OCR
Oxford Cambridge and RSA

Wednesday 7 June 2023 – Morning

GCSE (9–1) Mathematics

J560/02 Paper 2 (Foundation Tier)

Time allowed: 1 hour 30 minutes

You must have:
- the Formulae Sheet for Foundation Tier (inside this document)

You can use:
- geometrical instruments
- tracing paper

Do not use:
- a calculator

F

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

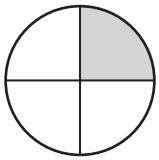
Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION
- The total mark for this paper is **100**.
- The marks for each question are shown in brackets **[ ]**.
- This document has **20** pages.

ADVICE
- Read each question carefully before you start your answer.

1 **(a)** Write down the percentage of this circle that is shaded.

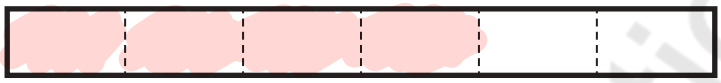


$\frac{1}{4} = \frac{25}{100} = 25\%$ (×25)

(a) ..... 25 % **[1]**

(b) Shade $\frac{2}{3}$ of this rectangle.

$\frac{2}{3} = \frac{4}{6}$ (×2)



[1]

2 **(a)** Work out.

$20 - 16 \div 2$

BIDMAS

$20 - 8 = 12$

(a) ..... 12 ..... **[1]**

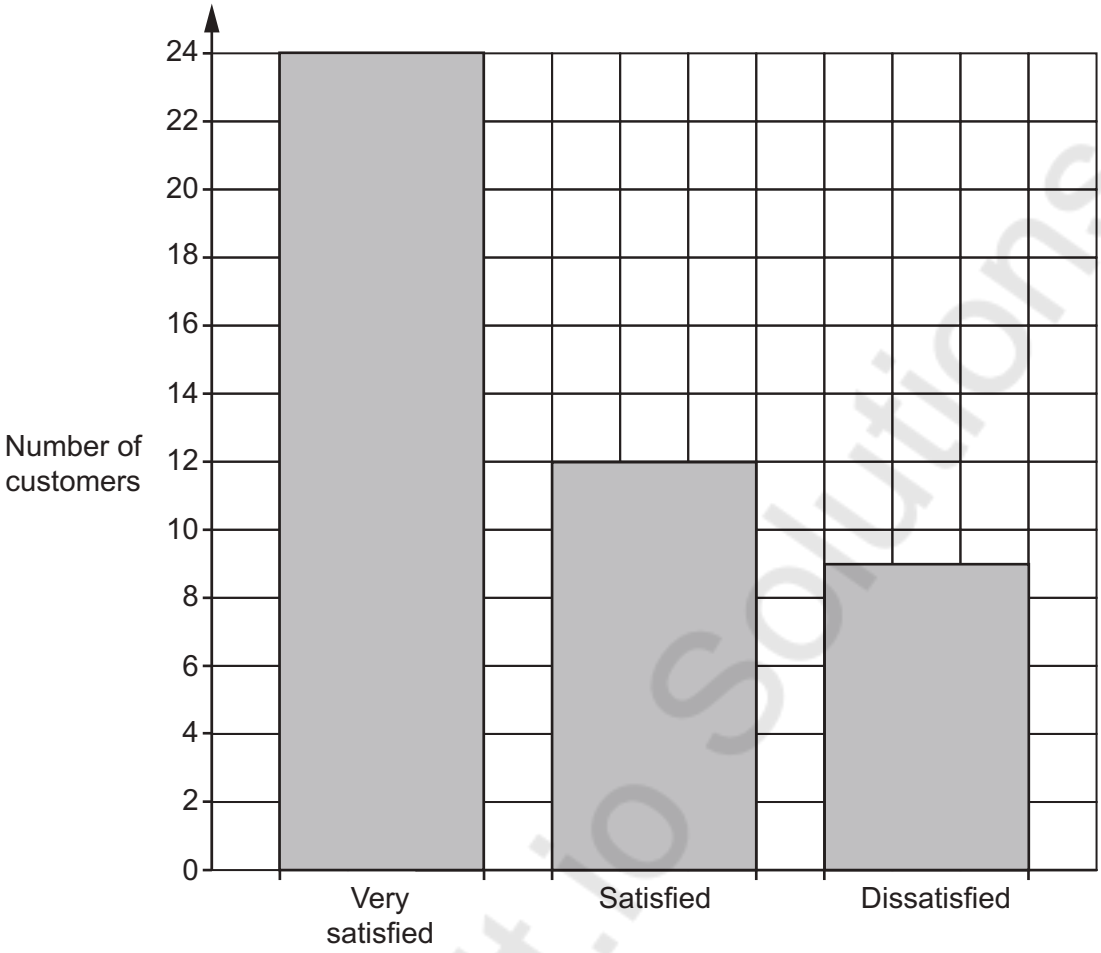
(b) Insert **one** pair of brackets to make this calculation correct.

