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GCSE

MATHEMATICS

GCSE Maths Predicted Paper 1
2026 (May): Non-Calculator
Set 1

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A/Prof (Dr) Nathan

GCSE Maths Predicted Papers 2026 (May)
Paper 1: Non-Calculator (Set 1)
Duration: 1 hour and 30 minutes

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This GCSE Maths paper 1 (Predicted Paper May 2026: Set 1) has been created based on the most common topics from previous past papers. This paper should be excellent for helping students revise for exams; however, it should not be relied upon as the sole basis for revision.

Grade Boundary: Grade 8: 71% and Grade 9: 84%

1.

Write 250 as a product of its prime factors

(2)

2. A particle moves in a straight line. The relationship between velocity, acceleration, and displacement is given by

$$v^2 = u^2 + 2as$$

The particle starts with an initial velocity of $u = \sqrt{20}$ m/s, moves with a constant acceleration of a 2 m/s², and travels a distance of s 4 m.

(a) Find the final velocity v

(b) Make $a$the subject of

(3)

3.

3 red balls have a mean weight of 6 kg.
4 blue balls have a mean weight of 8 kg.
2 green balls each have a weight of 5 kg.
Sam says,
"The mean weight of the 9 balls is less than 7 kg."
Is Sam correct? Show how you get your answer.

(4)

4.

(a) Simplify

$$(3q)^0 \text{ where } q > 0.$$

(b) Given that

$$x^7 \times x^{-4} = x^m,$$

Find the value of m.

(c) Simplify fully

$$(4b^3c^2)^2.$$

(3)

5.

The equation of line L_1 is

$$y = -3x + 4$$

The equation of line L_2 is

$$4y + px - 8 = 0$$

Line L_1 is perpendicular to line L_2.

Find the value of p.

You must show all your working.

(3)

6.

Find the exact vale of $\left(\frac{\sin 60 \times \tan 30}{2 \sin 30}\right)^4$

Give your answers in its simplest form

(2)

7.

Show that

$$\frac{(\sqrt{12}+\sqrt{3})^2}{\sqrt{6}-\sqrt{2}}$$

can be written in the form

$$\frac{a}{b}(\sqrt{6}+\sqrt{2}),$$

where a and b are integers.

(3)

8.

(a)

Write

$$\frac{4}{x+2}+\frac{3}{2x}$$

as a single fraction in its simplest form.

(b)

Factorise

$$(x+3y)^2+5(x+3y)$$

(3)

9.

A train travels for 36 minutes at an average speed of 100 km/h.

(a) How far does the train travel in these 36 minutes?

Liam says,

"100 kilometres per hour is faster than 50 metres per second."

(b) Is Liam correct? You must show how you get your answer.

(3)

10.

A box contains $3k$ red balls and $4k$ blue balls. A ball is drawn randomly and replaced after each trial. Find the probability that, after n trials ($n \geq 2$), at least one red ball and one blue ball have been selected.

(2)

11.

C and D are two similar cylindrical tanks.

The surface area of tank C : the surface area of tank D = 9: 16

Aisha fills tank C with juice.

She then pours all the juice into tank D.

Aisha repeats this until tank D is full.

Work out how many times Aisha fills tank C.

You must show all your working.

(4)

12.

For the curve $y = 12 + 6px - 2x^2$, find the coordinates of the maximum point in term of p.

(3)

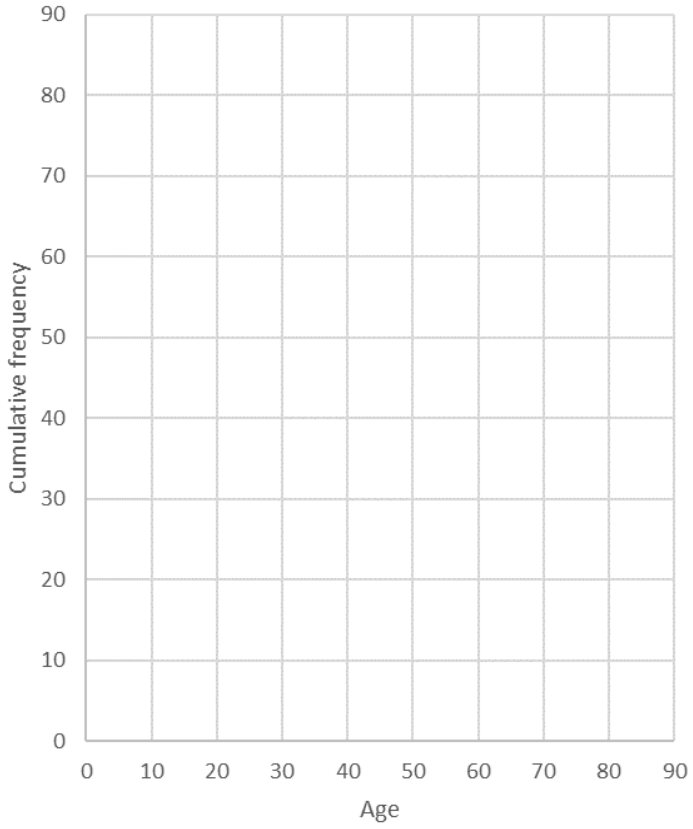
13.

The cumulative frequency table gives information about the ages of 90 people working for a company.

Age (x years)	Cumulative frequency
$20 < x \leq 30$	19
$20 < x \leq 40$	37
$20 < x \leq 50$	60
$20 < x \leq 60$	82
$20 < x \leq 70$	90

(a) On the grid below, draw a cumulative frequency graph for this information

(b) Use your graph to find an estimate for the Median Age, and Interquartile Range (IQR)



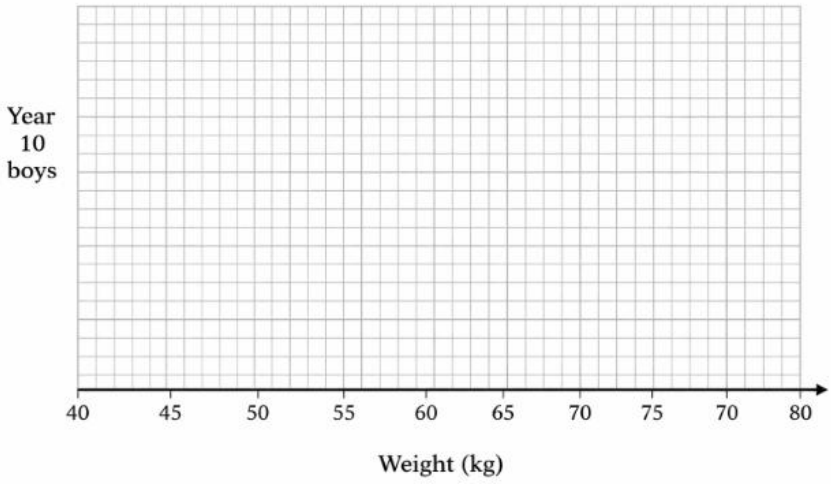
(3)

14.

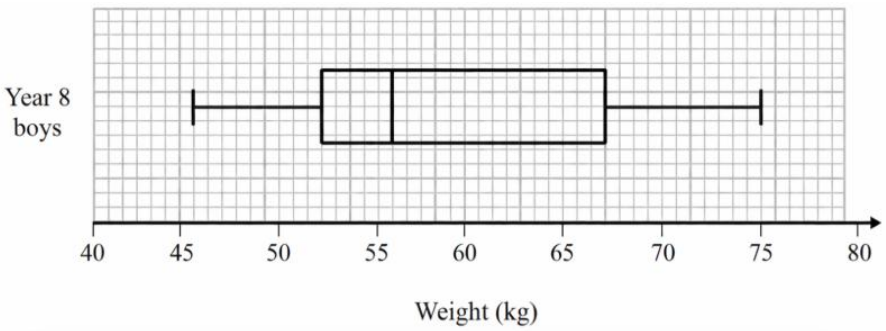
The table shows information about the weights (kg) of a group of Year 10 boys.

Measurements	Weight (kg)
Smallest	42
Median	55
Lower quartile	50
Interquartile range	10
Range	28

(a) Draw a box plot for this information on the grid.



The box plot below shows information about the weights (kg) of a group of Year 8 boys.

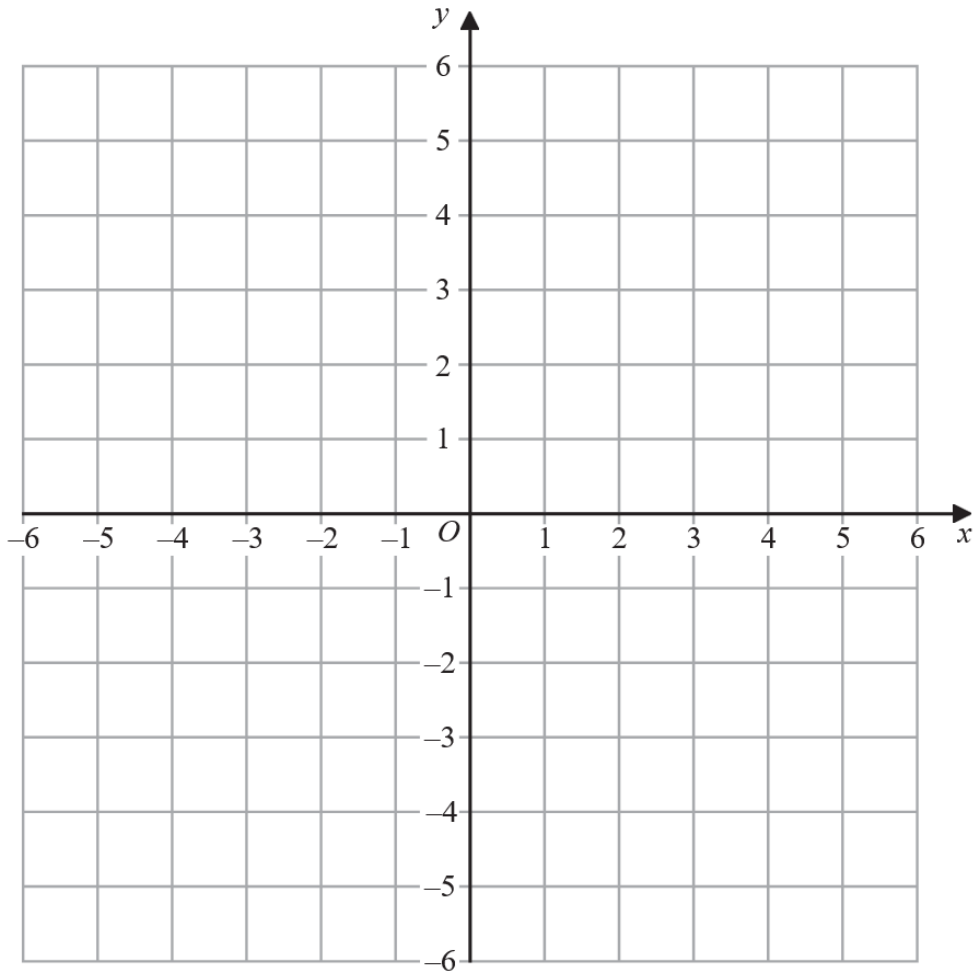


(b) Compare the distribution of weights of the Year 8 boys with the Year 10 boys.

(4)

15.

Draw the graph of $y = 2^x$ $\quad -2 \leq x \leq 2$



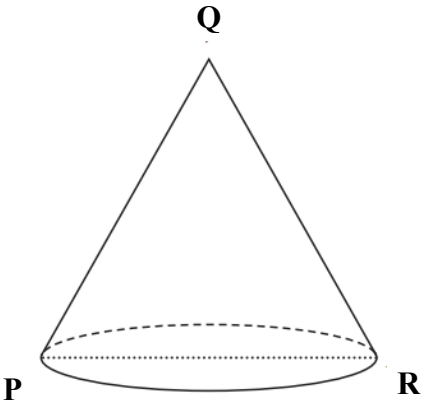
(b) The graph of the function $y = ab^x$ goes though the points (1,8) and (4,64). Find a and b.

(4)

16.

$$\frac{Area\ of\ the\ base\ of\ the\ cone}{Total\ surface\ area\ of\ the\ cone} = \frac{\sqrt{3}}{2+\sqrt{3}}$$

Find the Angle of PQR



(4)

17.

The function f is given by

$$f(x) = 3\sqrt{x} + 2$$

(a) Show that $f^{-1}(20) = 36$.

The functions g and h are given by

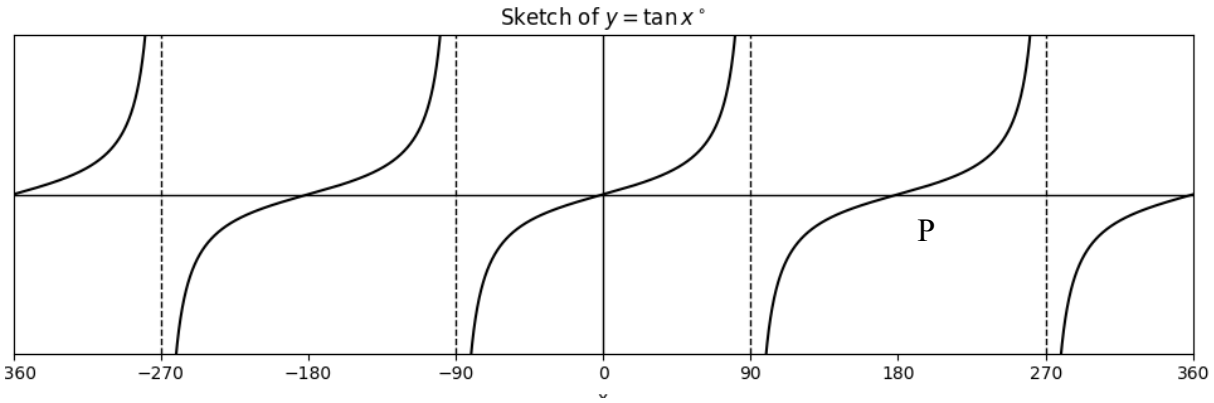
$$g(x) = x + 1 \text{ and } h(x) = 2x^2$$

(b) Find the values of x for which

$$hg(x) = 2$$

(3)

18.



The graph of $y = \tan\ x°$is translated to give the graph of

$$y = h(x).$$

After the translation, the point P shown on the graph moves to point Q.

- Point P has coordinates (180,0)
- Point Q has coordinates (280,6)

Find an expression for $h(x)$in terms of x.

(3)

19.

Using algebra, find the value of $\frac{0.3\dot{5}}{0.5\dot{5}}$

(3)

20.

k is inversely proportional to the square of p.

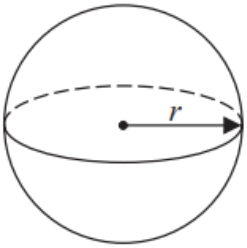
k = 1.0 when $P = \sqrt{7}$.

Find the value of k when p = 10

(3)

21.

Here is a sphere.



The surface area of a sphere is given by $4\pi r^2$

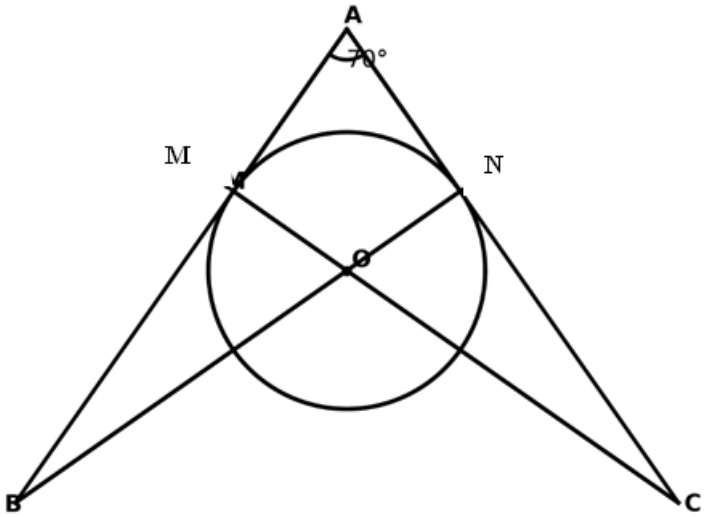
$\frac{2}{5}$of the surface area of this sphere is $32\pi\ cm^2$.

Find the radius of the sphere.

Give your answer in the form $a\sqrt{b}$, where a is an integer and $b$is a prime number.

