Edu-H | Summer '25 | 1

Examiner only

Answer **all** questions.

1. A quarter of a circle has been cut from a rectangular card.

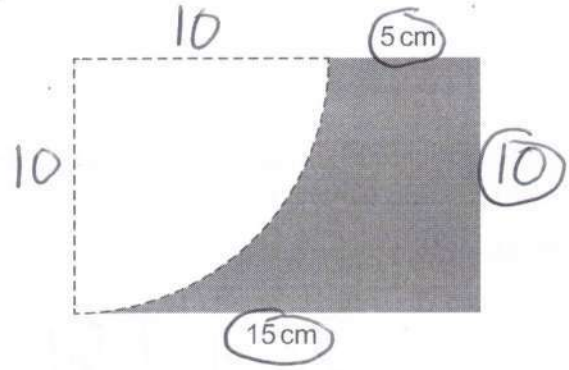


Diagram not drawn to scale

Calculate the perimeter of the remaining piece of card.
Give your answer in the form $a\pi + b$. [4]

$15 + 5 + 10 + \frac{1}{4} \times 2 \times \pi \times 10$ ✓

Perimeter of the remaining piece of card is $5\pi + 30$ ✓✓ cm

2. Jamie wants to buy a pair of trainers online.
The online company has a sale reducing all prices by 25%.

Jamie also has a discount code that will give him a further 10% off all **sale prices**.



Jamie says,

"The trainers have been reduced in price by a total of 35%."

Explain why Jamie is incorrect. [1]

It's 10% off of 75% so is 67·5%
∴ reduction is 32·5% ✓OE

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3. (a) Given that $3^{m+4} = 1$, find the value of m. [1]

$m+4 = 0$ $\quad m = -4$ ✓

(b) Betty bought c cakes costing £2 each and d doughnuts costing £1.50 each.
She paid with a twenty pound note and was given some change.

Write an inequality to show this information. [2]

$2c + 1.5d < 20$

✓ ✓ OE

(c) Given that:

- distance x = 15 miles
- distance y = 36 kilometres
- 5 miles is approximately equal to 8 kilometres.

Circle the ratio that best represents

distance x : distance y. [1]

3:5 5:12 3:4 (2:3) 2:5 ✓

÷5 ×8 → 15m : 36km → 24km : 36km

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4. The shape below is a triangular prism with $CD = 7$ cm.
The cross-section of the prism is a right-angled triangle where $AB = 6$ cm and $AC = 10$ cm.

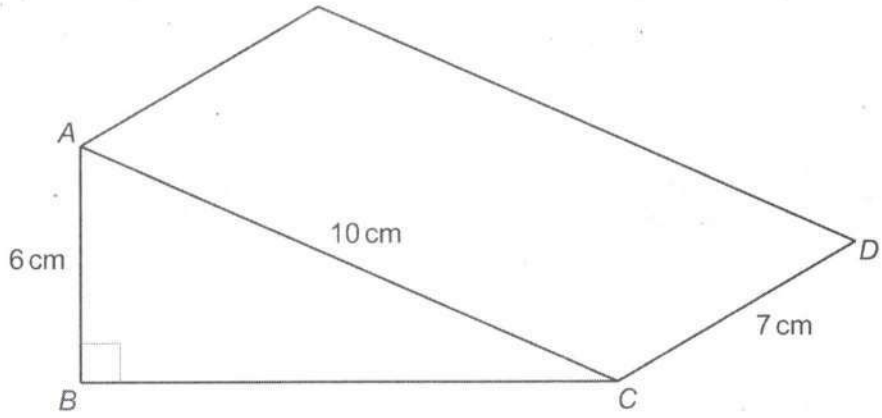


Diagram not drawn to scale

Calculate the total surface area of the triangular prism. [6]

$BC = \sqrt{10^2 - 6^2} = \sqrt{64} = 8$ ✓

✓✓

Base + Back + Slope + 2sides

$(8 \times 7) + (6 \times 7) + (10 \times 7) + 2(\frac{1}{2} \times 8 \times 6)$ ✓✓

$56 + 42 + 70 + 48$

The total surface area of the triangular prism is 216 cm^2 ✓

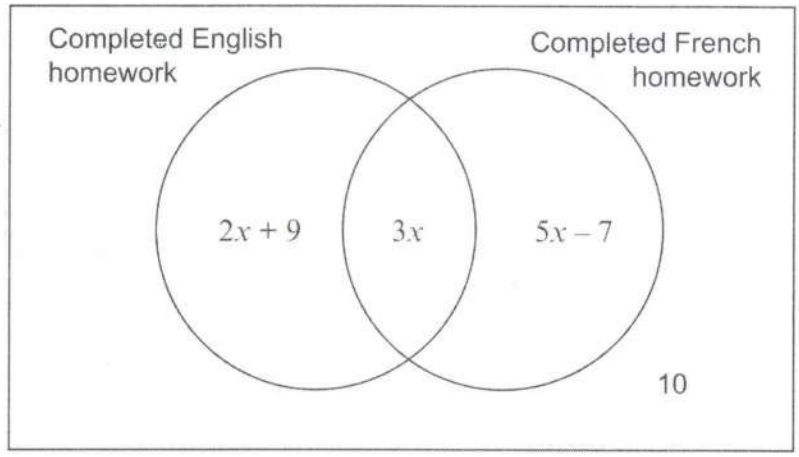
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5. Last week, 142 pupils in Year 7 were given English homework and French homework.