$2 + (7 - 3) \times 8 = 34$ **[1]**

$2 + 4 \times 8$

$2 + 32 = 34$

3 A store carries out a satisfaction survey on a sample of its customers.
The bar chart shows the results.



(a) Work out how many customers were in the sample.

24 + 12 + 9 = 45

(a) 45 ..... **[2]**

(b) The store manager decides to display the results in a pictogram.

Complete the final row of the pictogram and the key.

Very satisfied	◇ ◇ ◇ ◇
Satisfied	◇ ◇
Dissatisfied	◇ ◁

= 9

Key: ◇ represents 6 customers. **[2]**

4 **(a)** Complete this statement by writing the missing value in the box.

$$\frac{17}{5} = 3\frac{\boxed{2}}{5}$$

17 - 15 = 2

[1]

(b) Write $2\frac{1}{4}$ as an improper fraction.

2 x 4 + 1 = 9

(b) $\frac{9}{4}$ **[1]**

(c) Work out.

$\frac{4}{7} - \frac{5}{14}$

$\frac{4}{7} \xrightarrow{\times 2} \frac{8}{14}$

$\frac{8}{14} - \frac{5}{14} = \frac{3}{14}$

(c) $\frac{3}{14}$ **[2]**

(d) Work out, giving your answer as a fraction in its simplest form.

$\frac{2}{5} \times \frac{15}{16}$

$\frac{\cancel{2}^{1}}{\cancel{5}_{1}} \times \frac{\cancel{15}^{3}}{\cancel{16}_{8}}$

$\frac{1}{1} \times \frac{3}{8} = \frac{3}{8}$

(d) $\frac{3}{8}$ **[2]**

5 Solve.

(a) $\frac{x}{3} = 6$

$x = 6 \times 3$

$= 18$

(a) $x =$ 18 **[1]**

(b) $2x = -14$

$x = -14 \div 2$

$= -7$

(b) $x =$ -7 **[1]**

6 **(a)** Alex is 1.34 metres tall.
Gabi is 95 centimetres tall.

Find, in centimetres, how much taller Alex is than Gabi.

1m = 100cm

×100

Alex 1.34 × 100 = 134 cm

134 − 95 = 39 cm

(a) 39 cm **[2]**

(b) Arrange these units of capacity in order of size starting with the smallest.

250 millilitres $\frac{1}{5}$ litre 0.3 litres 0.199 litres

1L = 1000ml

÷1000

250ml ÷ 1000 =

0.25L

$\frac{1}{5} = \frac{2}{10} = 0.2$

0.2L

$\frac{1}{5}$ L

0.199 L, $\frac{1}{5}$ L, 250 ml, 0.3 L **[2]**

smallest

7 Azmi invests £700 at a rate of 2% per year simple interest.

(a) Work out the interest Azmi receives after one year.

100% = £700

÷100 (1% = £7) ÷100

×2 (2% = £14) ×2

(a) £ 14 **[2]**

(b) Work out the value of Azmi's investment after 3 years.