(3)

22.



Points M and N lie on a circle with centre O.
The lines AM and AN are tangents to the circle at M and N.
The line through N and O meets the tangent AM at B.
The line through M and O meets the tangent AN at C.
Given that $\angle MAN = 70°$.
Prove that $\triangle ABN$ and $\triangle ACM$ are congruent.
Give a reason for each step.

(4)

23.

Express as a single fraction in its simplest form

$$\frac{1}{x^2-4x+3} \div \left(\frac{3}{x^2-9} - \frac{5}{x-3}\right)$$

(3)

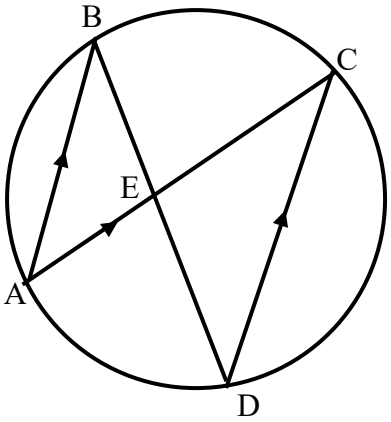
24.

Find the set of possible values of x for which

$6x^2 - 14x - 12 \leq 0 \; and \; 4x^2 + 2x > 30$

(3)

25.



A, B, C, D are points on a circle. The diagonals AC and BD intersect at E.
You are given the vectors:

$$\overrightarrow{AB} = 2\mathrm{a}, \overrightarrow{AE} = \mathrm{b}, \overrightarrow{DC} = 3\mathrm{a}.$$

Find $\overrightarrow{ED}$ in terms of a and b.

(5)

END

TOTAL FOR PAPER IS 80 MARKS

GCSE Level Maths Predicted Papers 2026 (May): Paper 1: Set 1: Answers

1.

$$\boxed{250 = 2 \times 5^3}$$

2.

(a) Find the final velocity v

$$v^2 = (\sqrt{20})^2 + 2(2)(4)$$
$$v^2 = 20 + 16 = 36$$
$$v = \sqrt{36} = 6$$
$$\boxed{v = 6 \text{ m/s}}$$

(b) Make $a$the subject

$$v^2 = u^2 + 2as$$
$$v^2 - u^2 = 2as$$
$$a = \frac{v^2 - u^2}{2s}$$
$$\boxed{a = \frac{v^2 - u^2}{2s}}$$

3.

Find total weight of each colour

- Red balls: $3 \times 6 = 18$kg
- Blue balls: $4 \times 8 = 32$kg
- Green balls: $2 \times 5 = 10$kg

Find total weight of all balls

$$18 + 32 + 10 = 60 \text{ kg}$$

$$\text{Mean} = \frac{60}{9} = 6.\bar{6} \text{ kg} \approx 6.67 \text{ kg}$$

Since $6.67 < 7$, Sam is correct.

4.

(a) Any non-zero expression raised to the power 0 equals 1.

$$(3q)^0 = \boxed{1}$$

(c) When multiplying powers with the same base, add the indices:

$$x^7 \times x^{-4} = x^{7+(-4)} = x^3$$
$$\boxed{m = 3}$$

(d) Apply the power to each factor:

$$(4b^3c^2)^2 = 4^2 \cdot b^{3\times2} \cdot c^{2\times2}$$
$$= 16b^6c^4$$
$$\boxed{16b^6c^4}$$

5.

The equation of L_1 is in the form $y = mx + c$, so the gradient is:

$$m_1 = -3$$

Rearrange $4y + px - 8 = 0$ into the form $y = mx + c$:

$$4y = -px + 8$$

$$y = -\frac{p}{4}x + 2$$

$$m_2 = -\frac{p}{4}$$

For two lines to be perpendicular:

$$m_1 \times m_2 = -1$$

$$(-3)(-\frac{p}{4}) = -1$$

$$\frac{3p}{4} = -1$$

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

6.

$$\left(\frac{\sin 60 \times \tan 30}{2\sin 30}\right)^4$$

$$= \left(\frac{\sqrt{3/2} \times \frac{1}{\sqrt{3}}}{2 \times 1/2}\right)^4$$

$$= 1/16$$

7.

First simplify the numerator:

$$(\sqrt{12} + \sqrt{3})^2 = 12 + 3 + 2\sqrt{36} = 15 + 12 = 27.$$

So the expression becomes

$$\frac{27}{\sqrt{6} - \sqrt{2}}.$$

Rationalise the denominator by multiplying top and bottom by $\sqrt{6} + \sqrt{2}$:

$$\frac{27(\sqrt{6} + \sqrt{2})}{(\sqrt{6} - \sqrt{2})(\sqrt{6} + \sqrt{2})} = \frac{27(\sqrt{6} + \sqrt{2})}{6 - 2} = \frac{27(\sqrt{6} + \sqrt{2})}{4}.$$

8.(a)

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

$$\frac{8x + 3x + 6}{2x(x + 2)} = \frac{11x + 6}{2x(x + 2)}$$

$$\boxed{\frac{11x+6}{2x(x+2)}}$$

(b)

Take out the common factor $(x+3y)$:

$$(x+3y)^2+5(x+3y)$$
$$=(x+3y)((x+3y)+5)$$
$$\boxed{(x+3y)(x+3y+5)}$$

9.

Convert 36 minutes to hours:

$$36\text{ min}=\frac{36}{60}=0.6\text{ h}$$

Distance =speed ×time:

$$100\times 0.6=60$$
$$\boxed{60\text{ km}}$$

(b) Is Liam correct?

Convert 100 km/hto m/s:

$$100\text{ km/h}=\frac{100\,000}{3600}\text{ m/s}\approx 27.8\text{ m/s}$$

Compare with 50 m/s:

$$27.8<50$$

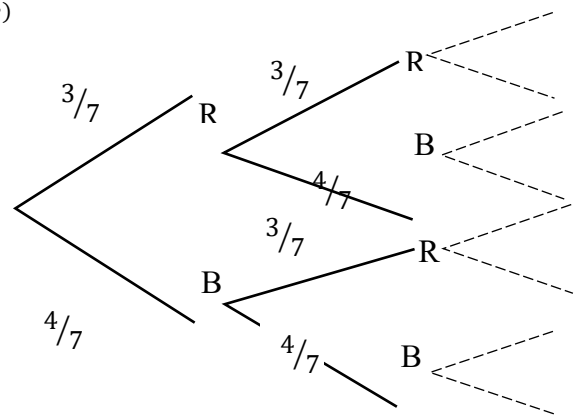
So 100 km/his slower than 50 m/s.

$$\boxed{\text{No, Liam is not correct.}}$$

10.

Probability $\Rightarrow 1-P_{(all\ red)}-P_{(all\ blue)}$

$$\Rightarrow 1-\left({}^{3}/_{7}\right)^{n}-\left({}^{4}/_{7}\right)^{n}$$



11.

For similar shapes:

- Surface area ratio $=9:16$
- Linear scale factor $=\sqrt{\frac{9}{16}}=\frac{3}{4}$(C to D)

Volume ratio is the cube of the linear scale factor:

$$\text{Volume ratio } C:D=(\frac{3}{4})^3=\frac{27}{64}$$

So tank D is:

$$\frac{64}{27}$$

times the volume of tank C.
That means Aisha must fill tank C:

$$\boxed{\frac{64}{27}}$$

Final answer: $\boxed{2\frac{10}{27} \text{ times}}$: 3 times

12.

$Y = 12 + 6px - 2x^2$

$Y = -2(x^2 - 3px - 6)$

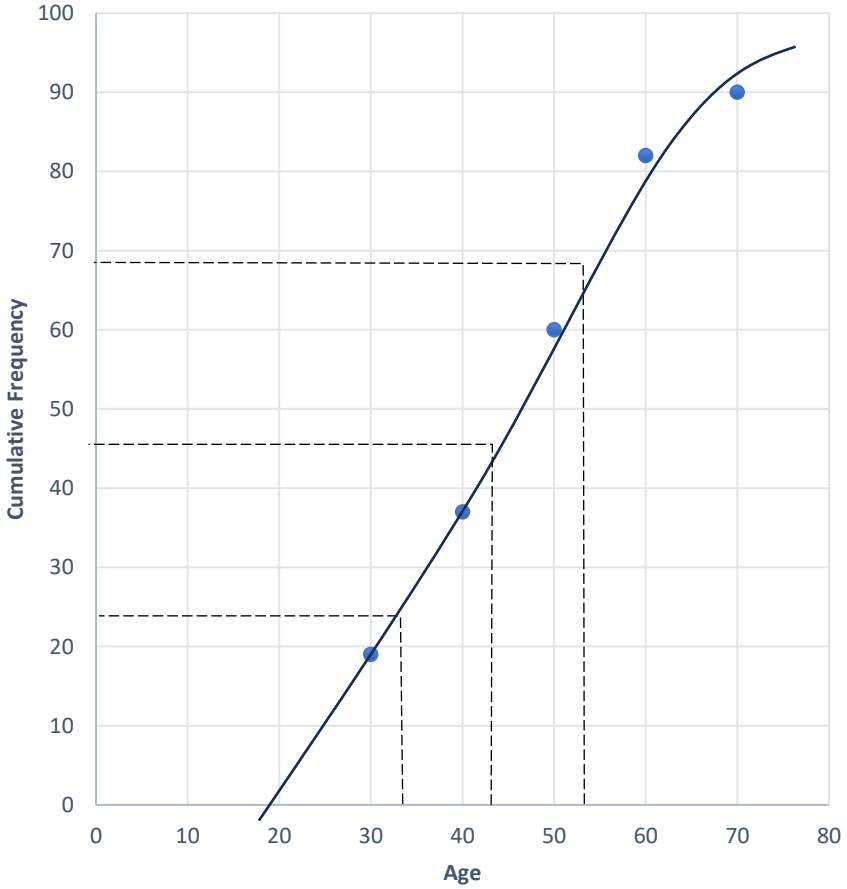
$= -2\left[\left(x - \frac{3p}{2}\right)^2 - \left(\frac{3p}{2}\right)^2 - b\right]$

$= -2\left[\left(x - \frac{3p}{2}\right)^2 - \left(\frac{9p^2 + 24}{4}\right)\right]$

$= -2\left(x - \frac{3p}{2}\right)^2 + \frac{9p^2 + 24}{2}$

Max. point $\left(\frac{3p}{2}, \frac{9p^2+24}{4}\right)$

13.a)



b)

$$\text{median} \rightarrow 90 \times {}^{1}/_{2} = 45^{th} \Rightarrow 43$$

$$\left.\begin{array}{l} \text{U.Q} \Rightarrow 90 \times {}^{3}/_{4} \Rightarrow 67.5 \Rightarrow 54 \\ \text{L.Q} \Rightarrow 90 \times {}^{1}/_{4} \Rightarrow 22.5 \Rightarrow 33 \end{array}\right\} \text{I.Q.R} = 54 - 33 = 21$$

14.

a) Find missing values

Find Upper Quartile $Q3$

$$Q3 = Q1 + IQR = 50 + 10 = 60$$

Find Maximum

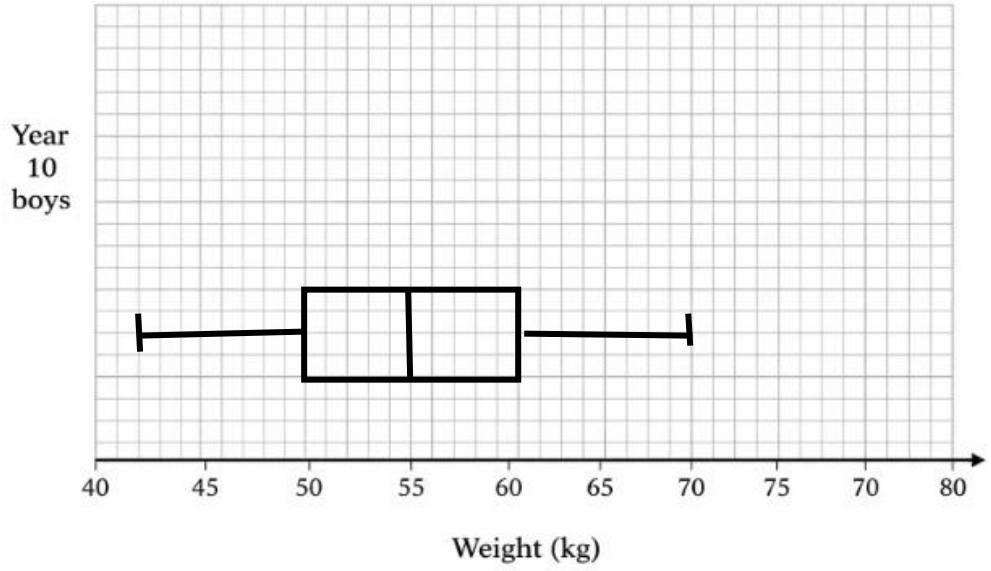
$$\text{Maximum} = \text{Smallest} + \text{Range} = 42 + 28 = 70$$

Five-number summary:

- Minimum = 42
- Q1 = 50
- Median = 55
- Q3 = 60
- Maximum = 70

Box plot (what you draw)

- Box from 50 to 60
- Median line at 55
- Whiskers to 42 and 70



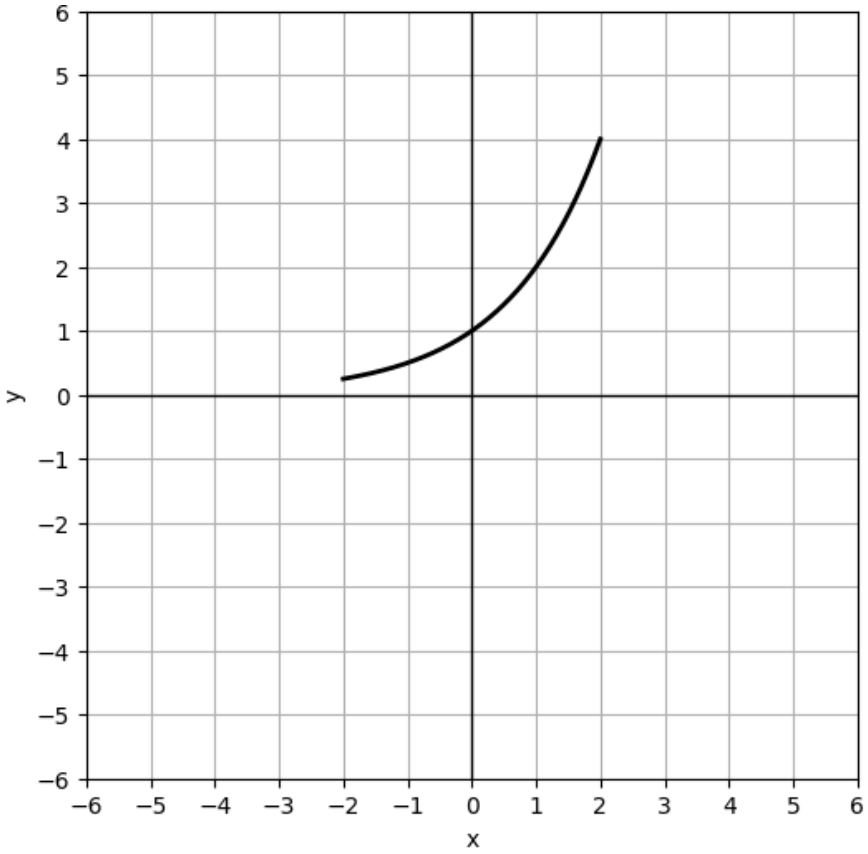
(b) Comparison (model answer)

Answer:

- The medians are similar (both around mid-50s)
- The Year 8 boys have a larger range, so their weights are more spread out

- The Year 10 boys have a smaller spread (IQR = 10), so their weights are more consistent

15. (a)



(b) Find $a$and $b$if $y = ab^x$passes through (1,8)and (4,64)

From (1,8):

$$8 = ab^1 \Rightarrow ab = 8$$

From (4,64):

$$64 = ab^4$$

Divide the second equation by the first:

$$\frac{64}{8} = \frac{ab^4}{ab} = b^3$$
$$8 = b^3 \Rightarrow b = 2$$

Now use $ab = 8$:

$$a(2) = 8 \Rightarrow a = 4$$
$$\boxed{a = 4, b = 2}$$

16.

