Year 10

2023   Mathematics   2024

Unit 16 Tasks

DO NOT WRITE INSIDE

Contents

1 Recurring Decimals

Intelligent Practice

Write the following out fully:

1) $0.\dot{5}$

2) $0.4\dot{5}$

3) $0.\dot{4}\dot{5}$

4) $0.3\dot{4}\dot{5}$

5) $0.\dot{3}4\dot{5}$

6) $0.2\dot{3}4\dot{5}$

7) $0.\dot{2}34\dot{5}$

8) $1.\dot{2}34\dot{5}$

Write the following using dot notation:

1) 0.666 …

2) 0.7666 …

3) 0.767676 …

4) 0.8767676 …

5) 0.876876876 …

6) 0.9876876876 …

7) 0.987698769876 …

8) 10.987698769876 …

Question 1:   Use division to convert these fractions to recurring decimals.

(a) $\dfrac{1}{3}$ (b) $\dfrac{2}{3}$ (c) $\dfrac{4}{9}$ (d) $\dfrac{7}{9}$ (e) $\dfrac{1}{6}$ (f) $\dfrac{5}{6}$

(g) $\dfrac{3}{11}$ (h) $\dfrac{8}{15}$ (i) $\dfrac{5}{22}$ (j) $\dfrac{1}{7}$ (k) $\dfrac{1}{30}$ (l) $\dfrac{6}{7}$

Extension

$\dfrac{1}{81}$

Extension

changing a fraction into a decimal

(1) work out what these fractions are as decimals by division (without using a calculator)

(a) $\frac{2}{5}$ (b) $\frac{3}{8}$ (c) $\frac{7}{8}$ (d) $\frac{4}{5}$ (e) $\frac{3}{25}$ (f) $\frac{7}{20}$ (g) $\frac{3}{80}$

why do you think these fractions as decimals terminate?

(2) work out what these fractions are as decimals by division (without using a calculator)

(a) $\frac{1}{6}$ (b) $\frac{5}{6}$ (c) $\frac{1}{9}$ (d) $\frac{2}{9}$ (e) $\frac{1}{11}$ (f) $\frac{2}{11}$ (g) $\frac{1}{22}$

(3) work out what these fractions are as decimals by division (without using a calculator)

(a) $\frac{1}{7}$ (b) $\frac{2}{7}$ (c) $\frac{3}{7}$ (d) $\frac{4}{7}$ (e) $\frac{5}{7}$ (f) $\frac{6}{7}$

2 × 7 = 14	6 × 7 = 42
3 × 7 = 21	7 × 7 = 49
4 × 7 = 28	8 × 7 = 56
5 × 7 = 35	9 × 7 = 63

what patterns can you find in the recurring
decimal values of sevenths?

Extension

changing a fraction into a decimal

(1) work out what these fractions are as decimals by division (without using a calculator)

(a) $\dfrac{1}{25}$ (b) $\dfrac{1}{40}$ (c) $\dfrac{1}{80}$ (d) $\dfrac{1}{16}$ (e) $\dfrac{1}{32}$ why do you think these fractions as decimals terminate?

(2) work out what these fractions are as decimals by division (without using a calculator)

(a) $\dfrac{1}{13}$ (b) $\dfrac{2}{13}$ (c) $\dfrac{3}{13}$ (d) $\dfrac{4}{13}$ (e) $\dfrac{5}{13}$

2 × 13 = 26	6 × 13 = 78
3 × 13 = 39	7 × 13 = 91
4 × 13 = 52	8 × 13 = 104
5 × 13 = 65	9 × 13 = 117

(3) work out which fraction is bigger (with a calculator)

(a) $\dfrac{5}{9}$ or $\dfrac{6}{11}$

(b) $\dfrac{7}{8}$ or $\dfrac{17}{20}$

(c) $\dfrac{2}{11}$ or $\dfrac{3}{17}$

(d) $\dfrac{4}{17}$ or $\dfrac{15}{62}$

(4) without a calculator

$\dfrac{27}{40} = 0.675$

$\dfrac{29}{40} = 0.725$

what are:

(a) $\dfrac{31}{40}$ (b) $\dfrac{37}{40}$

(5) without a calculator

$\dfrac{29}{32} = 0.90625$

what are:

(a) $\dfrac{29}{320}$ (b) $\dfrac{290}{32}$

(c) $\dfrac{13}{32}$ (d) $\dfrac{21}{32}$

Fluency Practice

By writing the denominator as a product of its prime factors, decide if each of these fractions would convert to a terminating or recurring decimal.

(a) $\frac{1}{8}$ (b) $\frac{1}{25}$ (c) $\frac{1}{15}$

(d) $\frac{1}{14}$ (e) $\frac{1}{50}$ (f) $\frac{1}{16}$

(g) $\frac{1}{30}$ (h) $\frac{1}{12}$ (i) $\frac{1}{40}$

Write out the following recurring decimals to show the first 10 decimal places.

(a) $0.\dot{4}$ (b) $0.\dot{7}$

(c) $0.\dot{1}\dot{4}$ (d) $0.\dot{2}\dot{3}$

(e) $0.\dot{1}2\dot{3}$ (f) $0.\dot{4}6\dot{1}$

(g) $0.0\dot{5}$ (h) $0.\dot{1}7\dot{2}$

Use your calculator to convert the following fractions into terminating or recurring decimals.

(a) $\frac{4}{9}$ (b) $\frac{2}{5}$ (c) $\frac{3}{10}$

(d) $\frac{7}{11}$ (e) $\frac{5}{16}$ (f) $\frac{1}{8}$

(g) $\frac{4}{7}$ (h) $\frac{29}{100}$ (i) $\frac{3}{35}$

Use your calculator to convert the following fractions into recurring decimals.

(a) $\frac{1}{9}$ (b) $\frac{2}{9}$ (c) $\frac{3}{9}$

Can you spot a pattern?

Use your calculator to convert the following fractions into recurring decimals.

(a) $\frac{12}{99}$ (b) $\frac{13}{99}$ (c) $\frac{14}{99}$

Can you spot a pattern?

Fluency Practice

For each of the following values of x, find

a) $10x$

b) $100x$

c) $1000x$

d) $2x$

e) $20x$

1) $x = 0.\dot{1}$

2) $x = 0.0\dot{1}$

3) $x = 0.00\dot{1}$

4) $x = 0.\dot{2}$

5) $x = 0.\dot{3}$

6) $x = 0.\dot{2}\dot{5}$

7) $x = 0.\dot{7}\dot{2}$

8) $x = 0.0\dot{2}\dot{5}$

9) $x = 0.1\dot{2}\dot{5}$

10) $x = 1.34\dot{2}\dot{4}$

11) $x = 0.\dot{2}2\dot{4}$

12) $x = 0.0\dot{2}2\dot{4}$

13) $x = 0.2\dot{2}2\dot{4}$

14) $x = 1.01\dot{1}01\dot{1}$

Question 3:   Convert the following recurring decimals to fractions.
Give each answer in its simplest form.

(a) $0.\dot{2}$

(b) $0.\dot{8}$

(c) $0.\dot{1}\dot{8}$

(d) $0.5\dot{3}$

(e) $0.7\dot{5}$

(f) $0.6\dot{3}$

(g) $0.1\dot{1}\dot{2}$

(h) $0.3\dot{3}\dot{9}$

(i) $0.17\dot{1}$

Question 5: Convert the following recurring decimals to fractions.
Give each answer in its simplest form.

(a) $0.2\dot{8}$

(b) $0.0\dot{3}$

(c) $0.9\dot{6}$

(d) $0.5\ddot{2}\dot{1}$

(e) $0.3\ddot{9}\dot{0}$

(f) $0.1\dot{2}3\dot{5}$

(g) $0.12\dot{6}$

(h) $0.50\ddot{3}\dot{5}$

Question 7: Convert the following recurring decimals to fractions.
Give each answer in its simplest form.

(a) $1.\dot{2}$

(b) $1.6\ddot{4}$

(c) $1.9\dot{2}$

(d) $2.0\dot{3}$

(e) $3.6\ddot{5}\dot{9}$

(f) $8.67\ddot{9}$

Given that $0.333... = \dfrac{1}{3}$

Write these as fractions:

a) 1.333…

b) 0.4333…

c) 0.35333…

d) 3.333…

Fluency Practice

Red box:

Which if the following fractions is equivalent to a recurring decimal?

(a) $\frac{7}{10}$ (b) $\frac{7}{9}$ (c) $\frac{7}{100}$

(d) $\frac{7}{11}$ (e) $\frac{7}{20}$ (f) $\frac{7}{30}$

Orange box:

Using an algebraic method, write the following recurring decimals as a fraction.

(a) $0.\dot{4}$ (b) $0.\dot{8}$

(c) $0.\dot{1}\dot{3}$ (d) $0.4\dot{5}$

(e) $0.\dot{5}\dot{7}$ (f) $0.4\dot{1}\dot{2}$

(g) $0.\dot{1}2\dot{7}$ (h) $0.\dot{6}7\dot{5}$

Green box:

Using an algebraic method, write the following recurring decimals as a fraction.

(a) $0.0\dot{4}$ (b) $0.0\dot{6}$

(c) $0.2\dot{3}$ (d) $0.1\dot{6}$

(e) $0.2\dot{1}\dot{7}$ (f) $0.004\dot{5}$

(g) $0.01\dot{5}\dot{5}$ (h) $0.3\dot{6}9\dot{5}$

Purple box:

Use an algebraic method to show that:

(a) $0.\dot{1}\dot{5} = \frac{5}{33}$

(b) $0.\dot{1}4\dot{4} = \frac{16}{111}$

(c) $0.7\dot{1} = \frac{32}{45}$

Blue box:

Using an algebraic method, find $0.\dot{9}$ as a fraction.

Fluency Practice

A1	A2	A3	A4
State the conditions under which a fraction can be written as a **terminating** decimal.	State the conditions under which a fraction can be written as a **recurring** decimal.	Which of the following can be written as **terminating** decimals: $\dfrac{2}{3}$ $\dfrac{3}{4}$ $\dfrac{4}{9}$ $\dfrac{5}{6}$ $\dfrac{5}{8}$ $\dfrac{3}{7}$ $\dfrac{3}{5}$	Which of the following can be written as **recurring** decimals: $\dfrac{5}{12}$ $\dfrac{7}{25}$ $\dfrac{3}{14}$ $\dfrac{5}{16}$ $\dfrac{5}{32}$ $\dfrac{5}{11}$
B1 Show that $0.\dot5 = \dfrac{5}{9}$	**B2** Show that $0.7\dot3 = \dfrac{11}{15}$	**B3** Show that $0.61\dot6 = \dfrac{37}{60}$	**B4** Show that $3.5\dot2 = 3\dfrac{47}{90}$
C1 Show that $0.\dot2\dot7 = \dfrac{3}{11}$	**C2** Show that $0.2\dot5\dot7 = \dfrac{17}{66}$	**C3** Show that $0.\dot44\dot7 = \dfrac{149}{333}$	**C4** Show that $2.\dot5\dot1 = 2\dfrac{17}{33}$
D1 Work out $0.2\dot7 \times 3$, writing your answer as a fraction in its simplest terms.	**D2** Work out $0.5\dot7 - 0.\dot2\dot6$, writing your answer as a fraction in its simplest terms.	**D3** x is a whole number such that $$1 \le x \le 9$$ Write the recurring decimal $0.1\dot x$ as a fraction in its simplest terms.	**D4** y is a whole number such that $$1 \le y \le 9$$ Show that $0.\dot3\dot y = \dfrac{y}{33}$

These decimals have one digit recurring:

$$0.\dot{2} = 0.22222222 \dots \qquad\qquad 0.07\dot{2} = 0.07222222 \dots$$

1) Write three different decimals with one digit recurring.

2) Convert you decimals in part one into fractions in their simplest form. Use the algebraic method.

3) Find five fractions with different denominators when in simplest form that have one digit recurring.

4) Find the prime factors of the denominators. What do you notice?

5) Find five fractions with different denominators when in simplest form that have two digits recurring.

6) Find the prime factors of the denominators. What do you notice?

7) Repeat 5 and 6 for 3 digits recurring.

8) Investigate for other decimals with different number of digits recurring.

More-Same-Less – Recurring Decimals

Instructions: Convert the decimal in the middle box to a fraction, giving your answer in its simplest form. Then fill in the remaining boxes, making the minimum change possible from the middle box.

Number of digits which recur when expressed as a decimal

Difference between numerator and denominator when expressed as a fraction in its simplest form		Less	Same	More
	More			
	Same		$0.\dot{3}\dot{6}$	
	Less			

Maths Venns

Can be expressed as a
recurring decimal

Denominator is a
prime number

A

D

B

If you think a
region is
impossible to
fill, convince
me why!

G

F

E

H
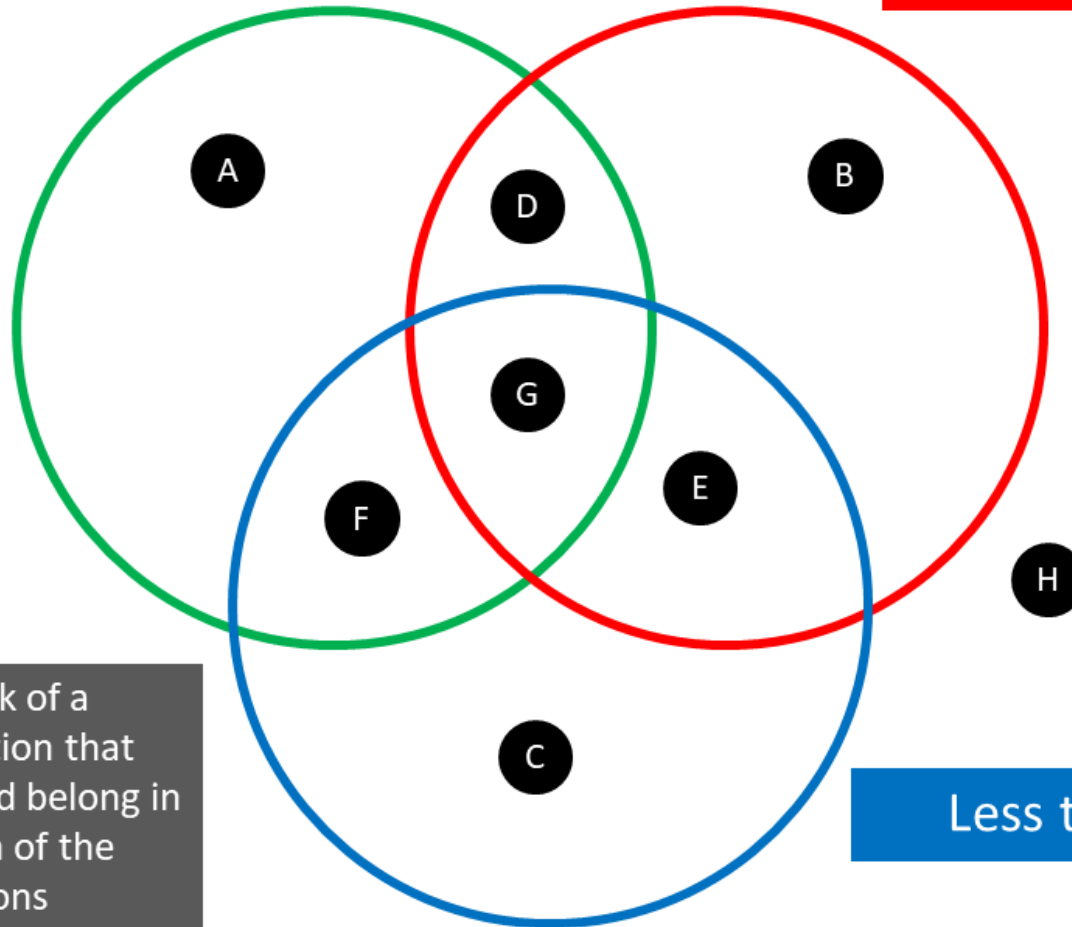
Think of a
fraction that
could belong in
each of the
regions

C

Less than $\frac{1}{2}$

Fluency Practice

Prove each of the following sums using recurring decimals.

Prove that $0.\dot{5} \times 0.\dot{8}\dot{1} = \frac{5}{11}$

Prove that $0.\dot{8} \div 0.\dot{7}\dot{2} = 1\frac{2}{9}$

Prove that $0.19\dot{4} \div 0.\dot{4} = \frac{7}{16}$

Prove that $0.\dot{1} \times 0.\dot{2}\dot{7} = \frac{1}{33}$

Prove that $0.\dot{1}\dot{8} \div 0.\dot{4} = \frac{9}{22}$

Prove that $0.12\dot{6} \div 0.\dot{2} = \frac{5}{8}$

Fluency Practice

Red box:

(a) Using algebra, show that

$$0.\dot{2} + 0.\dot{2}\dot{3} = \frac{5}{11}$$

(b) Using algebra, show that

$$1.3\dot{8}\dot{1} - 0.\dot{8}\dot{1} = \frac{31}{55}$$

Yellow box:

(a) Using algebra, show that

$$0.\dot{5} \times 0.\dot{5}\dot{4} = \frac{10}{33}$$

(b) Using algebra, show that

$$4 \times 0.8\dot{5} \times 0.1\dot{5} = \frac{14}{27}$$

Green box:

(a) Using algebra, show that

$$0.\dot{7} \div 0.2\dot{1} = 3\frac{13}{19}$$

(b) Using algebra, show that

$$0.3\dot{5} \div 1.2\dot{7} = \frac{32}{115}$$

Purple box:

(a) Show that the mean of the three numbers

$$0.\dot{8}, 0.8\dot{1} \text{ and } 0.\dot{8}\dot{1}$$

can be written in its simplest form as a fraction $\frac{a}{b}$, where a and b are integers to be found.

