

if I put 5 pencils into each jar I will have one jar left over
if I put 3 pencils into each jar I will have one pencil left over
how many jars
how many pencils?

(3)

if I put 9 pencils into each jar I will have two jars left over
if I put 6 pencils into each jar I will have three pencils left over
how many jars
how many pencils?

(4)

if I put 10 pencils into each jar I will have one jar left over
if I put 7 pencils into each jar I will have two pencils left over
how many jars
how many pencils?

what (same) number do you add to the numerator and denominator of:

(1) $\frac{2}{5}$ to make $\frac{5}{8}$?

(2) $\frac{4}{7}$ to make $\frac{2}{3}$?

(3) $\frac{3}{11}$ to make $\frac{5}{9}$?

(4) $\frac{2}{11}$ to make $\frac{2}{5}$?

(5) $\frac{3}{11}$ to make $\frac{3}{7}$?

(6) $\frac{1}{6}$ to make $\frac{1}{2}$?

(7) $\frac{1}{3}$ to make $\frac{3}{4}$?

(8) $\frac{5}{9}$ to make $\frac{9}{11}$?

(9) $\frac{5}{6}$ to make $\frac{2}{3}$?

(10) $\frac{2}{17}$ to make $\frac{2}{7}$?

(11) $\frac{3}{28}$ to make $\frac{2}{7}$?

(12) $\frac{2}{17}$ to make $\frac{3}{8}$?

(13) $\frac{4}{31}$ to make $\frac{1}{4}$?

(14) $\frac{3}{13}$ to make $\frac{3}{5}$?

(15) $\frac{1}{15}$ to make $\frac{2}{9}$?

(16) $\frac{2}{11}$ to make $\frac{5}{8}$?

(17) $\frac{2}{27}$ to make $\frac{1}{6}$?

(18) $\frac{2}{5}$ to make $\frac{11}{20}$?

consecutive numbers – setting up and using an equations to solve a problem

find three consecutive numbers that add up to 45

find four consecutive numbers that add up to 38

find five consecutive numbers that add up to 60

any number is **n**; the next number is **n + 1**

any even number is **2n**; the next even number is **2n + 2** etc

find three consecutive even numbers that add up to 42

find four consecutive even numbers that add up to 60

find five consecutive even numbers that add up to 60

find three consecutive odd numbers that add up to 57

find four consecutive odd numbers that add up to 48

find even numbers of consecutive odd numbers that add up to 72

any odd number is **2n + 1**; the next odd number is **2n + 3** etc

any multiple of 4 is **4n**; the next multiple of 4 is **4n + 4** etc

find three consecutive multiples of 3 that add up to 63

find four consecutive multiples of 5 that add up to 150

find five consecutive multiples of 2 that add up to 94

Consecutive Numbers

1) $0.2x + 5 = 8$

2) $0.2x - 0.5 = 8$

3) $0.5x + 0.2 = 8$

4) $0.8x - 0.2 = 50$

5) $0.2x + 0.15 = 0.5x$

6) $2x + 0.8 = 2 - 0.5x$

7) $0.002x + 50 = 80$

8) $80x + 0.002 = 0.05$

9) $0.2x - 0.07 = 0.35$

10) $0.03x + 0.04 = 0.46$

11) $9.7 - 0.07x = 1.3$

12) $3.3 + 0.03x = 0.07x + 0.5$

13) $0.2(x + 0.8) = 0.19$

14) $0.4(2x - 0.03) = 0.3$

15) $0.4(0.2x - 0.03) = 0.03$

16) $0.6(0.7x - 0.81) = 0.9$

17) $\frac{5x-0.8}{0.2} = 3.5$

18) $\frac{0.9x-0.04}{0.8} = 0.4$

19) $\frac{0.52x-0.04}{0.8} = 0.4x$

20) $\frac{0.7x-0.021}{0.3x} = 1.4$

21) $\frac{0.13}{0.004x} = 5.2$

22) $\frac{0.3}{1.4}(0.4x - 0.5) = 4.2$

23) $\frac{0.3}{1.4}(19.4x - 0.5) = 4.2x$

24) $0.541x + 0.81 = 0.416x + 1.56$

a)

Area = 55 cm^2 $a =$ ☐ cm

b)

Area = 27 cm^2 $b =$ ☐ cm

c)

Area = 90 cm^2 $c =$ ☐ cm

d)

Area = 160 cm^2 $d =$ ☐ cm

e)

Area = 21 cm^2 $e =$ ☐ cm

f)

Area = 40 cm^2 $f =$ ☐ cm

g)

Area $= 28.5\ \text{cm}^2$ $g =$ ☐ cm

h)

Area $= 2\frac{1}{6}\ \text{cm}^2$ $h =$ ☐ cm

i)

Area $= 2\frac{1}{4}\ \text{cm}^2$ $i =$ ☐ cm

j)

Area $= 2\frac{1}{2}\ \text{cm}^2$ $j =$ ☐ cm

k)

Area $= 4\frac{1}{8}\ \text{cm}^2$ $k =$ ☐ cm

l)

Area $= \frac{5}{6}\ \text{cm}^2$ $l =$ ☐ cm

Maths Venns

All numbers in the equation are between 3 and -3
If you think a region is impossible to fill, convince me why!
Has a solution x = -9
Equation is of the form ..... = 3
Create an equation that could belong in each of the regions
A
B
C
D
E
F
G
H

Maths Venns

Equation with a solution of x = 3
If you think a region is impossible to fill, convince me why!
Equation where one side is 3x + 4
Equation with x-terms on both sides
Create an equation that could belong in each of the regions
A
B
C
D
E
F
G
H

3 Sequences

Fluency Practice

1) A sequence starts with: 34, 38, 42, 46...
   Work out the next 3 terms.

2) A sequence starts with: 19, 25, 31, 37...
   Work out the next 4 terms.

3) A sequence starts with: 12, 6, 0, -6...
   Calculate the next 3 terms.

4) A sequence starts with: 22, 18, 14, 10...
   Calculate the next 4 terms.

5) A sequence starts with: 22, 19, 16, 13...
   Find the next 3 terms.

Fluency Practice

Use the common difference to work out the next term:

1) $13, 20, 27, 34, \ldots$

2) $7, 11, 15, 19, \ldots$

3) $6, 11, 16, 21, \ldots$

4) $9, 17, 25, 33, \ldots$

5) $12, 16, 20, 24, \ldots$

6) $10, 16, 22, 28, \ldots$

7) $-4, 4, 12, 20, \ldots$

8) $8, 13, 18, 23, \ldots$

9) $27, 35, 43, 51, \ldots$

10) $7, 12, 17, 22, \ldots$

11) $8, 15, 22, 29, \ldots$

12) $5, 9, 13, 17, \ldots$

13) $24, 21, 18, 15, \ldots$

14) $72, 63, 54, 45, \ldots$

15) $12, 10, 8, 6, \ldots$

16) $24, 16, 8, 0, \ldots$

17) $-1, -3, -5, -7, \ldots$

18) $-49, -58, -67, -76, \ldots$

19) $-18, -21, -24, -27, \ldots$

20) $-8, -6, -4, -2, \ldots$

21) $-9.5, -15.5, -21.5, -27.5, \ldots$

22) $7.5, 17.5, 27.5, 37.5, \ldots$

23) $-15, -9.5, -4, 1.5, \ldots$

Fluency Practice

1) A sequence starts with: 1, 5, 25, 125...
   Find the next 2 terms.

2) A sequence starts with: 3072, 768, 192, 48...
   Calculate the next 3 terms.

3) A sequence starts with: 8, 16, 32, 64...
   Find the next 4 terms.

4) A sequence starts with: 8, 32, 128, 512...
   Find the next 4 terms.

5) A sequence starts with: 1024, 256, 64, 16...
   Work out the next 3 terms.

Fluency Practice

1) A sequence starts with $3, 10, 13, 23, 36$ …
   Find the next two terms in the sequence.

2) A sequence starts with $2, 10, 12, 22, 34$ …
   Find the next two terms in the sequence.

3) A sequence starts with $1, 9, 10, 19, 29$ …
   Find the next two terms in the sequence.

4) A sequence starts with $4, 8, 12, 20, 32$ …
   Find the next two terms in the sequence.

5) A sequence starts with $5, 10, 15, 25, 40$ …
   Find the next two terms in the sequence.

1) What is the constant difference in the sequence?

a) The 7^{th} term is 20 and the 10^{th} term is 32

b) The 7^{th} term is 20 and the 10^{th} term is 35

c) The 7^{th} term is 20 and the 10^{th} term is 38

d) The 7^{th} term is 20 and the 13^{th} term is 38

e) The 7^{th} term is 20 and the 13^{th} term is 41

f) The 7^{th} term is 20 and the 13^{th} term is 44

g) The 7^{th} term is 20 and the 14^{th} term is 48

h) The 7^{th} term is 20 and the 15^{th} term is 52

i) The 7^{th} term is 20 and the 23^{rd} term is 52

j) The 7^{th} term is 20 and the 31^{st} term is 52

k) The 7^{th} term is 20 and the 39^{th} term is 52

l) The 7^{th} term is 52 and the 39^{th} term is 20

m) The 8^{th} term is 52 and the 40^{th} term is 20

n) The 8^{th} term is 51 and the 40^{th} term is 19

o) The 8^{th} term is 60 and the 40^{th} term is 12

2) Fill in the blanks so that the sequence increases by…

a) + 3
b) + 4
c) - 4
d) - 2
e) $+\frac{2}{3}$

15^{th} term = 20 16^{th} term = _____

15^{th} term = 20 19^{th} term = _____

15^{th} term = 20 20^{th} term = _____

20^{th} term = 20 25^{th} term = _____

15^{th} term = _____ 20^{th} term = 20

15^{th} term = 20 ___th term = 80

___th term = 20 20^{th} term = 80

Question 3: Each sequence below increases/decreases by the same amount each time. Find the missing terms.