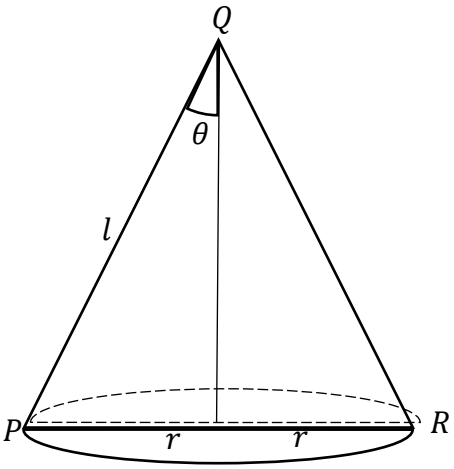
$$\frac{\text{Area of the base of the cone}}{\text{Total surface area of the cone}} = \frac{\sqrt{3}}{2+\sqrt{3}} = \frac{\pi r^2}{\pi r^2 + \pi r t}$$

$$\frac{r^2}{r^2 + rl} = \frac{\sqrt{3}}{2+\sqrt{3}}$$

$$r^2(2+\sqrt{3}) = (r^2 + rl)\sqrt{3}$$

$$2r^2 = \sqrt{3}rl$$

$$r = \frac{\sqrt{3}}{2}l$$



$$\sin\theta = \frac{r}{l}$$

$$= \frac{\sqrt{3}/_2\, l}{l}$$

$$\sin\theta = \sqrt{3}/_2$$

$$\sin\theta = \sin 60°$$

$$P\hat{Q}R = 2\theta$$

$$= \frac{2\pi}{3}$$

$$= 120°$$

17.

(a)

To show that $f^{-1}(20) = 36$, we check that $f(36) = 20$.

$$f(36) = 3\sqrt{36} + 2$$
$$= 3(6) + 2$$
$$= 18 + 2 = 20$$

Since $f(36) = 20$, it follows that:

$$\boxed{f^{-1}(20) = 36}$$

(b)

Find the values of $x$for which $hg(x) = 2$

First find the composite function:

$$hg(x) = h(g(x)) = h(x+1) = 2(x+1)^2.$$
$$2(x+1)^2 = 2$$
$$(x+1)^2 = 1$$
$$x + 1 = \pm 1.$$
$$x = 0 \text{ or } x = -2.$$

18.

Original graph:

$$y = \tan\ x^\circ$$

Point $P(180,0)$moves to point $Q(280,6)$

Horizontal movement

$$250 - 280 = 100$$

Vertical movement

$$6 - 0 = 6$$

$$h(x) = \tan\ (x - 100)^\circ + 6$$

19.

$x = 0.3\dot{5}$

$10x = 3.\dot{5}\ -$ ①

$100x = 35.\dot{5}\ -$ ②

② − ① ⇒ $90x = 32$

$x = {}^{32}/_{90}$

$y = 0.5\dot{5} = 0.\dot{5}\ -$ ③

$10y = 5.\dot{5}\ -$ ④

④ − ③ ⇒ $9y = 5$

$y = {}^{5}/_{9}$

$$\Rightarrow {}^{x}/_{y} = \frac{{}^{32}/_{90}}{{}^{5}/_{9}} = \frac{32}{50} = {}^{16}/_{25}$$

20.

$k\alpha \frac{1}{p^2}$

$k = \frac{m}{p^2}$

When $\binom{k=1}{p=\sqrt{7}} \Rightarrow 1 = \frac{m}{(\sqrt{7})^2}$

$m = 1 \times 7 = 7$

Equation $\Rightarrow k = \frac{7}{p^2}$

$p = 10$

$$k = \frac{7}{100} = 0.07$$

21.

Let the radius of the sphere be r.

$$\frac{2}{5} \times 4\pi r^2 = 32\pi$$

$$\frac{8}{5}\pi r^2 = 32\pi$$

$$r^2 = 32 \times \frac{5}{8} = 20$$

$$r = \sqrt{20} = \sqrt{4 \times 5} = 2\sqrt{5}$$

22.

1. $\angle ANB = 90°$
   Reason: A radius is perpendicular to a tangent at the point of contact.
   (ON is a radius and $AN$is tangent at N; also Blies on line ON, so $NB$is along ON.)

2. $\angle AMC = 90°$
   Reason: A radius is perpendicular to a tangent at the point of contact.
   (OM is a radius and $AM$is tangent at M; also Clies on line OM, so $MC$is along OM.)

3. $AN = AM$
   Reason: Tangents from the same external point are equal in length.

4. $\angle BAN = \angle CAM$
   Reason: They are the same angle formed by the same two lines $AM$and AN.
   (B lies on AM, Clies on AN, so $\angle BAN$is the angle between $AM$and AN, and $\angle CAM$is also the angle between $AN$and AM.)

5. Therefore, $\triangle ABN \cong \triangle ACM$
   Reason: ASA congruence (two equal angles and the included side:
   $\angle ANB = \angle AMC$, $AN = AM$, and $\angle BAN = \angle CAM$).

23.

$$\frac{1}{x^2-4x+3} \div \left(\frac{3}{x^2-9} - \frac{5}{x-3}\right)$$

$$\Rightarrow \frac{1}{(x-3)(x-1)} \div \left(\frac{3}{(x-3)(x+3)} - \frac{5}{(x-3)}\right)$$

$$\Rightarrow \frac{1}{(x-3)(x-1)} \div \left(\frac{3-5(x+3)}{(x-3)(x+3)}\right)$$

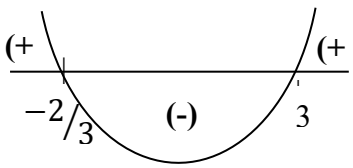
$$\Rightarrow \frac{1}{(x-3)(x-1)} \div \left(\frac{-5x-12}{(x-3)(x+3)}\right)$$

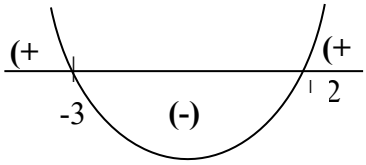
$$\Rightarrow \frac{1}{(x-3)(x-1)} \times \left(\frac{(x-3)(x+3)}{-(5x+12)}\right)$$

$$\Rightarrow \frac{-(x+3)}{(x-1)(5x+12)}$$

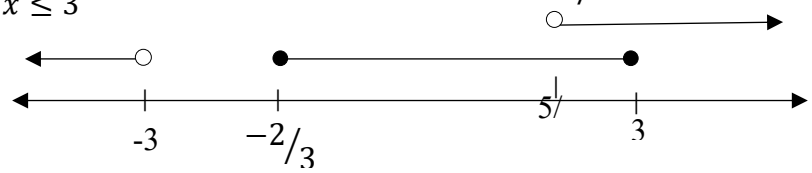
24.

$6x^2 - 14x - 12 \leq 0$	or	$4x^2 + 2x > 30$
$6x^2 - 14x - 12 \leq 0$	or	$2x(2x + 1) > 30$
$2(3x^2 - 7x - 6) \leq 0$	or	$x(2x + 1) > 15$
$2(3x + 2)(x - 3) \leq 0$	or	$2x^2 + x - 15 > 0$
$2(3x + 2)(x - 3) \leq 0$	or	$(2x - 5)(x + 3) > 0$





$-2/3 \leq x \leq 3$ $\quad -3 > x$ or $x > 5/2$



And $\quad 3 \geq x > 5/2$

25.

Identify two triangles

Consider triangles:

- $\triangle AEB$
- $\triangle CED$

Show the triangles are similar

- $\angle AEB = \angle CED$(vertically opposite angles, since $AC$and BD intersect at E)
- $\angle ABE = \angle CDE$(alternate/corresponding angles because $AB \parallel DC$and $BE$is the same line as DE)

$$\triangle AEB \sim \triangle CED$$

Use corresponding side ratios

From similarity:

$$\frac{AB}{DC} = \frac{AE}{EC}$$

Substitute $AB = 2$aand $DC = 3$a(same direction, parallel):

$$\frac{AB}{DC} = \frac{2}{3}$$

$$\frac{AE}{EC} = \frac{2}{3} \Rightarrow EC = \frac{3}{2}AE$$

Given $\overrightarrow{AE} = \mathrm{b}$, and Elies on ACso $\overrightarrow{EC}$is in the same direction as $\overrightarrow{AE}$,

$$\overrightarrow{EC} = \frac{3}{2}\mathrm{b}$$

$$\overrightarrow{ED} = \overrightarrow{EC} + \overrightarrow{CD} = \frac{3}{2}\mathrm{b} - 3\mathrm{a}$$

END

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GCSE

MATHEMATICS

GCSE Maths Predicted Paper 2
2026 (June): Calculator
Set 1

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GCSE Maths Predicted Paper 2026 (June)
Paper 2: Calculator (Set 1)
Duration: 1 hour and 30 minutes

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This GCSE Maths paper 2 (Predicted Paper June 2026: Set 1) has been created based on the most common topics from previous past papers. This paper should be excellent for helping students revise for exams; however, it should not be relied upon as the sole basis for revision.

Grade Boundary: Grade 8: 70% and Grade 9: 82%

1.

Work out

$$\sqrt{\frac{3.7 \times \sin 28°}{6.1^2 - 15.2 \tan 25^o}}$$

Give your answer correct to 3 significant figures.

(2)

2.

Last year, a community recycled 1200 kg of household waste.
65% of this waste was plastic and metal.
The ratio

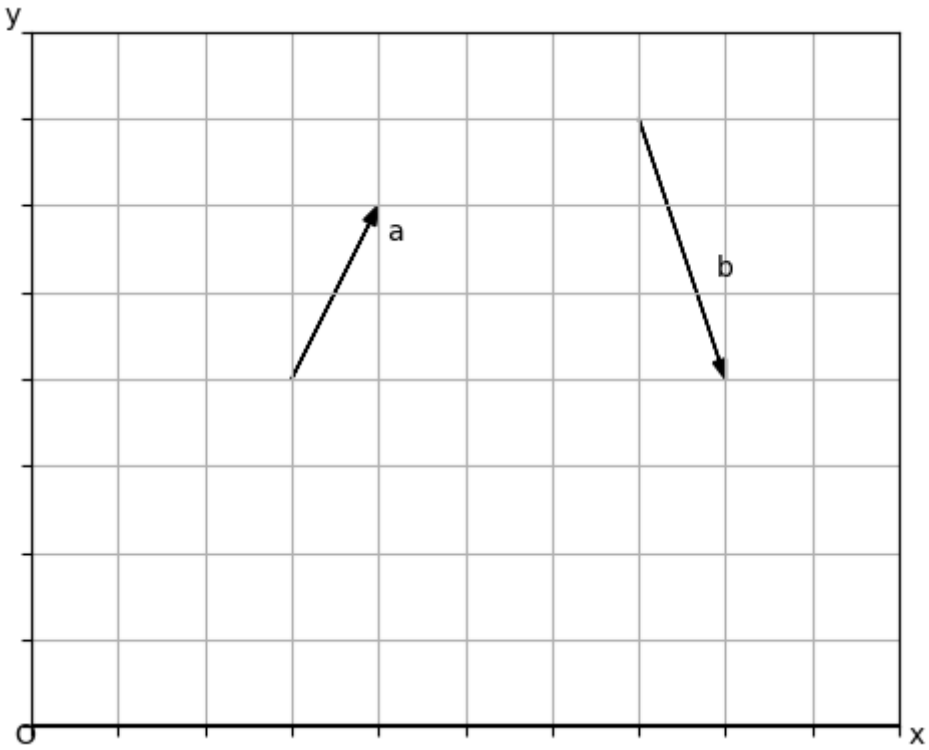
$$\text{weight of plastic:weight of metal} = 5:3.$$

Calculate the weight of metal recycled.

(3)

3.

The vector a and the vector b are shown on the grid



(a)
On the grid, draw and label the vector $-1.5a$.

(b)
Work out $3a + 4b$ as a column vector.

(3)

4.

A sector OAB of a circle has centre O and radius 10 cm.

The area of the sector is 75 cm^2.

Calculate the perimeter of the sector.

Give your answer correct to 3 significant figures.

(4)

5.

A force of 60 newtons acts on an area of 15 cm^2.

The force is increased by 15 newtons.

The area is increased by 5 cm^2.

A student says:

"The pressure decreases by more than 10%."

Is the student correct?

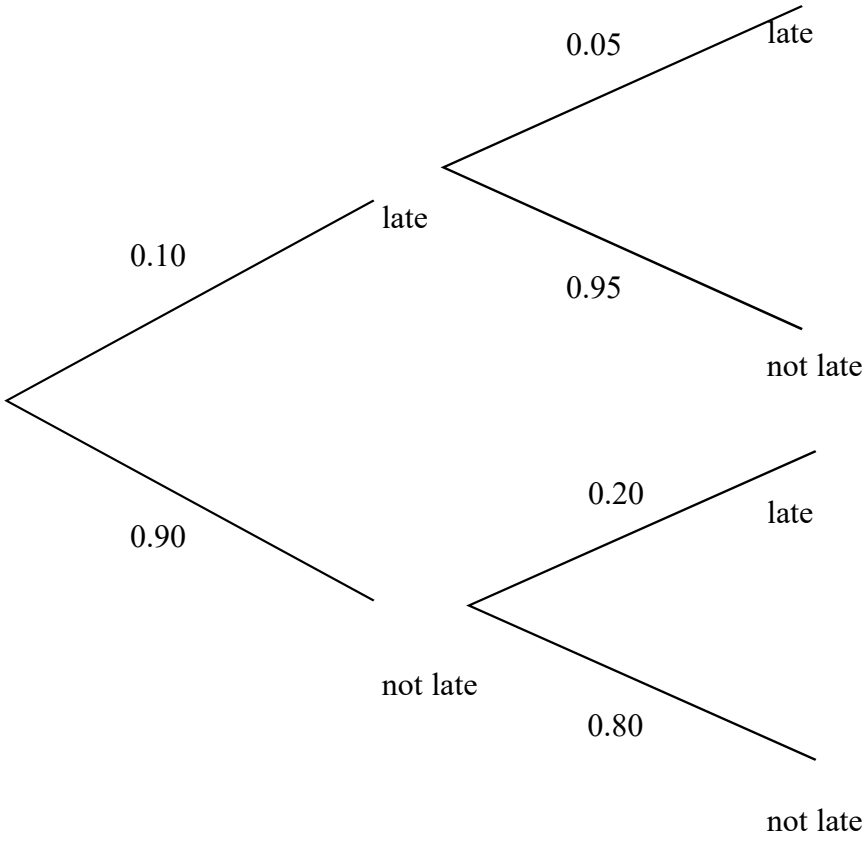
Show all your working.

$$\text{Pressure} = \frac{\text{force}}{\text{area}}$$

(3)

6.

The probability tree diagram shows the probabilities that Peter will be late for work on two days next week.



Calculate the probability that Peter will be late on exactly one of the two days.

(2)

7.

