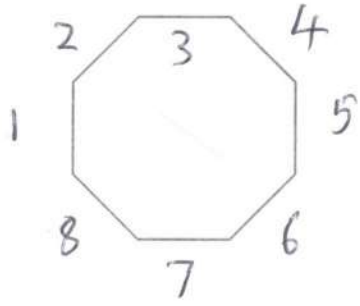
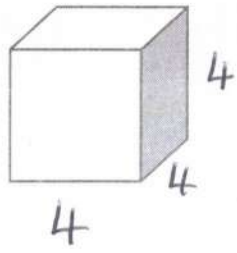
Answer **all** the questions.

1 **(a)** Write down the mathematical name of this polygon.



(a) Octagon ✓ [1]

(b) How many edges does a cube have?



(b) 12 ✓ [1]

2 Here is a list of numbers.

6 9 2 12 3 8 3

(a) Write down the mode.

3 ✓

(a) ..... [1]

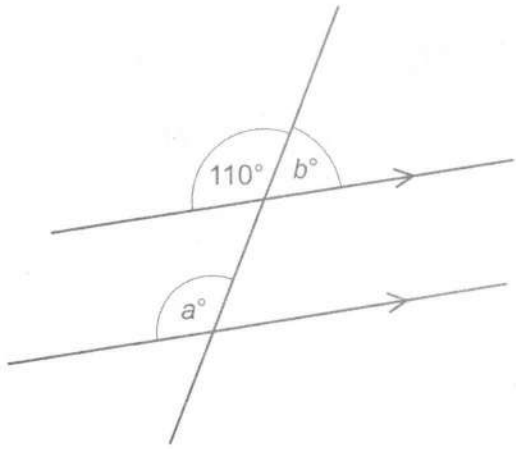
(b) Work out the range.

12 - 2 ✓

10 ✓

(b) ..... [2]

3 The diagram shows a pair of parallel lines.



Not to scale

(a) Write down the value of a.

(a) $a =$ 110 ✓ [1]

(b) Write down the value of b.

(b) $b =$ 70 ✓ [1]

4 Jamie has some empty boxes.
Each box can hold 73 pencils.
Jamie has 590 pencils.

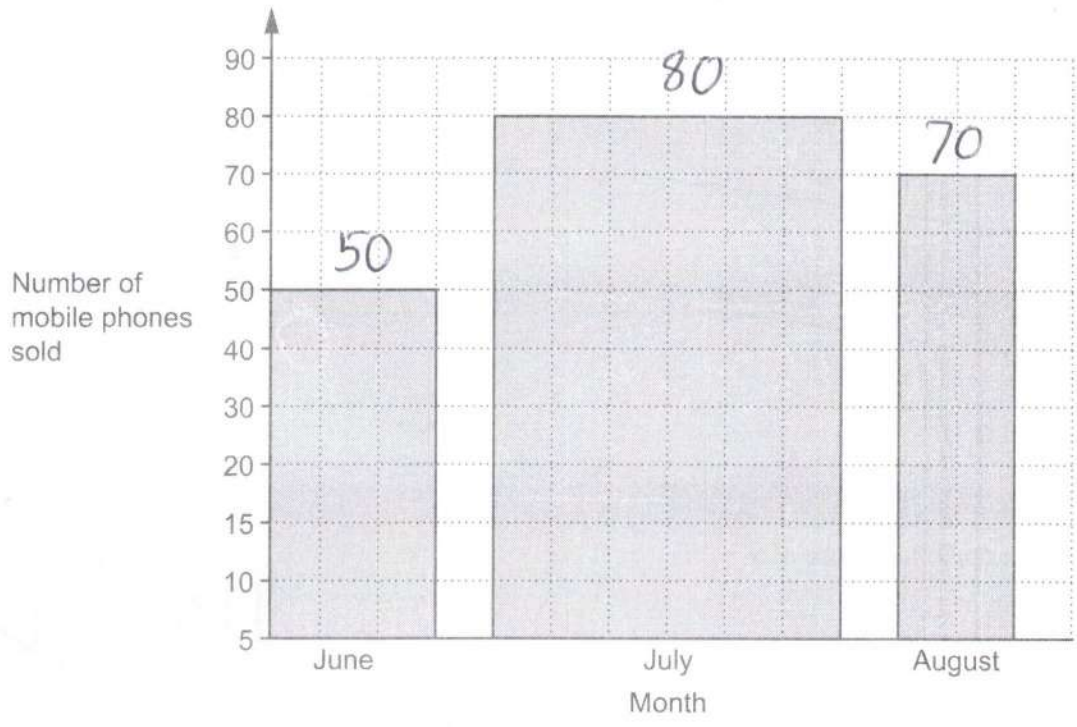
Jamie says that eight boxes are needed to hold all of the pencils.

Is Jamie correct?
You must show your working.

73 x 8 = 584 ✓OE

No ✓ because there's 6 pencils left over/ needs a 9th box etc [2]

5 This graph shows the number of mobile phones sold by a shop in June, July and August.



Give **two** reasons why the graph is misleading.

1 Bars are of unequal width ✓

2 y-axis does not start at 0 ✓

[2]

or

y-axis has unequal steps/spacing

6 Ashley has these three number tiles.

(a) Which one of Ashley's tiles shows a cube number?
Write the number on the blank tile on the answer line.