£14 x 3 = £42 interest

£700 + £42 = £742

(b) £ 742 **[2]**

8 Increase 200 by 15%.

100% = 200

÷10 (10% = 20) ÷10

÷2 (5% = 10) ÷2

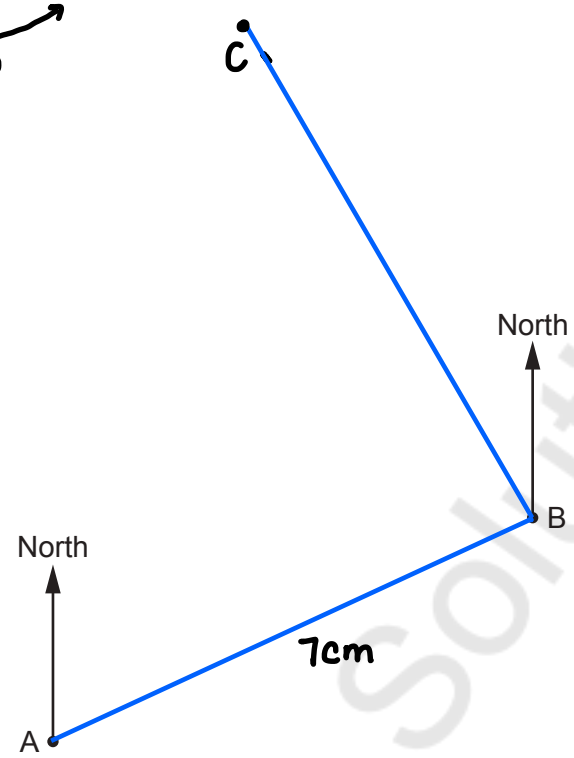
15% = 30

200 + 30 = 230

230 **[3]**

9 The scale drawing shows the positions of two towns, A and B.

Scale: 1 cm represents 10 km



(a) Find the actual distance between town A and town B.

7 x 10 = 70 km

(a) ..... 70 ..... km **[2]**

(b) Town C is 55 km from town B on a bearing of 330°.

On the scale drawing, mark and label the position of town C with a cross. **[2]**

1cm = 10km ÷10

55km ÷10 = 5.5cm

10 Hiro and Ling work in a restaurant.
Hiro is paid £9 per hour and Ling is paid £10 per hour.

One week, Hiro works a total of 30 hours.
Ling earns £50 more than Hiro that week.

Work out the number of hours that Ling works.

Hiro

£9 x 30 hours = £270

Ling

£270 + £50 = £320

Hours = £320 ÷ £10 = 32

..... 32 ..... hours **[4]**

11 Work out.

$\sqrt[3]{64} \times \left(\frac{1}{2}\right)^2$

$\sqrt[3]{64} = 4$

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

$4 \times \frac{1}{4} = 1$

..... 1 ..... **[3]**

12 Sasha is trying to remember a 4-digit pin number.
Sasha knows it has the following digits and that **the first digit is 9**.

9	3	2	7

(a) Write down all of the possible orders for Sasha's 4-digit pin number. **[2]**

9 3 2 7

9 3 7 2

9 7 3 2

9 7 2 3

9 2 3 7

9 2 7 3

(b) Sasha tries one of these orders at random.

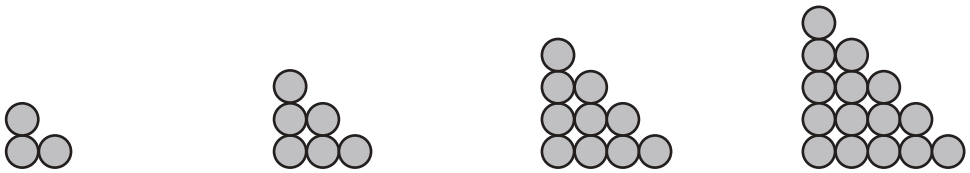
Write down the probability that the last digit of the pin number that Sasha tries is 2.

9372
9732

$\frac{2}{6}$

(b) ..... $\frac{2}{6}$ ..... **[1]**

13 Ryan is making a sequence of patterns using counters.
Here are the first four patterns in the sequence.



Pattern 1
3 counters

Pattern 2
6 counters

Pattern 3
10 counters

Pattern 4
15 counters

Pattern 5

Pattern 6

+3 +4 +5

21 28

49

(a) Ryan started with 80 counters.

Ryan says

I still have enough counters to make Pattern 5 and Pattern 6.

Is Ryan correct?
Show how you decide.

3 + 6 + 10 + 15 = 34

80 − 34 = 46

No because 49 > 46

[4]

(b) **(i)** Complete the table below for the addition of counters in consecutive patterns.

Patterns to add	Counters to add	Total counters
Pattern 1 + Pattern 2	3 + 6	9
Pattern 2 + Pattern 3	6 + 10	16
Pattern 3 + Pattern 4	10 + 15	25

[1]

(ii) The number of counters in Pattern k + Pattern $(k+1)$ is 144.