Make n the subject of

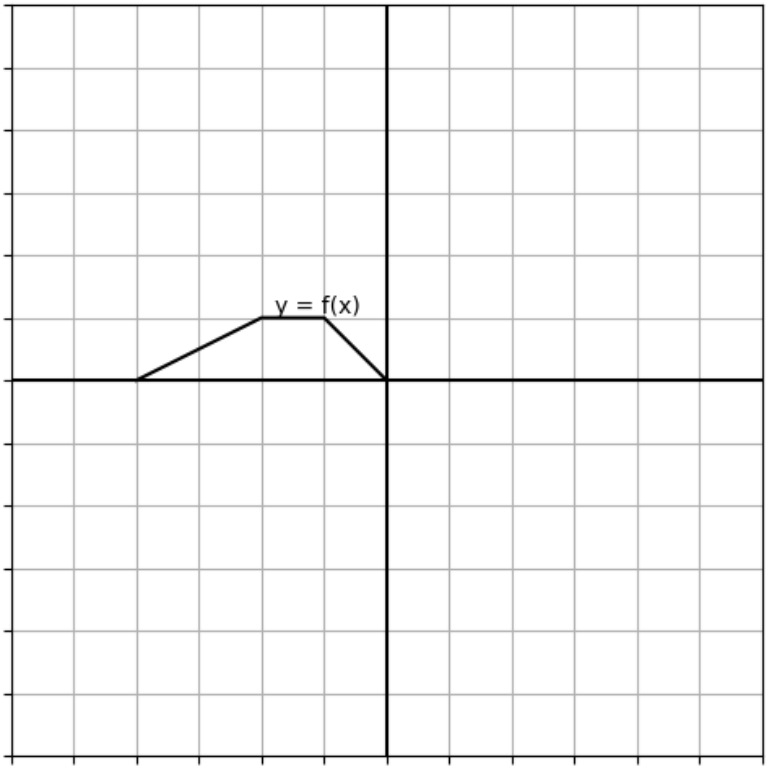
$$k = \frac{5n^2 - 3}{2n^2 + 7}.$$

(3)

8. Here is the graph of $y = f(x)$.

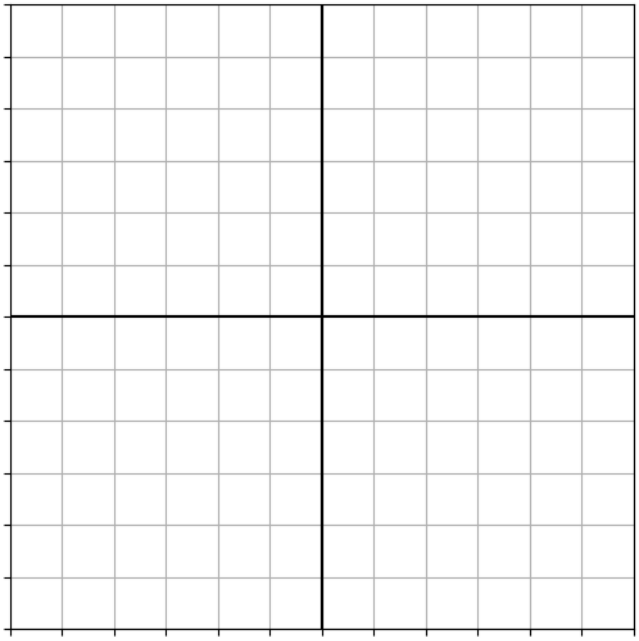
The graph consists of straight-line segments joining the points

$$(-4,0),\ (-2,1),\ (-1,1),\ (0,0).$$



(a) On the grid below, draw the graph of

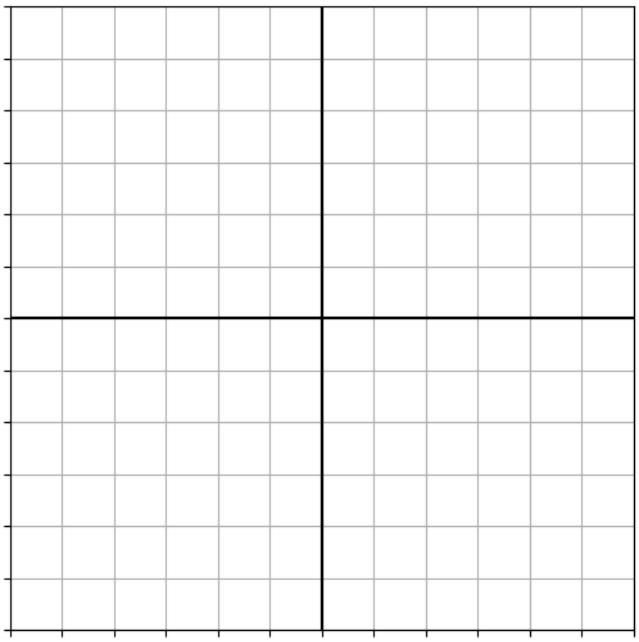
$$y = f(x) - 2.$$



(b)

On the grid below, draw the graph of

$$y = f(-x).$$



(2)

9.

Work out

$$(6.47 \times 10^{-8}) \div (3.236 \times 10^{-4})$$

Give your answer in standard form**.**

(3)

10.

Two mathematically similar cones are made from metal. The ratio of the surface area of the smaller cone to the surface area of the larger cone is 9:16. If the volume of the smaller cone is 250 cm³, find the volume of the larger cone.

(3)

11.

Given that

$$3a : 4c = 9 : 16$$
$$5b : 6c = 25 : 24$$

Show that

$$a + b : b + c = 8 : 9$$

(4)

12. Use algebra to solve the simultaneous equation find x and y values in degree.

$0^o \leq x, y \leq 90^o$

$$6sinx + 2siny = 3$$

$$3sinx - 4siny = -3$$

(4)

13.

ABC is a right-angled triangle, right-angled at B.

- $BC = 11.2$cm correct to the nearest mm
- $AC = 13.9$cm correct to the nearest mm

Angle $x$is at C.

Calculate the lower and upper bound for the size of angle x.

You must show all your working.

(3)

14.

Aamir invested £4200 for 4 years.

- He was paid 3.1% compound interest for each of the first 3 years.
- He was paid R%interest for the fourth year.

At the end of 4 years he had £4867.67.

Find R. Give your answer correct to 1 decimal place.

(3)

15.

The n^{th} term of a sequence is given by $pn^2 + qn$ where a and b are integers.The

2^{nd} term of the sequence is 2 and the 4^{th} term of the sequence is 10

(a) Find the 5^{th} term of the sequence.

(b) Here are the first 5 terms of a different quadratic sequence find the nth term of this sequence

0 4 12 24 40

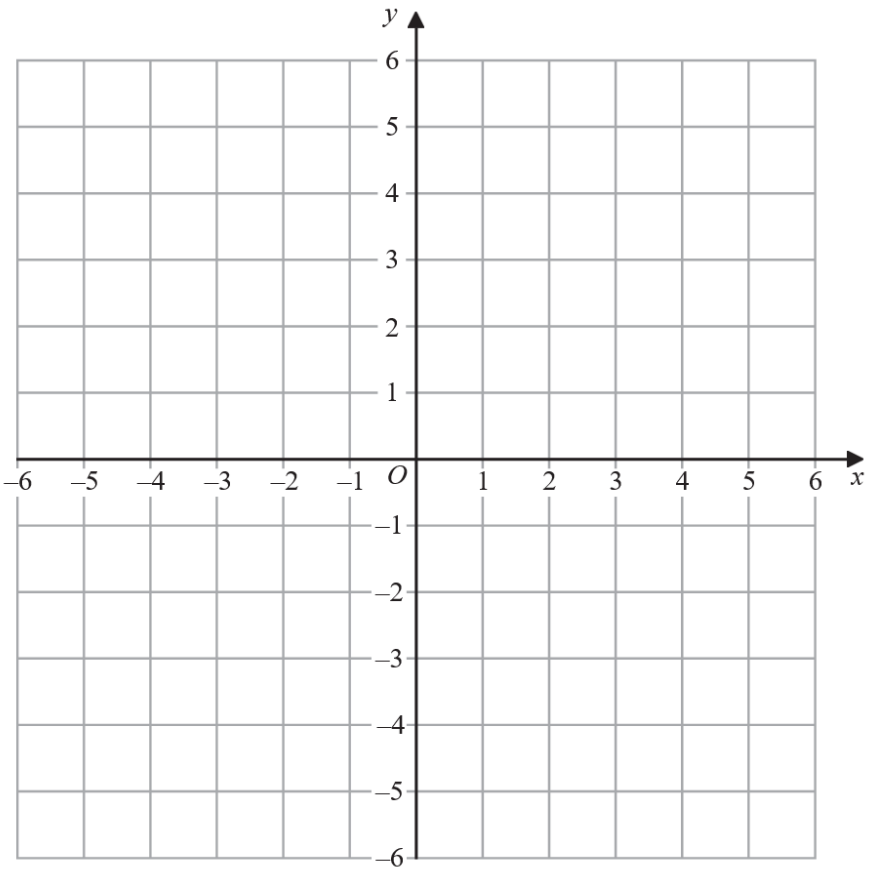
(4)

16.

(a) Complete the table of values for $y = 2x^2 - 2x - 3$

x	-2	-1	0	0	2	3
y						

(b) On the grid, draw the graph of $y = 2x^2 - 2x - 3$ for values of x from -2 to 3



(c) Use your graph to find estimates of the solutions of the equation

$x^2 + 2x - 1 = 0$

(4)

17.

$20x^2 = 7xy + 6y^2$ where $x > 0$ and $y > 0$

Find the ratio $x : y$

(3)

18.

(a)

Show that the equation

$$x^4 - x^2 - 3 = 0$$

can be written in the form

$$x = \sqrt[4]{x^2 + 3}.$$

(b)

Starting with $x_0 = 1.3$, use the iteration formula

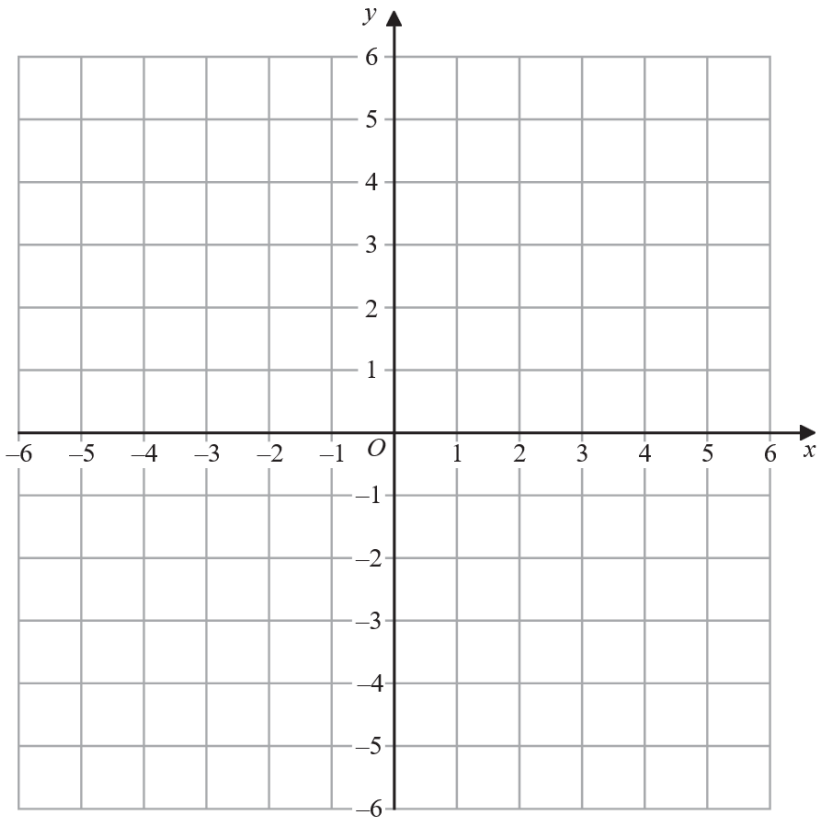
$$x_{n+1} = \sqrt[4]{x_n^2 + 3}$$

three times to find an estimate for a solution of $x^4 - x^2 - 3 = 0$.

(3)

19.

a) On the grid, construct the graph of $x^2 + y^2 = 25$



b) Using part (a), find estimates for the solutions of the simultaneous equations.

$$x^2 + y^2 = 25$$

$$y = -2x + 3$$

(4)

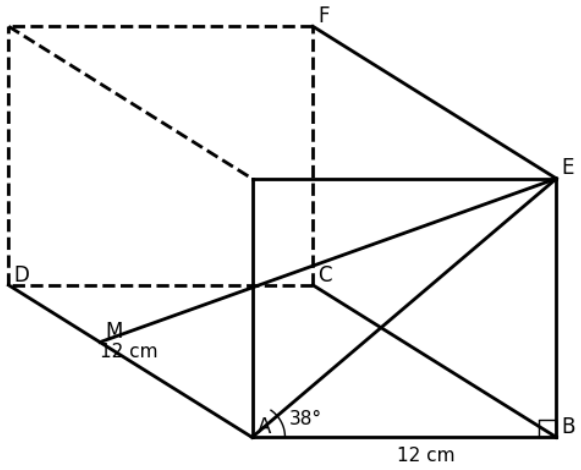
20.

James is ordering a new laptop.
He can choose:

- 12 different laptop colours
- 18 different storage options
- a number of different keyboard layouts

The total number of different laptops James can order is 4320.
Work out the number of different keyboard layouts James can choose from. **(3)**

21.



A triangular prism has a square base $ABCD$ of side length 12 cm.

- $\angle ABE$ and $\angle CBE$ are right angles.
- $\angle EAB = 38°$.
- M is on DA such that

$$DM : MA = 3 : 5$$

Calculate the angle between EM and the base of the prism.

(5)

22.

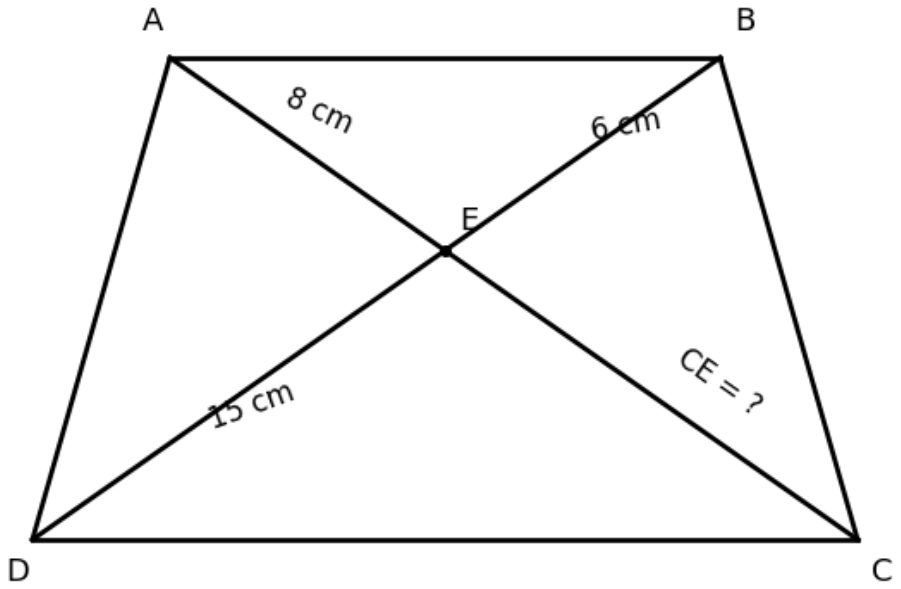
Here are the first five terms of an arithmetic sequence:

5, 11, 17, 23, 29

Prove that the difference between the squares of any two terms of this sequence is always a multiple of 12**.**

(3)

23.



Shape $ABCD$ is a trapezium with $AB \parallel DC$. Diagonals AC and BD intersect at E.
Given:

- $AE = 8$ cm
- $EB = 6$ cm
- $DE = 15$ cm

Find CE.

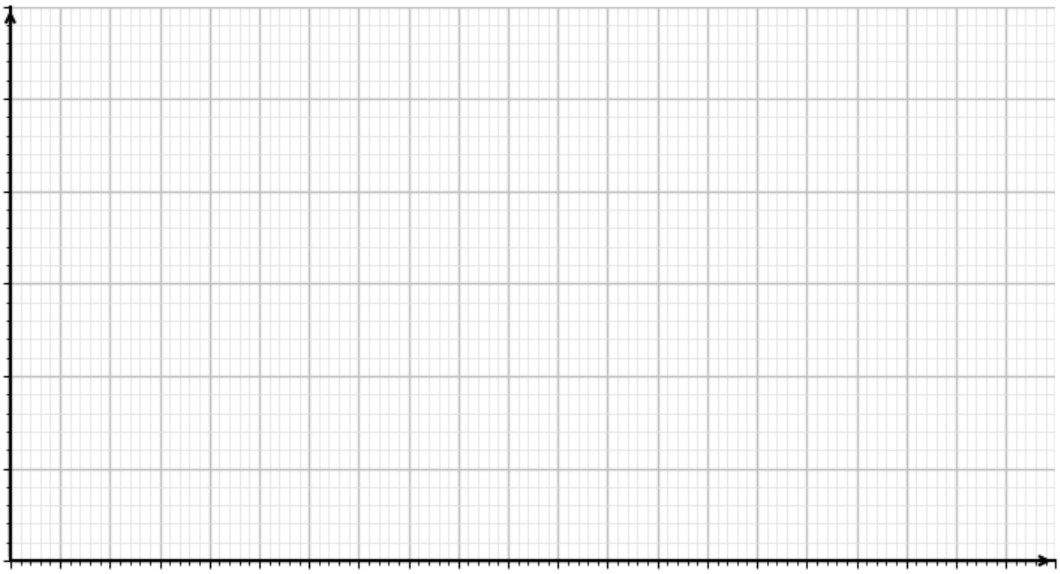
(3)

24.