10 pupils did not complete either homework.
Each expression in the following Venn diagram represents the number of pupils that completed at least one homework.



(a) Calculate the value of x. [3]

$2x+9+3x+5x-7+10 = 142$ ✓

$10x = 130$ ✓

$x =$ 13 ✓

(b) One pupil is chosen at random from the group.

What is the probability that this pupil completed **only** the French homework? [2]

$5 \times 13 - 7$

$= 58$

The probability that a pupil completed **only** the French homework is $\frac{58}{142}$ ✓ ✓

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6. (a) Work out $2\frac{1}{5} - 1\frac{2}{3}$.

Give your answer in its simplest form. [3]

$\frac{11}{5} - \frac{5}{3} = \frac{33}{15} - \frac{25}{15} = \frac{8}{15}$ ✓ ✓ ✓

(b) Calculate the value of the reciprocal of 0·4. [2]
Give your answer as a decimal.

$\frac{1}{0.4} \overset{\times 10}{=} \frac{10}{4} = 2\frac{1}{2} = 2.5$ ✓

(×10) ✓

(c) **Estimate** the value of $\frac{3 \cdot 02^3 + \sqrt{4 \cdot 17 \times 8 \cdot 9}}{0 \cdot 289}$. [3]

$= \frac{3^3 + \sqrt{4 \times 9}}{0.3}$ ✓

$= \frac{27 + 6}{3/10}$

✓ $= 33 \times \frac{10}{3} = 110$ ✓CAO

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7.

Use:

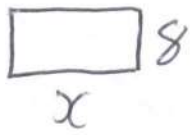
$$\text{Pressure} = \frac{\text{Force (N)}}{\text{Area (cm}^2\text{)}}$$

F = 6·2

P = 1/20

A cuboid rests on a horizontal floor.

The cuboid exerts a force of 6·2 newtons on the floor.
The pressure of this cuboid on the floor is 0·05 N/cm^2.



The base of the cuboid in contact with the floor has a **width** of 8 cm.

Calculate the **length** of the base of the cuboid. [5]

$P = F/A$

$\frac{1}{20} = \frac{6.2}{8x}$ ✓✓

$8x = 6.2 \times 20 = 124$ ✓

$8\overline{)124.0}$ = 15.5 ✓

Length of the base of the cuboid = 15.5 cm ✓

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8. (a) Work out the value of $5^{-32} \div 5^{-35}$. [2]

$5^{-32--35} = 5^3 = 125$ ✓

✓

(b) In a vacuum, a particle of light travels at approximately 3×10^8 metres per second.

What is this speed in kilometres per minute?
Give your answer in standard form. [3]

3×10^8 m = 1 sec

÷1000 3×10^5 Km = 1 sec ✓

(×6 ×10) (×60)

18×10^6 Km = 60 sec ✓

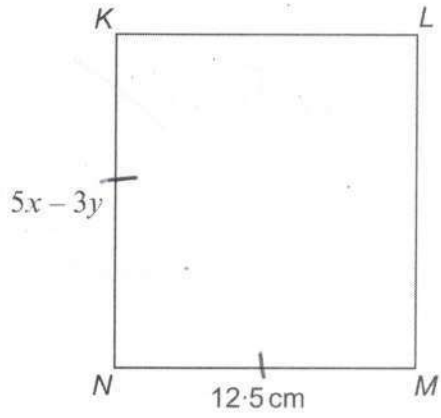
1.8×10^7 Km/min ✓

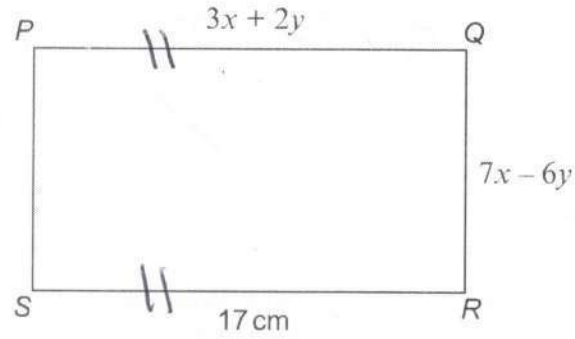
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9. A square *KLMN* and a rectangle *PQRS* are shown below.