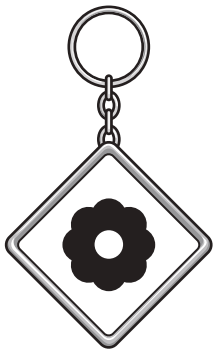
Find the value of k.

K K+1

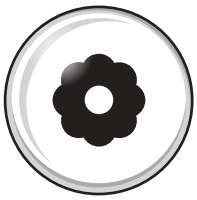
Pattern	4 + 5	5 + 6	6 + 7	7 + 8	8 + 9	9 + 10	10 + 11
Total	36	49	64	81	100	121	144

(b)(ii) $k =$ 10 **[2]**

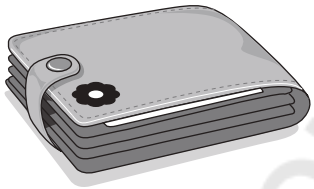
14 A student is buying some gifts for their friends.
The gifts are shown below with the prices.



Key ring
£3.50



Badge
£2.99



Wallet
£7.50

The student has £50 to spend.
They first buy 6 key rings and 2 wallets.
They then buy badges with the remainder of the money.

(a) Work out the maximum number of badges that the student can buy.
You must show your working.

Key rings $6 \times £3.50 = £21$

$^{3}350$
$\times \quad 6$
$2100p$

Wallets $2 \times £7.50 = £15$

$^{1}7.50$
7.50
15.00

Spent so far $= £21 + £15$
$= £36$

Remaining $= £50 - £36$
$= £14$

Badges $£14 \div £2.99$

$^{3}2^{3}99$
$\times \quad 4$
$1196p = £11.96$

(a) Number of badges ..... 4 ..... **[5]**

(b) Work out the amount of money they have left over.

$^{3}1^{9}4\not{0}^{1}0$
$-\ 1196$
$0204p = £2.04$

(b) Amount left over £ ..... 2.04 ..... **[2]**

15 Taylor performs in a show.

Taylor spends $\frac{1}{8}$ of the show singing, $\frac{1}{4}$ of the show dancing and the remaining 55 minutes backstage.

Work out how long the show lasted.
Give your answer in hours and minutes.
You must show your working.

$\frac{1}{8} + \frac{1}{4} = \frac{1}{8} + \frac{2}{8} = \frac{3}{8}$

$1 - \frac{3}{8} = \frac{5}{8}$

$\frac{5}{8} = 55$ mins

$\div 5$ $\qquad\qquad$ $\div 5$

$\frac{1}{8} = 11$ mins

$\times 8$ $\qquad\qquad$ $\times 8$

$\frac{8}{8}$ or $1 = 88$ mins

$88 - 60 = 28$ mins

..... 1 ..... h ..... 28 ..... min **[5]**

16 Complete this identity by writing in the missing numbers.

$4(\ldots\ldots 2 \ldots\ldots x + 1) = 14x - 6(x - 2) - \ldots\ldots 8 \ldots\ldots$ **[2]**

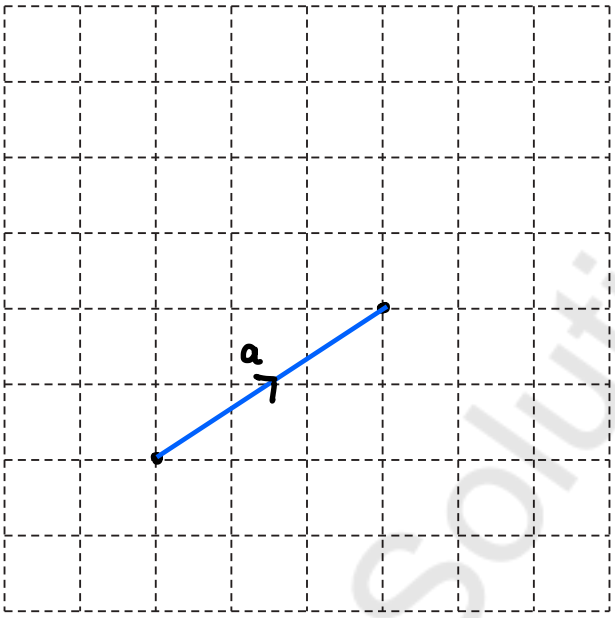
$8x + 4 = 14x - 6x + 12 - \_\_$

$= 8x + 12 - 8$

$= 8x + 4$

17 Vector $\mathbf{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ and vector $\mathbf{b} = \begin{pmatrix} 1 \\ -4 \end{pmatrix}$.