The table gives information about the widths w metres, of trees in some wood.

Width (w m)	Frequency
$0 < h \leq 3$	3
$3 < h \leq 4$	4
$4 < h \leq 7$	15
$7 < h \leq 15$	24
$15 < h \leq 21$	12

Draw a histogram to show this information.



(3)

25.

Given that

$$\cos x = \frac{p}{q}, \text{where } q > p > 0,$$

Find an expression for $\tan x$ in terms of p and q.

(3)

END

TOTAL FOR PAPER IS 80 MARKS

GCSE Level Maths Predicted Paper 2: 2026 (June) Set 1: Answers

1.

0.240

2.

$$65\% \text{ of } 1\,200 = 0.65 \times 1\,200 = 780 \text{ kg}$$

Plastic : Metal $= 5:3$

Total parts $= 5 + 3 = 8$

Each part:

$$780 \div 8 = 97.5 \text{ kg}$$

Step 3: Find the weight of metal

$$\text{Metal} = 3 \times 97.5 = 292.5 \text{ kg}$$

3.

(a) Draw and label the vector $-1.5a$

First calculate $-1.5a$:

$$-1.5a = -1.5\begin{pmatrix}1\\2\end{pmatrix} = \begin{pmatrix}-1.5\\-3\end{pmatrix}.$$

How to draw it on the grid

- From any point, move 1.5 units left
- Then move 3 units down
- Draw the arrow and label it $-1.5a$

(b) Work out $3a + 4b$as a column vector

Find 3a

$$3a = 3\begin{pmatrix}1\\2\end{pmatrix} = \begin{pmatrix}3\\6\end{pmatrix}.$$

Find 4b

$$4b = 4\begin{pmatrix}1\\-3\end{pmatrix} = \begin{pmatrix}4\\-12\end{pmatrix}.$$

Add the vectors

$$3a + 4b = \begin{pmatrix}3\\6\end{pmatrix} + \begin{pmatrix}4\\-12\end{pmatrix} = \begin{pmatrix}7\\-6\end{pmatrix}.$$

4.

$$\text{Area} = \frac{\theta}{360}\pi r^2$$

$$75 = \frac{\theta}{360}\pi(10)^2$$

$$\theta \approx 85.9°$$

$$\text{Arc length} = \frac{\theta}{360} \cdot 2\pi r$$

$$= \frac{85.9}{360} \cdot 2\pi(10)$$

$$\approx 14.99 \text{ cm}$$

Perimeter =arc length +two radii:

$$P = 14.99 + 2(10) = 34.99\ cm$$

5.

Pressure $= \frac{\text{force}}{\text{area}}$

Original pressure

$$P_1 = \frac{60}{15} = 4$$

New pressure

$$P_2 = \frac{75}{20} = 3.75$$

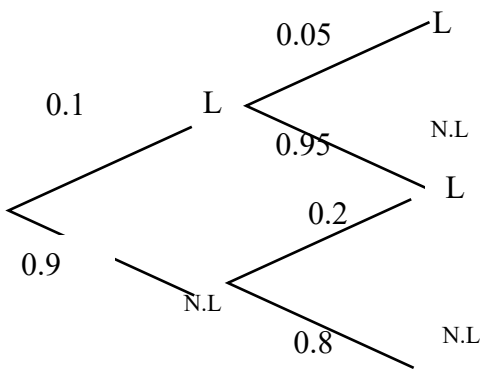
Decrease in pressure

$$4 - 3.75 = 0.25$$

$$\frac{0.25}{4} \times 100 = 6.25\%$$

Since $6.25\% < 10\%$, the student is not correct.

6.



Not late exactly one day $\Rightarrow 0.1 \times 0.95 + 0.9 \times 0.2$

$\Rightarrow 0.095 + 0.18$

$\Rightarrow 0.275$

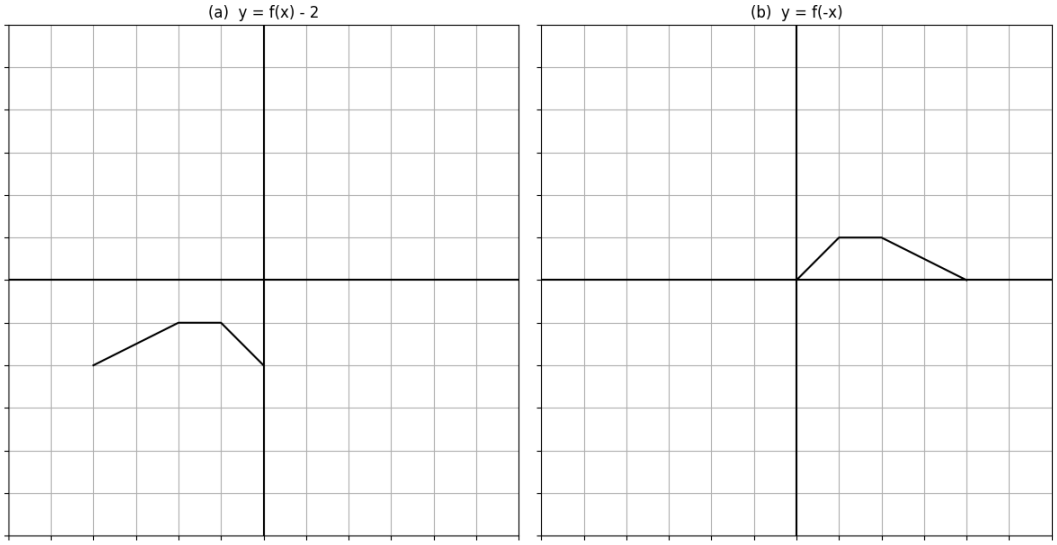
7.

$$k(2n^2 + 7) = 5n^2 - 3.$$
$$2kn^2 + 7k = 5n^2 - 3.$$
$$2kn^2 - 5n^2 = -3 - 7k$$
$$n^2(2k - 5) = -(7k + 3).$$

$$n^2 = \frac{-(7k+3)}{2k-5} = \frac{7k+3}{5-2k}.$$

$$\boxed{n = \pm\sqrt{\frac{7k+3}{5-2k}}}$$

8.



9.

1.998×10^{-4}

10.

		Small	:	large
Area ratio	=	9	:	16
Volume ratio	=	$(\sqrt{9})^3$	:	$(\sqrt{16})^3$
	=	27	:	64

Therefore, large volume $= \frac{250}{27} \times 64 = 592.6cm^3$

11.

$$3a:4c = 9:16$$
$$\frac{3a}{4c} = \frac{9}{16}$$
$$a = \frac{3}{4}c$$
$$5b:6c = 25:24$$
$$\frac{5b}{6c} = \frac{25}{24}$$

$$b = \frac{5}{4}c$$
$$a + b = \frac{3}{4}c + \frac{5}{4}c = \frac{8}{4}c = 2c$$
$$b + c = \frac{5}{4}c + c = \frac{9}{4}c$$
$$a + b : b + c = 2c : \frac{9}{4}c$$
$$\boxed{a + b : b + c = 8:9}$$

12.

$$a = \sin\ x, b = \sin\ y.$$

Then the equations become:

$$6a + 2b = 3(1)$$
$$3a - 4b = -3(2)$$
$$12a + 4b = 6(3)$$
$$15a = 3$$
$$a = \frac{1}{5}.$$
$$\sin\ x = \frac{1}{5}.$$
$$6(\frac{1}{5}) + 2b = 3$$
$$b = \frac{9}{10}.$$
$$\sin\ y = \frac{9}{10}.$$
$$x = \sin^{-1}(\frac{1}{5}) \approx 11.54°.$$
$$y = \sin^{-1}(\frac{9}{10}) \approx 64.16°.$$
$$\boxed{x \approx 11.5°, y \approx 64.2°}$$

13.

1) Write the bounds for BC and AC

$$BC = 11.2 \text{ cm}$$
$$11.15 \leq BC < 11.25$$

$$AC = 13.9 \text{ cm}$$
$$13.85 \leq AC < 13.95$$
$$\cos\ x_{\min} = \frac{11.25}{13.85} = 0.812274\ldots$$
$$x_{\min} = \cos^{-1}(0.812274\ldots) = 35.681\ldots°$$
$$\boxed{x_{\min} \approx 35.7°}$$
$$\cos\ x_{\max} = \frac{11.15}{13.95} = 0.799283\ldots$$
$$x_{\max} = \cos^{-1}(0.799283\ldots) = 36.938\ldots°$$
$$\boxed{x_{\max} \approx 36.9°}$$
$$\boxed{35.7° \leq x < 36.9°}$$

14.

After 3 years:

$$4200(1.031)^3$$
$$(1.031)^3 \approx 1.095939$$
$$\text{Amount after 3 years} \approx 4200 \times 1.095939 = 4602.94$$

Final amount:

$$4602.94(1+\frac{R}{100}) = 4867.67$$
$$1+\frac{R}{100} = \frac{4867.67}{4602.94} = 1.05750$$
$$\frac{R}{100} = 0.05750 \Rightarrow R = 5.750$$
$$\boxed{R = 5.8\% \text{ (1 d.p.)}}$$

15.

nth term $\Rightarrow\ pn^2 + qn$

$n = 2\ /\quad 2 = p2^2 + 2q$

$1 = 2p + q\ -\ ①$

$n = 4\ /\quad 10 = p(4)^2 + 4q$

$10 = 16p + 4q$

$5 = 8p + 2q\ -\ ②$

$① \times 2 \Rightarrow\quad 2 = 4p + 2q\ -\ ③$

$② - ③ \Rightarrow\quad 3 = 4p$

$p = {}^3/_4$

$1 = 2({}^3/_4) + q$

$q = 1\ {}^{-6}/_4 = {}^{-2}/_4$

$q = {}^{-1}/_2$

Equation $\Rightarrow\ {}^3/_4 n^2\ {}^{-1}/_2 n$

a) $n = 5\ /\quad {}^3/_4 (5)^2\ {}^{-1}/_2 (5)$

$\Rightarrow\ {}^{75}/_4\ {}^{-5}/_2 = {}^{65}/_4$

b) 0 , 4 , 12 , 24 , 40

4 , 8 , 12 , 16

4 , 4 , 4

$2a = 4\quad ,\quad 3a + b = 4\quad a + b + c = 0$

$a = 2\quad 6 + b = 4\quad 2 + (-2) + c = 0$

$b = (-2)$

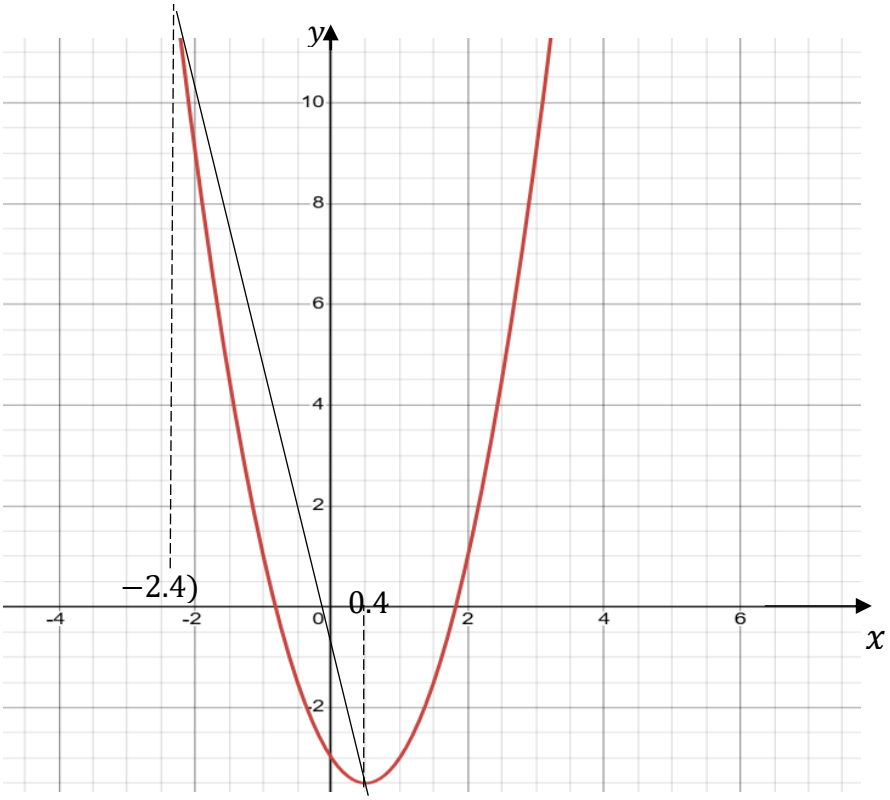
$\Rightarrow\ 2n^2 - 2n$

16.

a)

x	-2	-1	0	0	2	3
y	9	1	-3	-3	1	9

b)



$y = -6x - 1$

x	0	-1
y	-1	5

$$x^2 + 2x - 1 = 0$$
$$2x^2 + 4x - 2 = 0 \quad (1)$$
$$2x^2 - 2x - 3 = y \; (2)$$
$$(2) - (1) \quad -6x - 1 = y$$

Solutions $\Rightarrow x = 0.4, -2.4$

17.

Rearrange:

$$20x^2 - 7xy - 6y^2 = 0$$

Divide the whole equation by y^2

$$20(\frac{x}{y})^2 - 7(\frac{x}{y}) - 6 = 0$$

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

$$\frac{x}{y} = \frac{3}{4} \text{ or } \frac{x}{y} = -\frac{2}{5}$$

Apply the condition $x > 0, y > 0$

Reject the negative value.

$$\boxed{x : y = 3 : 4}$$

18. a)

$$x^4 - x^2 - 3 = 0 \Rightarrow x^4 = x^2 + 3 \Rightarrow x = \sqrt[4]{x^2 + 3}$$

(b) Three iterations

$$x_{n+1} = \sqrt[4]{x_n^2 + 3}$$

- $x_0 = 1.3$

$$x_1 = \sqrt[4]{1.3^2 + 3} = \sqrt[4]{1.69 + 3} = \sqrt[4]{4.69} \approx 1.472$$

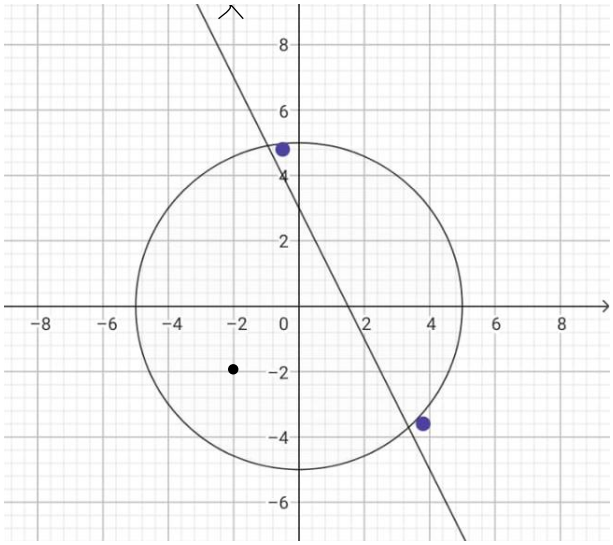
$$x_2 = \sqrt[4]{x_1^2 + 3} = \sqrt[4]{(1.4716)^2 + 3} = \sqrt[4]{2.1656 + 3} = \sqrt[4]{5.1656} \approx 1.508$$

$$x_3 = \sqrt[4]{x_2^2 + 3} = \sqrt[4]{(1.5076)^2 + 3} = \sqrt[4]{2.2728 + 3} = \sqrt[4]{5.2728} \approx 1.515$$

$$\boxed{x \approx 1.515}$$

19.

a)



b)

x

$y = -2x + 3$

x	0	1
y	3	1

x	y
- 0.9	4.8
3.4	- 3.7

20.

Use the product rule

Total combinations = (laptop colours) × (keyboard layouts) × (storage options)

Let the number of keyboard layouts be x.

$$12 \times x \times 18 = 4320$$

Solve for x

$$216x = 4320$$

$$x = \frac{4320}{216} = 20$$

21.