(a) 4, □, 8, 10, . . .

(b) 2, 5, □, 11, . . .

(c) 5, 9, □, 17, . . .

(d) 25, □, 37, 43, . . .

(e) 15, 24, □, 42, . . .

(f) 34, □, 24, 19, . . .

(g) 18, □, 40, 51, . . .

(h) 1, □, □, 19, . . .

(i) 3, □, □, 27, . . .

(j) 18, □, □, 39, . . .

(k) 6, □, □, □, 42, . . .

number patterns 1: fill in the gaps

these sequences all go up in equal sized steps

1) 2 5 _ _ 14 _

2) _ 13 22 _ _

3) _ _ 17 21 _ _

4) 1 _ 11 _ 21 _

5) _ 10 19 _ _ _

4) 3 _ _ 15 _ _ 27

5) 5 _ _ _ 17 _ 23

6) _ _ _ 34 40 _ 52

7) _ 13 _ _ 37 _ 53

8) _ _ 23 _ _ 44 _

9) _ 39 _ _ _ 75 _

10) _ 35 _ _ _ 67 _

11) _ 35 _ _ _ _ 20

12) _ 2.4 _ 3.4 _ _

13) 3.6 _ _ _ 10.8 _

14) _ _ 2.7 _ _ _ _ 4.2

15) -3 _ _ _ 13 _

16) -7 _ _ _ _ 48 _

17) _ -2 _ _ 13 _

18) 3.2 _ _ _ _ 4.7 _

number patterns 2: fill in the gaps

these sequences all have a regular pattern

1) 2 5 7 _ 19 _

2) 9 13 22 _ 57

3) 2 5 10 17 _ _

4) _ 3 8 11 _

5) 0 3 8 15 _ _

6) 3 6 12 24 _ _

7) 1 8 27 _ _

8) 5 100 2000 _ _

9) 7 2 _ 11 _ 31

10) 360 180 90 _ _

11) 3 8 15 _ _

12) 3 4 _ 11 _ 29 _

13) 4 10 18 _ _

14) 2 18 32 _ _

15) 9 -6 3 _ _ _

16) 1.2 2.4 4.8 _ _

17) -3 0 5 _ _

18) -7 11 _ 15 _

19) 4.123 41.23 412.3 _ _

20) 3.2 1.6 0.8 _ _ _ _

Fluency Practice

State the rule, in words, for each sequence:

1) $13, 20, 27, 34, \ldots$
2) $7, 11, 15, 19, \ldots$
3) $6, 11, 16, 21, \ldots$
4) $9, 17, 25, 33, \ldots$
5) $12, 16, 20, 24, \ldots$
6) $10, 16, 22, 28, \ldots$
7) $-4, 4, 12, 20, \ldots$
8) $8, 13, 18, 23, \ldots$
9) $24, 21, 18, 15, \ldots$
10) $72, 63, 54, 45, \ldots$
11) $12, 10, 8, 6, \ldots$
12) $24, 16, 8, 0, \ldots$
13) $4, 8, 16, 32, \ldots$
14) $64, 32, 16, 8, \ldots$
15) $3, 12, 48, 192, \ldots$
16) $50, 10, 2, 0.4, \ldots$
17) $-1, -3, -5, -7, \ldots$
18) $-49, -58, -67, -76, \ldots$
19) $-18, -21, -24, -27, \ldots$
20) $-8, -6, -4, -2, \ldots$
21) $-9.5, -15.5, -21.5, -27.5, \ldots$
22) $7.5, 17.5, 27.5, 37.5, \ldots$
23) $-15, -9.5, -4, 1.5, \ldots$

Question 1: Describe the rule for each sequence below and find the next three terms

(a) 3, 5, 7, 9, . . .

(b) 5, 10, 15, 20, . . .

(c) 1, 4, 7, 10, . . .

(d) 20, 19, 18, 17, . . .

(e) 5, 10, 20, 40, . . .

(f) 10, 14, 18, 22, . . .

(g) 1, 6, 11, 16, . . .

(h) 2, 4, 8, 16, . . .

(i) 100, 80, 60, 40, . . .

(j) 5, 12, 19, 26, . . .

(k) 1, 10, 100, 1000, . . .

(l) 64, 32, 16, 8, . . .

(m) 55, 66, 77, 88, . . .

(n) 32, 41, 50, 59, . . .

(o) 15, 9, 3, – 3, . . .

(p) 2, 2.5, 3, 3.5, . . .

(q) 8, 22, 36, 50, . . .

(r) 1, 3, 9, 27, . . .

Question 2: Describe the rule for each sequence below and find the next term.

(a) 2, 3, 5, 8, . . .

(b) 6, 8, 12, 18, . . .

(c) 5, 15, 35, 65, . . .

(d) 100, 99, 97, 94, . . .

(e) 3, 4, 7, 12, . . .

(f) 5, 6, 8, 12, . . .

Extension

Question 1: Here are the first four terms of a number sequence $9, 15, 21, 27, \ldots$

(a) Write down the next term of the number sequence.
(b) Explain how you found your answer to (a)

James says that the 20th term of the sequence is 122

(c) Explain why James must be wrong.

Question 2: Here are the first four terms of a number sequence $5, 8, 11, 14, \ldots$

(a) Write down the next term of the number sequence.
(b) Find the 10th term of the sequence.

The 100th term of the number sequence is 302

(c) Work out the 101st term of the number sequence.
(d) Work out the 99th term of the number sequence.

Question 3: Here are the first four terms of a number sequence $9, 13, 17, 21, \ldots$

Work out the difference between the 10th term and 15th term in the sequence.

Question 4: Here are the first five terms of a number sequence $18, 30, 42, 54, 66, \ldots$

(a) Write down the next term of the number sequence

883 is **not** a term in this number sequence.

(b) Explain why.

Question 5: The first term of a sequence is 3
The rule for continuing the sequence is **multiply by 4 then subtract 5**

(a) What is the second term of the sequence?
(b) What is the third term of the sequence?

Question 6: The second term of a sequence is 26
The rule for continuing the sequence is **Add 7 then multiply by 2**

(a) What is the first term of the sequence?
(b) What is the third term of the sequence?

Question 7: $2, 6, 22, 86, \ldots$
The rule for continuing the sequence is **multiply by a then subtract b**

Find the values of **a** and **b**

Question 8: Here are the first four terms of a number sequence $4, 9, 14, 19, \ldots$

Here are the first four terms of another number sequence $-11, -5, 1, 7, \ldots$

Find **three** numbers that are in both number sequences.

Question 9: A number sequence is generated by increasing by the same amount each time.
The first term is 7 and the fifth term is 13.

Work out the fourth term.

Question 10: Write down the next two terms in this sequence

$$5a - b,\ 9a - 2b,\ 13a - 3b,\ \ldots$$

Question 11: Find the next term in these sequences

(a) O, T, T, F, F, ... (b) M, T, W, T, F, ... (c) R, O, Y, G, B, ...

(d) 1, 11, 21, 1211, ...

Fluency Practice

Determine whether the sequences are Linear, Geometric, Quadratic or Fibonacci-Type:

1) $2, 6, 18, 54, \ldots$

2) $2, 7, 14, 23, \ldots$

3) $3, 8, 11, 19, \ldots$

4) $4, 5, 12, 25, \ldots$

5) $9, 13, 17, 21, \ldots$

6) $88, 44, 22, 11, \ldots$

7) $29, 21, 13, 5, \ldots$

8) $2, 5, 14, 29, \ldots$

9) $-3, -6, -9, -12, \ldots$

10) $3, 10, 13, 23, \ldots$

Fluency Practice

Identify whether the following sequences are **arithmetic** or **geometric**:

(a) 1, 4, 16, 64, 256,…

(b) 9, 4, -1, -6,…

(c) 5, 25, 45, 65,…

(d) 125, 100, 80, 64,…

(e) 2727, 909, 303, 101,…

Identify whether the following sequences are **arithmetic**, **geometric**, or **quadratic**:

(a) 8, 13, 20, 29, 40,…

(b) 5, 20, 45, 80, 125…

(c) 2, 6, 18, 54,…

(d) 4, 10, 22, 40, 64…

(e) 1280, 320, 80, 20,…

(f) 3, 8, 17, 30, 47,…

(g) 1, 1.1, 1.21, 1.331,…

(h) 16, 24, 36, 54,…

(i) 200, 180, 162, 145.8,…

(j) 343, 490, 700, 1000,…

Identify whether the following are **arithmetic**, **geometric**, or **quadratic**, and find the next term in each sequence.

(a) 0, 7, 18, 33, 52, 75,…

(b) $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \ldots$

(c) 3, -6, 12, -24, 48,…

(e) -1.4, -2.2, -3, -3.8,…

FILL THE GAPS

Determine the missing numbers in each sequence.
The type of sequence is written next to it.

Arithmetic		8			29		…
Geometric		6		54			…
Fibonacci			9			37	…
Quadratic	4	7	12				…
????????		10		21		36	…

Fluency Practice

Put the following sequences in the correct column:

- $2, 4, 6, 8, \ldots$
- $-3, -10, -17, -24, \ldots$
- $31, 32, 33, 34, \ldots$
- $1, 4, 9, 16, \ldots$
- $8, 16, 24, 32, \ldots$
- $100, 80, 70, 65, \ldots$
- $7, -7, 7, -7, \ldots$
- $7, 15, 23, 31, \ldots$
- $2, 5, 9, 14, \ldots$
- $a, a + 3, a + 6, a + 9, \ldots$
- $7, 2.5, -2, -6.5, \ldots$

Linear Sequences	Not Linear Sequences

Question 1: Find the n^{th} term for each of the following sequences

(a) 5, 8, 11, 14, ...