Diagrams not drawn to scale

Use an algebraic method (not trial and improvement) to find the value of x and the value of y.
Hence, calculate the perimeter of *PQRS*.
You must show all your working. [7]

$5x - 3y = 12.5$ (×2)
$3x + 2y = 17$ (×3) ✓

$+ \quad 10x - 6y = 25$ ✓
$\quad 9x + 6y = 51$
$19x = 76$ $\quad x = \frac{76}{19} = 4$ ✓

$5 \times 4 - 3y = 12.5$ ✓
$7.5 = 3y$
$2.5 = y$ ✓

$(17 \times 2) + 2(7 \times 4 - 6 \times 2.5)$ ✓
$34 + 2(13)$

The perimeter of *PQRS* is 60 cm ✓

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10. It takes 5 workers a total of 24 hours to build a wall 180 m long.

(a) The workers have enough materials left over to build a further 300 m of the same wall.

How long will it take **8 workers** to build this 300 m of wall? [3]

5w 24h 180m

1w 24h 36m ✓

8w 3h 36m

8w 1h 12m ✓

8w 25h 300m

36
5) 180

25
12) 300

It will take 8 workers 25 hours to build 300 m of wall. ✓

(b) (i) What assumption have you made in answering part (a)? [1]

All workers work at the same rate ✓ etc

(ii) If your assumption is not correct, what effect would this have on your answer to part (a)? [1]

eg if workers are slower, time will increase ✓ etc

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11. (a) The nth term of a sequence is given by $2n^2 + 9$.

Show that 90 is **not** a term in the sequence. [2]

$2n^2$ = even
9 = odd
even + odd = odd

OR

$2n^2 + 9 = 90$
$2n^2 = 81$
$n^2 = 40.5$
not possible

etc ✓✓

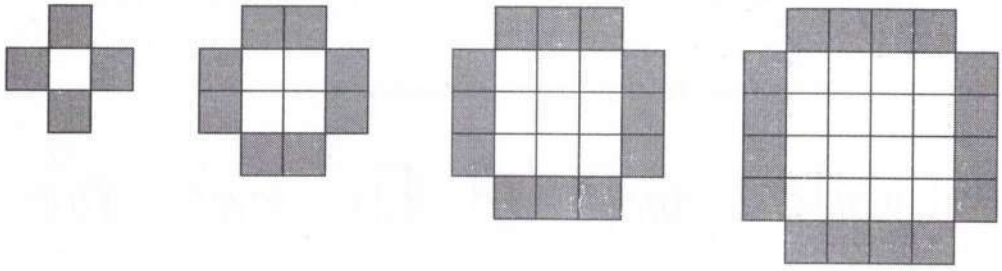
(b) The first four terms of a sequence are:

$2a^{17}b^3$, $4a^{15}b^6$, $8a^{13}b^{12}$, $16a^{11}b^{24}$,... $32a^9b^{48}$

Write down the **sixth** term of this sequence. [2]

$64a^7b^{96}$ ✓✓

(c) Grey and white tiles are used to make the four patterns in the diagram below.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

Write an expression for the **total** number of tiles needed to make Pattern n. [2]