Since $\angle ABE = 90°$, triangle $ABE$is right-angled at B.

$$\tan(\angle EAB) = \frac{BE}{AB}$$
$$BE = AB\tan 38° = 12\tan 38°$$
$$BE \approx 12(0.7813) = 9.375 \text{ cm}$$

Find BMin the base

$DA = 12$cm and $DM : MA = 3:5$so $DA$is split into $3 + 5 = 8$parts.

$$DM = \frac{3}{8} \times 12 = 4.5, MA = \frac{5}{8} \times 12 = 7.5$$
$$BM = \sqrt{(12)^2 + (7.5)^2} = \sqrt{200.25} \approx 14.151$$

Angle between $EM$and the base

In right triangle EBM:

$$\tan\theta = \frac{BE}{BM} = \frac{9.375}{14.151} = 0.6625$$
$$\theta = \tan^{-1}(0.6625) \approx 33.5°$$

22.

Write the nth term

The sequence has first term 5and common difference 6, so

$$u_n = 5 + (n-1)6 = 6n - 1$$

Take two terms $u_m$and u_n

$$u_m = 6m - 1, u_m = 6m - 1$$

Consider the difference of their squares:

$$u_m^2 - u_n^2$$

Use difference of two squares:

$$u_m^2 - u_n^2 = (u_m - u_n)(u_m + u_n)$$

Substitute

$$u_m - u_n = (6m - 1) - (6n - 1) = 6(m - n)$$
$$u_m + u_n = (6m - 1) + (6n - 1) = 6(m + n) - 2 = 2(3(m + n) - 1)$$

$$u_m^2 - u_n^2 = 6(m - n) \cdot 2(3(m + n) - 1)$$
$$= 12(m - n)(3(m + n) - 1)$$

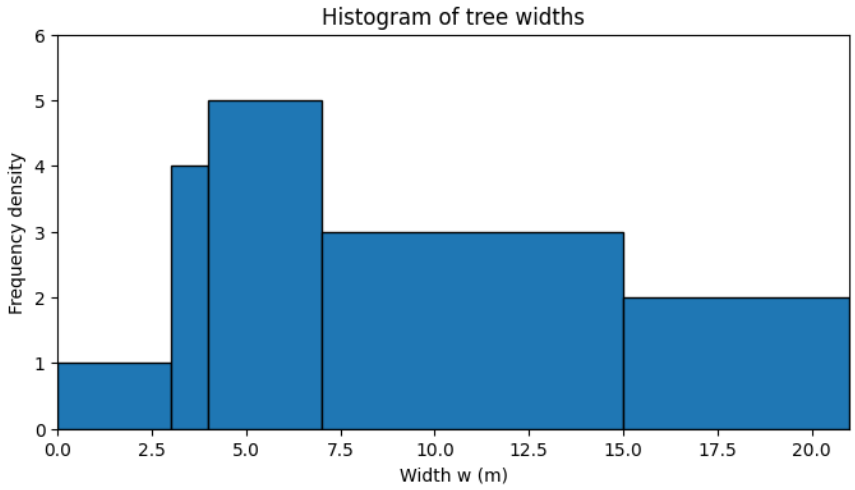
Conclude divisibility

Since $(m - n)(3(m + n) - 1)$is an integer,

$u_m^2 - u_n^2$ is always a multiple of 12.

Therefore, the difference between the squares of any two terms is divisible by 12.

23.



Calculate frequency density

$$\text{Frequency density} = \frac{\text{Frequency}}{\text{Class width}}$$

Class interval (m)	Frequency density
$0 < h \leq 3$	$3 \div 3 = 1$
$3 < h \leq 4$	$4 \div 1 = 4$
$4 < h \leq 7$	$15 \div 3 = 5$
$7 < h \leq 15$	$24 \div 8 = 3$
$15 < h \leq 21$	$12 \div 6 = 2$

24.

In a trapezium with $AB \parallel DC$, the diagonals intersecting at E divide each other in the same ratio:

$$\frac{AE}{CE} = \frac{BE}{ED}.$$

$$AE = 8, BE = 6, DE = 15$$

$$\frac{8}{CE} = \frac{6}{15}$$

$$\boxed{CE = 20 \text{ cm}}$$

25.

$$\cos x = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{p}{q},$$

- adjacent side $= p$
- hypotenuse $= q$

Let the opposite side be r.

Use Pythagoras' theorem

$$r^2 + p^2 = q^2$$

$$r^2 = q^2 - p^2$$

$$r = \sqrt{q^2 - p^2}$$

$$\tan x = \frac{\text{opposite}}{\text{adjacent}} = \frac{r}{p} = \frac{\sqrt{q^2 - p^2}}{p}$$

END

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GCSE

MATHEMATICS

GCSE Maths Predicted Paper 3
2026 (June): Calculator
Set 1

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This GCSE Maths paper 3 (Predicted Paper June 2026: Set 1) has been created based on the most common topics from previous past papers. This paper should be excellent for helping students revise for exams; however, it should not be relied upon as the sole basis for revision.

Grade Boundary: Grade 8: 70% and Grade 9: 82%

1.

Last year Sam paid £320 for his home insurance.

This year he has to pay £416 for his home insurance.

Work out the percentage increase in the cost of Sam's home insurance.

(2)

2.

Three shops sell the same model of bicycle.

- The price from Cycles UK is £1650
- The price from Vélos France is €2190
- The price from Ride USA is $2550

The exchange rates are:

- £1 = €1.30
- £1 = $1.50

Which shop sells the bicycle at the lowest price?

You must show all your working.

(3)

3.

Emma wants to buy 18 packs of floor tiles.

Here is some information about the cost of tiles from two different shops.

Tile World

- 6 packs for £78

Home Styles

- Pack of 3 costs £45
- 15% off the normal price

Emma wants to buy the 18 packs of tiles as cheaply as possible.

Should Emma buy the tiles from Tile World or from Home Styles?

You must show how you get your answer.

(3)

4.

x and y are integers such that

$$2 < x < 7, \qquad 5 < y < 12$$

and

$$2x + y = 15$$

Find all possible values of x.

(4)

5.

Alex, Bella, and Chris are sharing tokens.

- Alex has some tokens.
- Bella has three times as many tokens as Alex.
- Chris has 8 fewer tokens than Bella.
- Altogether, they have 69 tokens.

The ratio

number of tokens Alex has : number of tokens Chris has = 1 : n

Work out the value of n.

(3)

6.

Here are three alarms.

- Alarm A sounds every 18 seconds.
- Alarm B sounds every 30 seconds.
- Alarm C sounds every 72 seconds.

The three alarms start sounding at the same time.

How many times in 2 hours will all three alarms sound at the same time?

(4)

7.

$$(my^{-3})^{\frac{4}{n}} = 16y^{-2}$$

Work out the value of $n$and the value of m.

(3)

8.

Triangle $PQR$is a right-angled triangle.

- Angle $Q = 90°$
- $PR = 18$ cm
- The ratio

size of angle P: size of angle $R = \sqrt{2}:\sqrt{3}$

Work out the length of PQ.

(3)

9.

Shape P is reflected in the line with equation

$$x = 1$$

to give shape Q**.**

Shape Q is then reflected in the line with equation

$$x = 5$$

to give shape R**.**

Describe fully the single transformation that maps shape P directly onto shape R**.**

(3)

10.

Solve algebraically the simultaneous equations:

$$x^2 - 9y^2 = 16$$
$$4x + 3y = 10$$

(4)

11.

There are 12 basketball teams in a tournament.
Each team plays two matches against each of the other teams.
Work out the total number of matches played in the tournament.

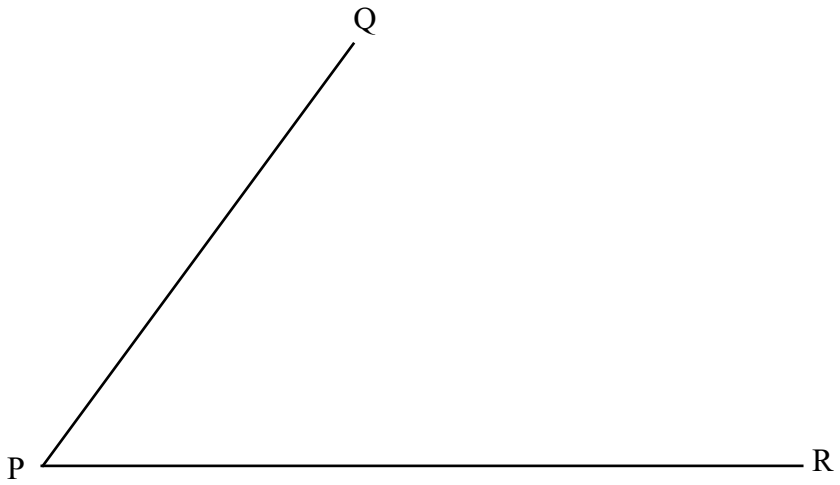
(3)

12.

Use ruler and compasses to construct the bisector of angle QPR

Use ruler and compasses to construct a perpendicular bisector of the line PR

A point X is to be placed where the two paths cross. Mark the position of point X



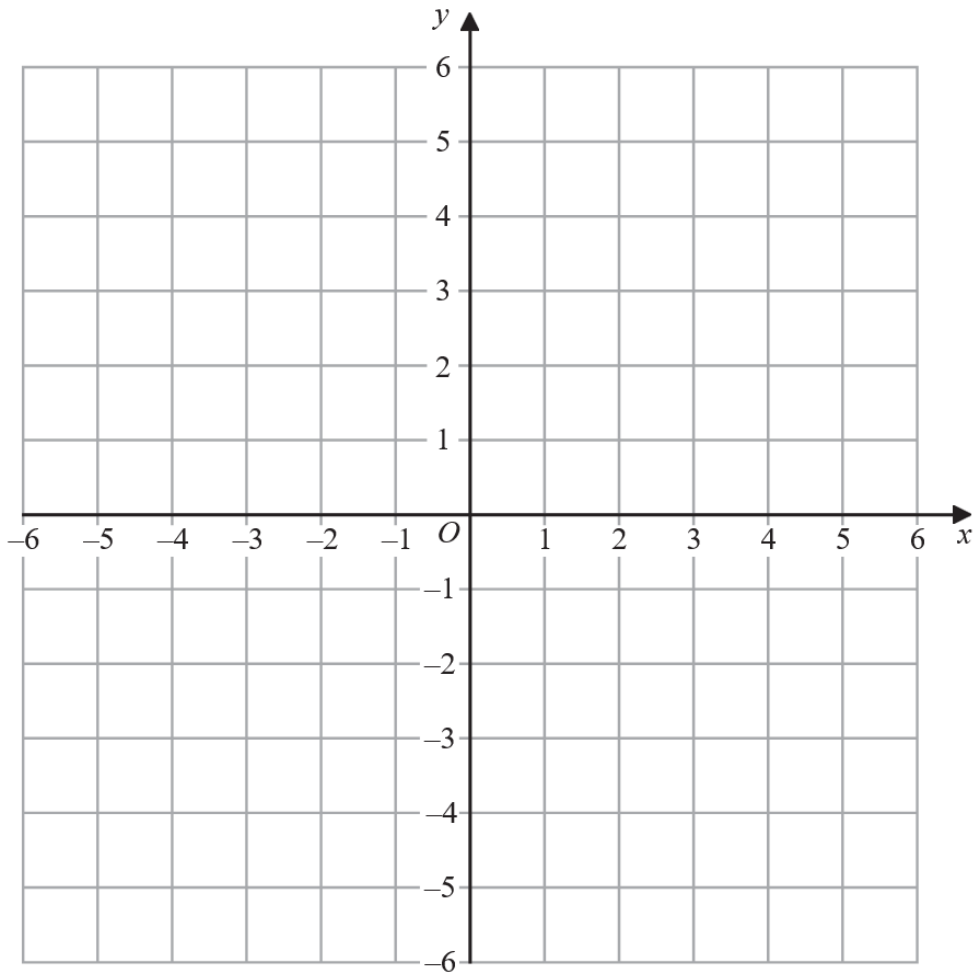
(3)

13.

On the grid show, by shading, the region that satisfies all of these inequalities.

$$2x + y - 2 < 0 \quad x + y \geq 1 \quad y \geq 1 \quad x \geq -2$$

Label the region **A**.



(4)

14.

The diagram shows a cuboid.

The cuboid measures $3x$ cm by $4x$ cm by y cm.

The volume of the cuboid is 600 cm^3.

The total surface area of the cuboid is A cm^2.

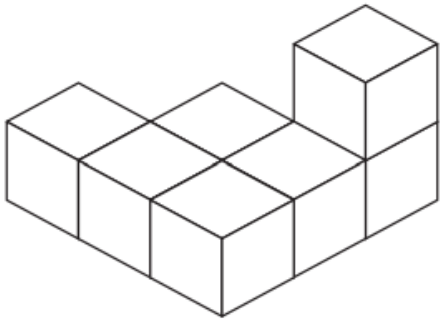
Show that

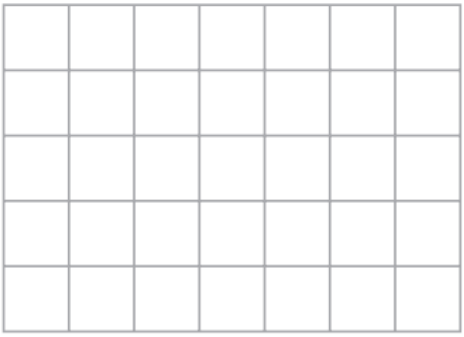
$$A = 24x^2 + \frac{700}{x}$$

You must show all stages of your working.

(4)

15.

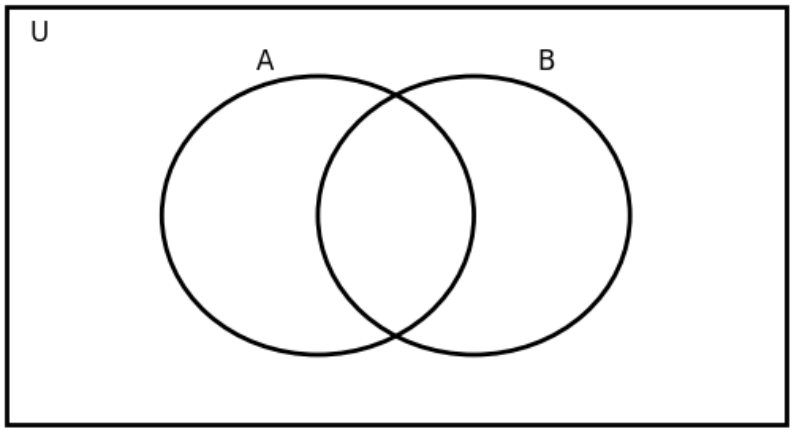




The image shows a 3D structure composed of seven 1 cm³ cubes.
Using the centimetre grid above, draw a top-down view (plan) of the solid, representing how it would look from above.

(2)

16.



The universal set is

$$U = \{1,2,3,4,5,6,7,8,9,10\}$$

The sets $A$and $B$are defined as:

$$A = Even\ number$$
$$B = Prime\ number$$

(a) Complete the Venn diagram to represent this information.

A number is chosen at random from the universal set U.