(b) 9, 14, 19, 24, ...

(c) 1, 3, 5, 7, ...

(d) 10, 14, 18, 22, ...

(e) 2, 7, 12, 17, ...

(f) 3, 9, 15, 21, ...

(g) 11, 31, 51, 71, ...

(h) 20, 23, 26, 29, ...

(i) 1, 7, 13, 19, ...

(j) 100, 125, 150, 175, ...

(k) 13, 22, 31, 40, ...

(l) 1.5, 2, 2.5, 3, ...

Question 2: Find the n^{th} term for each of the following sequences

(a) 10, 7, 4, 1, ...

(b) 6, 4, 2, 0, ...

(c) 9, 4, -1, -6, ...

(d) 20, 10, 0, -10, ...

(e) 5, -1, -7, -13, ...

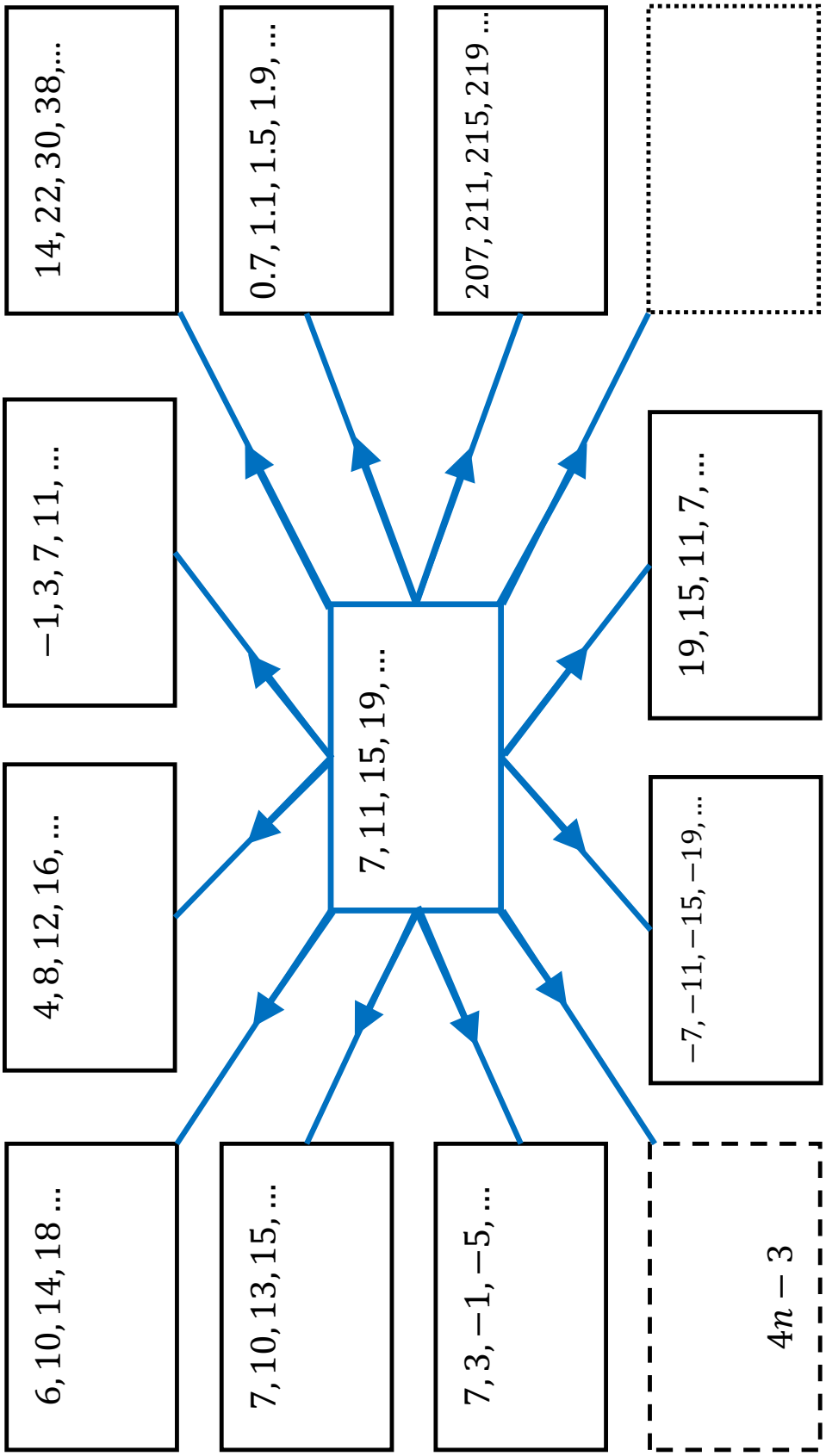
(f) 5, 4, 3, 2, ...

(g) -6, -13, -20, -27, ...

(h) -10, -13, -16, -19, ...

(i) 2.5, 2, 1.5, 1, ...

Nth Term of a Linear Sequence Spider



More-Same-Less – Nth Term of a Linear Sequence

Instructions: Write a new sequence based on the nth term of the given sequences. Complete the remaining boxes by making the minimum change possible to the nth term of the original sequence.

Coefficient of *n* in *n*th term

	Less	Same	More
More			
Same		$4, 7, 10, 13, 16, \ldots$	
Less			

Constant value in *n*th term

Fluency Practice

Find the n^{th} term of the following sequences:

1) $\frac{1}{3}, \frac{2}{3}, 1, 1\frac{1}{3}, \ldots$

2) $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1, \ldots$

3) $\frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}, \ldots$

4) $\frac{2}{3}, 1, 1\frac{1}{3}, 1\frac{2}{3}, \ldots$

5) $\frac{1}{2}, \frac{3}{4}, 1, 1\frac{1}{4}, \ldots$

6) $\frac{3}{5}, \frac{4}{5}, 1, 1\frac{1}{5}, \ldots$

7) $\frac{1}{2}, \frac{2}{3}, \frac{5}{6}, 1, \ldots$

8) $1, 1\frac{2}{3}, 2\frac{1}{3}, 3, \ldots$

9) $\frac{5}{6}, 1, 1\frac{1}{6}, 1\frac{1}{3}, \ldots$

10) $1\frac{1}{2}, 1\frac{5}{8}, 1\frac{3}{4}, 1\frac{7}{8}, \ldots$

11) $\frac{4}{7}, \frac{6}{7}, 1\frac{1}{7}, 1\frac{3}{7}, \ldots$

12) $3\frac{1}{3}, 2\frac{2}{3}, 2, 1\frac{1}{3}, \ldots$

A: Positive integers

	Sequence	*nth* term rule
A1.	5, 8, 11, 14, 17 …	
A2.	4, 7, 10, 13, 16 …	
A3.	2, 5, 9, 11, 15 …	
A4.	2, 6, 10, 14, 18 …	
A5.	2, 7, 12, 17, 22 …	
A6.	4, 14, 24, 34, 44 …	
A7.	−6, 4, 14, 24, 34 …	

B: Including negatives

	Sequence	*nth* term rule
B1.	1, 3, 5, 7, 9 …	
B2.	−1, −3, −5, −7, −9 …	
B3.	−2, −4, −6, −8, −10 …	
B4.	10, 8, 6, 4, 2 …	
B5.	−10, −8, −6, −4, −2 …	
B6.	−5, −4, −3, −2, −1 …	
B7.	1, 2, 3, 4, 5	

C: Including decimals

	Sequence	*nth* term rule
C1.	5, 11, 17, 23, 29 …	
C2.	2.5, 5.5, 8.5, 11.5, 14.5 …	
C3.	4.5, 7.5, 10.5, 13.5, 16.5 …	
C4.	0.9, 1.5, 2.1, 2.7, 3.3 …	
C5.	−0.1, 0.5, 1.1, 1.7, 2.3 …	
C6.	2.3, 1.7, 1.1, 0.5, −0.1	
C7.	2.3, 1.6, 0.9, 0.2, −0.5 …	

D: Including factions

	Sequence	*nth* term rule
D1.	13, 14, 15, 16,17 …	
D2.	$3\frac{1}{4}, 3\frac{1}{2}, 3\frac{3}{4}, 4, 4\frac{1}{4}$, …	
D3.	$3, 3\frac{1}{4}, 3\frac{1}{2}, 3\frac{3}{4}, 4$, …	
D4.	$9, 9\frac{3}{4}, 10\frac{1}{2}, 11\frac{1}{4}, 12$, …	
D5.	$12, 11\frac{1}{4}, 10\frac{1}{2}, 9\frac{3}{4}, 9$, …	
D6.	$12, 11\frac{1}{5}, 10\frac{2}{5}, 9\frac{3}{5}, 8\frac{4}{5}$, …	
D7.	$12\frac{1}{3}, 11\frac{8}{15}, 10\frac{11}{15}, 9\frac{14}{15}, 9\frac{2}{15}$, …	

Question 7: Find the n^{th} term for each of the following sequences

(a) $\frac{1}{2}, \frac{3}{4}, \frac{5}{6}, \frac{7}{8}, \ldots \ldots$

(b) $\frac{9}{11}, \frac{13}{16}, \frac{17}{21}, \frac{21}{26}, \ldots \ldots$

(c) $\frac{3}{7}, \frac{6}{12}, \frac{9}{17}, \frac{12}{22}, \ldots \ldots$

(d) $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \ldots \ldots$

(e) $\frac{20}{21}, \frac{25}{32}, \frac{30}{43}, \frac{35}{54}, \ldots \ldots$

(f) $\frac{99}{100}, \frac{97}{95}, \frac{95}{90}, \frac{93}{85}, \ldots \ldots$

Question 4: The n^{th} term for some sequences are given below.
Find the first 5 terms for each sequence.