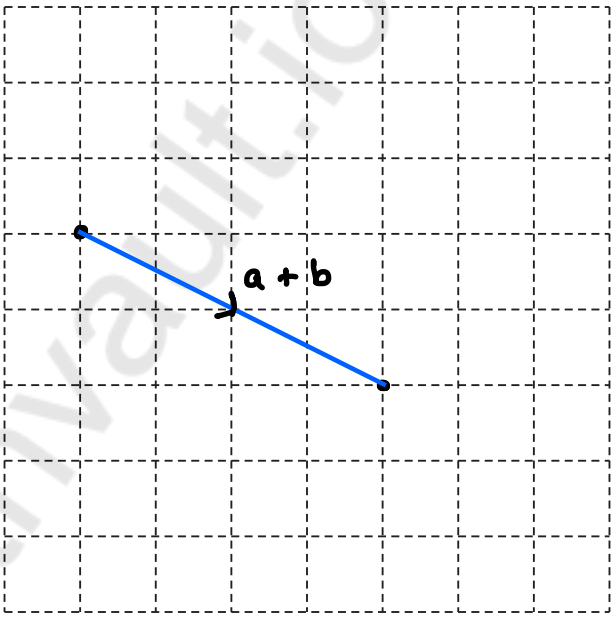
(a) On the grid, draw vector **a**.



$\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ 3 right 2 up

[1]

(b) On the grid, draw vector $\mathbf{a} + \mathbf{b}$.

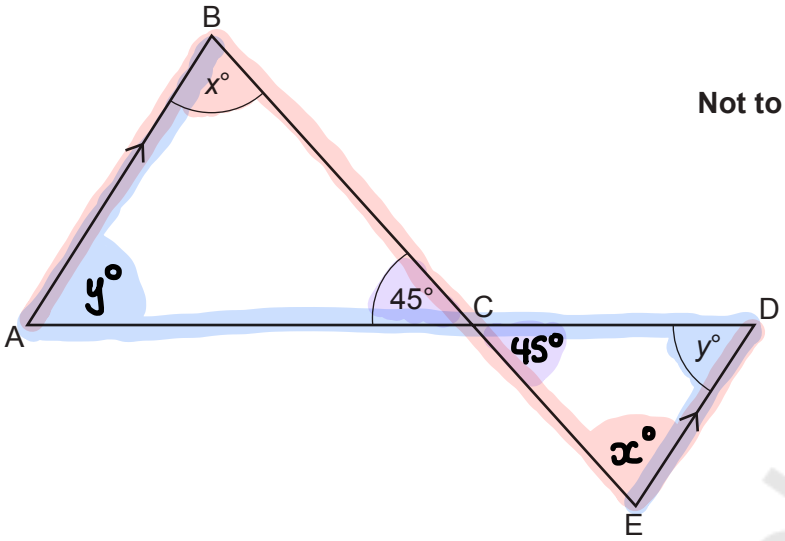


$\begin{pmatrix} 3 \\ 2 \end{pmatrix} + \begin{pmatrix} 1 \\ -4 \end{pmatrix} = \begin{pmatrix} 4 \\ -2 \end{pmatrix}$

4 right
2 down

[2]

18 In the diagram, line AB is parallel to line ED.
The points A, C and D lie on a straight line.
The points B, C and E lie on a straight line.



Not to scale

Angle BCA = 45°, angle ABC = x° and angle CDE = y°.
The ratio x : y is 3 : 2.

Work out the value of x.