(b) Find the probability that the number chosen is in the set $A \cap B$

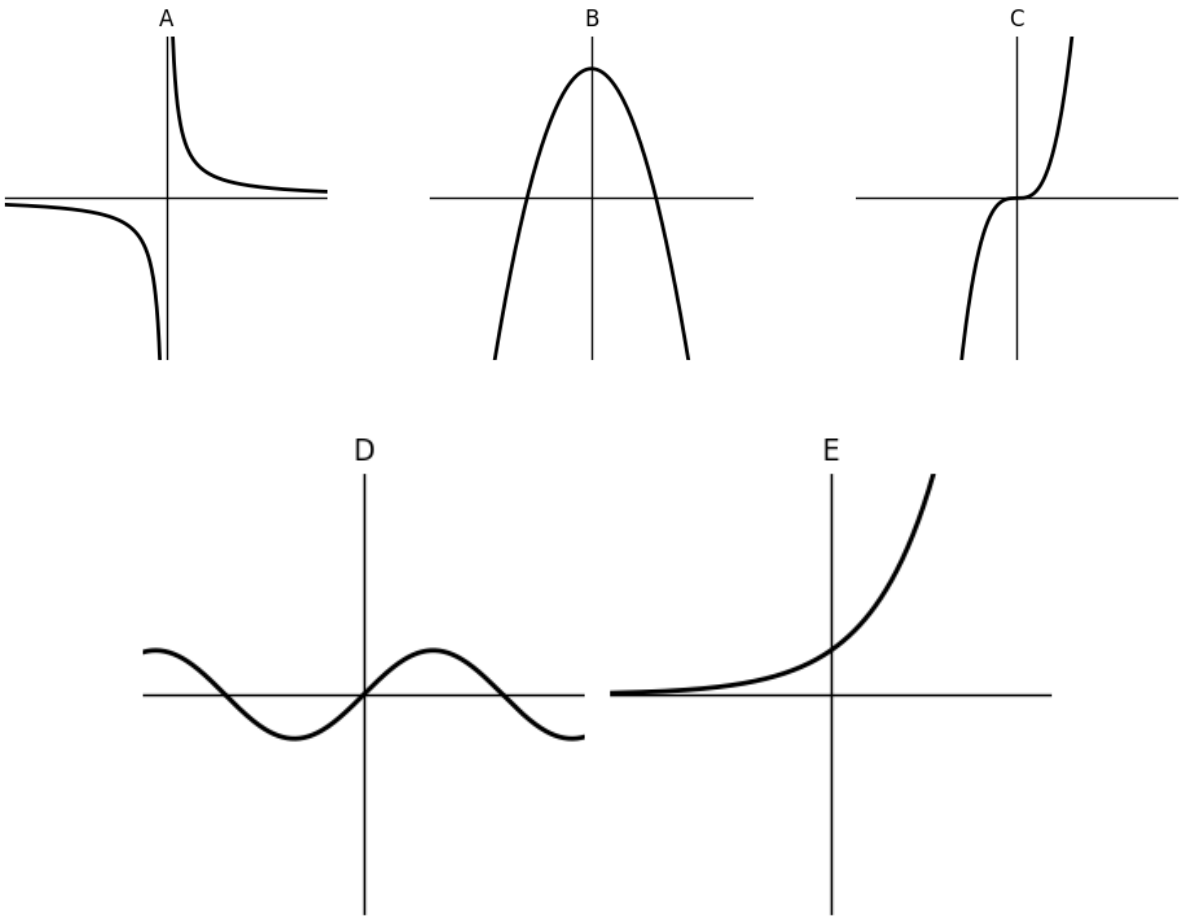
(3)

17.

The line $y = 2x + 5$ is the perpendicular bisector of the line PQ where: P has coordinates $(a, 5)$ and Q has coordinates $(2, b)$ Find the coordinates of the midpoint of the line PQ.

(4)

18.



Here are five graphs, labelled A, B, C, D and E.
Each graph represents a different type of function.
The equations below are not in the same order as the graphs.

$(a)\ y = 2^x$

$(b)\ y = 4 - x^2$

$(c)\ y = \frac{1}{x}$

$(d)\ y = x^3$

Match each equation to the correct graph A, B, C, D or E.

(2)

19.

Six-sided dice is biased.

The probabilities of the dice landing on each of the numbers are

Number	1	2	3	4	5	6
Probability	n+0.05	0.15	0.25	0.15	n+0.10	0.10

Dice is thrown 2 times

Calculate the probability that Dice will land on 1 (Both times).

(2)

20.

The circle with centre O at the origin (0, 0).

A line AB is a tangent to the circle at the point A.

$\angle OBA = 30°$.

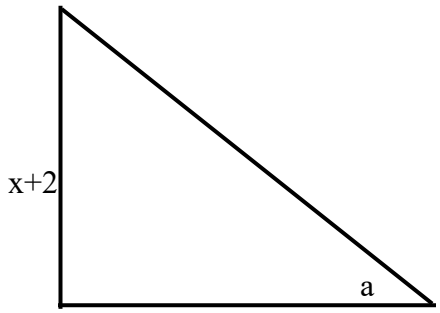
Point B has coordinates $(18, 4)$.

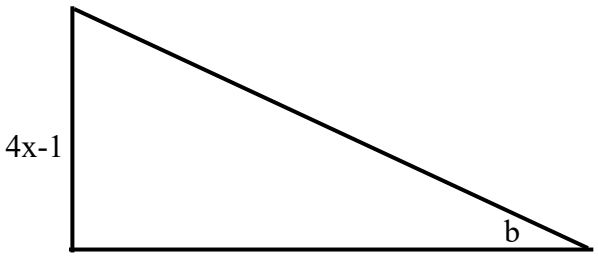
Point P lies on the circle and has coordinates $(3p - 2,\ 2p + 1)$.

Find the value of p. $p > 0$

(5)

21.





Here are two right-angled triangles.

- In the first triangle, the vertical side is $x + 2$and the base is $5x - 3$.
  The angle at the base is a.
- In the second triangle, the vertical side is $4x - 1$and the base is $10x + 7$.
  The angle at the base is b.

Both triangles are right-angled at the bottom left corner.
Given that

$$\tan a = 2\tan b$$

find the value of x.

(4)

22.

Given that

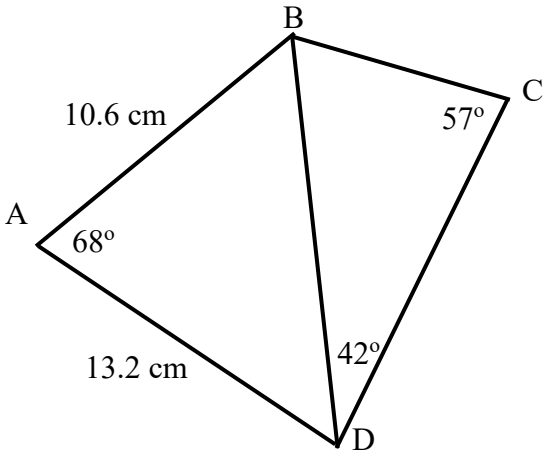
$$(\sqrt{y}+1),\ 3,\ (\sqrt{y}-1)$$

are the first three terms of the geometric sequence T, find the value of y.

You must show all your working.

(3)

23.



In the quadrilateral $ABCD$, the diagonal BD is drawn.

You are given:

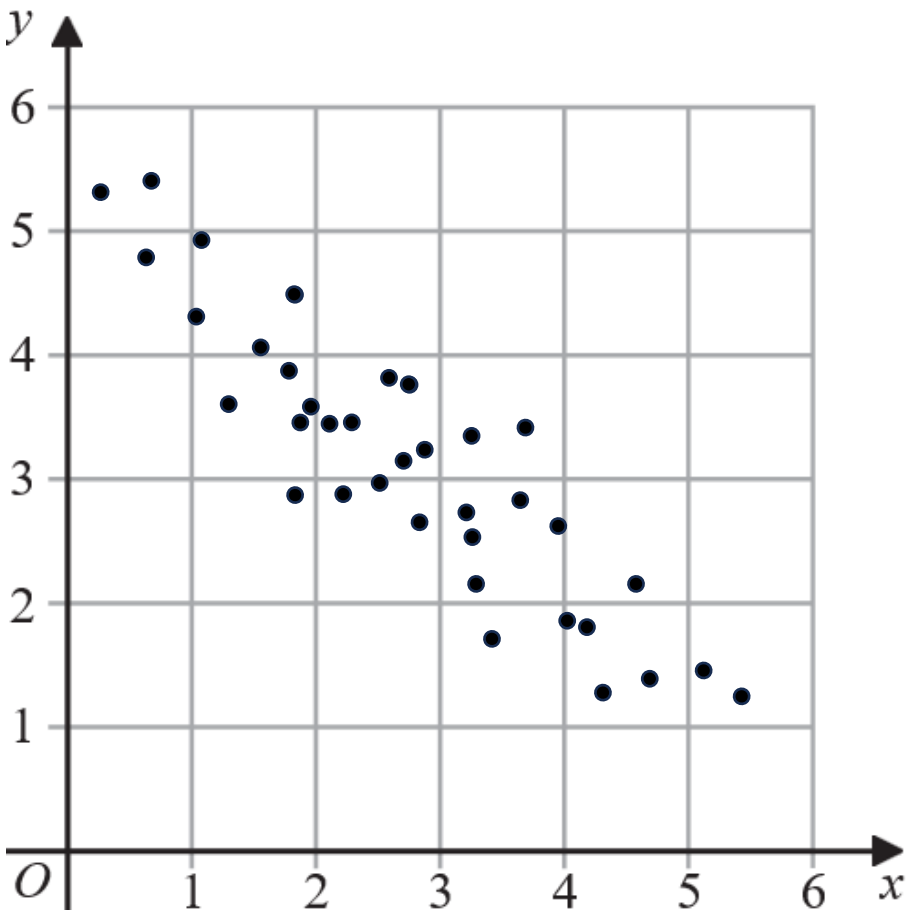
- $AB = 10.6$ cm
- $AD = 13.2$ cm
- $\angle BAD = 68°$
- $\angle BCD = 57°$
- $\angle BDC = 42°$

Calculate the length BC.

(3)

24.

The scatter diagram the correlation between x and y values



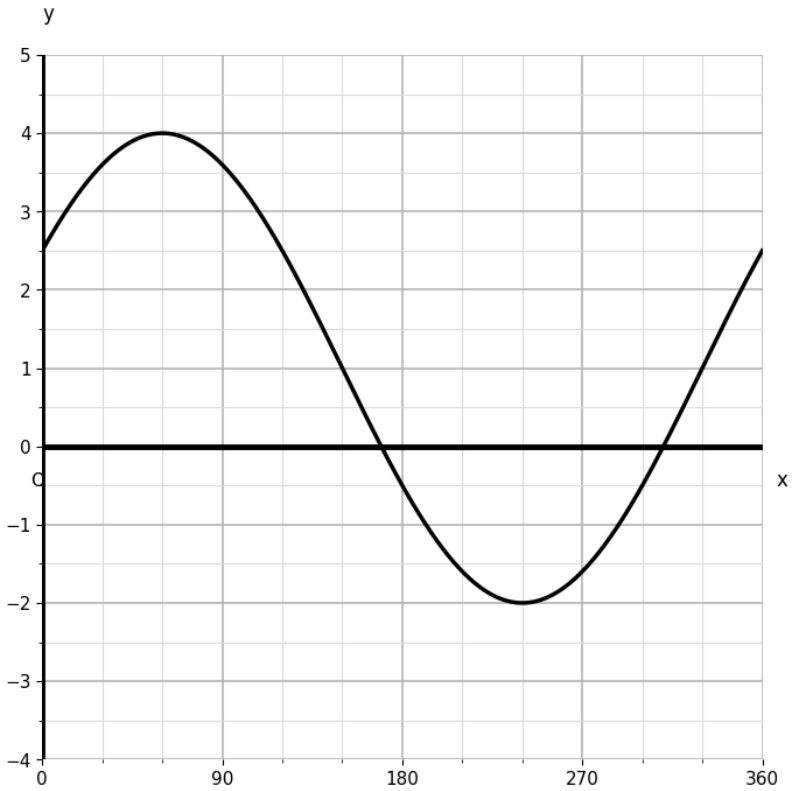
(a) Draw a line of best fit.

(b) What type of correlation is shown.

(c) Find the equation of your best fit line.

(3)

25.



The graph of

$$y = p\sin(x + q)° + r \text{ for } 0 \leq x \leq 360$$

is shown.

From the graph:

- the maximum value of $y$is 4
- the minimum value of $y$is -2
- the curve reaches its maximum at $x = 60°$

Find suitable values of p, q and r.

(3)

END

TOTAL FOR PAPER IS 80 MARKS

GCSE Level Maths Predicted Paper 3: 2026 (June) Set 1: Answers

1.

Find the increase

$$416 - 320 = 96$$

Divide by the original amount

$$\frac{96}{320} = 0.3$$

Convert to a percentage

$$0.3 \times 100 = 30$$

$$\boxed{30\%}$$

2.

To compare the prices fairly, convert all prices into pounds (£).

Cycles UK

Price is already in pounds:

$$£1650$$

Vélos France (convert euros to pounds)

$$£1 = €1.30$$

$$\text{Price in pounds} = \frac{2190}{1.30}$$

$$= £1684.62 \text{ (to 2 d.p.)}$$

Ride USA (convert dollars to pounds)

$$£1 = \$1.50$$

$$\text{Price in pounds} = \frac{2550}{1.50}$$

$$= £1700$$

Cycles UK sells the bicycle at the lowest price.

3.

Tile World

Each deal gives 6 packs.

Number of deals needed:

$$18 \div 6 = 3$$

Cost:

$$3 \times £78 = £234$$

Home Styles

Normal price per pack:

$$£45 \div 3 = £15$$

Apply 15% discount:

$$15\% \text{ of } £15 = 0.15 \times 15 = £2.25$$

Discounted price per pack:

$$£15 - £2.25 = £12.75$$

Cost for 18 packs:

$$18 \times £12.75 = £229.50$$

Emma should buy from Home Styles as it is cheaper.

4.

$$2 < x < 7, 5 < y < 12, 2x + y = 15$$

Make y the subject

$$y = 15 - 2x$$

Use the inequality for y

Substitute $y = 15 - 2x$ into $5 < y < 12$:

$$5 < 15 - 2x < 12$$

Solve the double inequality

$$-10 < -2x < -3$$

Divide throughout by -2(remember to reverse the inequality signs):

$$5 > x > 1.5$$

$$1.5 < x < 5$$

Combine with the condition for x

Given:

$$2 < x < 7$$

$$2 < x < 5$$

Since $x$is an integer:

$$\boxed{x = 3 \text{ or } x = 4}$$

5.

Let the number of tokens Alex has be x.

Then:

- Bella has $3x$.
- Chris has $3x - 8$.

Total number of tokens

$$x + 3x + (3x - 8) = 69$$

$$7x - 8 = 69$$

$$7x = 77$$

$$x = 11$$

Number of tokens Chris has

$$3x - 8 = 3(11) - 8 = 33 - 8 = 25$$

Form the ratio

$$\text{Alex : Chris} = 11:25$$

Given the ratio is $1:n$,

$$\frac{11}{25} = \frac{1}{n} \Rightarrow n = \frac{25}{11}$$

6.

Find the lowest common multiple (LCM)

Prime factors:

- $18 = 2 \times 3^2$
- $30 = 2 \times 3 \times 5$

- $72 = 2^3 \times 3^2$

LCM uses the highest powers:

$$\text{LCM} = 2^3 \times 3^2 \times 5 = 360$$

all three alarms sound together every 360 seconds.

Convert 2 hours to seconds

$$2 \text{ hour} = 2 \times 60 \times 60 = 7200 \text{ seconds}$$

Find how many times they sound together

$$7200 \div 360 = 20$$

7.

Left side:

$$(my^{-3})^{\frac{4}{n}} = m^{\frac{4}{n}} y^{\frac{-12}{n}}$$

$$m^{\frac{4}{n}} y^{\frac{-12}{n}} = 16y^{-2}$$

Match powers of y:

$$\frac{-12}{n} = -2 \Rightarrow -12 = -2n \Rightarrow n = 6$$

Match coefficients:

$$m^{\frac{4}{6}} = m^{\frac{2}{3}} = 16$$

Raise both sides to the power $\frac{3}{2}$:

$$m = 16^{\frac{3}{2}} = (\sqrt{16})^3 = 4^3 = 64$$

$$\boxed{n = 6, m = 64}$$

8. Triangle $PQR$is right-angled at Q.

Given

- $\angle Q = 90°$
- $PR = 18$ cm(the hypotenuse)
- $\angle P : \angle R = \sqrt{2} : \sqrt{3}$

Find the angles $P$and R

Since the angles in a triangle add to 180°and $\angle Q = 90°$:

$$\angle P + \angle R = 90°$$

$$\angle P = k\sqrt{2}, \angle R = k\sqrt{3}$$

$$\angle P = \frac{90\sqrt{2}}{\sqrt{2} + \sqrt{3}}$$

Side $PQ$is adjacent to angle P, and $PR$is the hypotenuse.

$$\cos P = \frac{PQ}{PR} \Rightarrow PQ = PR\cos P$$

$$\frac{90\sqrt{2}}{\sqrt{2} + \sqrt{3}} \approx 40.8°$$

$$\cos 40.8° \approx 0.757$$

$$PQ = 18 \times 0.757 \approx 13.6$$

$$\boxed{PQ \approx 13.6 \text{ cm}}$$

9. A reflection in a vertical line $x = a$ followed by a reflection in a parallel vertical line $x = b$ is equivalent to a translation.

Find the distance between the two lines

$$\text{Distance} = 5 - 1 = 4$$

Because the second mirror line is to the right of the first, the overall movement is to the right.

The single transformation that maps shape P onto shape R is:

$$\boxed{\text{A translation } \begin{pmatrix} 8 \\ 0 \end{pmatrix}}$$

That is, a translation 8 units to the right.