(b) Using algebra, prove that the area of the trapezium shown is

$$\frac{97}{330} \, cm^2$$

$0.\dot{2} \, cm$

$0.\dot{5}\dot{4} \, cm$

$0.\dot{8}5 \, cm$
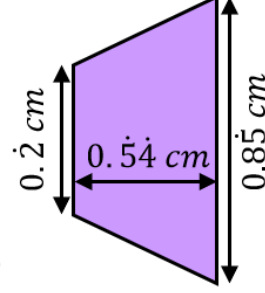
Extension

find the length of the missing side as a fraction in its simplest form

Triangle a: $0.\ddot{1}\ddot{8}$ (left side), a (hypotenuse), $0.\dot{2}\dot{4}$ (base)

Triangle b: b (left side), $0.1\dot{6}$ (hypotenuse), $0.1\dot{3}$ (base)

Triangle c: $0.2\dot{3}$ (left side), $0.8\dot{3}$ (hypotenuse), c (base)

Triangle d: d (left side), $0.\ddot{6}\dot{1}$ (hypotenuse), $0.\dot{6}\dot{0}$ (base)

Triangle e: e (left side), $0.4\dot{5}$ (hypotenuse), $0.\dot{4}$ (base)

Triangle f: $0.4\dot{6}$ (left side), $1.\dot{6}$ (hypotenuse), f (base)

Triangle g: g (left side), $0.1\dot{8}$ (hypotenuse), $0.1\dot{6}$ (base)

Triangle h: $0.08\dot{3}$ (left side), $0.21\dot{6}$ (hypotenuse), h (base)

Triangle j: j (left side), $0.47\dot{2}$ (hypotenuse), $0.41\dot{6}$ (base)

2 Parallel and Perpendicular Lines

Fluency Practice

Corbett mOths

Parallel Lines | Parallel Lines | Perpendicular Lines | Perpendicular Lines

Scan here | Scan here

Examples

Click here | Click here

Workout

Question 1: Write down the equation of a line parallel to each of the following

(a) $y = 2x + 3$

(b) $y = 5x - 3$

(c) $y = -3x + 1$

(d) $y = x - 7$

(e) $y = -7x - 10$

(f) $y = -x$

(g) $y = 10x$

(h) $y = 4$

(i) $x + y = 5$

(j) $2x + y - 1 = 0$

(k) $x - 2y + 5 = 0$

(l) $3x - 4y - 9 = 0$

Question 2: Write down the equation of each of the following lines

(a) Parallel to $y = 3x + 5$ and passing through (0, 2)

(b) Parallel to $y = 4x - 1$ and passing through (0, 6)

(c) Parallel to $y = 5x$ and passing through (0, −3)

(d) Parallel to $y = -2x + 10$ and passing through the origin

(e) Parallel to $x + y = 8$ and passing through (0, −4)

(f) Parallel to $x - 2y + 3 = 0$ and passing through (0, 5)

Question 3: Write down the equation of the line parallel to Line 1 and passing through A.

(a)

(b)

(c)
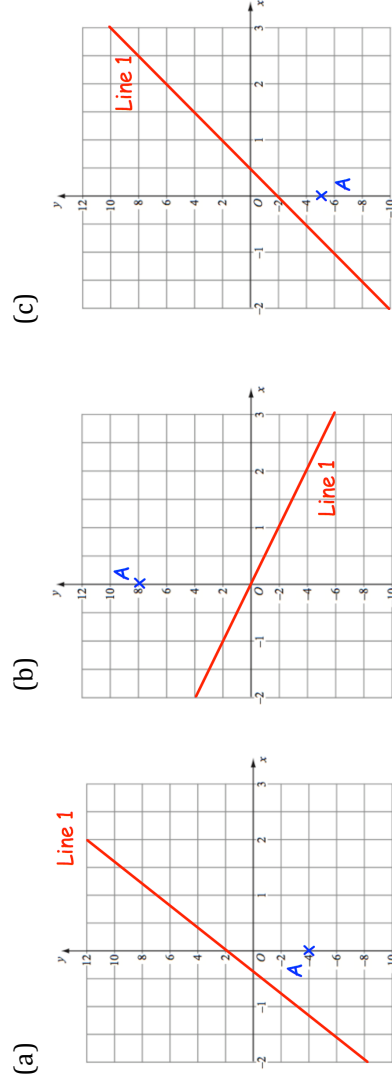
Intelligent Practice

Write down the equation:

Parallel to the line	Goes through the point	Answer
$y = 3x + 2$	$(0,7)$	
$y = 3x + 2$	$(3,0)$	
$y = 3x + 2$	$(3,7)$	
$y = 3x + 10$	$(3,7)$	
$y = 2x - 2$	$(3,7)$	
$y = 2x - 2$	$(-3,7)$	
$y = 2x - 2$	$(0,0)$	

Question 4: Write down the equation of each of the following lines

(a) Parallel to $y = 2x - 1$ and passing through (1, 8)

(b) Parallel to $y = 3x + 2$ and passing through (1, 1)

(c) Parallel to $y = 5x - 4$ and passing through (2, 9)

(d) Parallel to $y = 3x - 7$ and passing through (4, 15)

(e) Parallel to $y = 4x$ and passing through (−1, 3)

(f) Parallel to $y = -2x + 5$ and passing through (−3, 0)

(g) Parallel to $y = 6x + 3$ and passing through (10, 5)

(h) Parallel to $y = -\frac{1}{2}x + 1$ and passing through (3, 0)

(i) Parallel to $x + y = 10$ and passing through (4, 0)

(j) Parallel to $x - 3y - 6 = 0$ and passing through (−9, −2)

Line A passes through the points (2, 1) and (5, 10)
Find the equation of the line parallel to A that passes through (2,5)   [3]

Line A passes through the points (2, 1) and (5, 10)
Line B passes through the points (4, 7) and (2, 1)
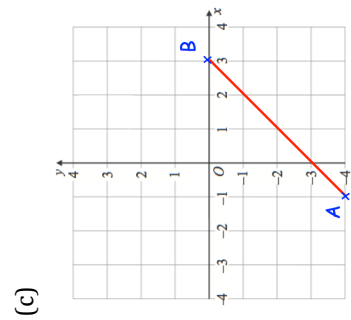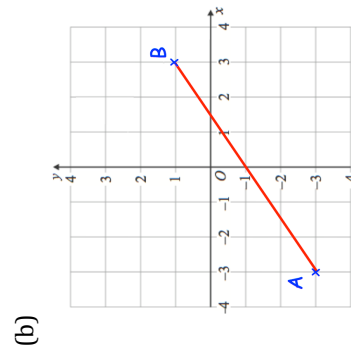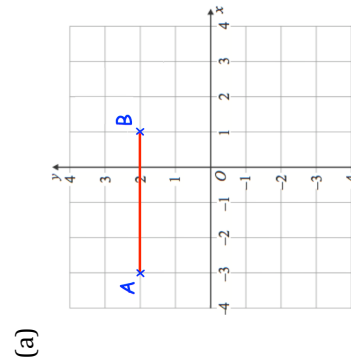Show that Line A and Line B are parallel   [4]

Line A passes through the points (3, 6) and (5, -2)
Line B passes through the points (2, 5) and (8, k)
Line A and Line B are parallel. Find the value of k.   [4]

Maths Venns

Parallel to y = 4x

Passes through (2, 5)

A

D

B

G

F

E

H

C
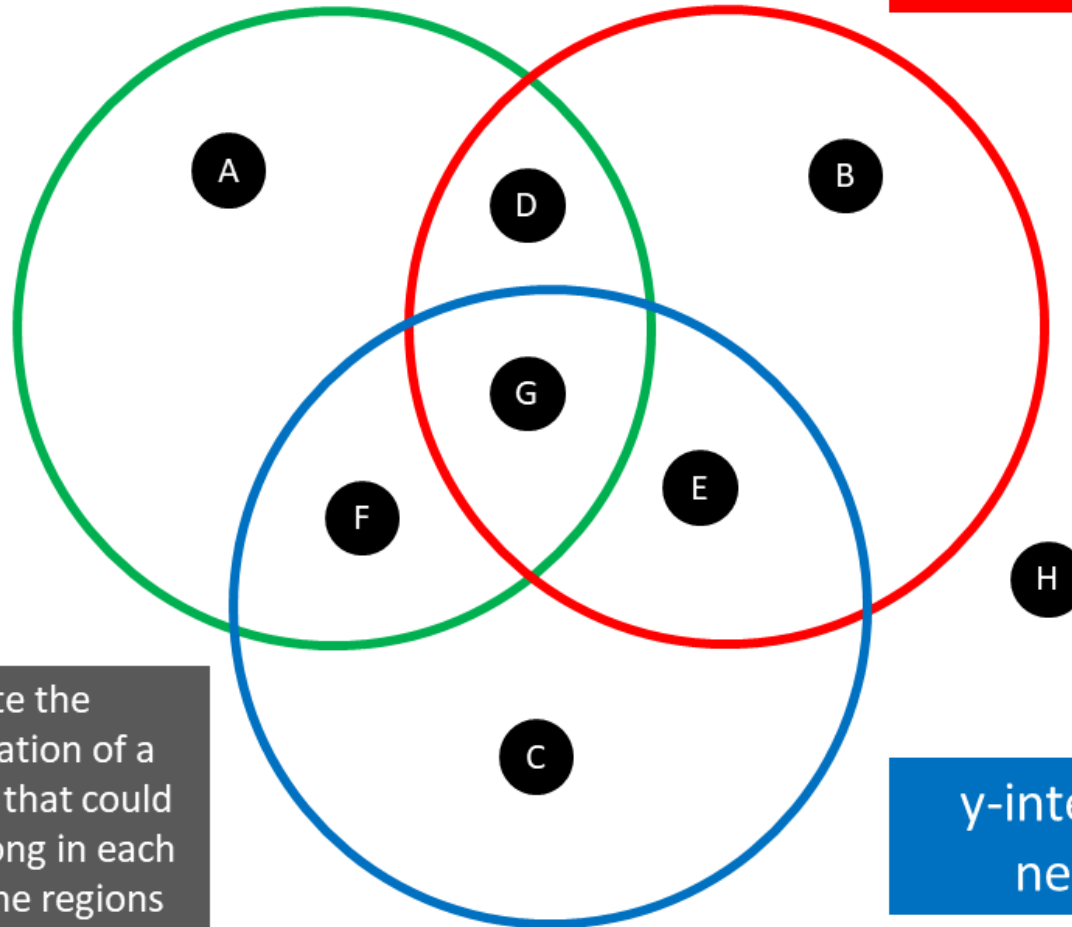
If you think a region is impossible to fill, convince me why!

Write the equation of a line that could belong in each of the regions

y-intercept is negative

Page 37

Maths Venns

A

D

B

G

If you think a region is impossible to fill, convince me why!

F

E

H

Write the equation of a line that could belong in each of the regions

C

Is parallel to $y = -2x + 1$

Question 5: Write down the negative reciprocal of each number below.

(a) 4 (b) $\dfrac{2}{3}$ (c) -6 (d) 8 (e) $\dfrac{1}{2}$ (f) 1

(g) $-\dfrac{1}{3}$ (h) $-\dfrac{2}{5}$ (i) $\dfrac{4}{7}$ (j) $1\dfrac{1}{2}$ (k) -1 (l) $-1\dfrac{3}{4}$

$$y = \dfrac{1}{2}x + 3 \qquad y = \dfrac{3}{4}x - 2 \qquad y = -\dfrac{1}{5}x + 1$$

$$y = -\dfrac{2}{3}x - 5$$

4   $\dfrac{2}{3}$ 8 $\dfrac{1}{2}$ 1

$-\dfrac{1}{3}$ -6 $-\dfrac{2}{5}$ $\dfrac{4}{7}$ -1 $1\dfrac{1}{2}$ $-1\dfrac{3}{4}$

Question 6: Write down the equation of a line perpendicular to each of the following

(a) $y = 4x + 2$ (b) $y = 2x - 7$ (c) $y = -5x + 2$ (d) $y = x - 3$

(e) $y = -x + 1$ (f) $y = \dfrac{1}{2}x + 3$ (g) $y = \dfrac{3}{4}x - 2$ (h) $y = -\dfrac{1}{5}x + 1$

(i) $y = -\dfrac{2}{3}x - 5$ (j) $x + y = 12$ (k) $x - 2y + 8 = 0$ (l) $5x - 3y - 3 = 0$

Question 7: Write down the equation of each of the following lines

(a) Perpendicular to $y = 2x + 4$ and passing through (0, 3)

(a) "pendicu

(d) Perpendicular to $y = \dfrac{1}{3}x - 2$ and passing through the origin

(e) Perpendicular to $y = -\dfrac{1}{5}x + 8$ and passing through (0, –2)

(f) Perpendicular to $y = -\dfrac{2}{9}x - 10$ and passing through (0, 6)

Question 8: Write down the equation of the line perpendicular to Line 1 & passing through A.

(a)

(b)

(c)

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mCths
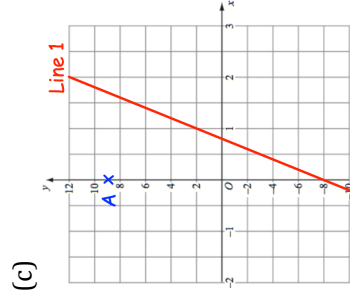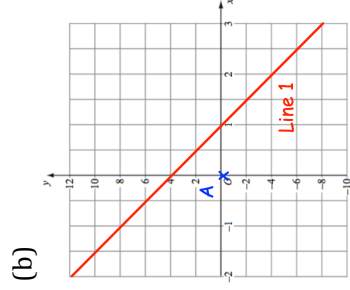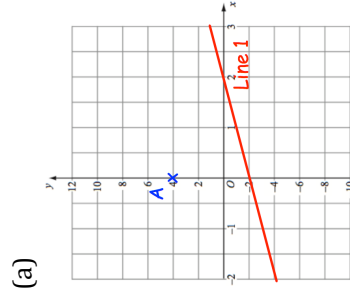
Intelligent Practice

Write down the equation:

Perpendicular to the line	Goes through the point	Answer
$y = -x + 2$	$(0,7)$	
$y = 2x + 2$	$(0,7)$	
$y = 2x + 2$	$(12,7)$	
$y = 3x + 2$	$(12,7)$	
$y = 3x + 2$	$(10,7)$	
$y = 3x + 2$	$(-12,7)$	
$y = 2x + 2$	$(0,0)$	

Question 9:   Write down the equation of each of the following lines

(a)   Perpendicular to $y = 2x - 1$ and passing through (4, 0)

(b)   Perpendicular to $y = -3x + 4$ and passing through (6, 1)

(c)   Perpendicular to $y = 4x$ and passing through (−12, 5)

(d)   Perpendicular to $y = -\frac{1}{2}x + 1$ and passing through (3, −7)

(e)   Perpendicular to $y = \frac{2}{3}x + 4$ and passing through (−6, −4)

(f)   Perpendicular to $y = -\frac{3}{5}x - 2$ and passing through (9, 9)

(g)   Perpendicular to $x + 4y - 6 = 0$ and passing through (1, 8)

Apply

Extension

Equation of line l_1	Two points that l_1 passes through.		Equation of a line perpendicular to l_1, through point A, in the form $ax + by + c = 0$
	Point A	Point B	
$2x + 3y - 5 = 0$	$(-5, a)$ a	$(b, -5)$ $b =$	
	$(-4, 1)$	$(-3, -2)$	
	$(a, 1)$ $a =$	$(b, 3)$ $b =$	$x + 3y - 3 = 0$
$-x + 6y + 17 = 0$		$(b, -2)$ $b =$	$6x + y - 65 = 0$

Write down the equation of a line perpendicular to $y = 3x + 3$ [1]

Write down the equation of the line perpendicular to $y = \frac{1}{2}x + 4$ which passes through (0,7) [2]

Line A passes through the points (-3, -1) and (-1, 9).
Line B passes through the points (-2, 1) and (k, 4).
Line A and Line B are perpendicular.
Find the value of k. [4]

Fluency Practice

Midpoint Between Two Coordinates
Videos 87, 198 on www.corbettmaths.com

Examples

Workout

Click here

Scan here

Question 1: Find the coordinates of the midpoints of the following line segments.

(a)

(b)

(c)

(d)

(e)

(f)
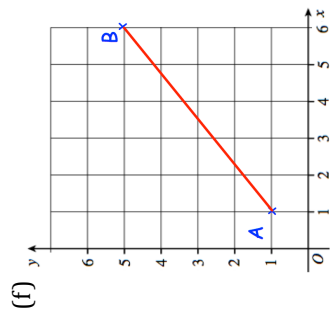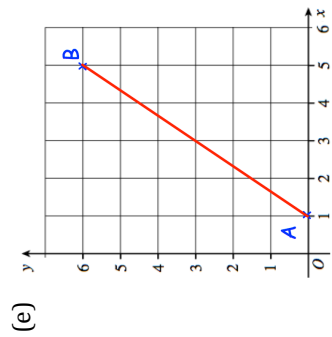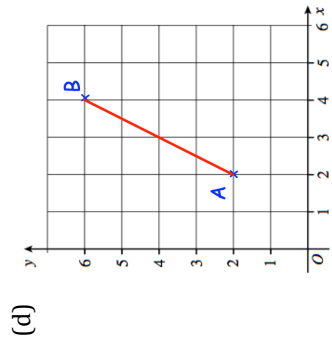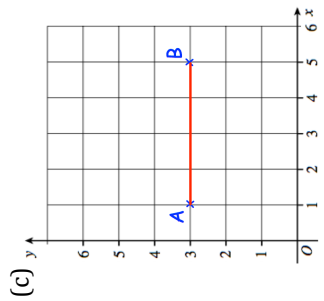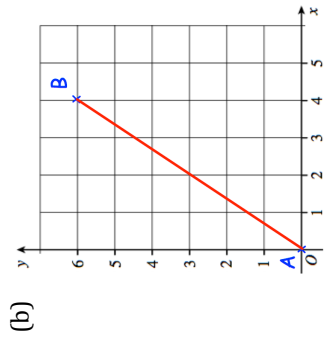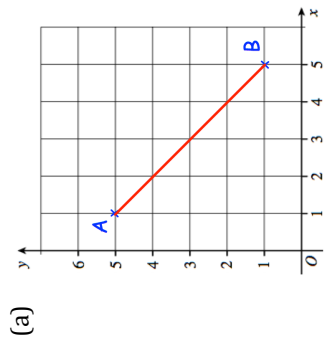
Question 2: Find the coordinates of the midpoints of the following line segments.