(a) $5n + 3$

(b) $2n + 9$

(c) $3n - 2$

(d) $10n - 6$

(e) $9n + 10$

(f) $n + 8$

(g) $-7n + 20$

(h) $50 - 5n$

(i) $3.5n + 4$

Intelligent Practice

Generate the first 5 terms of each sequence:

1) $2n$

2) $3n$

3) $4n$

4) $4n + 1$

5) $4n + 7$

6) $4n - 2$

7) $4n - 10$

8) $n - 10$

9) $n + 10$

10) $\frac{1}{2}n + 10$

11) $\frac{1}{2}n + 5$

12) $-\frac{1}{2}n + 5$

13) $-\frac{1}{2}n - 5$

14) $-n - 5$

15) $-7n - 5$

16) $-14n - 10$

Fluency Practice

2	**342**	**199**	**11**	**2**	**35**	**62**	**190**	**21**	**9**
370	**505**	**153**	**51**	**25**	**6**	**13**	**6**	**403**	**60**
-3	**189**	**-10**	**19**	**8**	**-210**	**-7**	**39**	**198**	**907**
200	**55**	**3**	**14**	**310**	**15**	**14**	**457**	**10**	**105**
17	**14**	**33**	**150**	**28**	**340**	**38**	**15**	**-1**	**66**
10	**4**	**100**	**27**	**692**	**-130**	**303**	**11**	**83**	**385**
306	**10**	**6**	**598**	**233**	**13**	**198**	**25**	**107**	**253**
100	**-1**	**15**	**52**	**89**	**5**	**30**	**175**	**109**	**18**
255	**690**	**803**	**7**	**5**	**43**	**19**	**6**	**20**	**-280**
16	**8**	**-9**	**4**	**19**	**298**	**-460**	**10**	**-10**	**398**
11	**10**	**250**	**394**	**59**	**25**	**97**	**397**	**22**	**3**
199	**30**	**101**	**18**	**16**	**18**	**53**	**9**	**201**	**503**
28	**58**	**160**	**195**	**4**	**100**	**399**	**55**	**40**	**7**
2	**342**	**199**	**11**	**2**	**35**	**62**	**190**	**21**	**9**
370	**505**	**153**	**51**	**25**	**6**	**13**	**6**	**403**	**60**
-3	**189**	**-10**	**19**	**8**	**-210**	**-7**	**39**	**198**	**907**
200	**55**	**3**	**14**	**310**	**15**	**14**	**457**	**10**	**105**

n^{th} term	1st term	2nd term	5th term	10th term	50th term	100th term
$2n + 1$						
$4n - 2$						
$5n + 3$						
$2n$						
$3n + 3$						
$7n - 8$						
$n + 5$						
$n + 9$						
$2n - 11$						
$9n + 7$						
$6n - 2$						
$7n - 10$						
$8n + 3$						
$200 - n$						
$400 - 3n$						
$3n + 10$						
$4n - 1$						
$5n + 5$						
$40 - 5n$						
$20 - 3n$						

Work out the terms in the sequences above, and then cross off each number in the grid at the top of this page. Some numbers appear in the top grid more than once – only cross one off at a time. When you're done, there will be 10 numbers left in the top grid. Add them all up!

Extension

Here are the nth terms for 6 different linear sequences:

3n + 5	**2n - 1**	**34 – 5n**
n - 6	**33 – 4n**	**3n - 7**

How many of the sequences above do each of the following numbers appear in?

-6, -3, -1, 17, 26, 29

Order the numbers in order of which appears in the most to the least

773 is in the following sequences:

2n + a

3n + b

4n + c

5n + d

6n + e

Find the value of a, b, c, d and e

Fluency Practice

1) The nth term of a sequence is $5(4n + 1)$
   Work out the 30th term of the sequence.

2) The nth term of a sequence is $5(2n - 6)$
   Work out the 20th term of the sequence.

3) The nth term of a sequence is $2(-2n + 5)$
   Work out the 8th term of the sequence.

4) The nth term of a sequence is $4(-4n - 4)$
   Work out the 30th term of the sequence.

5) The nth term of a sequence is $n^2 + 5n + 1$
   Work out the 10th term of the sequence.

6) The nth term of a sequence is $n^2 - 3n + 4$
   Work out the 10th term of the sequence.

7) The nth term of a sequence is $2n^2 + n + 5$
   Work out the 20th term of the sequence.

8) The nth term of a sequence is $3n^2 - n + 4$
   Work out the 50th term of the sequence.

9) The nth term of a sequence is $4n^2 + 2n - 6$
   Work out the 20th term of the sequence.

10) The nth term of a sequence is $4n^2 - n + 6$
    Work out the 10th term of the sequence.

Fluency Practice

A1 Write down the first four terms of the sequence given by the formula: $6n$	**A2** Write down the first three terms of the sequence given by the formula: $3n+2$	**A3** Write down the 10^{th} term of the sequence given by the formula: $20-4n$	**A4** Write down the 51^{st} term of the sequence given by the formula: $\frac{n+5}{2}$
B1 Write down the first five terms of the sequence given by the formula: n^2	**B2** Write down the first four terms of the sequence given by the formula: n^2-3n	**B3** Write down the 15^{th} term of the sequence given by the formula: $n(n+1)$	**B4** Write down the 99^{th} term of the sequence given by the formula: $(n+2)(n-3)$
C1 Write down the first four terms of the sequence given by the formula: 3^n	**C2** Write down the first five terms of the sequence given by the formula: 2^n-1	**C3** Write down the 10^{th} term of the sequence given by the formula: 4×2^n	**C4** Write down the 100^{th} term of the sequence given by the formula: $(-1)^n$
D1 Write down the first six terms of the sequence given by the formula: n^3	**D2** Write down the first four terms of the sequence given by the formula: $\frac{n-1}{3}$	**D3** Write down the 11^{th} term of the sequence given by the formula: $(n+1)(n-3)(n+5)$	**D4** Write down the 19^{th} term of the sequence given by the formula: $\frac{n^2+5}{n-4}$

A1 Find the next two terms 2, 5, 8, 11, …	**A2** Find the next two terms 11, 8, 5, 2, …	**A3** Find the next two terms 9, 13, 17, 21, …	**A4** Find the next two terms 23, 14, 5, –4, …
B1 Find the 20^{th} term 11, 14, 17, 20, …	**B2** Find the 30^{th} term 5, 13, 21, 29, …	**B3** Find the 45^{th} term 2, 7, 12, 17, …	**B4** Find the 51^{st} term 30, 23, 16, 9, …
C1 Find the first three terms nth term = $3n + 4$	**C2** Find the first four terms nth term = $2n + 7$	**C3** Find the first three terms nth term = $7n – 5$	**C4** Find the first five terms nth *term* = $11 – 3n$
D1 Find the nth term formula 3, 11, 19, 27, …	**D2** Find the nth term formula 7, 11, 15, 19, …	**D3** Find the nth term formula 4, 5, 6, 7, …	**D4** Find the nth term formula 39, 33, 27, 21, …

Fluency Practice

Work out the first four terms of the sequence with these nth terms.

(a) $n+1$ (b) $n+2$

(c) $2n+1$ (d) $2n+2$

(e) $3n+2$ (f) $3n-2$

(g) $0.5n+3$ (h) $6-n$

(i) $12-n$ (j) $12-2n$

Find the nth term for each of these sequences.

(a) $4, 7, 10, 13, \ldots$

(b) $5, 8, 11, 14, \ldots$

(c) $5, 9, 13, 17, \ldots$

(d) $4, 8, 12, 16, \ldots$

(e) $0, 4, 8, 12, \ldots$

(f) $4, 5, 6, 7, \ldots$

(g) $10, 8, 6, 4, \ldots$

(h) $10, 5, 0, -5, \ldots$

(i) $10, 9, 8, 7, \ldots$

(j) $-10, -9, -8, -7, \ldots$

Find the nth term of these sequences.

(a) $1.5, 2, 2.5, 3, \ldots$

(b) $4.2, 4.4, 4.6, 4.8, \ldots$

(c) $8, 7.5, 7, 6.5, \ldots$

(d) $-2, -2.5, -3, -3.5, \ldots$

Find the 100th term of these sequences.

(a) $5, 9, 13, 17, \ldots$

(b) $3, 9, 15, 21, ..$

(c) $1.5, 3, 4.5, 6, \ldots$

(d) $4, 2, 0, -2, \ldots$

(e) $\frac{1}{2}, 1, \frac{3}{2}, 2, \ldots$

(f) $-3, -5, -7, -9, \ldots$

nth term: arithmetic sequences.

Can you match each sequence to its 10th term and nth term rule?

sequence	10th term	nth term
1,4,7,10....	23	5n
2,8,14,20....	-2.6	-7+3n
18,14,10,6...	28	9 + 2(n-1)
-4,-1,2,5...	50	6n-4
0.1,0.4,0.7,1...	-18	0.3n-0.2
9,11,13,15...	27	3n-2
-0.8,-1,-1.2,-1.4..	56	-0.2n-0.6
5,10,15,20...	2.8	22-4n

Fluency Practice

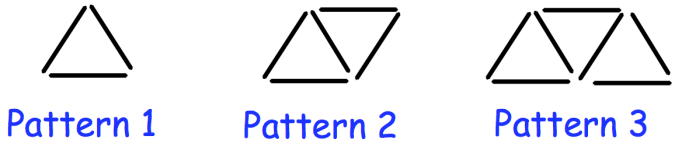
complete the sequence

Can you fill in the missing terms in these sequences?