White = n^2
Grey = $4n$ ✓✓

Total = $n^2 + 4n$ OE

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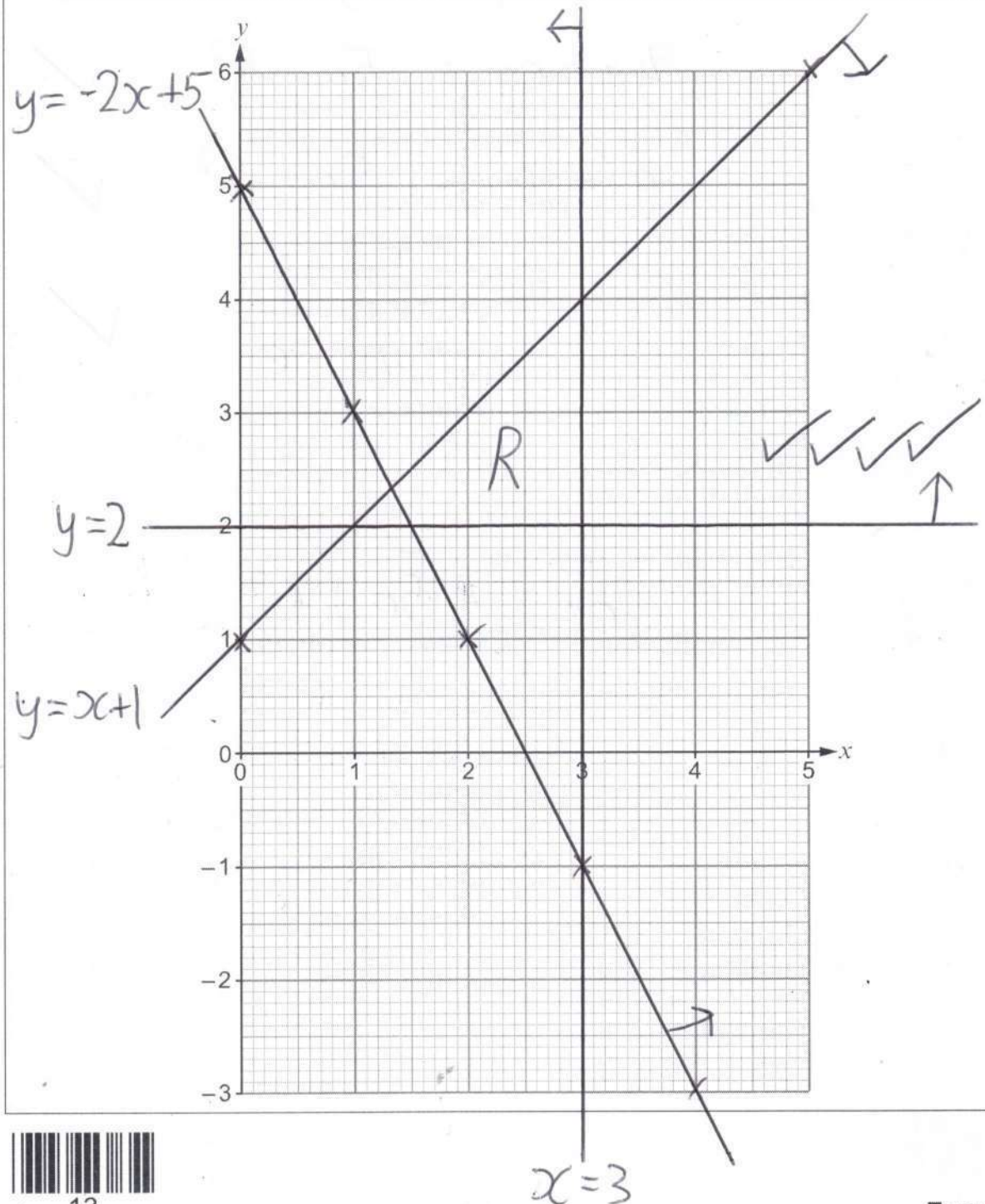
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12. On the graph paper below, draw the region that satisfies the following inequalities. Indicate clearly the region that is your answer. [4]

$x \leqslant 3$
$y \geqslant 2$
$y \leqslant x + 1$
$y \geqslant 5 - 2x$

$y \leqslant x + 1 \rightarrow m = 1, c = 1$

$y \geqslant 5 - 2x \rightarrow m = -2, c = 5$



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13. Rearrange the following formula to make g the subject. [4]

$$\frac{f^2+4g}{g+5}=e$$

$f^2+4g=e(g+5)$ ✓

$f^2+4g=eg+5e$

$4g-eg=5e-f^2$ ✓

$g(4-e)=5e-f^2$ ✓

$g=\dfrac{5e-f^2}{4-e}$ ✓

or $\dfrac{-5e+f^2}{-4+e}$

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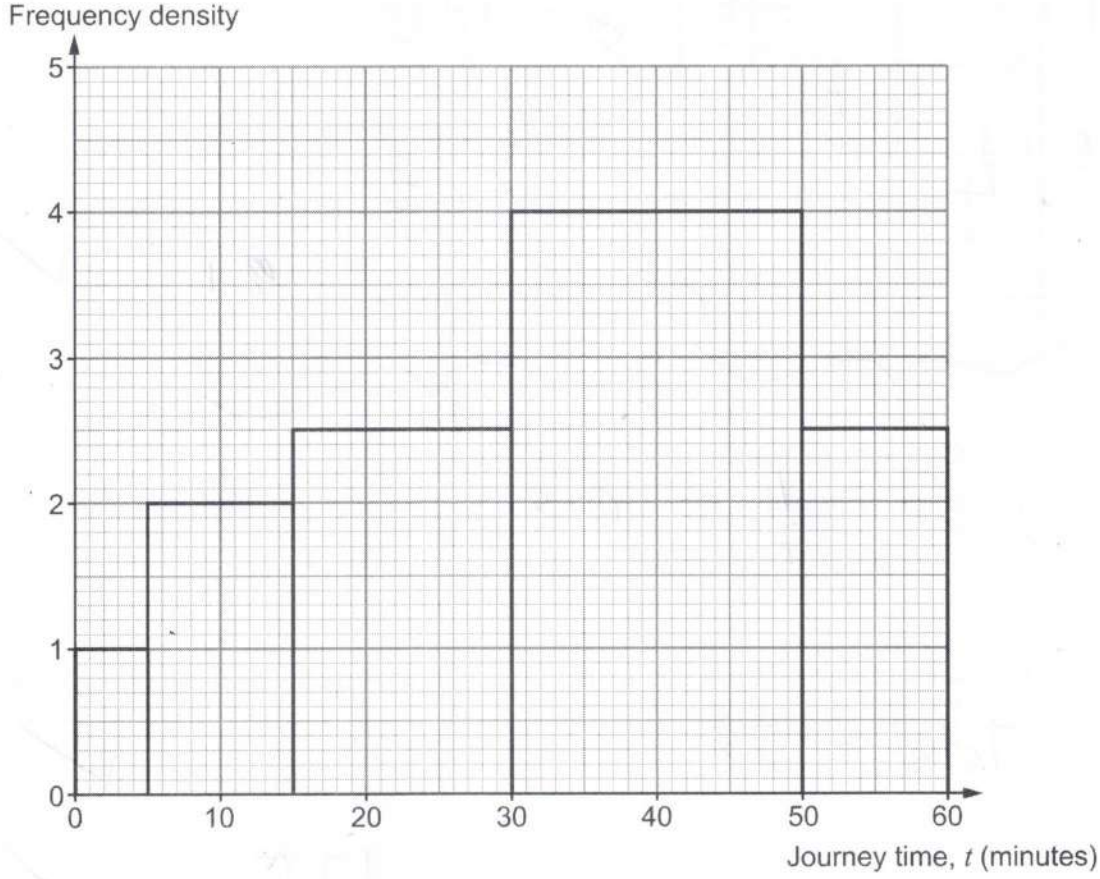
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14. Cally, Deena and Juan are working on a GCSE project.
They are each in a different class.
Cally, Deena and Juan each record the journey times to school of pupils in their own class.