(a)

(b)

(c)

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(d)

(e)

(f)
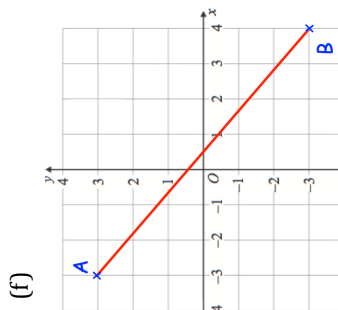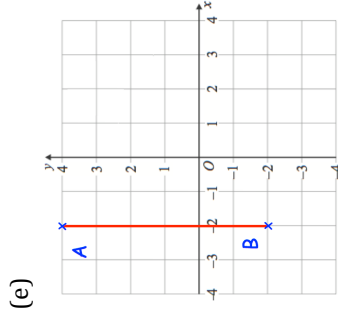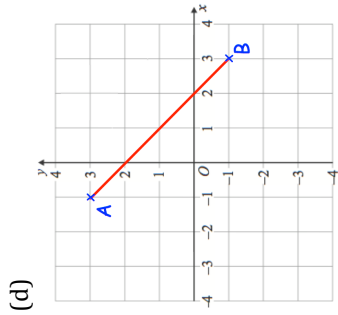
Question 3: Find the midpoint of the line joining these pairs of points

(a) (2, 4) and (6, 10)

(b) (1, 4) and (9, 12)

(c) (0, 7) and (6, 1)

(d) (−5, 2) and (5, −4)

(e) (−3, 9) and (7, −1)

(f) (0, −4) and (9, 0)

(g) (−10, −6) and (−2, 8)

(h) (0, 5) and (−11, −10)

(i) (9, 8) and (4, 8)

Question 4: M is the midpoint of PQ in each diagram below.
Find the coordinates of Q in each diagram.

(a)

(b)

(c)
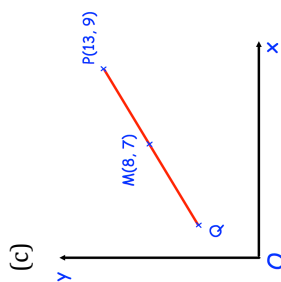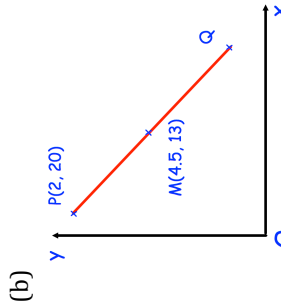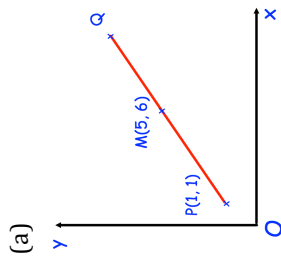
Question 5: M is the midpoint of PQ in each diagram below.
Find the coordinates of Q in each diagram.

(a)

(b)

(c)

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Videos 87, 198 on www.corbettmaths.com

Apply
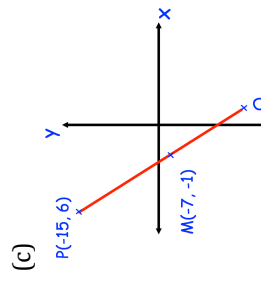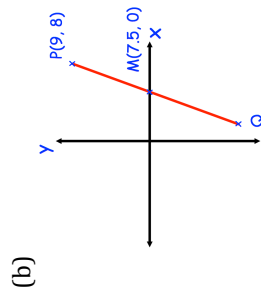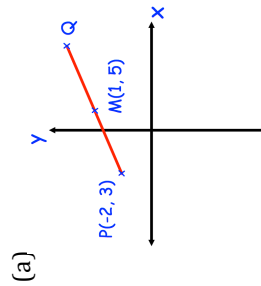
Question 1: A is the midpoint of the line PQ.
B is the midpoint of the line PR.
M is the midpoint of the line AB.
Find the coordinates of the point M

R(10, 4)

P(-10, 8)

Y

B

M

A

X

Q(2, -10)
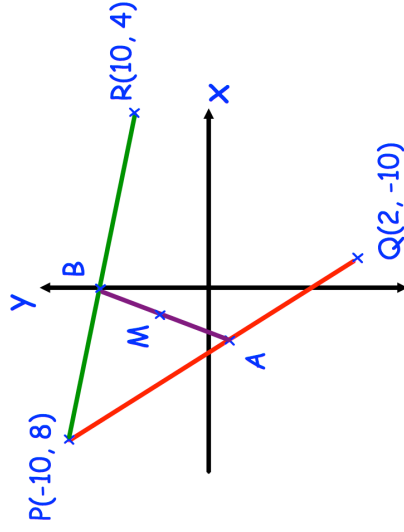
Question 2: M is the midpoint of the line AB.
The coordinates of the point M are (7, 2)
The coordinates of the point B are (11, 8)
The coordinates of the point C are (7, -4)
Find the area of triangle ACM.

Question 3: M is the midpoint of AB.
N is the midpoint of AM.
Find the coordinates of the point B.

B

Y

N(-10.5, 3.25)

M

X

A(-20, 1)

Answers

Click here
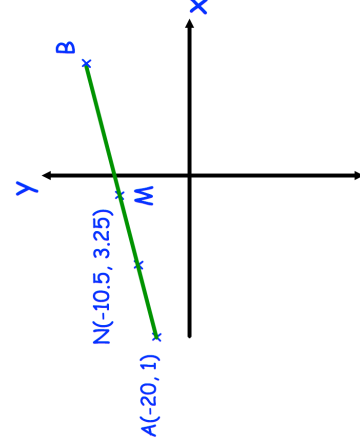
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Apply

Question 1: Write down the equations of the lines, from the box, that are:

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

(a) parallel   (b) perpendicular   (c) cross the y–axis at (0, 3)

(d) pass through the origin   (e) pass through the point (1, 1)

Parallel and Perpendicular Lines
Videos 196 and 197 on www.corbettmaths.com

Question 10: Two straight lines are shown.

Line 1 has equation $y = \frac{3}{2}x - 24$

(a) Find the equation of Line 2

(b) Are the lines perpendicular?
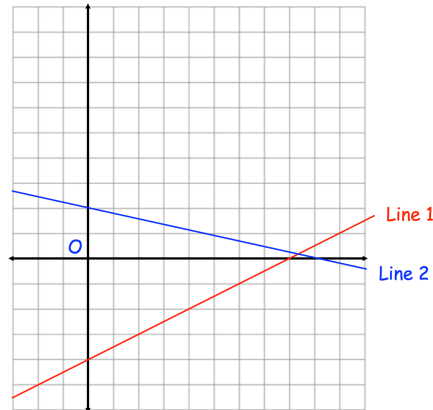
Question 2: Are the lines 2x + y = 8 and y = 2x + 5 parallel?

Question 3: Are the lines 4x − y − 5 = 0 and x + 4y + 1 = 0 perpendicular?

Question 4: A straight line passes through the points A(1, 4) and B(5, 16).

(a) Find the equation of the line parallel to AB that passes through (1, 7)

(b) Find the equation of the line perpendicular to AB that passes through the midpoint of AB.
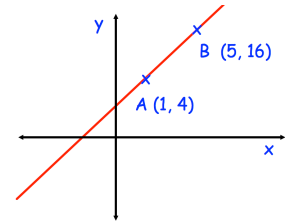
Question 5: The line L has equation y = 2x + 8
The line L crosses the x–axis at the point A.
The line M is perpendicular to Line L and passes through the point A

(a) Find the coordinates of the point A.
(b) Find equation of the Line M.

Question 6: The point A has coordinates (−12, −7) and the point B has coordinates (−8, 1)

Find the equation of the line parallel to AB and passing through (2, 5)

Question 7: The line L passes through the points (−2, 1) and (2, 3).
The line N passes through the points (4, 7) and (12, 11).

Bryan says that the lines L and N are parallel.
Is Bryan correct? Explain your answer.

Question 8: The point C has coordinates (2, −3) and the point D has coordinates (4, 6).

Find the equation of the line perpendicular to CD and passing through D.

Question 9: The line Q passes through the points (−10, −2) and (−8, −8)
The line R passes through the points (1, 2) and (10, a)

The lines Q and R are perpendicular.

Find a.

Answers

Fluency Practice

In each question you will need to use the formula $y = mx + c$.

Find the equation of the line perpendicular to the line $y = 2x + 3$ and passes through the point (4, 11)

Where does the line cross the x and y axis?

Find the equation of the line perpendicular to the line $y = 3x - 5$ and passes through the point (3, 4)

Where does the line cross the x and y axis?

Find the equation of the line perpendicular to the line $y = -2x + 8$ and passes through the point (6, -4)

Find the equation of the line perpendicular to the line $y = -3x + 5$ and passes through the point (6, -13)

Find the equation of the line perpendicular to the line $y = \frac{1}{2}x + 4$ and passes through the point (6, 7)

Find the equation of the line perpendicular to the line $y = 5x - 9$ and passes through the point (10, 41)

Extension

perpendiculars

(1) prove that the triangle with vertices:
     A (3, 0), B (6, 4) and C (− 1, 3)
     is right–angled
     show that it is also isosceles

(2) triangle ABC is isosceles with $AC = BC$
     if $A = (3, − 2)$ and $B = (5, 2)$
     and the coordinates of C are (12, k)
     a) find the value of k
     b) find the area of triangle ABC

(3) triangle ABC has vertices:
     $A = (3, 3)$, $B = (3, − 7)$ and $C = (6, − 6)$
     a) show that the triangle is right-angled
     b) show that the centre of the circle that passes
         through A, B and C lies on AB
     c) find the area of triangle ABC

(4) a) which point on the y–axis is equidistant from
         (5, − 3) and (− 4, 6) ?

     b) which point on the x–axis is equidistant from
         (2, − 5) and (− 2, 9) ?

(5) the point P (x, y) is equidistant from
     A (5, 1) and C (− 1, 5)
     a) prove that $2y = 3x$
     b) find the other two coordinates of the square
         $ABCD$

(6) the point P (x, y) is equidistant from
     E (4, 3) and G (− 3, 4)
     a) prove that $y = 7x$
     b) find the other two coordinates of the
         square $EFGH$
     c) which square, $ABCD$ (above) or $EFGH$
         has the larger area?

(7) the point P (x, y) is equidistant from
     A ($a + b$, $b − a$) and
     B ($a − b$, $a + b$)

     prove that $ay = bx$

(8) the triangle with vertices:
     A (4, 7), B (t, 6) and C (8, 1)
     is right–angled at B

     find the values of t

Extension

based on GCSE exam questions

(1) the straight line L_1 passes through the points with coordinates (4, 8) and (12, 4)
the straight line L_2 passes through the origin (O) and has gradient -3

the two lines meet at point P
find the coordinates of P

the perpendicular to L_1 from the origin meets L_1 at Q

establish that △OPQ is an isosceles right angled triangle

what is its area?

(2) the point P = (3, 4) and Q = (a, b)

a line perpendicular to PQ is: $3x + 2y = 7$

find an expression for b in terms of a and give four possible coordinates for Q [other than (3, 4)]

(3) PQR is a triangle with vertices P, Q and R
P = (-3, -6), Q = (1, 4) and R = (5, -2)
M is the midpoint of PQ
N is the midpoint of QR

prove that MN is parallel to PR
establish that the length $MN = ½ PR$

(4) ABCD is a rhombus with A = (5, 11)
the equation of the diagonal DB is $y = ½ x + 6$

find an equation of the diagonal AC

what are the coordinates of the centre of the rhombus?

what are the coordinates of (i) B (ii) D (iii) C ?

DC is parallel to the x axis

(5)

B is on the x axis
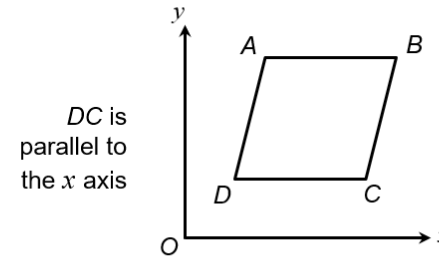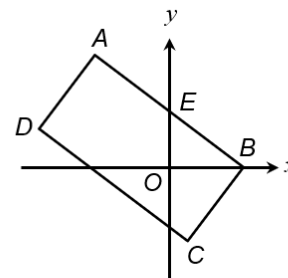
ABCD is a rectangle
the equation of the line AB is $x + 2y = 12$

$AE = EB$

find an equation for AD

find an equation for DC

what are the coordinates of (i) A (ii) D (iii) C ?

Problem Solving

	All Sides Equal	Has 4 Right Angles	Diagonals Cross at Right Angles
Forms a Parallelogram			
Diagonals not Equal in Length			

Put these cards into the correct part of the table.
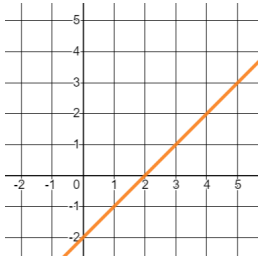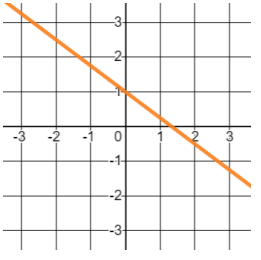
y = 2x – 1 y = 2x -11 2y = 3 – x 4y = -(2x – 16)	y = x + 3 y = x - 5 7y = -35 – 49x 7x = 35-y	**IT'S** **IMPOSSIBLE!**

There are 3 missing spaces. Create sets of equations for them.

Fluency Practice

(a)	(b)	(c)	(d)
Write down the gradient and y-intercept of the straight line with equation $y = 5x - 2$	Write down the gradient and y-intercept of the straight line with equation $y = -\frac{1}{2}x + 7$	Write down the gradient and y-intercept of the straight line with equation $3y = 2x - 9$	Find the gradient of the line joining $(2, 5)$ and $(4, 11)$

(e)	(f)	(g)	(h)
Find the equation of the line.	Find the equation of the line.	Write down the equation of the line that is parallel to $y = -4x - 9$ and passes through $(0, 2)$	Write down the equation of the line that is perpendicular to $y = -3x$ and passes through the point $(0, -5)$

(i)	(j)	(k)
Find the equation of the line that has a gradient of 2 and passes through $(4, 3)$	Find the equation of the line that is perpendicular to the line $2y = x - 8$ and passes through $(-1, 9)$	Find the equation of the line that passes through $(2, 9)$ and $(5, 3)$.

Fluency Practice

Diagram 1

Central box: $y = 2 - 4x$

Surrounding boxes:
- x-intercept is....
- Quick sketch....
- y-intercept is....
- Another point on the line is....
- One point on the line is....
- In the form $ax + by + c = 0$ is...
- Gradient is....

Diagram 2

Central box: $2y - 3x - 2 = 0$

Surrounding boxes:
- x-intercept is....
- Quick sketch....
- y-intercept is....
- Another point on the line is....
- One point on the line is....
- In the form $y = mx + c$ is...
- Gradient is....

Diagram 3

Central box: $y = -2x + 1$

Surrounding boxes:
- Gradient is...
- Equation of parallel line passing through $(2, 3)$ is...
- y-intercept is....
- Perpendicular gradient is...
- A point on the line is....
- In the form $ax + by + c = 0$ is...
- Equation of perpendicular line passing through $(1, 5)$ is...

Diagram 4

Central box: $5x + 2y - 8 = 0$

Surrounding boxes:
- Gradient is...
- Equation of parallel line passing through $(4, -1)$ is...
- y-intercept is....
- Perpendicular gradient is...
- A point on the line is....
- In the form $y = mx + c$ is...
- Equation of perpendicular line passing through $(3, 2)$ is...

Fluency Practice

①

$y = 2x + 5$

On the axes, sketch the graphs:

$y = 3x$ $y = 2x - 6$

$$y = \frac{x}{2} + 5$$

②

$y = 3x + 5$

Gradient = _____

y-intercept = _____

$y = 8 - 2x$

Gradient = _____

y-intercept = _____

$2y + x = 7$

Gradient = _____

y-intercept = _____

③

$y = 3x - 4$
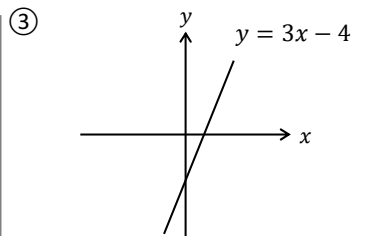
Which coordinates are on this graph?

(4, 8)   (0, 4)   (−2, −2)

Complete these coordinates for the graph $2y = 5x + 2$

(4, y)   (x, 6)   (x, −9)

④

$y = 4x - 8$

$y = x + 1$

A
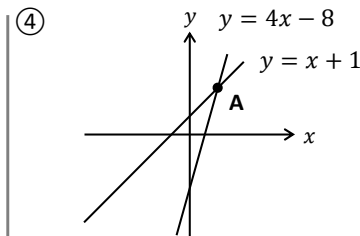
Find the coordinates of point **A**.

Find the coordinates of the point where the graphs

$y = 3x + 9$ & $y = \frac{x}{2} + 4$

intersect.

⑤

Line N is parallel to the graph $y = 5x - 7$ & passes through (4, 22). Find the equation of Line N

Line O is parallel to the graph $y = 5 - 2x$ & passes through (5, −13). Find the equation of Line O

⑥

y

(3, 13)

4

x
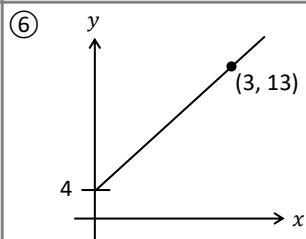
Find the equation of this line.

Line P passes through (1, 3) & (3, 11). Find the equation of this line.

Line Q passes through (−2, 10) & (5, −4). Find the equation of this line.

⑦

$y = 2x + 5$

Find the gradient of a line perpendicular to this graph.

$y = 10 - 4x$

Find the gradient of a line perpendicular to this graph.

$3y + 2x = 7$

Find the gradient of a line perpendicular to this graph.

⑧

Line R is perpendicular to the graph $y = 2x + 4$ & passes through (8, 2). Find the equation of Line R

Line S passes through (4, 6) & (8, 8) Line T is perpendicular to this line & passes through its midpoint. Find the equation of Line T.