0th term	1st term	2nd term	3rd term	10th term	20th term	100th term	nth term
-3	1	5		37			4n-3
	7		17	52			
6			-6	-34		-394	
-4	-2			16		196	
0.1	0.3			2.1		20.1	
5							5-5n
0				60			

Fluency Practice

Question 1: These patterns are made from sticks



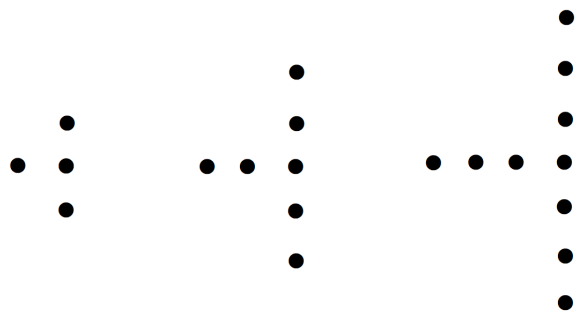
Pattern 1 Pattern 2 Pattern 3

(a) Draw pattern 4
(b) Draw pattern 5
(c) How many sticks will there be in pattern 6?
(d) How many sticks will there be in pattern 10?
(e) Which pattern will use 31 sticks?

Theo says that he has made a pattern with exactly 100 sticks.

(f) Explain why Theo must be wrong.

Question 2: Here are some patterns of dots



Pattern 1 Pattern 2 Pattern 3

(a) Continue the pattern to show pattern 4
(b) How many dots will there be in pattern 6?
(c) Which pattern will use 28 dots?
(d) Which pattern will use 43 dots?

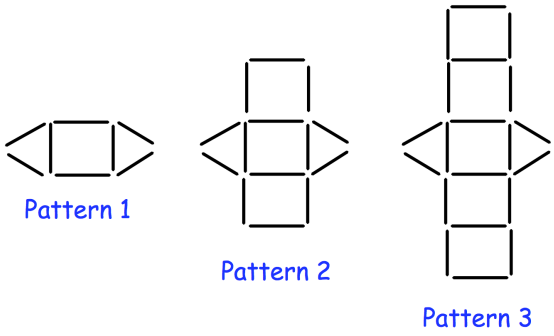
Pattern 800 has 2401 dots.

(e) How many dots will pattern 801 have?
(f) How many dots will pattern 799 have?

Fluency Practice

Question 3: The patterns below are made from sticks

(a) Complete the table for pattern 4.



Pattern Number	1	2	3	4
Number of Sticks	8	14	20	

(b) Sketch pattern 5.

Here is a rule for working out the number of sticks

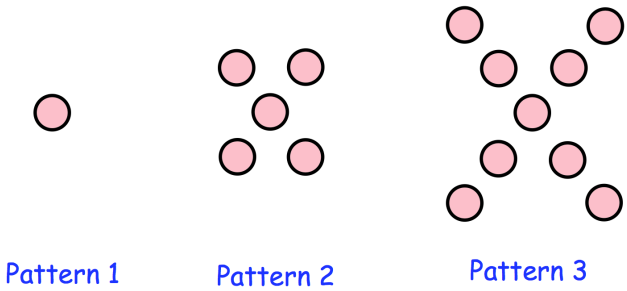
Multiply pattern number by 6 and add 2

(c) How many sticks will be in pattern 30?
(d) How many sticks will be in pattern 120?
(e) Which pattern will have 80 sticks?
(f) Which pattern will have 482 sticks?

Question 4: The diagram shows a sequence of patterns

(a) Draw pattern 4.

(b) Work out the number of circles in pattern 5.



(c) Write down a rule for continuing the patterns.

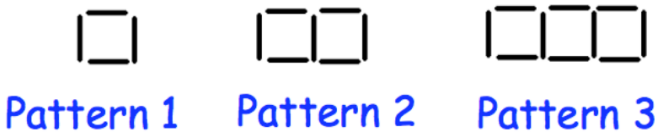
(d) Explain why you **cannot** make a pattern with exactly 66 circles.

(e) Complete this rule

Number of circles = Pattern number x ☐ - ☐

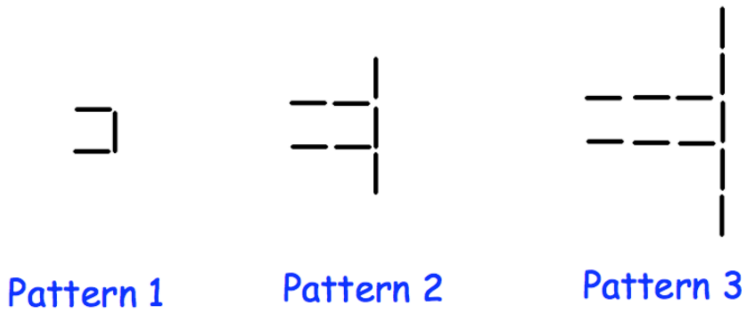
Fluency Practice

Question 5: The patterns below are made from sticks.



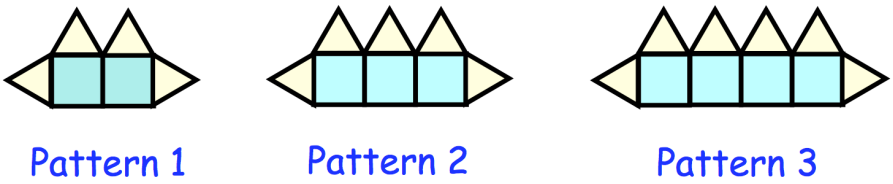
(a) Write an expression, in terms of n, for the number of sticks in pattern *n*
(b) How many sticks will there be in pattern 55?
(c) Which pattern number will use exactly 100 sticks?

Question 6: These patterns are made from sticks.



(a) Write an expression, in terms of n, for the number of sticks in pattern *n*
(b) How many sticks will there be in pattern 220?
(c) Which pattern number will use exactly 139 sticks?

Question 7: The patterns below are made from squares and triangles.



(a) How many triangles are there in pattern 6?
(b) How many squares are there in pattern 7?

(c) Write an expression, in terms of n, for the number of squares in pattern *n*
(d) Write an expression, in terms of n, for the number of triangles in pattern *n*

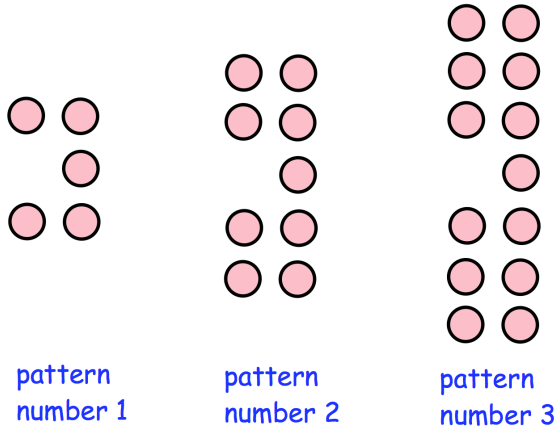
Extension

Question 1: Here is a pattern made with circular discs.

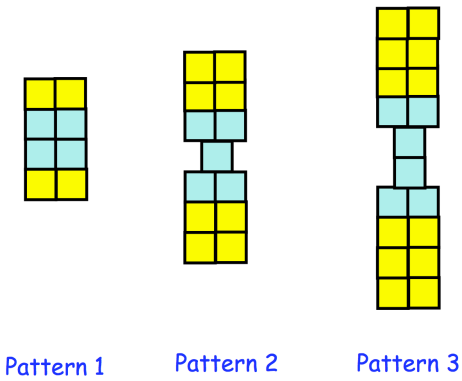
(a) Find an expression, in terms of n, for the number of discs in pattern number n.

Olivia has 103 discs.

(b) Can Olivia make a pattern in this sequence using exactly 103 discs?
Explain your answer.



Question 2: Here is a pattern of blue and yellow squares.



Which statements below are true?

A Pattern 5 has 9 blue squares

B The number of yellow squares is always even

C Pattern 10 has 50 squares in total

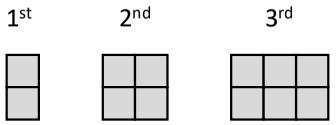
D Every pattern has more yellow than blue squares

E Pattern 7 has 28 yellow squares

F The number of blue squares in Pattern 16 is a prime number

Sequences with Shape

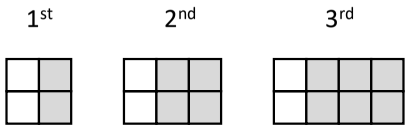
1) These are the first 3 shapes in a sequence. Complete the table.



Shape	Squares
1st	2
2nd	4
3rd	
4th	
5th	
10th	
20th	

Why is it easy to predict the squares in the 10th & 20th shapes?

2) This is a **similar** sequence with white & grey squares. Complete the table.

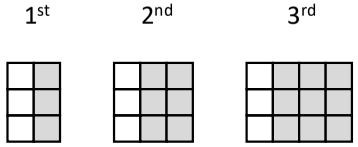


Shape (n)	Total Squares
1st	
2nd	
3rd	
4th	
5th	
10th	
20th	
30th	

Describe how you would calculate the squares in the 100th shape.

Using n to represent the shape number, write an **algebraic expression** for the number of squares in **any** shape in the sequence.

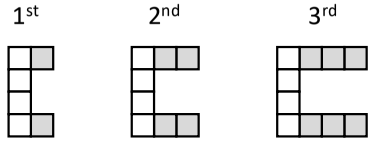
3) Complete the table for this sequence of shapes.



Shape (n)	Total Squares
1st	
2nd	
3rd	
4th	
10th	
20th	
n^{th}	

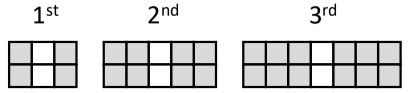
Use the last row to write an algebraic expression for the sequence.