$180° - 45° = 135°$

$x : y$
$3 : 2$ 5 parts

$135 \div 5 = 27$

$5 \overline{)135}$ → 27

$x = 3 \times 27$
$= 81°$

$27 \times 3 = 81$

$x =$ 81 **[4]**

19 A sphere has a radius of 3 cm.

Calculate the volume of the sphere.
Give your answer in terms of π in its simplest form.
[The volume V of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$V = \frac{4}{3}\pi(3)^3$

$= \frac{4}{3} \times \pi \times 27$

$= \frac{108}{3}\pi$

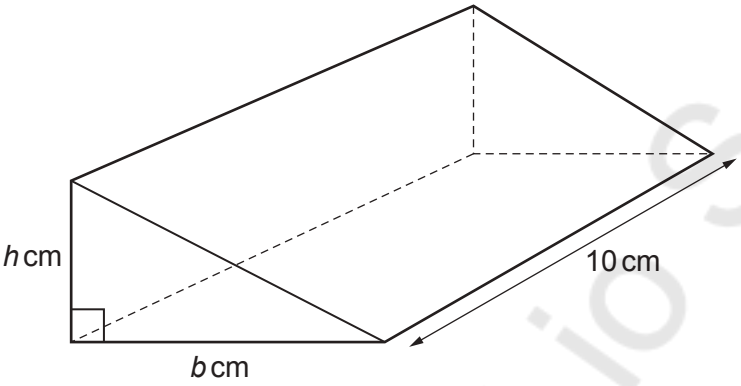
$= 36\pi$

$^{2}27 \times 4 = 108$

$3\overline{)108}$ 36

..... 36π cm^3 **[3]**

20 The diagram shows a prism of length 10 cm.



The cross-section of the prism is a right-angled triangle.
The base, b cm, is 2 cm longer than the height, h cm.
The volume of the prism is 240 cm^3.

A student is explaining how they worked out the value of b.

They say

b is 6 because that means h is 4 and 6 × 4 × 10 = 240.

Describe the student's error and find the correct value of b.

V = area triangle × length

$= \frac{1}{2}bh \times l$

240 = area triangle × 10

$24 = \frac{1}{2}bh$

$48 = bh$ $\quad h = 6 \quad b = 8$

The error is ..... they have not multiplied by $\frac{1}{2}$ .....

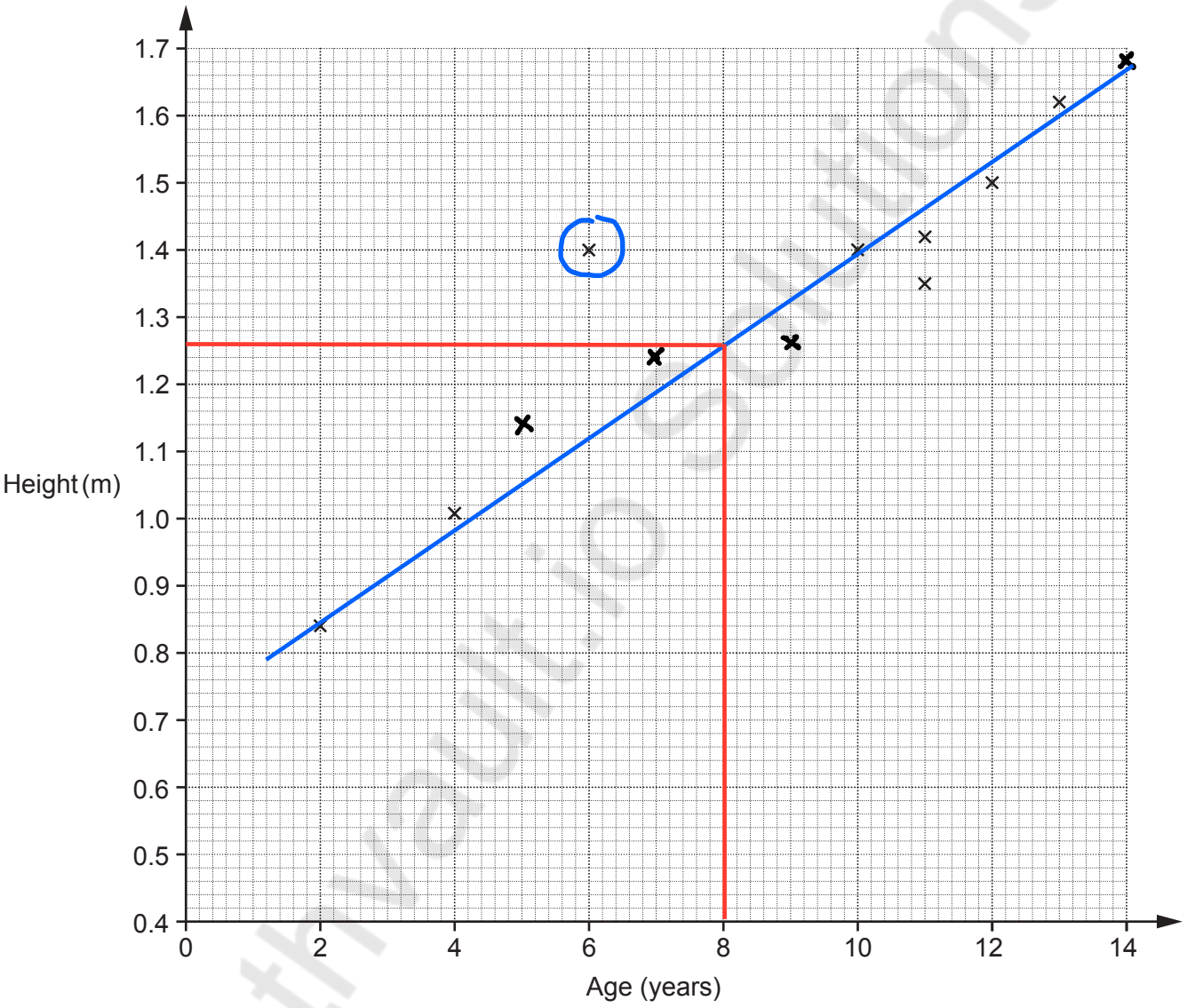
.....