Fluency Practice

Harder Coordinate Geometry

(a)	(b)	(c)
Find an equation of the line that passes through the points $(4, 2)$ and $(-8, 11)$. Give your answer in the form $ax + by = c$ where a, b and c are integers. $3x + 4y = 20$	The straight line L has equation $5x - 3y = 18$. Find an equation of the line that is parallel to L and crosses the x-axis at $(4, 0)$. $y = \dfrac{5}{3}x - \dfrac{20}{3}$	The straight line L_1 has equation $x + 2y - 7 = 0$. The straight line L_2 passes through the points $(-2, -6)$ and $(5, 8)$. Show that the lines L_1 and L_2 are perpendicular to each other. $m \; for \; L_1 = -\dfrac{1}{2} \qquad m \; for \; L_2 = 2$ $-\dfrac{1}{2} \times 2 = -1$, therefore perpendicular

(d)	(e)	(f)
The straight line L passes through the points $(1, -1)$ and $(5, 9)$. Find an equation of the line that is parallel to L and passes through the point $(2, 4)$. Give your answer in the form $ax + by + c = 0$ where a, b and c are integers. $5x - 2y - 2 = 0$	The straight line L_1 has equation $2x - 3y = 4$. The straight line L_2 is perpendicular to L_1 and passes through the point $(1, 2)$. Find the equation of the line L_2 and the coordinates of the point where it crosses the x-axis. $y = -\dfrac{3}{2}x + \dfrac{7}{2}$ $\left(\dfrac{7}{3}, 0\right)$	ABC is a triangle, where $\widehat{BAC} = 90°$. The point C has coordinates $(9, 5)$ and points A and B lie on the line with equation $2x + 3y = 7$. Find the equation of the line that passes through A and C, giving your answer in the form $ax + by = c$ where a, b and c are integers. $3x - 2y = 17$

Q1. $y = 5x - 4$ is the equation of a straight line.

(a)   Write down the gradient of the line $y = 5x - 4$

Answer ....

(1)

(b)   Write down the coordinates of the y-intercept of the line $y = 5x - 4$

Answer   (........................ , ...)

(1)

(Total 2 marks)

Q2. A sketch of $2x + 3y = 12$ is shown.
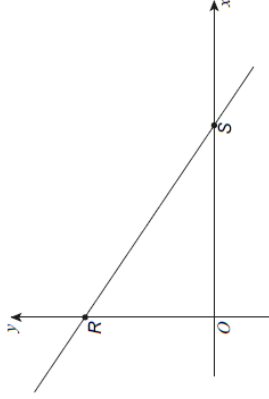
(a)   Work out the coordinates of R.

Answer (........................ , ...)

(1)

(b)   Work out the coordinates of S.

Answer (........................ , ...)

(2)

(Total 3 marks)

Q3.

(a)   Write down the equation of a straight line that is parallel to $y = 5x + 6$

....

(1)

(b) Find an equation of the line that is perpendicular to the line $y = 5x + 6$ and passes through the point (–2, 5).

....

(3)

(Total 4 marks)

Exam Questions

Q4. Lines, A and B, intersect on the y-axis.

Line B intersects the x-axis at the point $(6, 0)$.

The equation of line A is $\qquad$ $4x + 3y + 12 = 0$
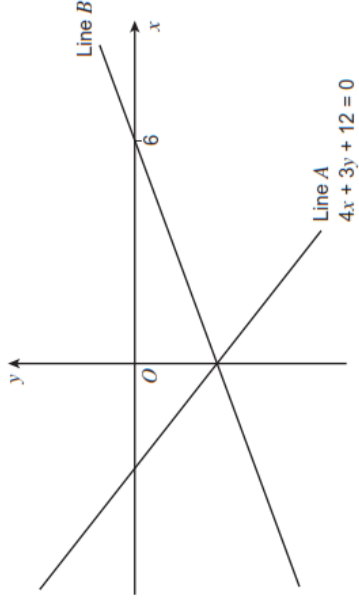
Work out the equation of line B.

Answer ....

Q5. The diagram shows a line $ABCD$.
A is the point $(400, 920)$.
B is the point $(250, 620)$.
The line cuts the y-axis at C and the x-axis at D.

Not drawn accurately
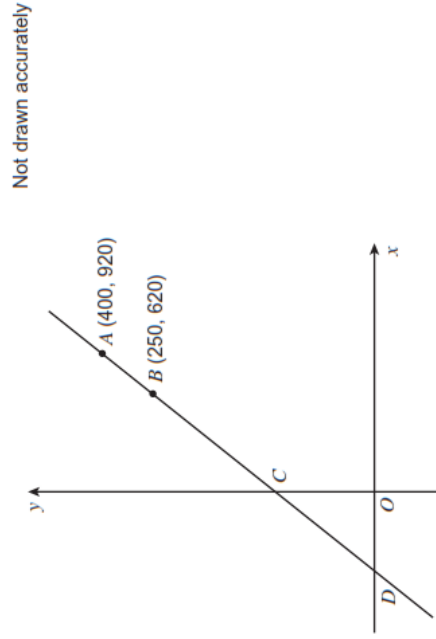
Work out the coordinates of C and D.

C (............. , ...)

D (............. , ...)

Exam Questions

Q6. Two straight lines are shown.

Not drawn accurately

(6, 4)

2

0

−3

9

x

y
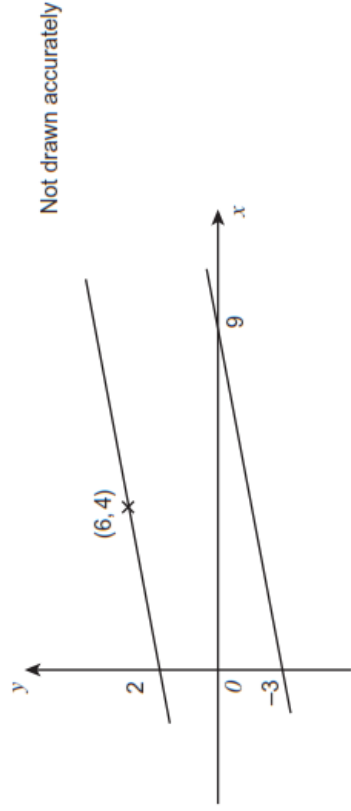
Prove that the lines never meet.

(Total 4 marks)

Q7.

Diagram **NOT** accurately drawn

y

O

x

L $y = 2x + 1$

B

(4, 9)

A

(2, 5)
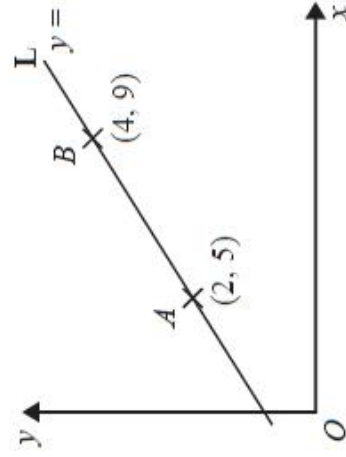
The point A has coordinates (2, 5).
The point B has coordinates (4, 9).

The line **L** passes through the points A and B.
The equation of line **L** is $y = 2x + 1$

M is the midpoint of the line segment AB.

Find an equation of the line that is perpendicular to line **L** and passes through M.

(Total 3 marks)

Exam Questions

*Q8. *A* is the point with coordinates (1 , 3)

B is the point with coordinates (4, −1)

The straight line *L* goes through both *A* and *B*.

Is the line with equation $2y = 3x - 4$ perpendicular to line *L*?

You must show how you got your answer.

Q9.
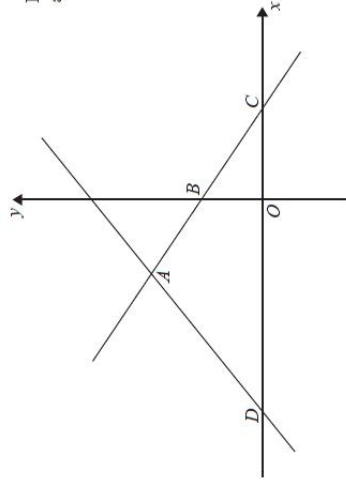
Diagram NOT accurately drawn

In the diagram, *ABC* is the line with equation $y = -\frac{1}{2}x + 5$

AB = *BC*

D is the point with coordinates (−13, 0)

Find an equation of the line through *A* and *D*.

3 Graphical Inequalities

Extension

linear inequalities: regions

(1) $y \le 2x + 3$

      $x \le 3$

      $y \ge 5$

(4) $y \ge 2x - 3$

      $y \ge 3$

      $y \le x + 2$

find each of these regions
on a 10 by 10 grid:

(2) $x + 2y \ge 8$

      $x \le 6$

      $y \le 3$

(5) $y \le \frac{1}{3}x + 6$

      $y \ge x$

      $y \ge 7$

(3) $x + y \ge 9$

      $x \le 4$

      $y \le x + 5$

(6) $x + 2y \ge 8$

      $x \le 6$

      $2y \le 3x - 8$
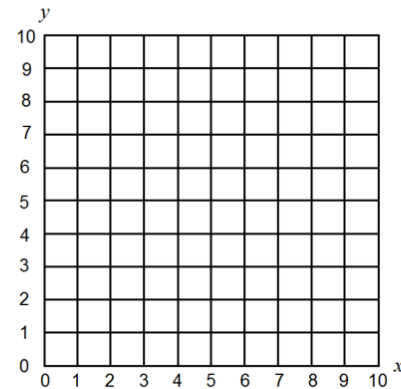
the region for all questions should
be a triangle with an area of
4 squares

establish that this is the case

Fluency Practice

Describing Graphical Inequalities

Write down the inequality or inequalities that define the shaded region.

(a)
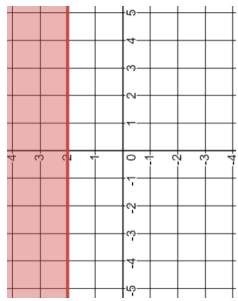
(b)
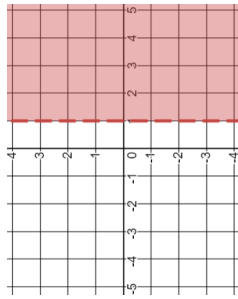
(c)
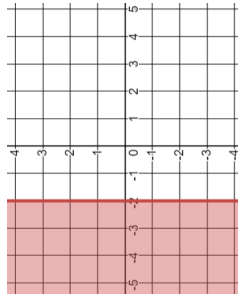
(d)
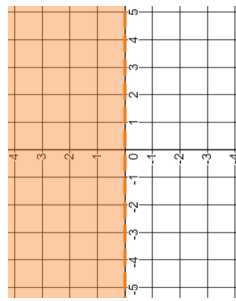
(e)
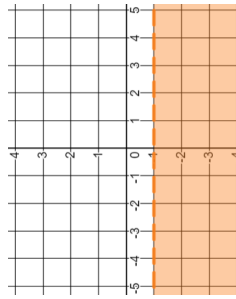
(f)
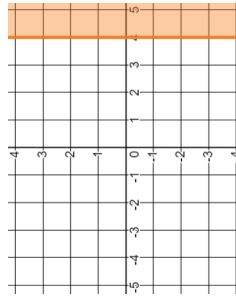
(g)
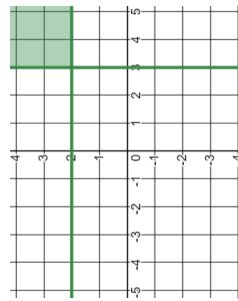
(h)
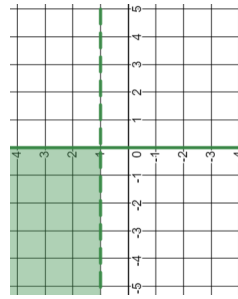
(i)
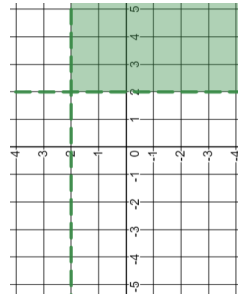
(j)
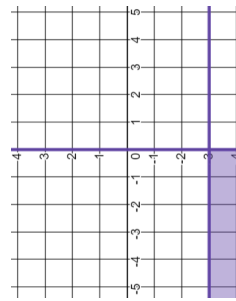
(k)
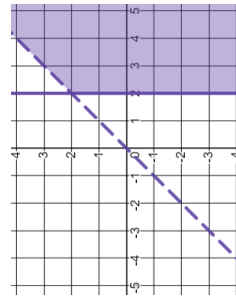
(l)
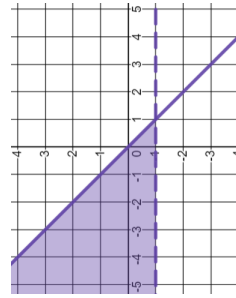
Fluency Practice

Describing Harder Graphical Inequalities

Write down the inequality or inequalities that define the shaded region.
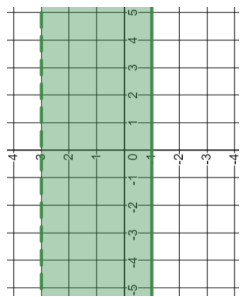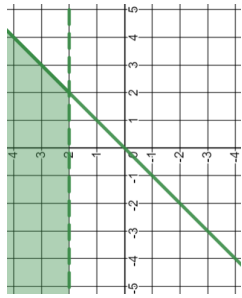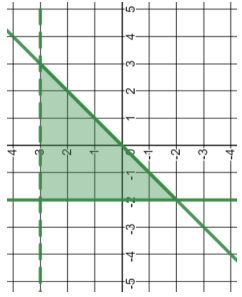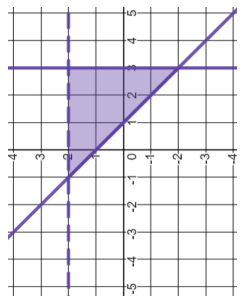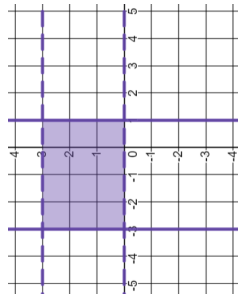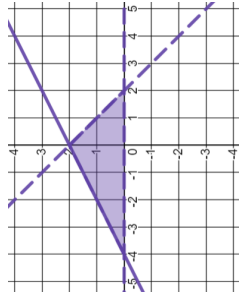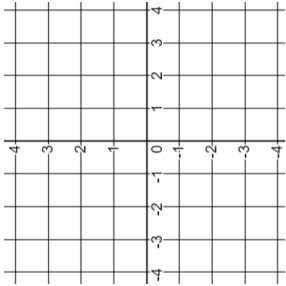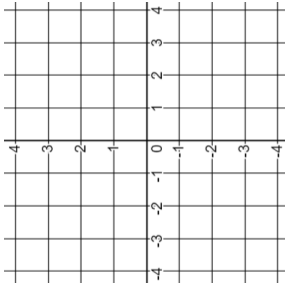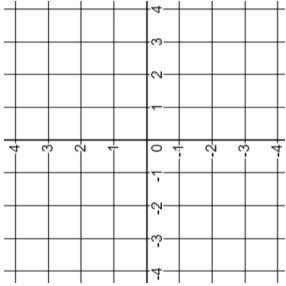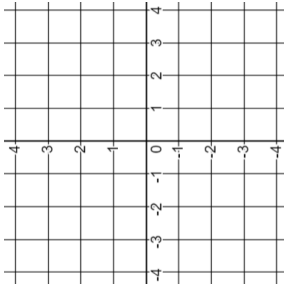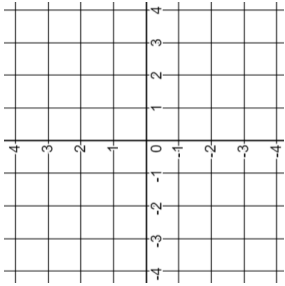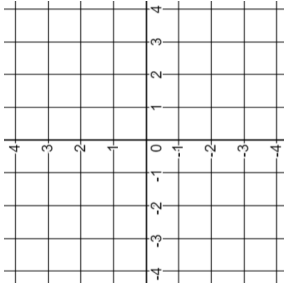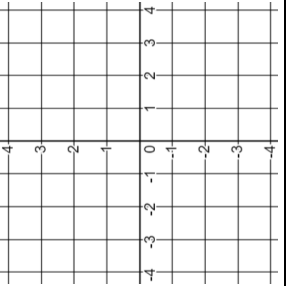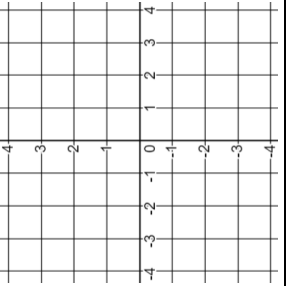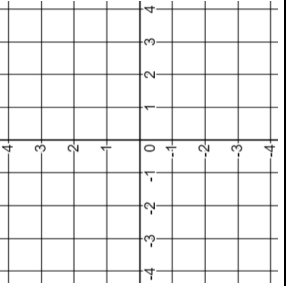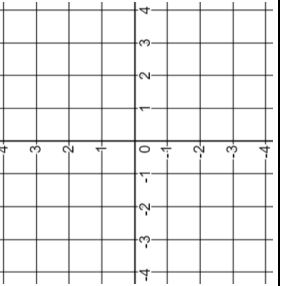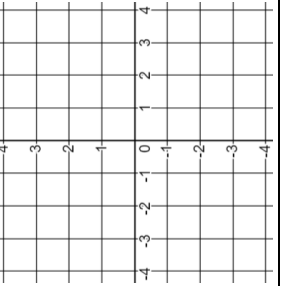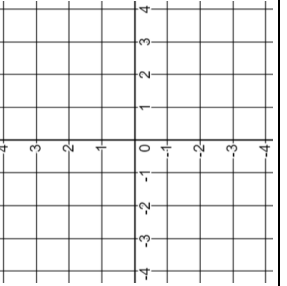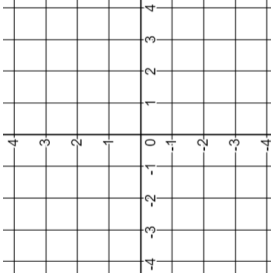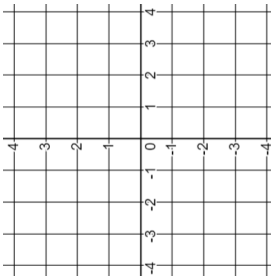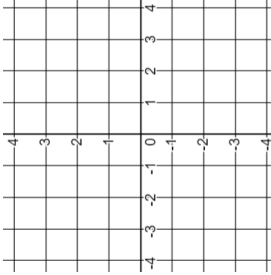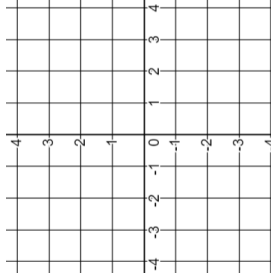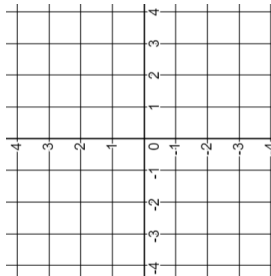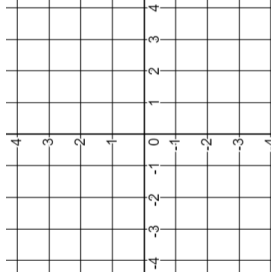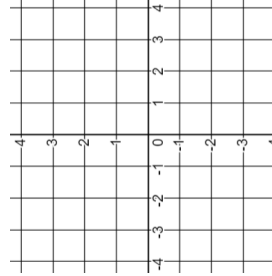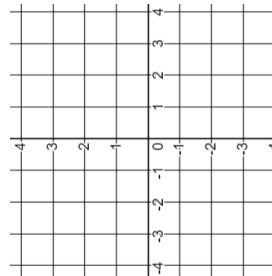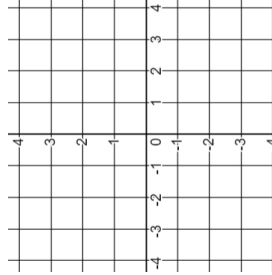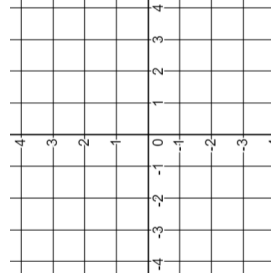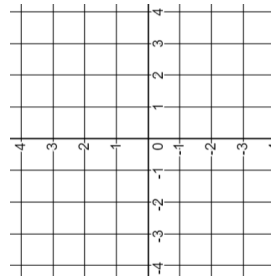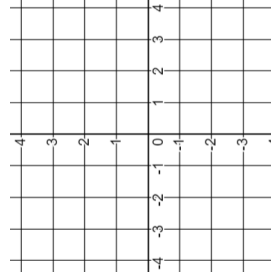
Fluency Practice