4) Complete the table for this sequence of shapes. ①

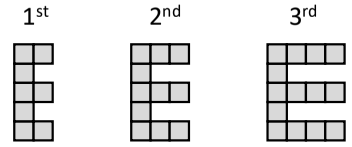


Shape (n)	Total Squares
1st	
2nd	
3rd	
4th	
10th	
20th	
n^{th}	

5) Complete the tables for these sequences.
Think about the 'common difference' between shapes, & how many squares need to be added to make the sequence correct.

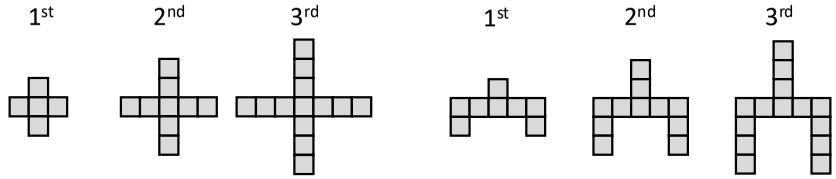


Shape (n)	Total Squares
1st	
2nd	
3rd	
4th	
10th	
20th	
n^{th}	



Shape (n)	Total Squares
1st	
2nd	
3rd	
4th	
8th	
15th	
n^{th}	

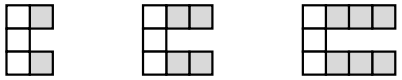
6) What is the n^{th} term for these 2 different sequences?



Sequences with Shape

1) These are the first 3 shapes in a sequence. Complete the table.

1st 2nd 3rd



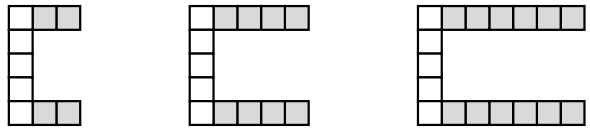
Shape (n)	Total Squares
1st	
2nd	
3rd	
4th	
10th	
20th	
n^{th}	

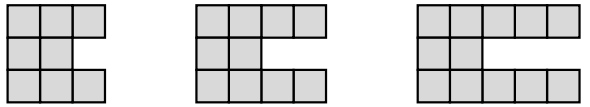
Use the last row to write an algebraic expression for the sequence.

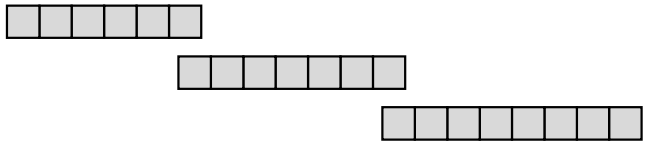
For each of the next shape sequences write an algebraic expression for the n^{th} term.
A table might help you.

Think about the 'common difference' between shapes,
& how many squares need to be added to make the sequence correct.

1st 2nd 3rd







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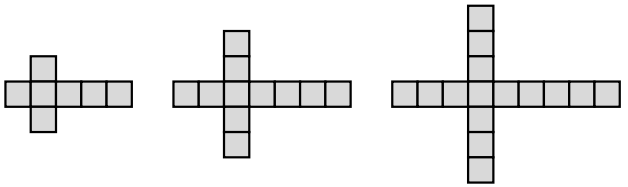
② 

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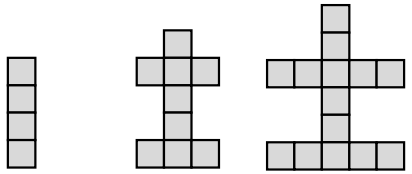
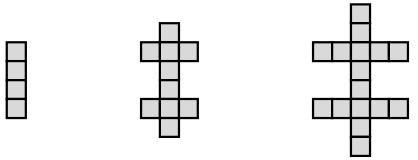
Complete the table for this sequence, how is it different?



Shape (n)	Total Squares
1st	
2nd	
3rd	
4th	
10th	
n^{th}	

The sequence increases by 5 each time, but it begins lower than 5.
We must adjust the sequence by subtracting one.

Find the n^{th} term for these sequences.



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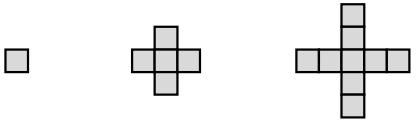

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Try finding the n^{th} term for these numerical sequences.

a) 6, 10, 14, 18, 22

b) 4, 9, 14, 19, 24

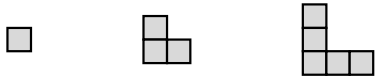
c) 3, 11, 19, 27

d) 8, 6, 4, 2

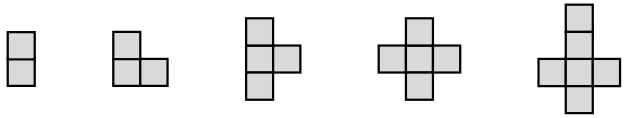
Sequences: Area & Perimeter

For each sequence, sketch the next shape & complete the table.
Try to find an algebraic expression for the values for **any** shape in the sequence (the n^{th} term).

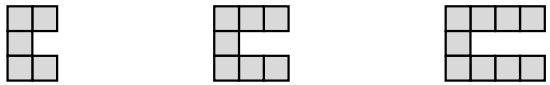
A	1st	2nd	3rd	4th	n^{th}
Squares	1				n
Perimeter	4				$2n + 2$



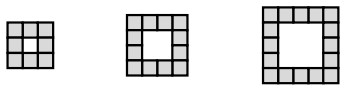
C	1st	2nd	3rd	4th	n^{th}
Squares					
Perimeter					



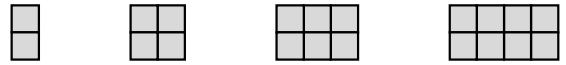
E	1st	2nd	3rd	4th	5th	n^{th}
Squares						
Perimeter						



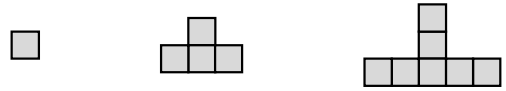
G	1st	2nd	3rd	4th	5th	n^{th}
Squares						
Perimeter						



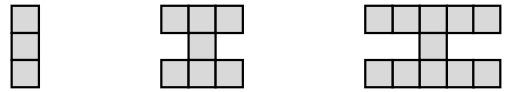
I	1st	2nd	3rd	4th	5th	6th	n^{th}
Squares							
Perimeter							



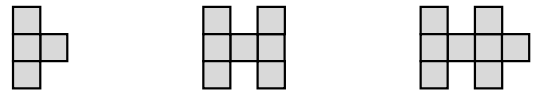
B	1st	2nd	3rd	4th	n^{th}
Squares					
Perimeter					



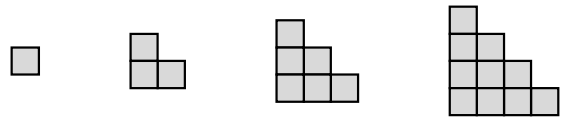
D	1st	2nd	3rd	4th	n^{th}
Squares					
Perimeter					



F	1st	2nd	3rd	4th	n^{th}
Squares					
Perimeter					



H	1st	2nd	3rd	4th	5th	6th	n^{th}
Squares							
Perimeter							



J	1st	2nd	3rd	4th	5th	6th	7th	n^{th}
Squares								
Perimeter								

Fluency Practice

Question 1: The first 4 numbers in the Fibonacci sequence are $1, 1, 2, 3, \ldots$

(a) What is the 5^{th} term of the Fibonacci sequence?
(b) What is the 6^{th} term of the Fibonacci sequence?
(c) Describe the rule for continuing the Fibonacci sequence.

Question 2: Find the next three terms of the following Fibonacci-style sequences

(a) $2, 4, 6, 10, \ldots$ (b) $3, 6, 9, 15, \ldots$ (c) $4, 8, 12, 20, \ldots$

(d) $15, 23, 38, 61, \ldots$ (e) $5, 12, 17, 29, \ldots$ (f) $-3, 5, 2, 7, \ldots$

(g) $35, 60, 95, 155, \ldots$ (h) $-1, -3, -4, -7, \ldots$ (i) $1.2, 2.7, 3.9, 6.6, \ldots$

(j) $0.11, 2.32, 2.43, 4.75, \ldots$ (k) $-5.1, 1.1, -4, -2.9, \ldots$ (l) $-0.5, -0.7, -1.2, -1.9, \ldots$

(m) $\frac{1}{11}, \frac{3}{11}, \frac{4}{11}, \frac{7}{11}, \ldots$ (n) $\frac{5}{6}, \frac{11}{12}, \frac{7}{4}, \frac{8}{3}, \ldots$ (o) $-\frac{1}{5}, \frac{1}{2}, \frac{3}{10}, \frac{4}{5}, \ldots$

Question 3: Find the missing term in each of the Fibonacci-style sequences below.

(a) $\square, 13, 20, 33, \ldots$ (b) $11, \square, 26, 41, \ldots$ (c) $\square, 69, 109, 178, \ldots$

(d) $\square, 3.7, 4.9, 8.6, \ldots$ (e) $26.3, \square, 64.4, 102.5, \ldots$ (f) $10.25, \square, 25.75, 41.25, \ldots$

(g) $6, \square, 4, 2, \ldots$ (h) $-12, \square, -4, 4, \ldots$ (i) $\square, -\frac{5}{4}, -2, -\frac{13}{4} \ldots$

Question 1: For each of the following Fibonacci-style sequences, find the next 4 terms.