$b =$ ..... 8 ..... **[3]**

21 The table shows the ages and heights of 12 children.

Age (years)	2	4	12	6	10	11	13	11	5	7	9	14
Height (m)	0.84	1.01	1.5	1.4	1.4	1.35	1.62	1.42	1.14	1.24	1.26	1.68

The points for the first eight children (shaded in the table above) are plotted on the scatter diagram.



(a) Plot the points for the remaining four children. **[2]**

(b) Describe the type of correlation shown in the completed scatter diagram.

Positive ..... **[1]**

(c) One of these children is taller than expected for their age.

On the scatter diagram, circle the point representing this child. **[1]**

(d) **(i)** Kai is 8 years old.
By drawing a line of best fit, estimate Kai's height.

(d)(i) 1.26 m **[2]**

(ii) Describe an assumption you have made in giving your answer to part **(d)(i)**.

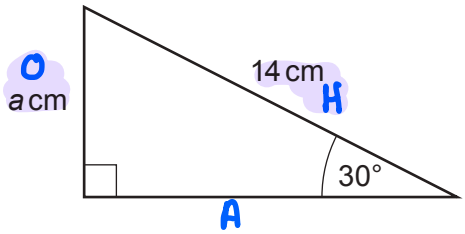
They fit the average pattern and will not be too tall or short for their age. **[1]**

(e) Explain why using this data to estimate the height of a child that is 17 years old may be unreliable.

Only have data up to age 14

[1]

22 The diagram shows a right-angled triangle.



Not to scale

Work out the value of a.

a = ... [3]

23 **(a)** Factorise $x^2 + 10x + 24$.

(a) ..... [2]

(b) Write down the solutions to $x^2 + 10x + 24 = 0$.

(b) x = ... or x = ... [1]

24 A volunteer packs boxes for a charity.
They can pack 5 boxes in 45 seconds.

(a) Use this information to show that they can pack 55 boxes in less than 9 minutes. **[4]**

60 sec = 1 min
(×60)

9 mins × 60 = 540 sec

5 boxes = 45 seconds
(×11)
55 boxes = 495 seconds

45 × 11 = 45 + 450 = 495

495 < 540

(b) What assumption did you make in part **(a)**?

They continue to pack the boxes at the same rate [1]

TURN OVER FOR QUESTION 25

25 A student draws two different regular polygons.
The exterior angle of one polygon is $p°$.
The exterior angle of the other polygon is $q°$.

The sum of p and q is 112°.
The difference between p and q is 32°.

Find the **number of sides** of each polygon.
You must show your working.

$p + q = 112$
$p - q = 32$

$2q = 80$
$\div 2 \quad \div 2$
$q = 40$

$360 \div 40 = 9$ sides

$p + q = 112$
$p + 40 = 112$
$-40 \quad -40$
$p = 72$

$360 \div 72 = 5$ sides

.....5..... sides and .....9..... sides **[6]**

END OF QUESTION PAPER