(a) The times for pupils in Cally's class are shown in the table below.

Journey time, t (minutes)	Number of pupils
$0 < t \leqslant 5$	5
$5 < t \leqslant 15$	5
$15 < t \leqslant 30$	6
$30 < t \leqslant 50$	5
$50 < t \leqslant 60$	4

She decides to draw a histogram of her results.



Most of the frequency densities used in the histogram are incorrect.
What error did Cally make when she calculated the frequency densities? [1]

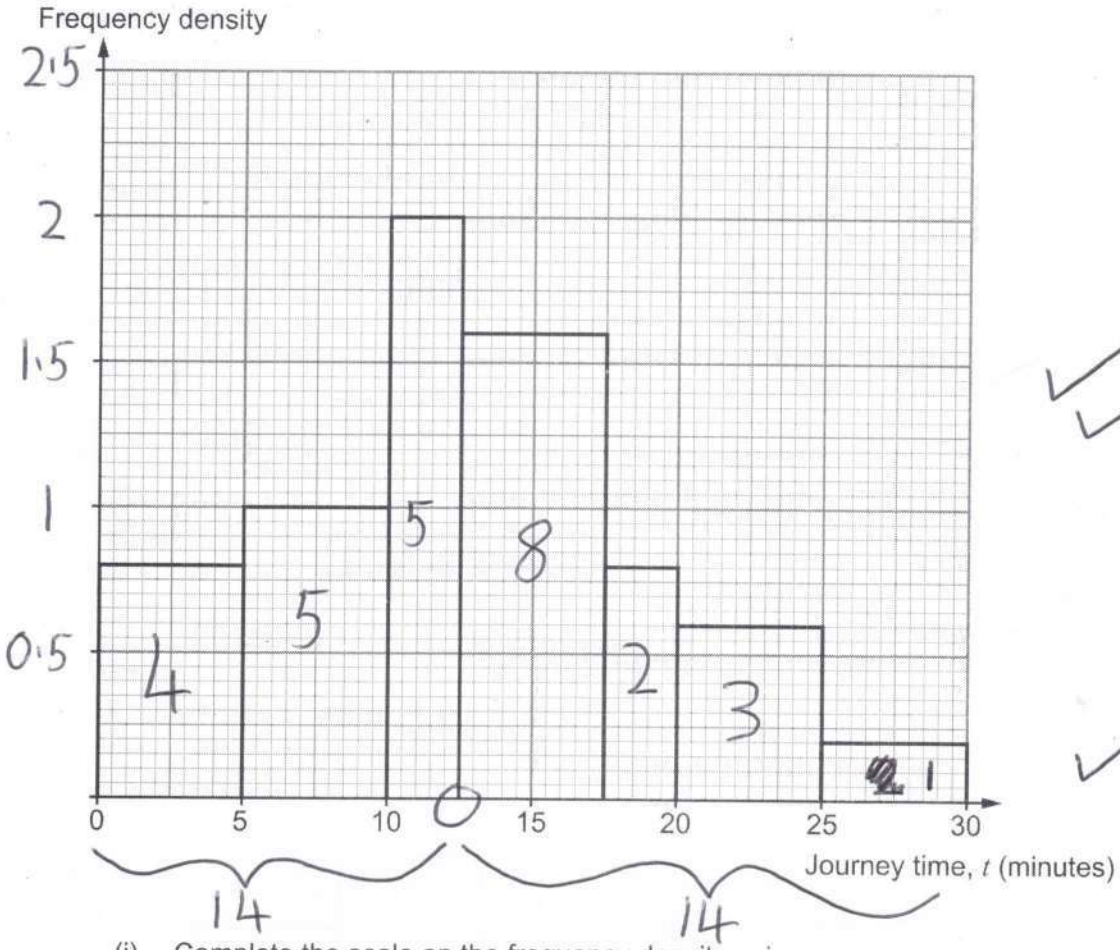
Should use freq density = frequency ÷ width

etc

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(b) Deena has correctly drawn the histogram for her results.
4 pupils take between 0 and 5 minutes to travel to school.