Shading Graphical Inequalities

(a) $y > 1$

(b) $y \leq -2$

(c) $x < 0$

(d) $x \geq 3$

(e) $y \geq 0$

(f) $x \leq -3$

(g) $x \geq 2$ and $y < 1$

(h) $x < -1$ and $y > 3$

(i) $x \leq 0$ and $y < 0$

(j) $x \geq -1$ and $y \geq 3$

(k) $y \geq x$ and $x < 2$

(l) $y < -x$ and $y \leq -1$

Fluency Practice

Shading Harder Graphical Inequalities

(a) $y \geq -1$

(b) $x < 2$

(c) $y > x$

(d) $y \geq 0.5x - 1$

(e) $x + y \leq 3$

(f) $-3 \leq y < 2$

(g) $-2 \leq x < 3$

(h) $x \geq 0 \text{ and } y < x$

(i) $x \geq -1, y > 0 \text{ and } x + y < 2$

(j) $2 < x < 4 \text{ and } -1 \leq y \leq 1$

(k) $y < 2x, x + y \leq 4 \text{ and } y > 0$

(l) $y < x, y \geq -2 \text{ and } 2x + y < 4$

Fluency Practice

Shading and Describing Harder Graphical Inequalities

Shade the region that satisfies the inequalities $x \leq 4 \quad y \geq -1 \quad y \leq x$	Shade the region that satisfies the inequalities $x > -1 \quad y \geq 0 \quad x + y \leq 3$	Shade the region that satisfies the inequalities $2x + 3y < 6 \quad y \leq x + 2$ $y > -1$
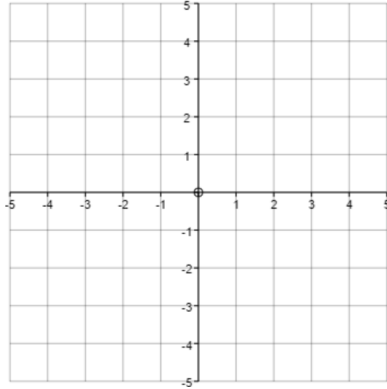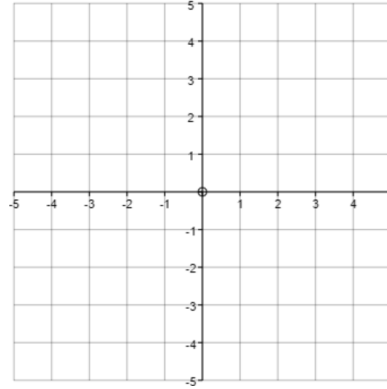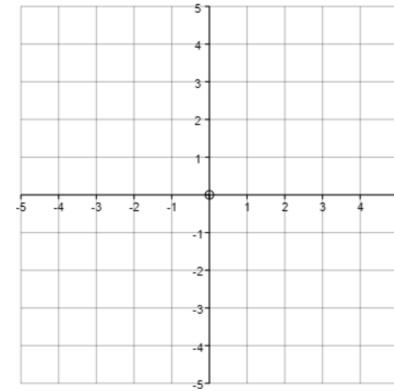
Write down the inequalities which fully describe the shaded region.	Write down the inequalities which fully describe the shaded region.	Write down the inequalities which fully describe the shaded region.
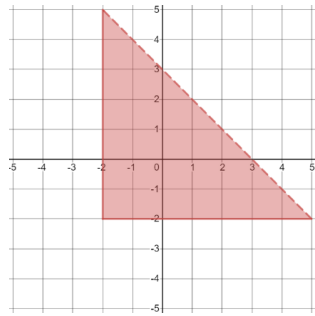
Fluency Practice

A1

Write down the inequality which defines the unshaded region.

A2

Write down the inequality which defines the unshaded region.

A3
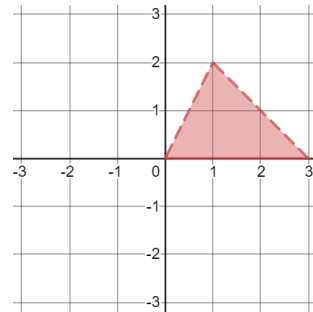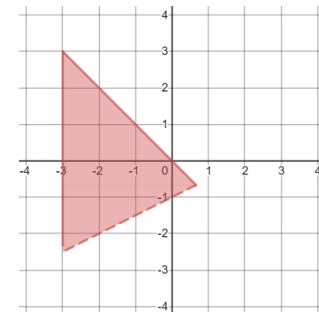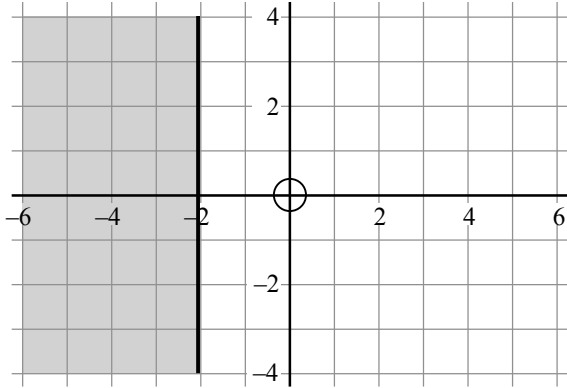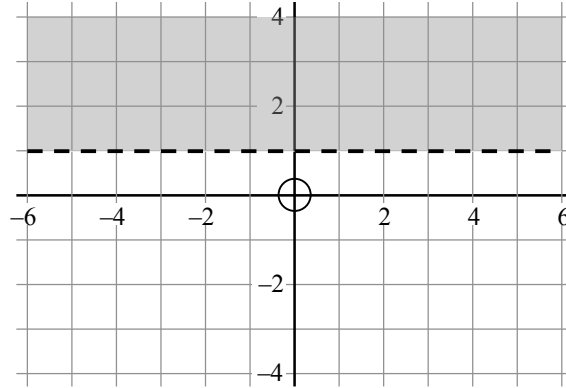
Write down the inequalities which define the unshaded region.

B1
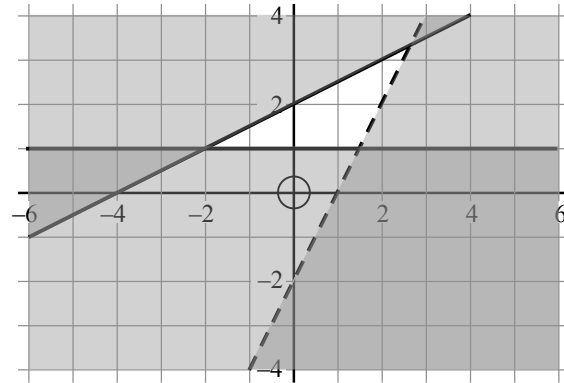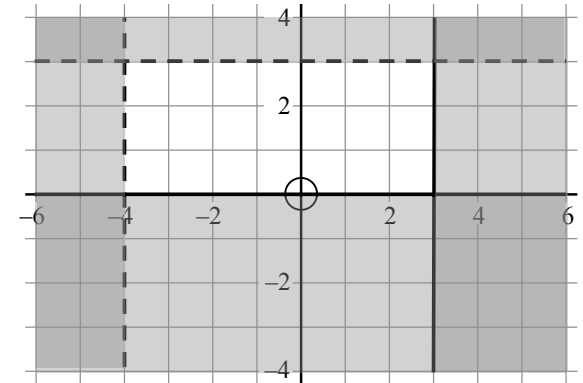
Write down the inequality which defines the unshaded region.

B2

Write down the inequality which defines the unshaded region.

B3

Write down the inequality which defines the unshaded region.

Fluency Practice

A1

Write down the inequalities which fully define the unshaded region.

A2

Write down the inequalities which fully define the unshaded region.

A3

Write down the inequalities which fully define the unshaded region.

B1

Write down the inequalities which fully define the unshaded region.

B2

Write down the inequalities which fully define the unshaded region.

B3

Write down the inequalities which fully define the unshaded region.

Fluency Practice

A1 Show, by shading on the grid, the region defined by $y \geq -1$
Label your region **R**.
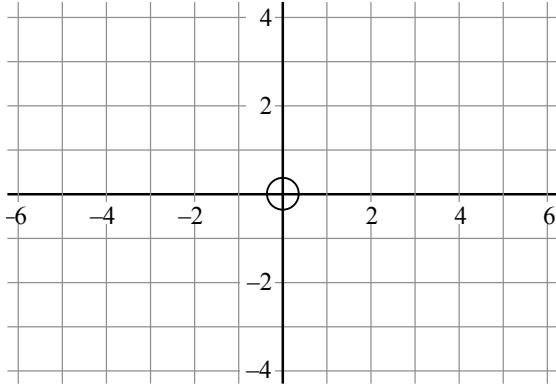
A2 Show, by shading on the grid, the region defined by $x < 3$
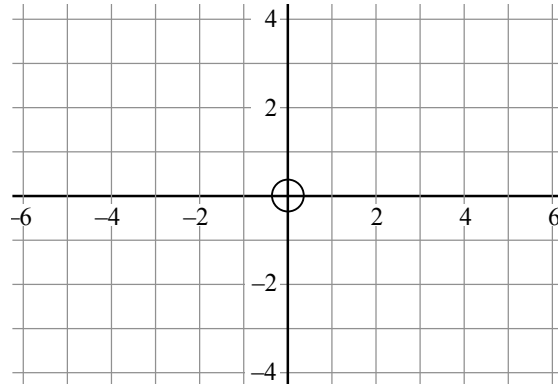Label your region **R**.
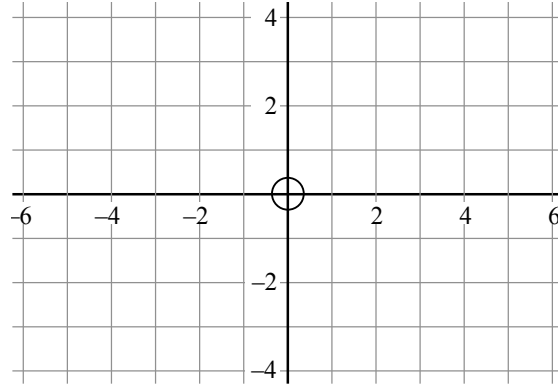
A3 Show, by shading on the grid, the region defined by $y < x$
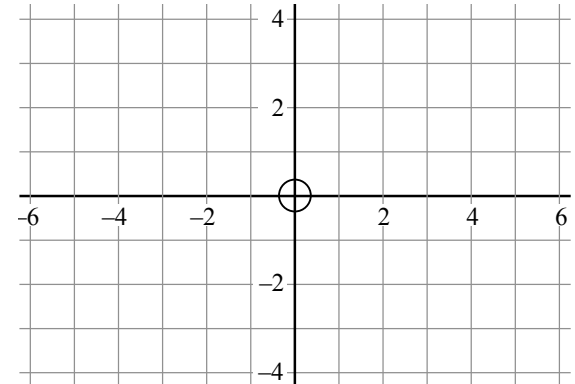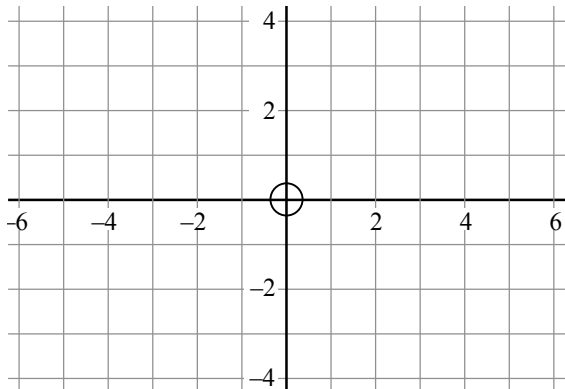Label your region **R**.
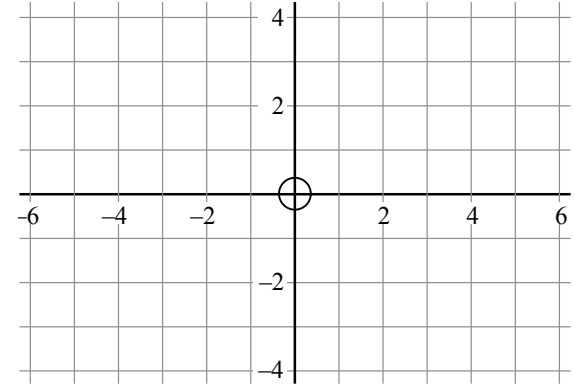
B1 Show, by shading on the grid, the region defined by $y \geq 0.5x - 1$
Label your region **R**.
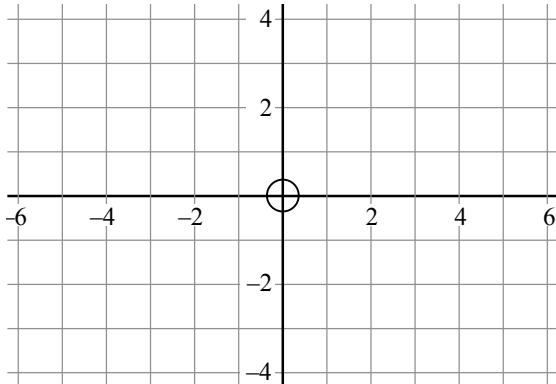
B2 Show, by shading on the grid, the region defined by $x + y \leq 3$
Label your region **R**.

B3 Show, by shading on the grid, the region defined by $-3 \leq y < 2$
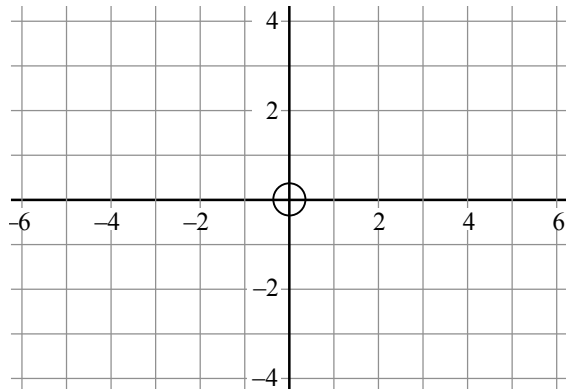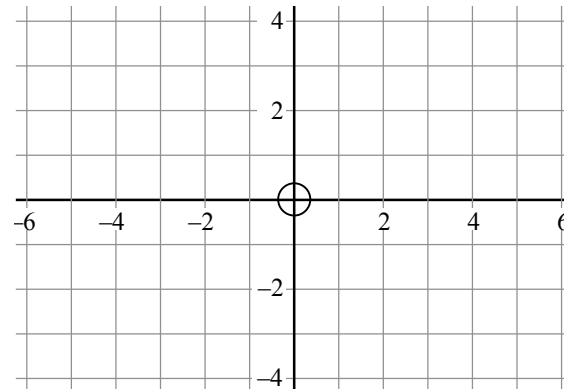Label your region **R**.

Fluency Practice

A1 Show, by shading on the grid, the region defined by $-4 \leq x \leq 3$

Label your region **R**.
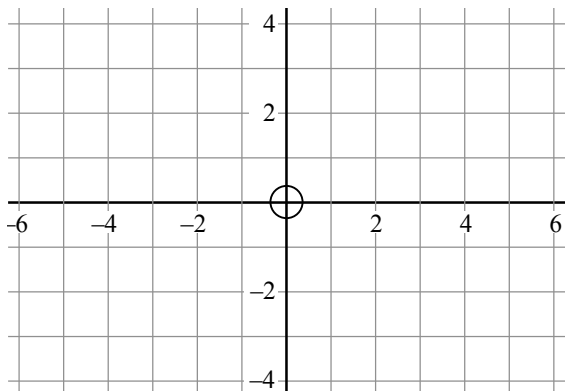

A2 Show by shading on the grid the region defined by $x \geq -3$, $y < 2$ **and** $y > x$
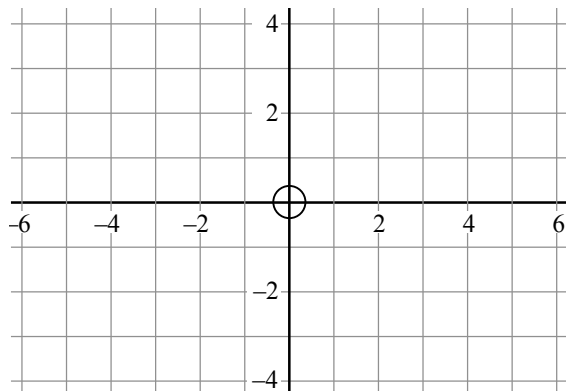
Label your region **R**.