(a) $a, 4a, 5a, 9a, \ldots$ (b) $3x, 3x + y, 6x + y, 9x + 2y, \ldots$

(c) $6a, -2a, 4a, 2a, \ldots$ (d) $2y, y + z, 3y + z, \ldots$

(e) $4x - 5y, 2x - y, 6x - 6y, \ldots$ (f) $-x, x + y, y, \ldots$

Fluency Practice

Determine whether each of these sequences is a Fibonacci-like sequence.

(a) $1, 1, 2, 3, 5, 8, 13, \ldots$

(b) $1, 2, 3, 6, 11, 20, 37, \ldots$

(c) $2, 4, 6, 10, 16, 26, \ldots$

(d) $-1, 3, 2, 5, 7, 12, \ldots$

Fill in the missing terms in each of these Fibonacci-like sequences.

1st	2nd	3rd	4th	5th	6th	7th	8th
1	3						
2	7						
	5	7					
	7		18				
		20	33				
-2	4						
	10		19				
					6		15

(a) Milly think that 70 is in the Fibonacci-like sequence that starts $6, 10, 16, 26, \ldots$ Is Milly correct? Explain your answer.

(b) A Fibonacci-like sequence contains the third term 10. Suggest two possible sequences, and give their first five terms.

(c) The sum of the first three terms of a Fibonacci-like sequence is zero. What is the third term?

(d) The first two terms of a Fibonacci-like sequence are a and $2a$. Find the next five terms of the sequence.

This is the Fibonacci sequence. The first two terms are 0 & 1.
To find the next term, we add the previous 2.
Complete the 8th, 9th & 10th terms.

0	1	1	2	3	5	8			

These are Fibonacci-rule sequences but they don't start with 0 & 1.
Complete the missing terms

A			2	4	6			
B				10		25		
C						24	39	
D	0				12			
E	−2			2				

Fibonacci Sequences with Algebra

Using algebra, how can we **express** the next terms of these sequences?

F	0	n	n	2n			
G	1	n	n+1				
H	n	2					
I	n−1	n					
J	2n−3	n+1					
K	5−3n	n−2					

Using algebra, find the value of n & complete these sequences.

L	Algebra:	n	n+1				
	Number:				8		

M	Algebra:	n	n+4				
	Number:					17	

N	n−1	n				
						37

O	n−4	2n+2				
						37

Complete these Fibonacci-rule sequences.

P	4					42

Q	−3					11

Complete this Fibonacci-rule sequence.
How can you form an expression for the 1st term using n?

R		−2	n					6

Create a similar Fibonacci-rule sequence where the third number is n.
Express each term algebraically.

(a) Is 205 a term in the sequence 1, 5, 9, 13, ... ?
(b) Is 200 a term in the sequence 4, 10, 16, 22, ... ?
(c) Is 1000 a term in the sequence 50, 65, 80, 95, ... ?
(d) Is 999 a term in the sequence 11, 20, 29, 38, ... ?
(e) Is 458 a term in the sequence 5, 12, 19, 26, ... ?

Intelligent Practice

1) Is 101 in the sequence $1, 4, 7, 10, 13, \ldots$?

2) Is 101 in the sequence $4, 7, 10, 13, 16, \ldots$?

3) Is 101 in the sequence $5, 8, 11, 14, 17, \ldots$?

4) Is 101 in the sequence $5, 9, 13, 17, 21, \ldots$?

5) Is 1010 in the sequence $50, 90, 130, 170, 210, \ldots$?

6) Is -101 in the sequence $13, 10, 7, 4, 1, \ldots$?

7) Is -110 in the sequence $16, 13, 10, 7, 4, \ldots$?

8) Is -110 in the sequence $17, 14, 11, 8, 5, \ldots$?

9) Is -101 in the sequence $21, 17, 13, 9, 5, \ldots$?

10) Is -1010 in the sequence $210, 170, 130, 90, 50, \ldots$?

Fluency Practice

(a) The first four terms of a sequence are $3, 7, 11, 15, \ldots$ Is 50 in the sequence? Explain your answer.

(b) The first four terms of a sequence are $-4, -2, 0, 2, \ldots$ Is 33 in the sequence? Explain your answer.

(c) The first four terms of a sequence are $1, 6, 11, 16, \ldots$ Is 41 in the sequence? Explain your answer.

(a) The first four terms of a sequence are $6, 9, 12, 15, \ldots$ Is 39 in the sequence? Explain your answer.

(b) The first four terms of a sequence are $7, 10, 13, 16, \ldots$ Is 67 in the sequence? Explain your answer.

(c) The first four terms of a sequence are $5, 8, 11, 14, \ldots$ Is 40 in the sequence? Explain your answer.

(a) The nth term of a sequence is $3n - 2$. Is 95 a term of the sequence? Explain your answer.

(b) The nth term of a sequence is $5n + 3$. Is 118 a term of the sequence? Explain your answer.

(c) The first four terms of a sequence are $7, 11, 15, 19, \ldots$ Is 97 in the sequence? Explain your answer.

(d) The first four terms of a sequence are $-2, 5, 12, 19, \ldots$ Is 110 in the sequence? Explain your answer.

(a) How many terms in the sequence $5, 9, 13, 17, \ldots$ are less than 200?

(b) Find two numbers that are in the sequence $7, 12, 17, 22, \ldots$ and also in the sequence $-4, 2, 8, 14, \ldots$

arithmetic sequences

Work out what is happening in the sequences.
Can you figure out the missing terms?

A	7	12	17	22		
B	5	8	11	14		
C	16	13	10	7		
D	15	9	3	-3		
E	22	14	6			
F	9		15		21	
G	-3		5		13	

H	-2			-8		
I	-12			-3		
J	0.1		0.14		0.18	
K		0.24		0.18		
L		-1.3	-1.36			
M	$\frac{1}{2}$	1	$\frac{3}{2}$			
N	$\frac{1}{2}$	$\frac{3}{4}$	1	$\frac{5}{4}$		
O	$\frac{1}{8}$	$\frac{1}{4}$		$\frac{1}{2}$		
P	$\frac{1}{5}$		1		$\frac{9}{5}$	

Decimal Sequences

decimal sequences

Work out the missing numbers in each of these sequences

A)	0.1	0.4	0.7				
B)	0.01	0.05	0.09				
C)	1.55	1.7	1.85				
D)	1.09	1.2	1.31				
E)	4.15	4.1	4.05				
F)	3.65	3.5	3.35				
G)	1.01		1.07		1.13		
H)	2.6		2.52		2.44		
I)	0.6		1.8		3		
J)	0.5			1.1			1.7
K)	0.05			0.23			0.41
L)	2.06						1.46
M)	1.05					0.85	

Name that Sequence

A. Fill in the missing words from the list on the right:

A sequence is a set of numbers that follow a ……..

Another word for …….. is ……..

The …….. rule tells us how to get from one number in a sequence to the next.

In an **arithmetic** sequence the term-to-term rule involves …….. or …….. the same number each time.

In **geometric** sequences the term to term rule involves …….. or dividing by the ……. number each time.

A **Fibonacci** sequence is one where we have to add the …….. two …….. together in order to get the next term.

term-to-term
rule
same
previous
progression
multiplying
sequence
adding
terms
subtracting

B. Work out the next two terms of each sequence and the type of sequence.

A	1	1	2	3			
B	4	7	10	13			
C	10	1	0.1	0.01			
D	-1	-3	-5	-7			
E	3400	340	34	3.4			
F	4	5	9	14			
G	2	4	8	16			
H	0.1	0.25	0.4	0.55			
I	0.1	0.2	0.3	0.5			
J	8	-4	2	-1			
K	-2	-3	-5	-8			

Fluency Practice

For each of the sequences given, decide whether it is special, arithmetic, quadratic or geometric, then write down the next two terms.

(a) $1, 1, 2, 3, 5, 8, \ldots$

(b) $4, 7, 10, 13, \ldots$

(c) $2, 4, 8, 16, \ldots$

(d) $10, 8, 6, 4, 2, \ldots$

(e) $1, 3, 6, 10, 15, \ldots$

(f) $160, 80, 40, 20, \ldots$

(g) $2, 5, 10, 17, \ldots$

(h) $1, 3, 5, 7, 9, \ldots$

Generate the first four terms of the sequences with nth terms:

(a)	$2n$	(b)	$3n - 1$
(c)	n^2	(d)	$20 - n$
(e)	$7 - 3n$	(f)	$n^2 + 5n$
(g)	$2n^2 - 1$	(h)	$\frac{n(n+1)}{2}$

Generate the 6th and 20th terms of the sequences with nth terms:

(a)	$4n - 1$	(b)	$n + 10$
(c)	$1 + n^2$	(d)	$50 - 5n$
(e)	$-1 - n$	(f)	$n^2 - 2n$
(g)	$3n^2 + n + 1$	(h)	$\frac{n+1}{n+2}$

(a) Find the first term in the sequence with nth term $5n + 7$ that is greater than 250.

(b) Find the first term in the sequence with nth term $150 - 8n$ that is a negative number.

(c) Find the only number that is in both the sequences with nth term rules $2n - 9$ and $17 - 7n$.

Fluency Practice

For each of the sequences given, decide whether it is special, arithmetic, quadratic or geometric, then write down the next two terms.

(a) 1, 1, 2, 3, 5, 8,…

(b) 4, 7, 10, 13,…

(c) 2, 4, 8, 16,…

(d) 10, 8, 6, 4, 2,…

(e) 1, 3, 6, 10, 15,…

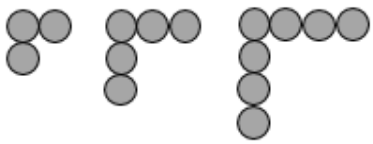
(f) 160, 80, 40, 20,…

(g) 2, 5, 10, 17,…

(h) 1, 3, 5, 7, 9,…

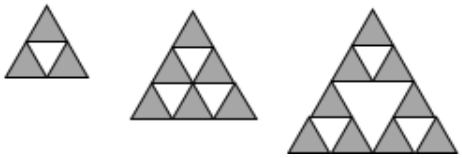
For each of these sequences, draw the next two patterns in the sequence.