(i) Complete the scale on the frequency density axis. [2]

$fd = \frac{4}{5} = 0{\cdot}8$

(ii) Calculate an estimate of the median journey time for the pupils in Deena's class.
You must show all your working. [3]

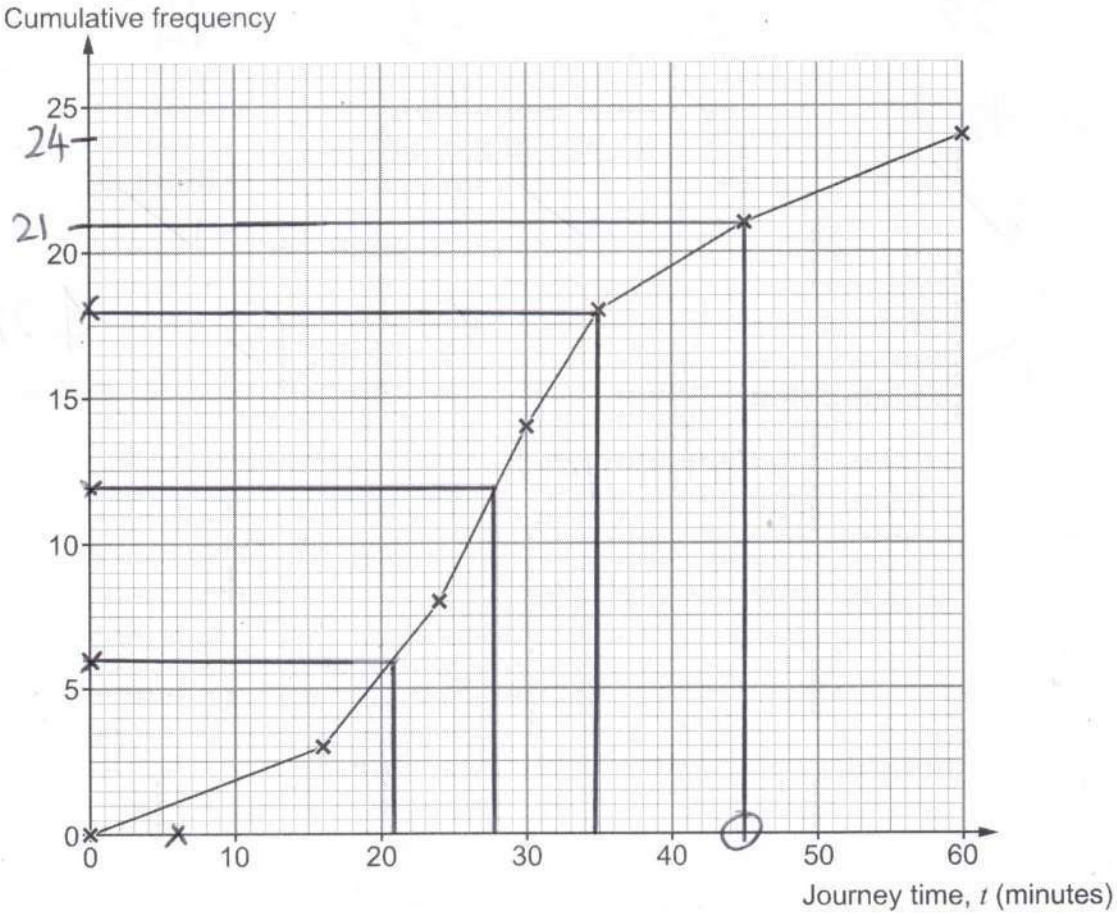
Total = 28

12·5

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(c) Juan decides to display the journey times of the 24 pupils for his class on a cumulative frequency diagram.



Use the cumulative frequency diagram to give the best estimates for the answers to each of the following questions.

(i) Calculate the percentage of pupils in Juan's class that take 45 minutes or longer to travel to school. [3]

$\frac{3}{24} \times 100$

$= 12.5\%$

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(ii) Complete the table for the journey time to school of the pupils in Juan's class. [3]

Median	Lower quartile	Upper quartile	Inter-quartile range
28	21	35	14

12 6 18

✓ ✓ ✓

(iii) Two pupils were absent when Juan collected his data.
The journey times of these two pupils are 6 minutes and 40 minutes. ↕ 28

What effect would including these two results have on the median journey time for the class? [1]

Unchanged

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15. Factorise and hence solve $3x^2 - 13x - 10 = 0$. [3]

$(3x+2)(x-5)=0$ ✓✓

$x = -\frac{2}{3}$ $x = 5$ ✓

16. (a) Use the iterative formula $x_{n+1} = 2x_n - 5$.