10.

$$4x + 3y = 10$$
$$3y = 10 - 4x$$
$$y = \frac{10 - 4x}{3}$$

Substitute into the first equation

$$x^2 - 9\left(\frac{10 - 4x}{3}\right)^2 = 16$$

$$x^2 - (10 - 4x)^2 = 16$$

$$x^2 - (100 - 80x + 16x^2) = 16$$

$$15x^2 - 80x + 116 = 0$$

Using the quadratic formula:

$$x = \frac{80 \pm \sqrt{80^2 - 4(15)(116)}}{2 \cdot 15}$$
$$x = \frac{80 \pm \sqrt{6400 - 6960}}{30}$$
$$x = \frac{92}{30} = \frac{46}{15} \text{ or } x = \frac{68}{30} = \frac{34}{15}$$

Find corresponding y-values

Using $y = \frac{10-4x}{3}$:

When $x = \frac{46}{15}$:

$$y = \frac{10 - \frac{184}{15}}{3} = \frac{-\frac{34}{15}}{3} = -\frac{34}{45}$$

When $x = \frac{34}{15}$:

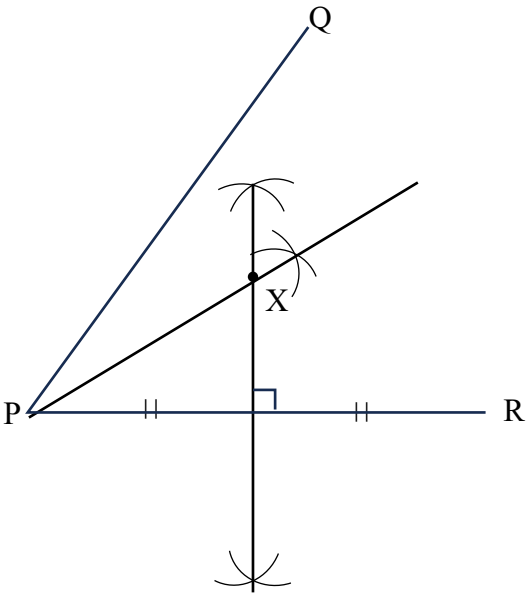
$$y = \frac{10 - \frac{136}{15}}{3} = \frac{\frac{14}{15}}{3} = \frac{14}{45}$$

$$\boxed{\left(\frac{46}{15}, -\frac{34}{45}\right) \text{ and } \left(\frac{34}{15}, \frac{14}{45}\right)}$$

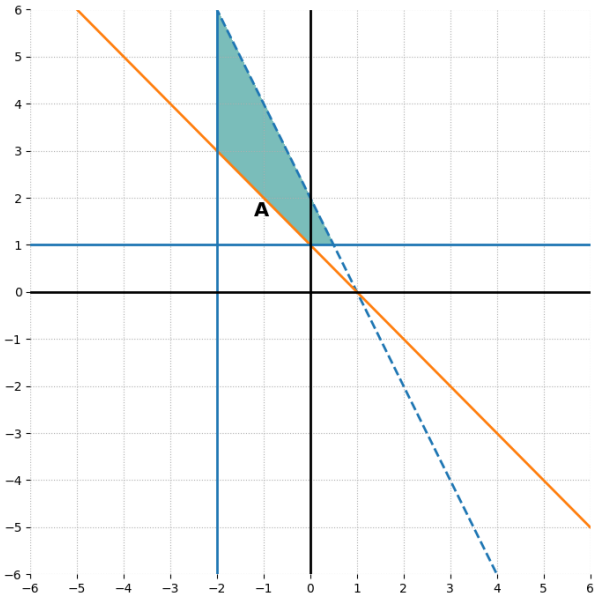
11.

12×11=132

12.



13.



14.

Use the volume to find y

$$\text{Volume} = (3x)(4x)(y) = 12x^2y$$

Given the volume is 600:

$$12x^2y = 600$$

$$y = \frac{600}{12x^2} = \frac{50}{x^2}$$

Write the surface area formula

Surface area of a cuboid:

$$A = 2(lw + lh + wh)$$

Here:

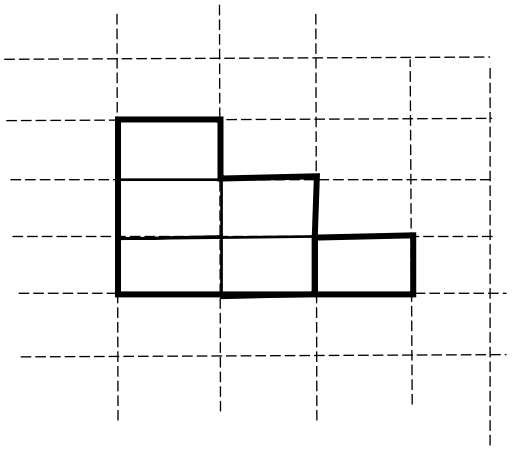
- $l = 3x$
- $w = 4x$
- $h = y$

$$A = 2((3x)(4x) + (3x)(y) + (4x)(y))$$
$$A = 2(12x^2 + 3xy + 4xy)$$
$$A = 2(12x^2 + 7xy)$$
$$A = 24x^2 + 14xy$$

Substitute $y = \frac{50}{x^2}$

$$A = 24x^2 + 14x(\frac{50}{x^2})$$
$$A = 24x^2 + \frac{700}{x}$$
$$\boxed{A = 24x^2 + \frac{700}{x}}$$

15.



16.

(a) Completed Venn diagram

- $A \cap B$(even and prime):

$$\{2\}$$

- A only (even but not prime):

$$\{4,6,8,10\}$$

- Bonly (prime but not even):

$$\{3,5,7\}$$

- Outside both A and B:

$$\{1,9\}$$

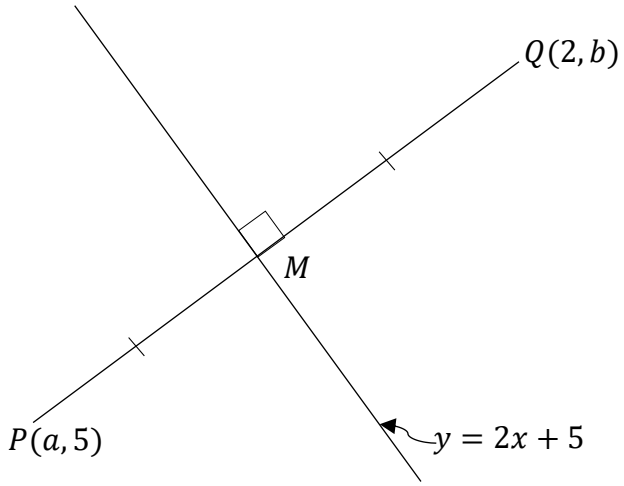
(b) Probability

Number of elements in $U = 10$

Number of elements in $A \cap B = 1$

$$P(A \cap B) = \frac{1}{10}$$
$$\boxed{\frac{1}{10}}$$

17.



M coordinate $= \left(\frac{a+2}{2}, \frac{5+b}{2}\right)$

$\frac{5+b}{2} = 2\left(\frac{a+2}{2}\right) + 5$

$\frac{5+b}{2} = a + 7$

$5 + b = 2a + 14$

$b - 2a = 9$ — ①

Gradient of line $= 2$

Gradient of $PQ = {}^{-1}/_{2}$

Gradient Of $PQ = \frac{5-b}{a-2}$

${}^{-1}/_{2} = \frac{5-b}{a-2}$

$2 - a = 10 - 2b$

$2b - a = 8$ — ②

① $\times 2 -$ ② $\Rightarrow -3a = 10$

$a = {}^{-10}/_{3}$

① $\Rightarrow b + {}^{20}/_{3} = 9$

$b = {}^{7}/_{3}$

Midpoint $\left(\frac{{}^{-10}/_{3}+2}{2}, \frac{5+{}^{7}/_{3}}{2}\right)$

$\left({}^{-2}/_{3}, {}^{11}/_{3}\right)$

18.

Equation	Graph
(a) $y = 2^x$	E
(b) $y = 4 - x^2$	B
(c) $y = \frac{1}{x}$	A
(d) $y = x^3$	C

19.

Use total probability = 1

$$(n + 0.05) + 0.15 + 0.25 + 0.15 + (n + 0.10) + 0.10 = 1$$

$$2n = 0.20 \Rightarrow n = 0.10$$

Probability of landing on 1

$$P(1) = n + 0.05 = 0.10 + 0.05 = 0.15$$

Probability of landing on 1 both times

The two throws are independent:

$$P(1 \text{ both times}) = 0.15 \times 0.15 = 0.0225$$

20.

Find the radius of the circle

Since AB is tangent at A, the radius $OA$is perpendicular to AB.

So triangle $OAB$is right-angled at A.

First find OB:

$$OB = \sqrt{18^2 + 4^2} = \sqrt{324 + 16} = \sqrt{340}$$

In right triangle OAB, with $\angle OBA = 30°$,

$$\sin\ 30° = \frac{OA}{OB}$$

$$OA = OB\sin\ 30° = \sqrt{340} \cdot \frac{1}{2} = \frac{\sqrt{340}}{2}$$

So the radius is $r = OA = \frac{\sqrt{340}}{2}$. Hence

$$r^2 = (\frac{\sqrt{340}}{2})^2 = \frac{340}{4} = 85$$

Use the circle equation $x^2 + y^2 = r^2$

Point $P(3p - 2,\ 2p + 1)$lies on the circle, so:

$$(3p - 2)^2 + (2p + 1)^2 = 85$$

Expand:

$$(9p^2 - 12p + 4) + (4p^2 + 4p + 1) = 85$$
$$13p^2 - 8p + 5 = 85$$
$$13p^2 - 8p - 80 = 0$$

Solve the quadratic

$$13p^2 - 8p - 80 = 0$$

$$p = \frac{8 \pm \sqrt{(-8)^2 - 4(13)(-80)}}{2 \cdot 13} = \frac{8 \pm \sqrt{64 + 4160}}{26} = \frac{8 \pm \sqrt{4224}}{26}$$

Since $p$must give a valid point on the diagram, take the positive value:

$$\boxed{p = 2.8}$$

21.

Write $\tan a$and $\tan b$

For a right-angled triangle,

$$\tan\ (\text{angle}) = \frac{\text{opposite}}{\text{adjacent}}$$

$$\tan\ a = \frac{x + 2}{5x - 3}$$

$$\tan\ b = \frac{4x - 1}{10x + 7}$$

Use the given condition

$$\tan\ a = 2\tan\ b$$

$$\frac{x+2}{5x-3} = 2\left(\frac{4x-1}{10x+7}\right)$$

$$(x+2)(10x+7) = 10x^2 + 27x + 14$$

Set equal:

$$10x^2 + 27x + 14 = 40x^2 - 34x + 6$$

Rearrange:

$$0 = 30x^2 - 61x - 8$$

Using the quadratic formula:

$$x = \frac{61 \pm \sqrt{61^2 - 4(30)(-8)}}{2(30)}$$

$$x = \frac{61 \pm \sqrt{3721 + 960}}{60} = \frac{61 \pm \sqrt{4681}}{60}$$

Since side lengths must be positive:

$$5x - 3 > 0 \Rightarrow x > 0.6$$

$$\boxed{x = \frac{61 + \sqrt{4681}}{60}} = 2.16$$

22.

(a) Finding the value of y

For a geometric sequence, the common ratio is the same between consecutive terms.

$$\frac{3}{\sqrt{y}+1} = \frac{\sqrt{y}-1}{3}$$

Cross-multiply:

$$9 = (\sqrt{y}+1)(\sqrt{y}-1)$$

Use the identity $(a+b)(a-b) = a^2 - b^2$:

$$9 = y - 1$$

$$y = 10$$

23.

Find BDusing cosine rule in $\triangle ABD$

$$BD^2 = AB^2 + AD^2 - 2(AB)(AD)\cos\ 68°$$

$$BD^2 = 10.6^2 + 13.2^2 - 2(10.6)(13.2)\cos\ 68°$$

$$BD \approx 13.48 \text{ cm}$$

Use sine rule in $\triangle BCD$

Now use sine rule:

$$\frac{BC}{\sin 42°} = \frac{BD}{\sin 57°}$$

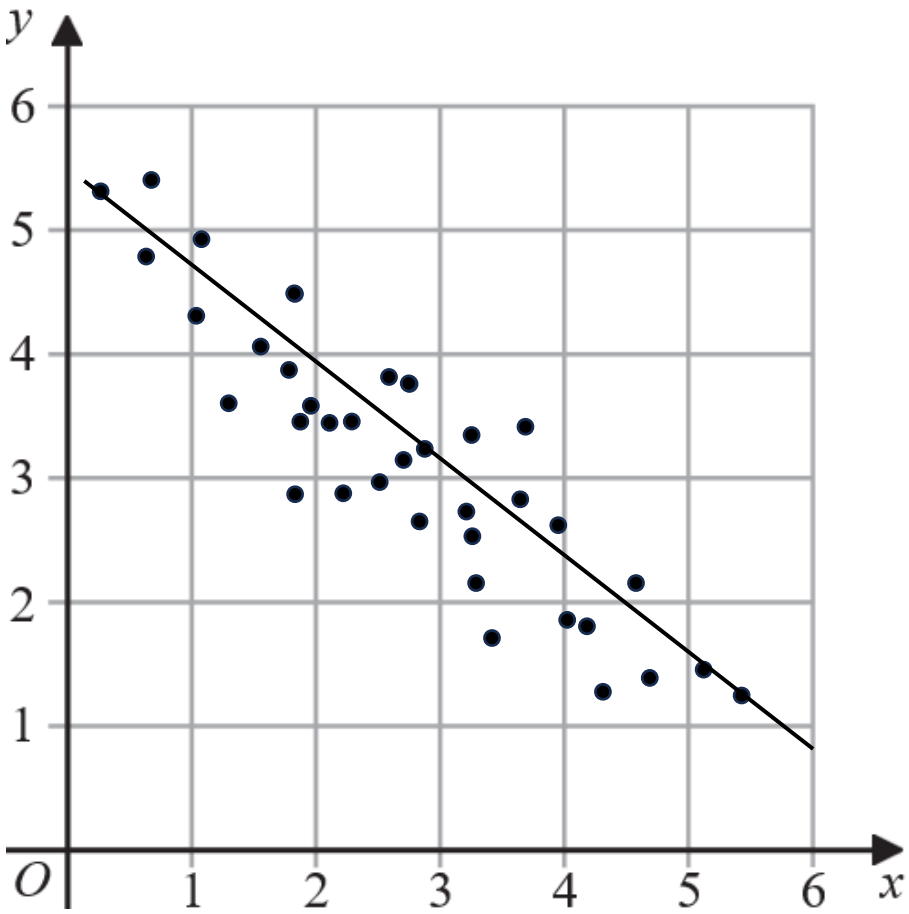
$$BC = BD \cdot \frac{\sin 42°}{\sin 57°} = 13.48 \cdot \frac{\sin 42°}{\sin 57°}$$

$$BC \approx 10.7567 \approx 10.8 \text{ cm}$$

$$\boxed{BC = 10.8 \text{ cm (3 s.f.)}}$$

24.

(a)



b) Type of correlation

The points clearly slope downwards as $x$increases, so this shows negative correlation (fairly strong).

$$\boxed{\text{Negative correlation}}$$

(c) Equation of a suitable best-fit line

Using two reasonable points on the trend, e.g. (1,4.8)and (5,1.6):

Gradient:

$$m = \frac{1.6 - 4.8}{5 - 1} = \frac{-3.2}{4} = -0.8$$

Use $y = mx + c$ with (1,4.8):

$$4.8 = -0.8(1) + c \Rightarrow c = 5.6$$

$$y = -0.8x + 5.6$$

25.

Find r(midline)

Maximum value of $y = 4$

Minimum value of $y = -2$

The midline is:

$$r = \frac{4 + (-2)}{2} = \frac{2}{2} = 1$$

$$\boxed{r = 1}$$

Find p(amplitude)

Amplitude is:

$$p = \frac{4 - (-2)}{2} = \frac{6}{2} = 3$$

$$\boxed{p = 3}$$

Find q(horizontal shift)

A sine graph reaches its maximum when:

$$x + q = 90°$$

The graph reaches its maximum at $x = 60°$

$$60 + q = 90$$

$$q = 30$$

$$\boxed{q = 30}$$

$$\boxed{p = 3, q = 30, r = 1}$$

END