A3 Show by shading on the grid the region defined by $x + y \leq -1$, $x \geq -4$ **and** $y \geq -3$
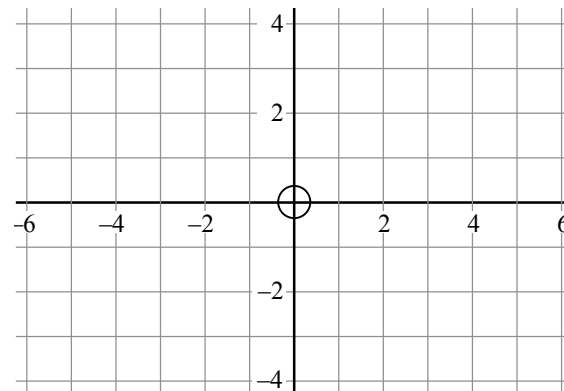
Label your region **R**.

B1 Show by shading on the grid the region defined by $-2 < y \leq 3$ **and** $-3 \leq x < 5$

Label your region **R**.

B2 Mark with a cross (✗) a point on the grid which satisfies both the inequalities
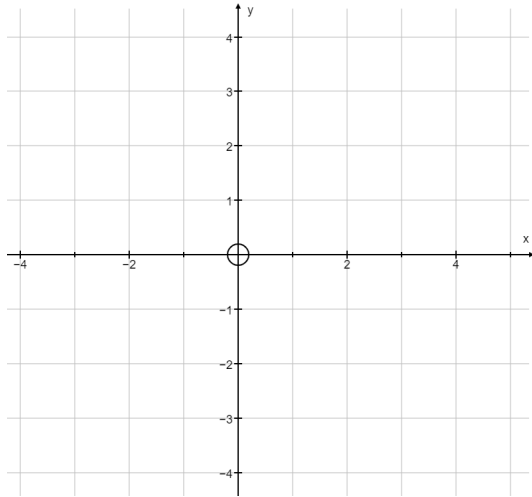
$x > 1$ **and** $x - 3y > 3$

B3 Show by shading on the grid the region defined by $y > x + 3$, $x \geq -3$ **and** $2y - x \leq 4$

Label your region **R**.

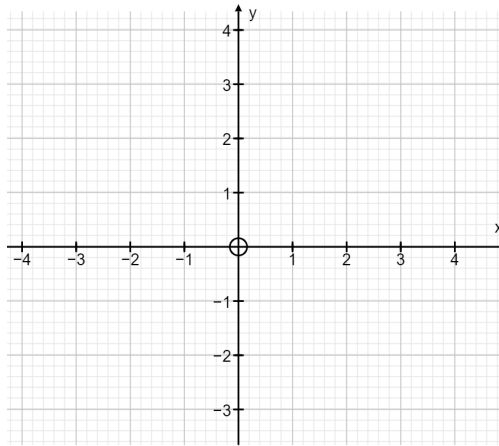# Interwoven Maths – Pythagoras' Theorem with Inequalities

Identify the region described by the inequalities and calculate the perimeter of the region.

$y \geq 1$ $x \geq 2$ $2y + x \leq 6$	$y \geq 0$ $y \leq 1.5x$ $y \geq 3x - 9$ $y \leq 3$	$y \leq 4x + 11$ $5y + 4x \leq 7$ $y \geq -1$

Perimeter:
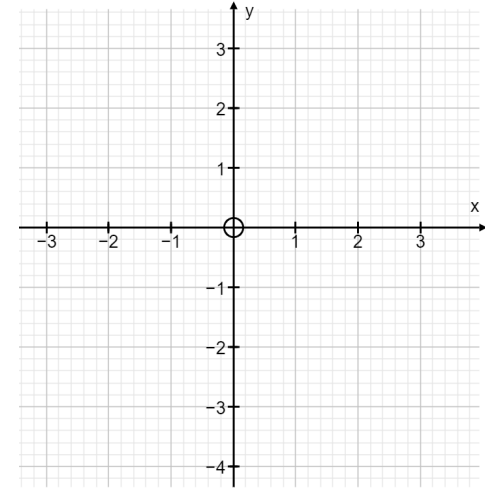
Perimeter:

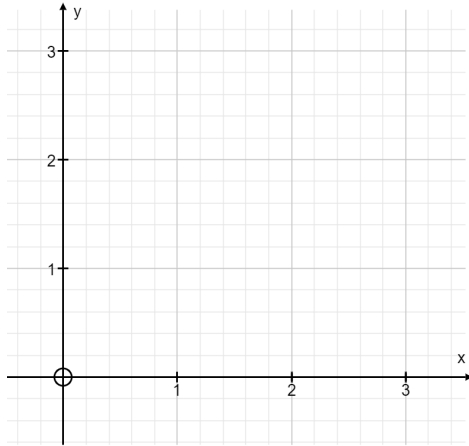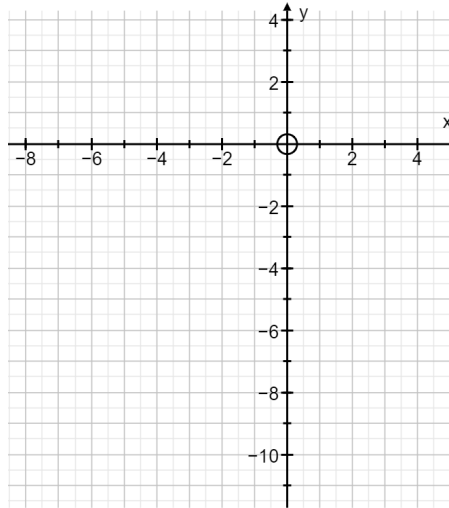Perimeter:

Interwoven Maths – Pythagoras' Theorem with Inequalities

Identify the region described by the inequalities and calculate the perimeter of the region.

$$y \geq \frac{2}{3}x$$
$$y \leq 1.5x$$
$$x \leq 3$$
$$y \leq 3$$

Perimeter:

$$2y + 2x \leq 7$$
$$2x - 2y \leq 7$$
$$2y - 4x \geq 7$$

Perimeter:

$$3y + x \leq 6$$
$$4x - 3y \leq 9$$
$$3y - x \leq 6$$
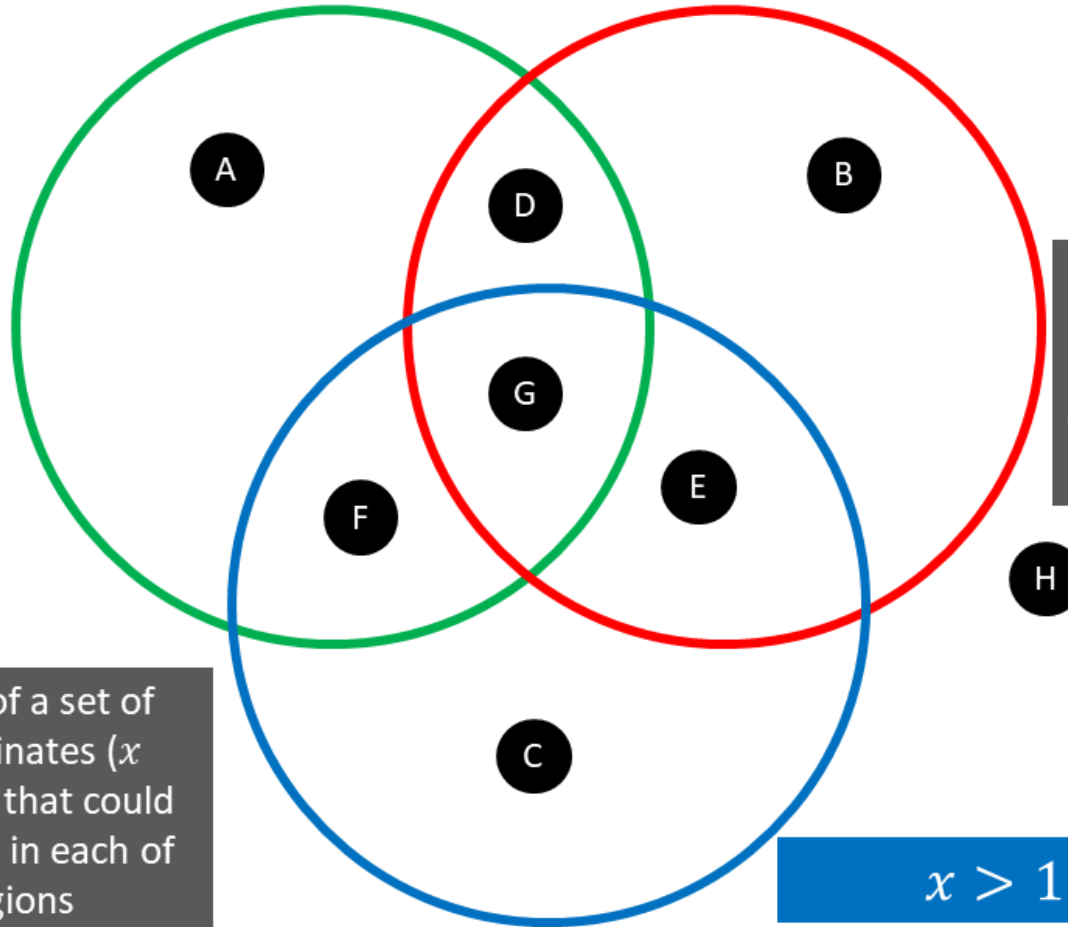$$4x + 3y \geq -9$$
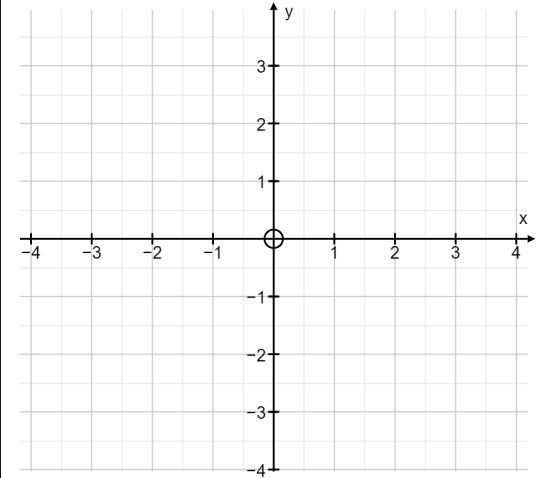
Perimeter:

Maths Venns

$y < 2x$

$y < 6$

A

D

B

If you think a region is impossible to fill, convince me why!

G

F

E

H

Think of a set of co-ordinates (x and y) that could belong in each of the regions

C

$x > 1$

Maths Venns

$y < x$

$x + y < 8$

$x > 0$

A

B

C

D

E

F

G

H

If you think a region is impossible to fill, convince me why!
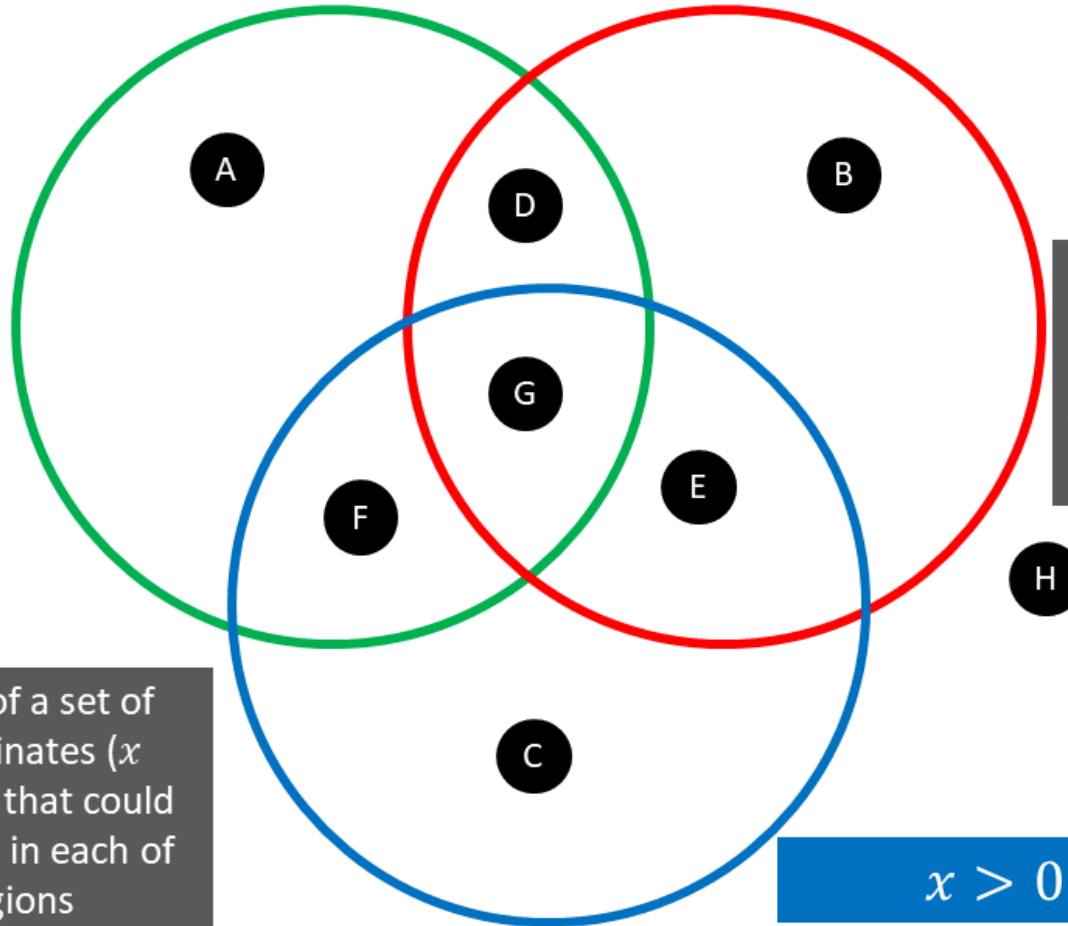
Think of a set of co-ordinates (x and y) that could belong in each of the regions

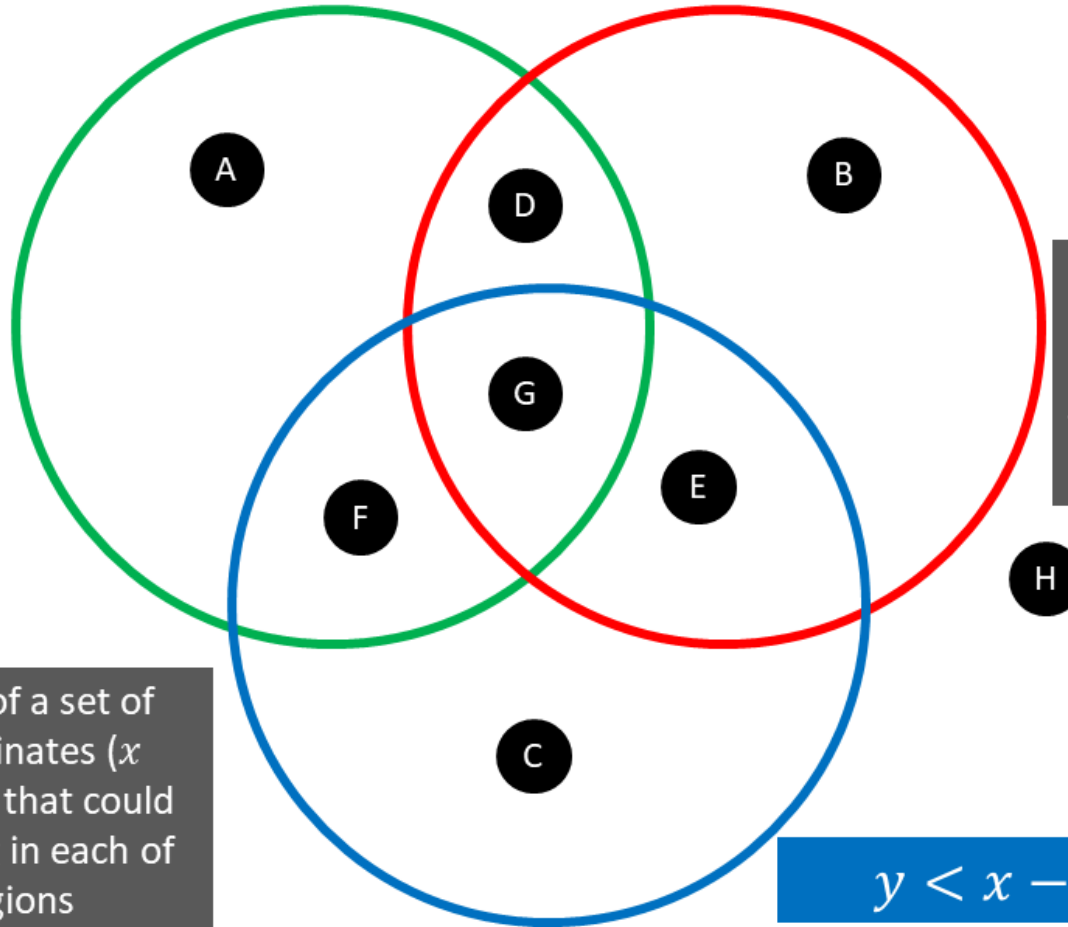# Maths Venns

$y > 2x + 1$

$x + y < 1$

A

D

B

If you think a region is impossible to fill, convince me why!