(a)



(b)

(c)



The first three terms of a Fibonacci sequence are:

$a \qquad b \qquad a + b$

Show that the 6th term is $3a + 5b$

(1)

What type of sequence would make the second term 48?

(2)

What type of sequence would make the mean of the first four terms equal their median?

(3)

What type of sequence would make the second and fourth terms sum to 180?

(7)

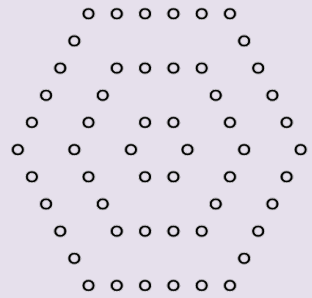
For each of the sequences in **(2)** to **(5)**, find the n^{th} term.

Sequences

$\boxed{6}$, $\square$, $\boxed{54}$, $\square$, ...

(4)

What type of sequence would make the third term look like this?



(6)

For each of the sequences in **(1)** to **(5)**, find the 8^{th} term.

(5)

What type of sequence would make the fourth term 81?

1) Assuming that each pair of numbers is the start of an arithmetic sequence, find: (i) the next three terms, (ii) the nth term rule, (iii) the 200^{th} term.

2) Assuming that each pair of numbers is the start of a geometric sequence, find: (i) the next three terms, (ii) the ratio between the first and third terms, (iii) the ratio between the second and fifth terms.

a) $\frac{1}{2}, \frac{3}{2}$

b) $\frac{1}{2}, \frac{3}{4}$

c) $\frac{1}{2}, \frac{3}{8}$

d) $\frac{1}{3}, 3$

e) $\frac{1}{3}, \frac{1}{4}$

f) $\frac{1}{4}, \frac{2}{3}$

g) $\frac{1}{4}, 1\frac{2}{3}$

h) $\frac{1}{4}, -1\frac{1}{2}$

i) $2\frac{1}{3}, 3\frac{1}{2}$

j) $3\frac{1}{2}, 2\frac{1}{3}$

k) $2\frac{1}{3}, -3\frac{1}{2}$

l) $-3\frac{1}{2}, 2\frac{1}{3}$

Linear Sequences

Choose some starting numbers and write them in the boxes on the left.
You should not repeat any sequences.

			Is an increasing linear sequence with n^{th} term	

Change 1 number

			Is not a linear sequence

Change 1 number

			Is an increasing linear sequence with n^{th} term	

Change the number marked with ★

*			Is not a linear sequence

Change 1 number

			Is an increasing linear sequence with n^{th} term	

Change 1 number

			Is not a linear sequence

Change 1 number

			Is an increasing linear sequence with n^{th} term	

Change at least one number, but not the one marked ✚

		+	Is an increasing linear sequence with n^{th} term	

Change 1 number

			Is not a linear sequence

Change 1 number

			Is an increasing linear sequence with n^{th} term	

Change 1 number

			Is not a linear sequence

Change 2 numbers

			Is a decreasing linear sequence with n^{th} term	

Change 2 numbers

			Is an increasing linear sequence with n^{th} term	

Change 1 number

			Is not a linear sequence

Change 2 numbers

			Is not a linear sequence

Change 1 number

			Is an increasing linear sequence with n^{th} term	

the expressions are the first four consecutive terms in an arithmetic sequence for one value of 'n'
find the value of 'n'

(a)

1) 4n + 2
2) 5n + 3
3) 8n
4) 19

(b)

1) 3n + 1
2) 4n – 1
3) 4n + 3
4) 5n + 1

(c)

1) n – 4
2) 2(n – 2)
3) n + 2
4) 3n – 1

(d)

1) 2n + 1
2) 4n
3) 7n – 5
4) 7n + 2

(e)

1) ½ (n + 19)
2) 3n
3) 5n – 6
4) 5n + 2

(f)

1) ⅔ n
2) n – 7
3) ½ (n – 13)
4) 3 – n

(g)

1) n – 1
2) 18 – n
3) 4n + 2
4) 41 – 2n

(h)

1) 3n – 33
2) 4 – n
3) 2n – 29
4) – 2 – n

the following expressions are an arithmetic sequence, in order, for one value of 'n'

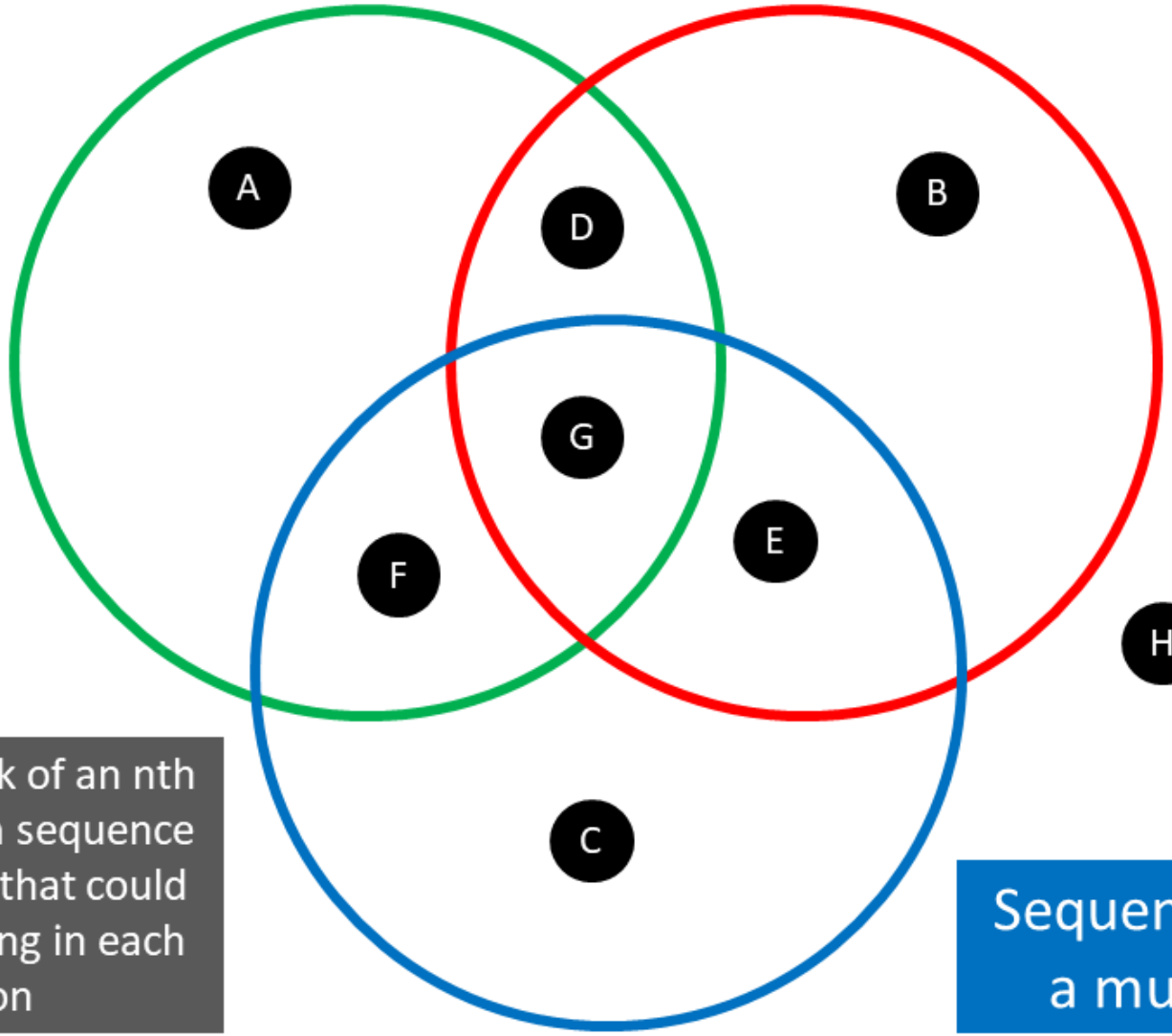
(a)		(b)		(c)		(d)	
1)	2n – 9	1)	2n + 1	1)	3(n – 4)	1)	5n – 9
2)	n + 7	2)	n + 11	2)	n + 5	2)	7n – 16
3)	3n – 1	3)	3(n – 1)	3)	2n + 7	3)	4n + 17
4)	5n – 9	4)	n + 15	4)	6(n – 1)	4)	2(4n – 3)
5)	4n + 7	5)	2n + 9	5)	4n + 11	5)	9(n – 1)

(e)		(f)		(g)		(h)	
1)	2n – 3	1)	3n – 8	1)	2n + 7	1)	40 – n
2)	4n	2)	n + 10	2)	28 – n	2)	7(n + 1)
3)	3(2n + 1)	3)	28 – n	3)	6n	3)	19 – 3n
4)	9n – 4	4)	46 – 3n	4)	n + 26	4)	5n – 14
5)	11n – 2	5)	n – 2	5)	2(2n + 7)	5)	8n – 33

Maths Venns

Numbers in the sequence go up

First term is 10



If you think a region is impossible to fill, convince me why!

Think of an nth term sequence rule that could belong in each region

Sequence contains a multiple of 4

Maths Venns

Sequence contains the number 12
If you think a region is impossible to fill, convince me why!
Sequence contains exactly 3 negative terms
Difference between each term is + or - 6
Think of an nth term sequence rule that could belong in each region
A
B
C
D
E
F
G
H