Calculate the value of x_4 when $x_1 = 6$. [2]

$x_2 = 7$ $x_3 = 9$ ✓

$x_4 =$ 13 ✓

(b) Use the iterative formula $x_{n+1} = \frac{2}{3}x_n$.

Calculate the value of x_3 when $x_5 = 8$. [2]

$8 \div \frac{2}{3} \rightarrow 8 \times \frac{3}{2} = 12$ ✓

$12 \times \frac{3}{2} =$

$x_3 =$ 18 ✓

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17. (a) Calculate the value of $144^{0.5} \times 6^{-2}$.
Give your answer as a fraction in its simplest form. [3]

$\sqrt{144} \times \frac{1}{6^2}$

$= \frac{12}{36} = \frac{1}{3}$ ✓

(b) Write $\frac{430}{33}$ as a recurring decimal. [1]

$33\overline{)430.0^{10}0^{10}0^{10}0\ldots}$ $13.03\ldots$ ✓

(c) Expand and simplify $(9+2\sqrt{5})(4-3\sqrt{5})$. [2]

$36 - 27\sqrt{5} + 8\sqrt{5} - 6\times5$

$6 - 19\sqrt{5}$

(d) Find the mean of $4\sqrt{75}$ and $3\sqrt{48}$.
Give your answer in the form $a\sqrt{b}$ where b is as small as possible. [3]

$4\sqrt{25}\sqrt{3} + 3\sqrt{16}\sqrt{3} = 20\sqrt{3} + 12\sqrt{3}$

$\frac{32\sqrt{3}}{2} = 16\sqrt{3}$ ✓

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18. (a) The diagram shows triangle *FGH*.
X is a point on *FH* where *FX*:*XH* = 3:2.
Y is the midpoint of *FG*.

$\frac{3}{5} = 9\mathbf{j}$ so $\frac{1}{5} = 3\mathbf{j}$ ✓

$\frac{2}{5} = 6\mathbf{j}$

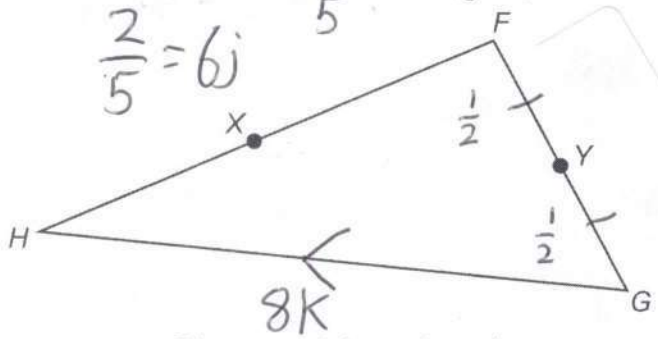


Diagram not drawn to scale

FX = 9**j** and **GH** = 8**k**.
Write the vector **FY** in the form a**j** + b**k**. [3]

$\overrightarrow{FY} = \frac{1}{2}\overrightarrow{FG}$

$= \frac{1}{2}(FH + HG)$

$= \frac{1}{2}(15\mathbf{j} + -8\mathbf{K})$ ✓

FY = $7.5\mathbf{j} - 4\mathbf{K}$ ✓

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(b) The vectors **OA**, **OB** and **OC** are shown in the diagram.

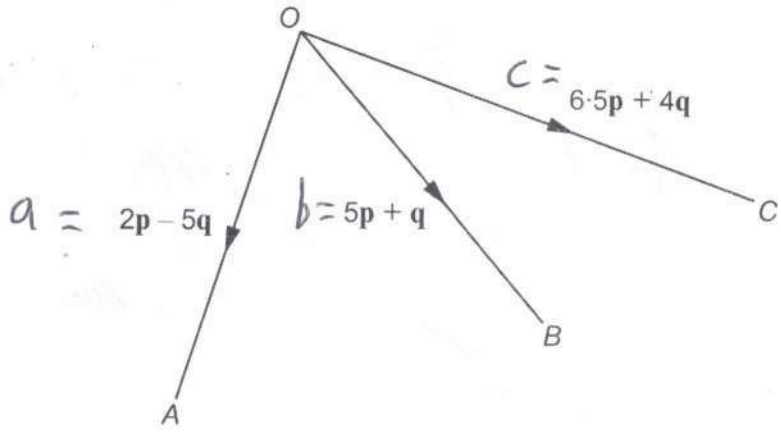


Diagram not drawn to scale

Show that the points *A*, *B* and *C* lie on a straight line. [4]

$\overrightarrow{AB} = b - a = (5p + q) - (2p - 5q) = 3p + 6q$ ✓

$= 3(p + 2q)$ ✓

$\overrightarrow{AC} = c - a = (6{\cdot}5p + 4q) - (2p - 5q) = 4{\cdot}5p + 9q$

$= 4{\cdot}5(p + 2q)$ ✓

$\overrightarrow{AC} = 1{\cdot}5\overrightarrow{AB}$ ✓ OE

so $\overrightarrow{AB}$ and $\overrightarrow{AC}$ are parallel

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19. A bag contains 3 pink cubes and 5 green cubes.
The following steps are taken.