G

F

E

H

Think of a set of co-ordinates (x and y) that could belong in each of the regions
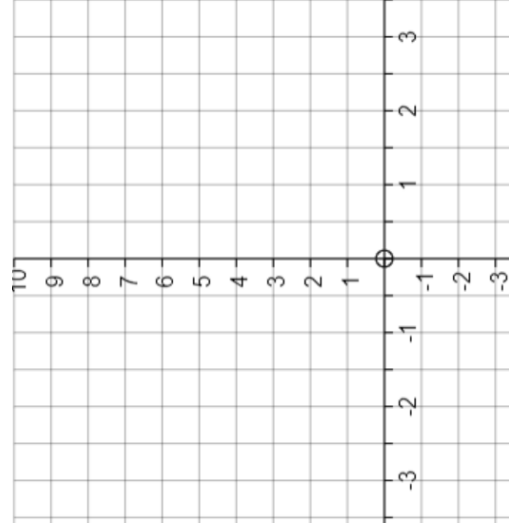
C

$y < x - 1$

4 Non-Linear Graphs
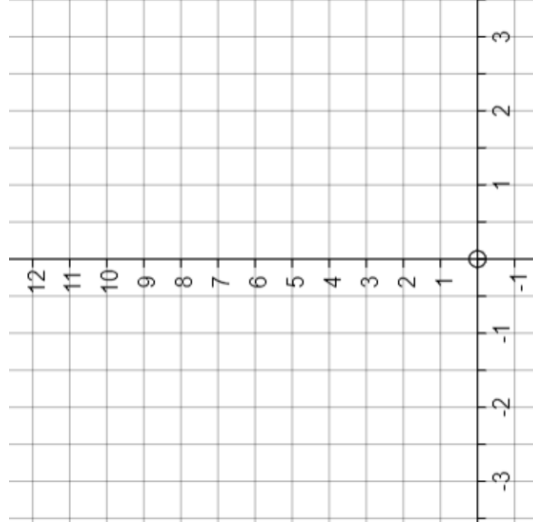
Fluency Practice

Plotting Quadratic Graphs

(a) $y = x^2$

x	-3	-2	-1	0	1	2	3
y							

(b) $y = x^2 + 3$

x	-3	-2	-1	0	1	2	3
y							

(c) $y = x^2 - 2$

x	-3	-2	-1	0	1	2	3
y							
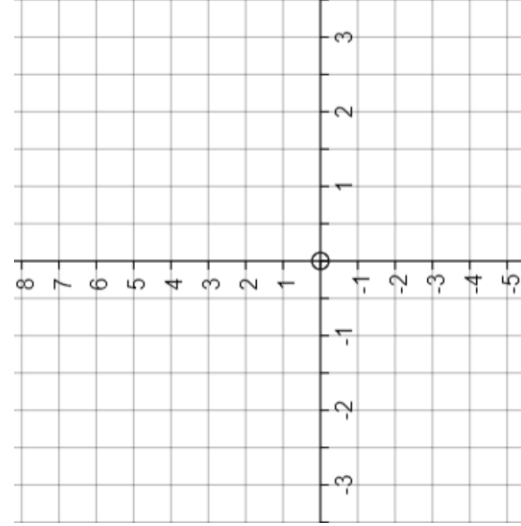
(d) $y = 2x^2$

x	-3	-2	-1	0	1	2	3
y							
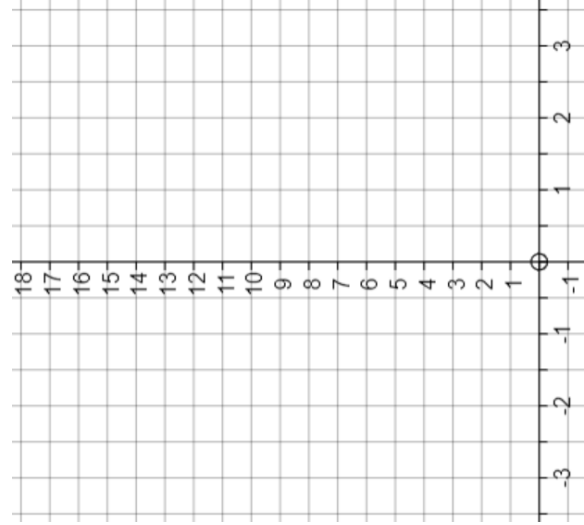
Fluency Practice

(e) $y = -x^2$

x	-3	-2	-1	0	1	2	3
y							
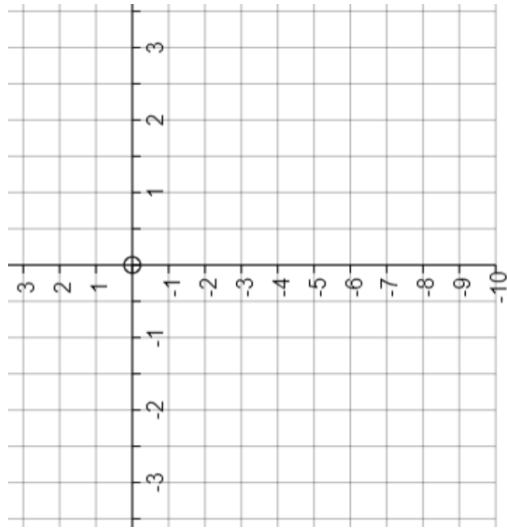
(f) $y = x^2 - x - 6$

x	-3	-2	-1	0	1	2	3	4
y								
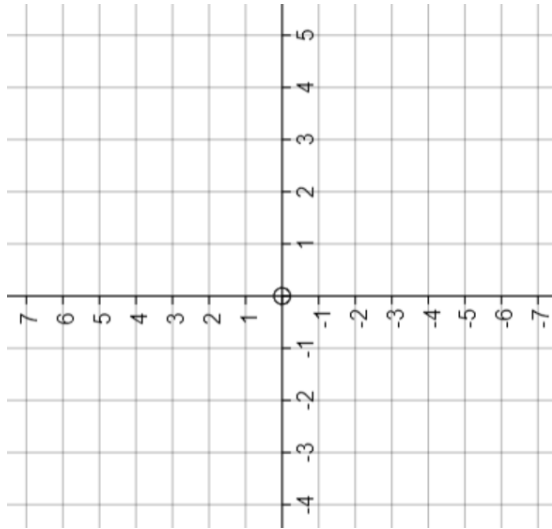
(g) Plot the graph of $y = x^2 - 5x + 4$ for
$-1 \le x \le 6$
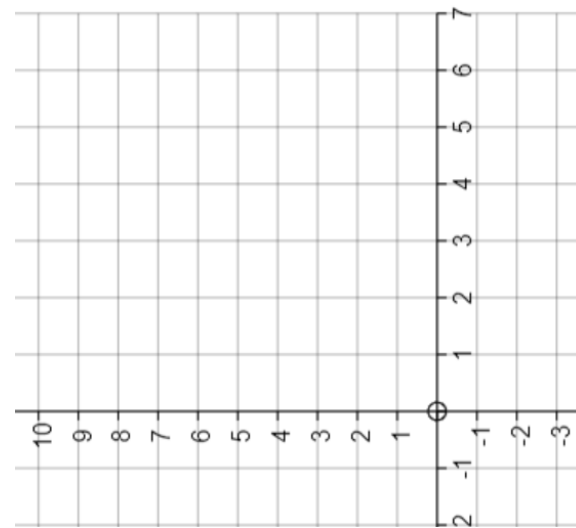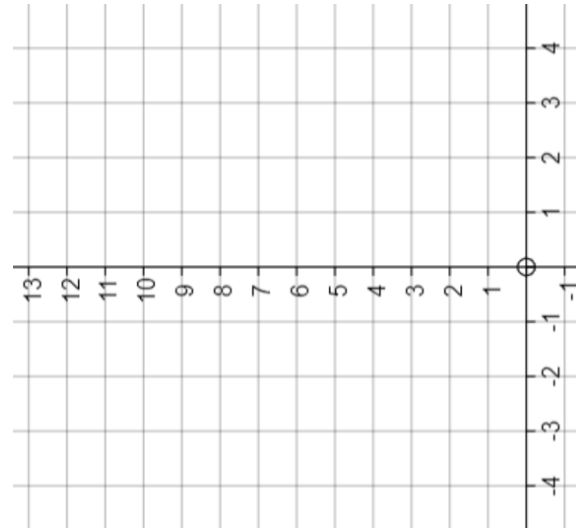
(h) Plot the graph of $y = 12 + x - x^2$ for
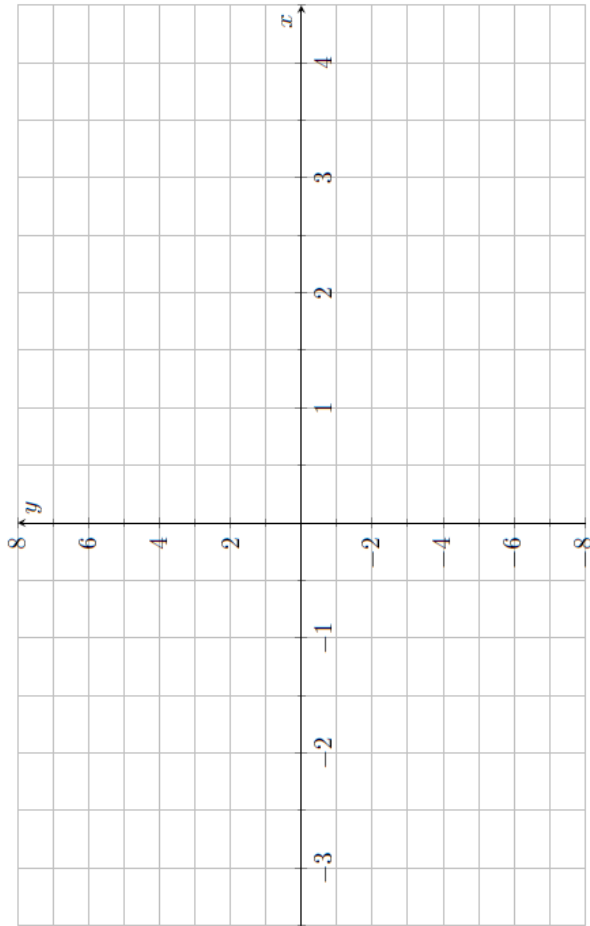$-3 \le x \le 4$

Fluency Practice

Solving Equations Graphically

(a)

Plot the graph of $y = 6 + x - x^2$. Use the graph to find the solutions to equation
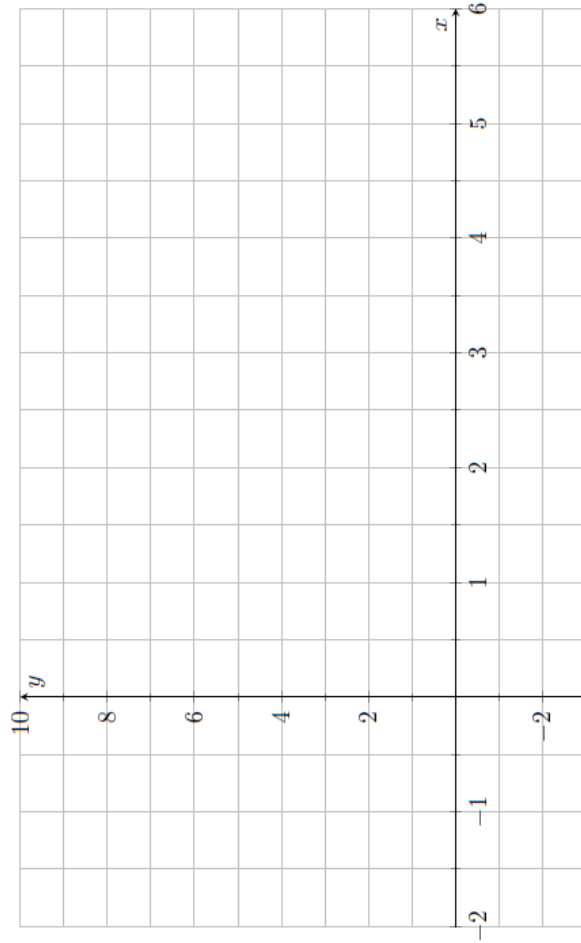
(a) $6 + x - x^2 = 0$

(b) $6 + x - x^2 = -6$

(b)

Plot the graph of $y = x^2 - 4x + 3$. Use the graph to find the solutions to equation

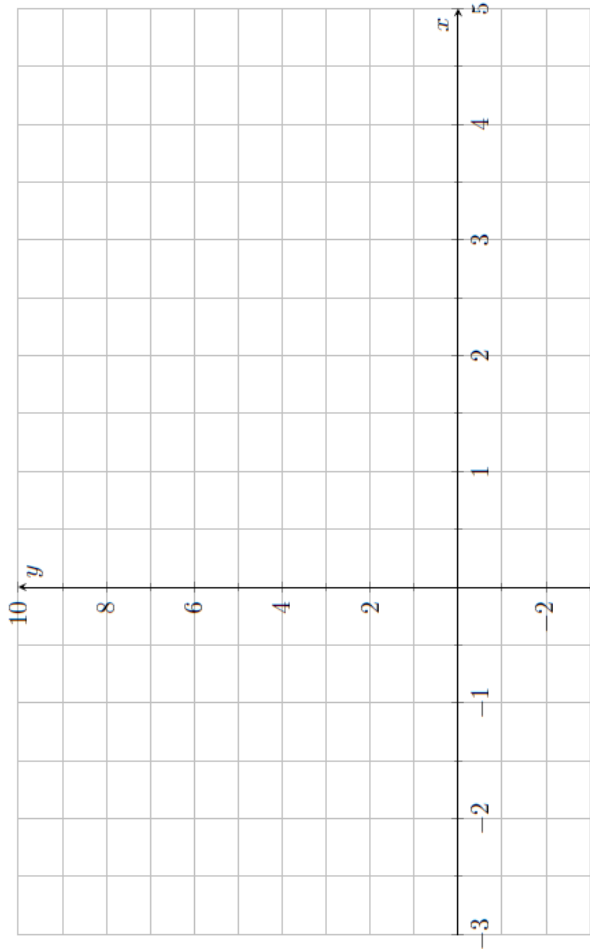(a) $x^2 - 4x + 3 = 0$

(b) $x^2 - 4x + 3 = 8$

Fluency Practice

(c)

Plot the graph of $y = 8 + 2x - x^2$. Use the graph to find the solutions to the equation

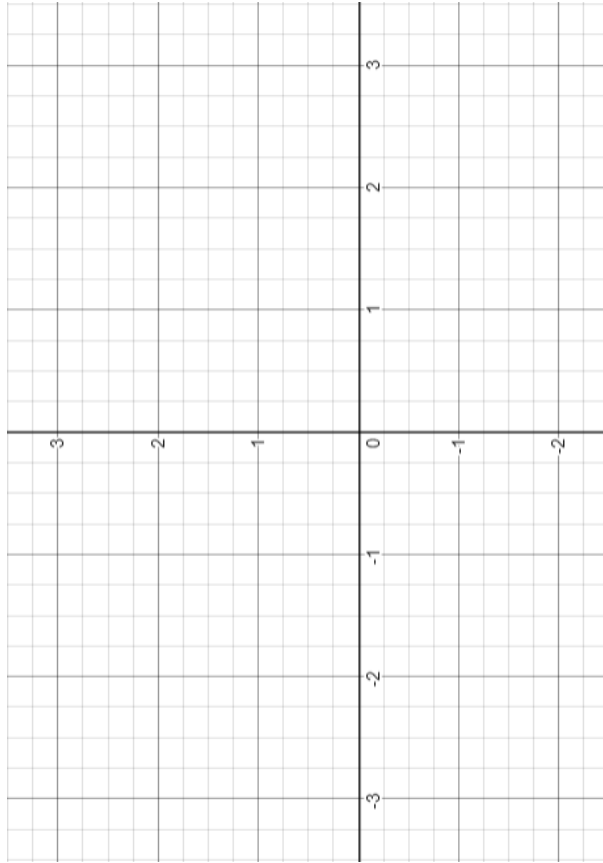   (a) $8 + 2x - x^2 = 5$ (b) $8 + 2x - x^2 = 8 - x$

(d)

Plot the graph of $y = x^3 - 3x$. Use the graph to estimate the solutions to the equation

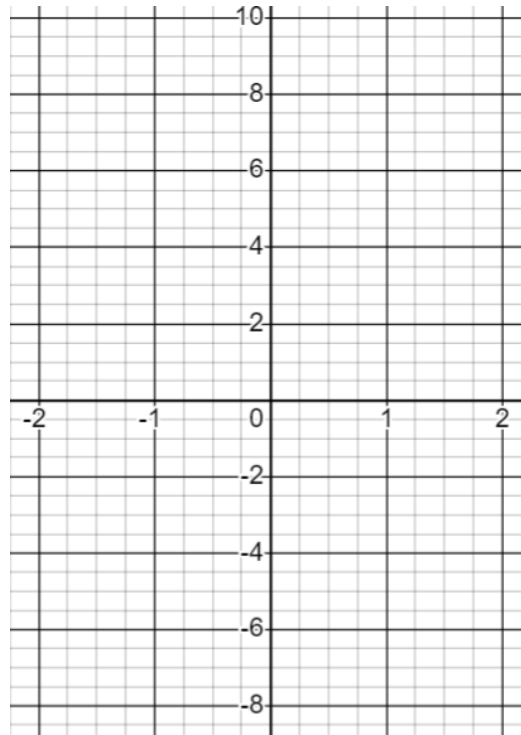   (a) $x^3 - 3x = 1$ (b) $x^3 - 3x = x + 1$

Fluency Practice

Plotting Cubic Graphs

(a)

Plot the graph of $y = x^3 + 1$ from $x = -2$ to $x = 2$

x	-2	-1	0	1	2
y					

(b)

Plot the graph of $y = x^3 - 2x^2 - x + 2$ from $x = -2$ to $x = 3$

x	-2	-1	0	1	2	3
y						

(c)
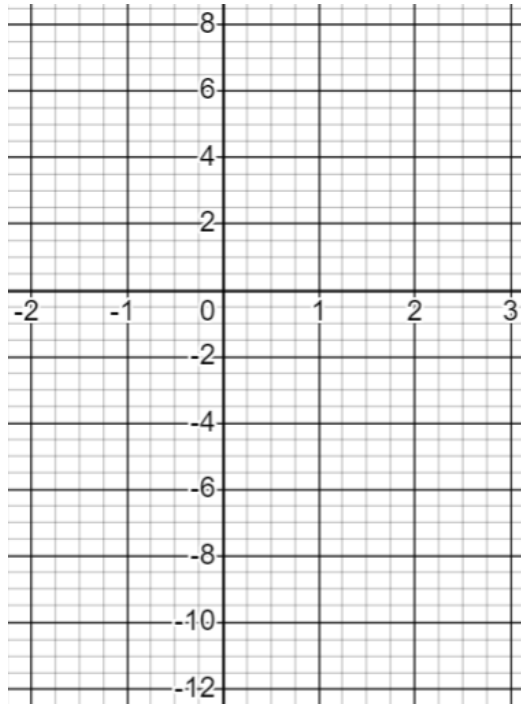
Plot the graph of $y = 3 - x + 2x^2 - x^3$ from $x = -2$ to $x = 3$

x	-2	-1	0	1	2	3
y						
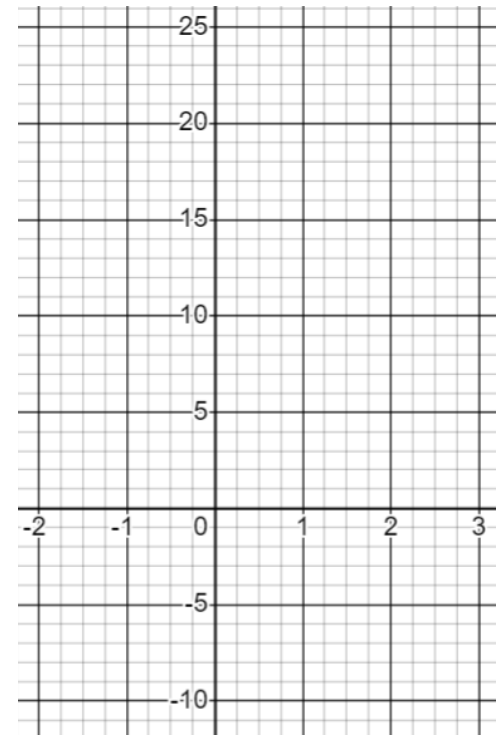
Fluency Practice

1. Draw the graph of $y = x^3 - 4x^2 + 3$

x	-2	-1	0	1	2	3	4
y							
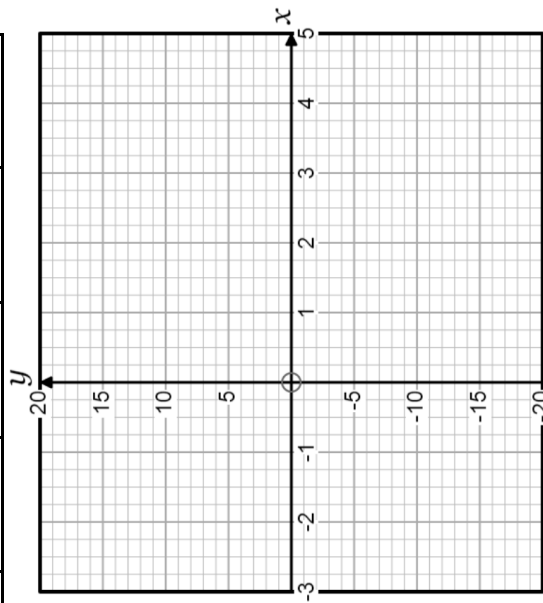
2. Estimate the roots of $y = x^3 - 4x^2 + 3$
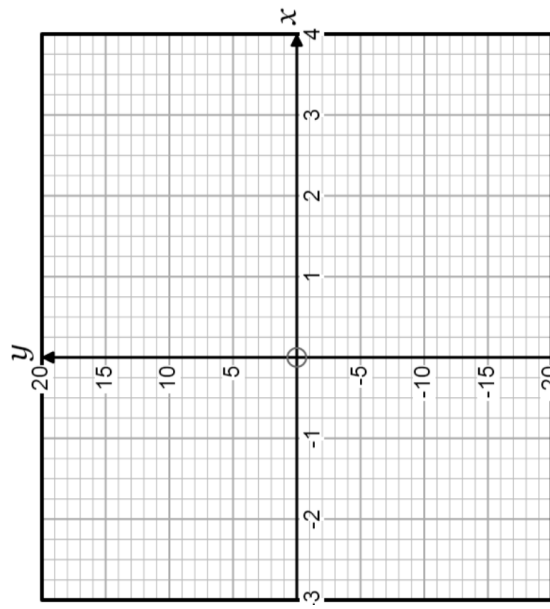
3. Estimate the co-ordinates of the turning points of $y = x^3 - 4x^2 + 3$

4. Draw the graph of $y = 2x(x-2)(x+2)$

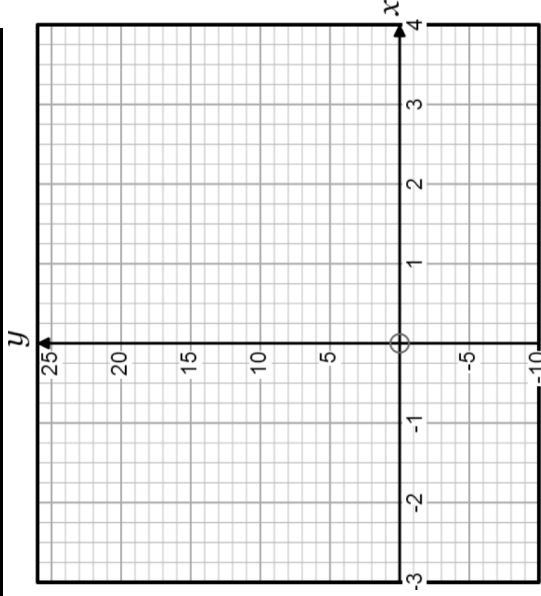| x	-2.5	-2	-1	0	1	2	2.5
y							

5. What are the roots of $y = 2x(x-2)(x+2)$?

6. Estimate the co-ordinates of the turning points of $y = 2x(x-2)(x+2)$

7. Draw the graph of $y = 5 - x^3 + 3x^2$

x	-2	-1	0	1	2	3	4
y							

8. Estimate the roots of
$y = 5 - x^3 + 2x^2$

9. Estimate the co-ordinates of the turning points of
$y = 5 - x^3 + 2x^2$

10. Why is this cubic graph 'upside down'?

11. Match the graphs to their functions:

A, B, C, D, E, F, G, H, I, J

$y = -x^2$ $y = 2x$ $y = (x-3)(x+1)$ $y = x^2 - 10$ $y = -x^3$

$y = 4 - x$ $y = 0.5x^2$ $y = x^3$ $y = x^3 - 3$ $y = (x-5)(x-3)(x+1)$
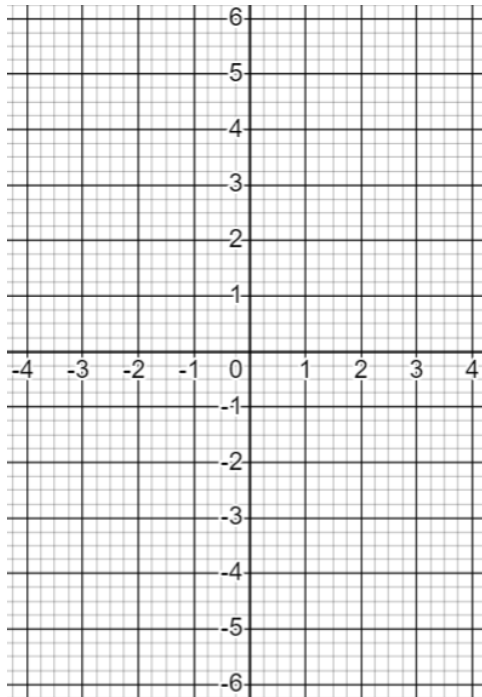
Fluency Practice

Plotting Reciprocal Graphs

(a)

Plot the graph of $y = \dfrac{2}{x}$
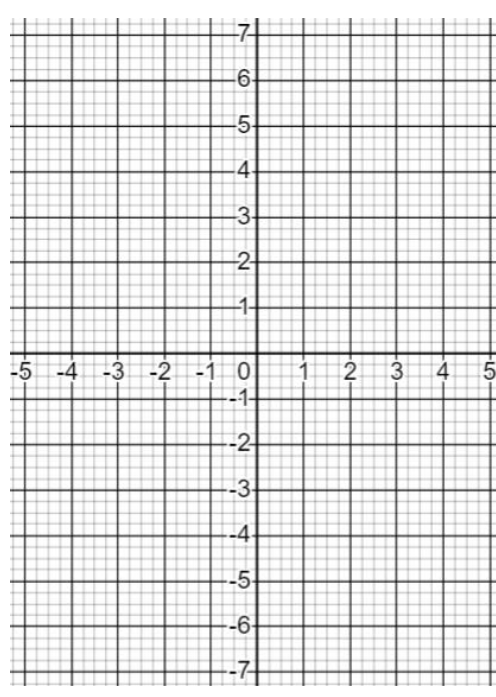
from $x = -4$ to $x = 4$

x	-4	-2	-1	0	1	2	4
y							

(b)

Plot the graph of $y = -\dfrac{5}{x}$

from $x = -5$ to $x = 5$

x	-5	-2	-1	0	1	2	5
y							

(c)

Plot the graph of $y = \dfrac{10}{x^2}$

from $x = -2$ to $x = 3$

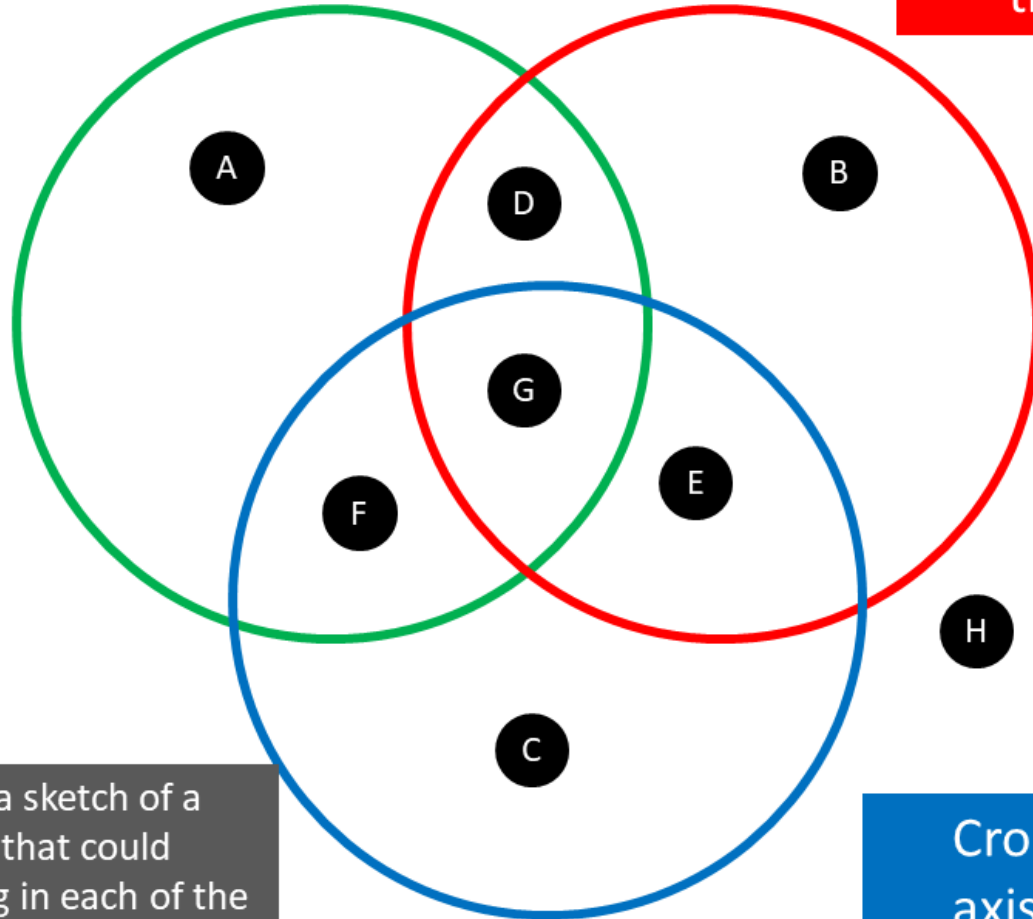| x	-5	-2	-1	0	1	2	5
y							
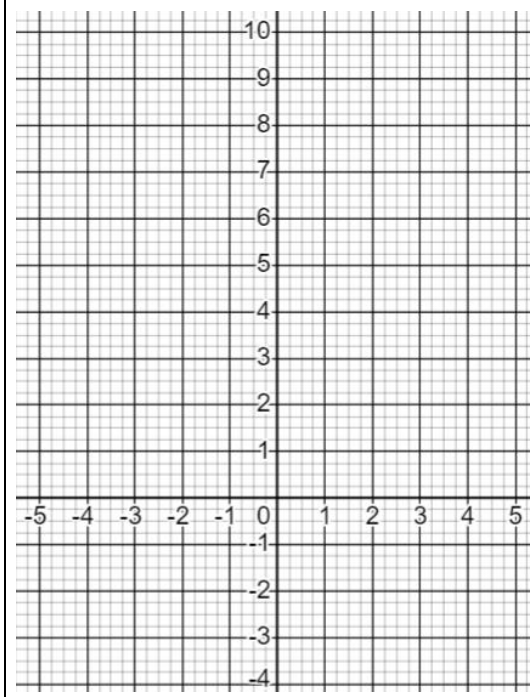
Maths Venns

Is symmetrical about the y-axis

Passes through the origin

A

D

B

If you think a region is impossible to fill, convince me why!

G

F

E

H

BONUS: Can you give the equations?

C
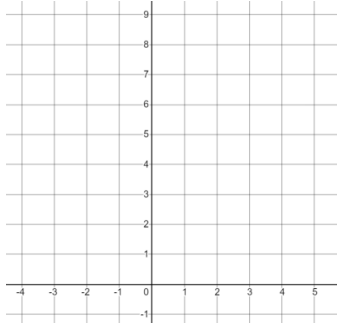
Draw a sketch of a graph that could belong in each of the regions.

Crosses the x-axis twice

Fluency Practice

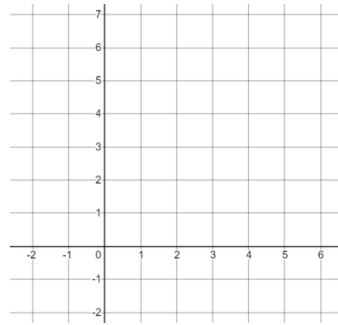## (a)

Plot the graph of the equation $y = 2x + 3$

x	-2	-1	0	1	2	3
y						

(c)

Plot the graph of $y = x^2 - 4x + 2$

x	-1	0	1	2	3	4	5
y							

(e)

Plot the graph of $y = x^3 - 4x^2 + 5$

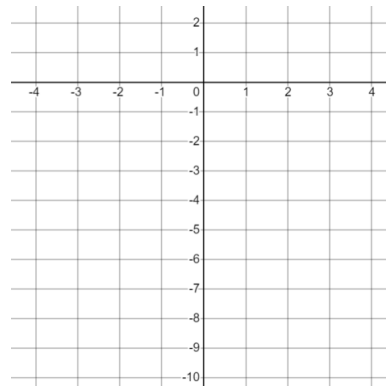| x	-1	0	1	2	3	4
y						
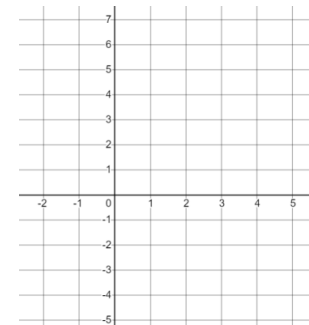
(b)

On the grid, plot the graph of $2x - 3y = 6$ from $x = 0$ to $x = 9$

(d)
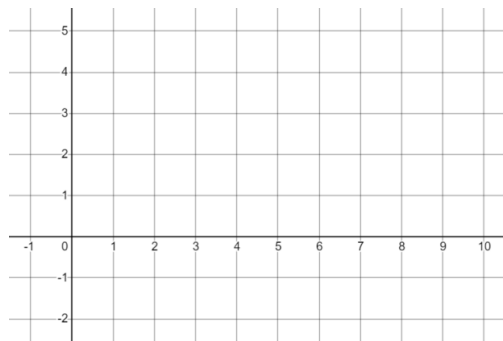
Plot the graph of $y = 2 + x - x^2$ for $x = -3$ to $x = 3$

(f)

Plot the graph of $y = x + \dfrac{8}{x}$

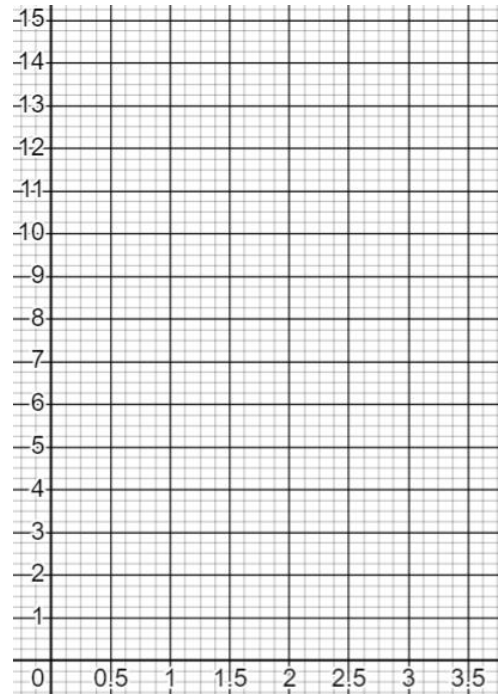| x	1	2	3	4	6	8
y						

Page 136
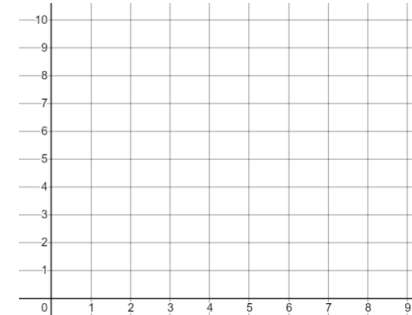
Fluency Practice

Plotting Harder Non-Linear Graphs

(a)

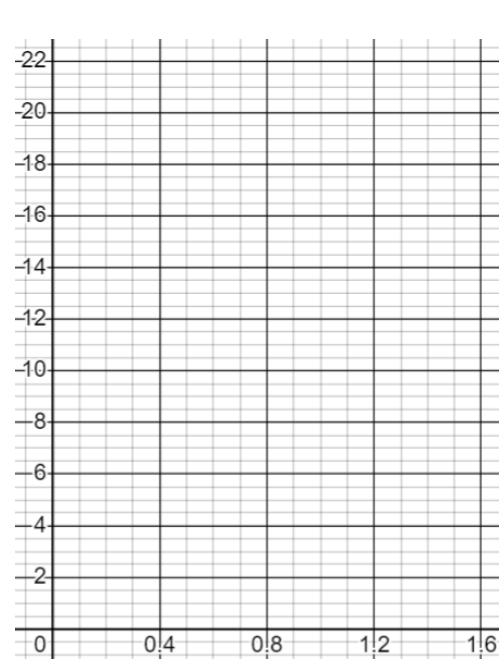Plot the graph of $y = x^2 + \dfrac{2}{x^2}$

between $x = 0.5$ and $x = 3.5$

x	0.5	1	1.5	2	2.5	3	3.5
y							

(b)

Plot the graph of $y = x^3 + 3x + \dfrac{2}{x}$

from $x = 0.1$ to $x = 1.5$

x	0.1	0.2	0.4	0.7	1	1.2	1.5
y							

(c)

Plot the graph of $y = x\left(\dfrac{x}{2} - \dfrac{1}{x^2}\right)$

from $x = -4$ to $x = -0.5$

x	-4	-3	-2	-1	-0.5	-0.25
y						