- Step 1: A cube is chosen at random from the bag and replaced by 2 more cubes of the **other** colour.
- Step 2: Repeat step 1.
- Step 3: A third cube is chosen at random.

(a) Show that the probability that all three cubes are pink is $\frac{1}{120}$. [3]

P1 P2 P3

$\frac{3}{8} \times \frac{2}{9} \quad \frac{1}{10} = \frac{6}{720} = \frac{1}{120}$ ✓✓ ✓

(b) Calculate the probability that the first two cubes are the same colour and the third cube is a different colour. [4]

PPG + GGP

$\left(\frac{3}{8} \times \frac{2}{9} \times \frac{9}{10}\right) + \left(\frac{5}{8} \times \frac{4}{9} \times \frac{7}{10}\right)$ ✓✓✓

$\frac{54}{720} + \frac{140}{720}$

$= \frac{194}{720}$ OR $\frac{97}{360}$ ✓

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20. The sketch below shows a circle with diameter PQ.
The line $y - 2x + 5 = 0$ is a tangent to the circle at the point Q.

Find the equation of the line PQ.
Write your answer in the form $ax + by + c = 0$. [5]

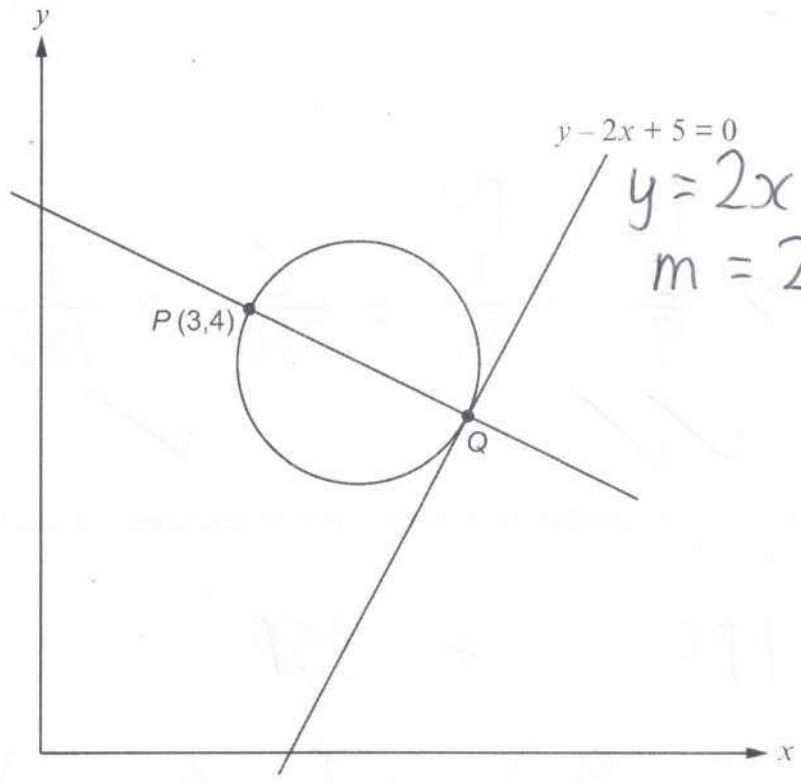


Diagram not drawn to scale

$y = 2x - 5$
$m = 2$ ✓

$m_{PQ} = -\frac{1}{2}$ ✓

use $y = mx + c$ (3,4)

$4 = -\frac{1}{2} \times 3 + c$ ✓

$5.5 = c$

$y = -\frac{1}{2}x + 5.5$ ✓

$2y = -x + 11$

$x + 2y - 11 = 0$ ✓

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21. The function $f(x)$ is defined by $f(x)=5x-2$.

(a) (i) Find $f^{-1}(x)$. [2]

$y = 5x - 2$

$y + 2 = 5x$ ✓

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

so $f^{-1}(x) = \frac{x+2}{5}$ ✓

(ii) Find and simplify an expression for $ff(x)$. [2]

$= 5(5x-2) - 2$ ✓

$= 25x - 10 - 2$

$= 25x - 12$ ✓

(b) The function $g(x)$ is defined by $g(x)=kx^2+3$.

Given that $fg(-2) = 73$, calculate the value of k. [4]

$g(-2) = K(-2)^2 + 3 = 4K + 3$ ✓

$f(4K+3) = 73$

$5(4K+3) - 2 = 73$ ✓

$20K + 15 - 2 = 73$

$20K = 60$ ✓

$K = 3$ ✓

END OF PAPER

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