(a) 8 ✓ [1]

(b) Write down a two-digit prime number that can be made using two of Ashley's tiles.

(b) 83 or 23 ✓ [1]

(c) Write down the three-digit number closest to 300 that can be made using all three of Ashley's tiles.

(c) 283 ✓ [1]

7 **(a)** Simplify.

$t + 5t - 4t$

(a) 2t ✓ [1]

(b) Factorise.

$x^2 + 2x$

(b) $x(x+2)$ ✓ [1]

8 Write the following in order of size, smallest first.

52.9% $\frac{530}{1000}$ $\frac{9}{17}$ 0.5209

0.529 0.530 0.529411... m✓

0.5209 52.9 $\frac{9}{17}$ $\frac{530}{1000}$ ✓ [2]

smallest

9 A pattern is made out of blue tiles and yellow tiles.

$\frac{1}{3}$ of the tiles are blue.

There are 36 yellow tiles.

Work out the **total** number of tiles.

B $\frac{1}{3}$ Y $\frac{2}{3}$

36 ✓

18

36 + 18 = 54 ✓

✓

..... [3]

10 Work out, using your calculator.

$\sqrt{17.5^2 + 60^2}$

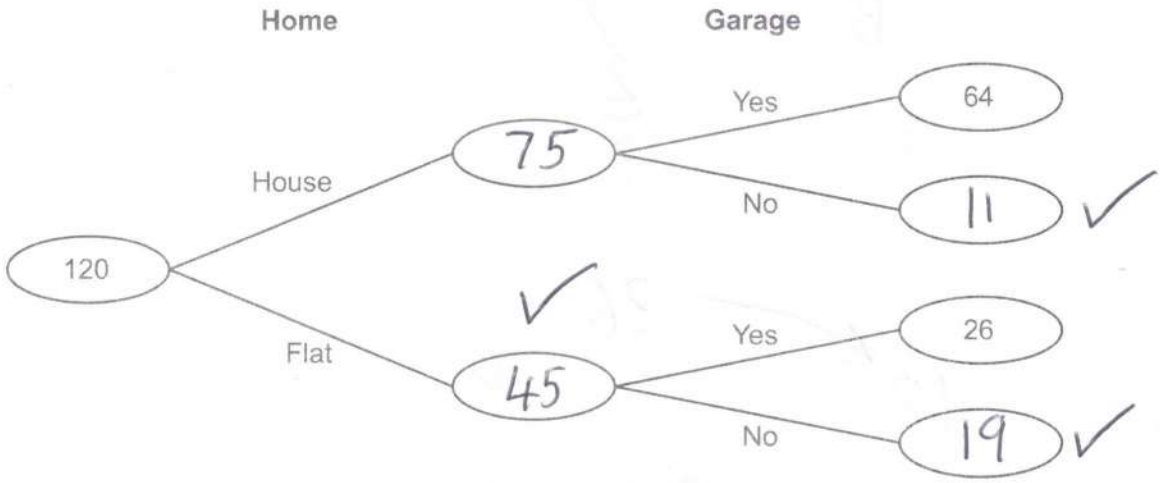
$\sqrt{3906.25}$ ✓

625 ✓

..... [2]

11 120 new homes are built in a village.
Each home is either a house or a flat.
Each home either has a garage or does not have a garage.
64 of the houses have a garage and 26 of the flats have a garage.

This frequency tree shows the above information.



(a) $\frac{5}{8}$ of the homes are houses.

Complete the frequency tree. **[4]**

$\frac{5}{8} \times 120 = 75$ ✓

(b) Show that 75% of the homes have a garage.

Garage = $\frac{64+26}{120} \times 100$ = 75%

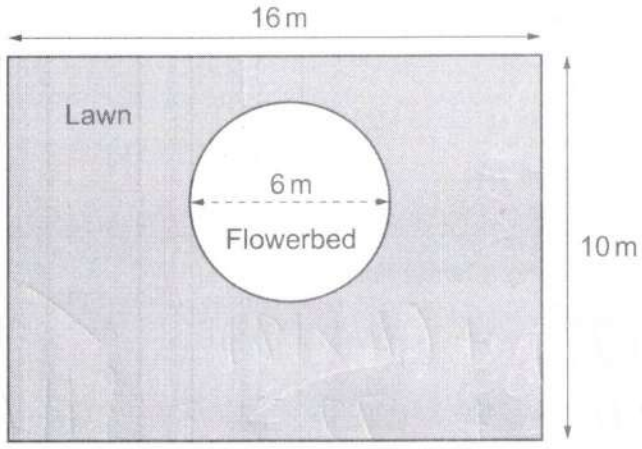
.....

.....

[2]

12 The diagram shows Kai's garden.
The garden is a rectangle, 16 m by 10 m.

It has a lawn and a flowerbed.
The flowerbed is a circle of diameter 6 m.



Not to scale

$r = 3m$

Work out the area of Kai's **lawn**.

$16 \times 10 - \pi \times 3^2$ ✓ ✓

$160 - 9\pi$ ✓

$= 131.7256...$

131.7 ✓ etc

..... m^2 **[4]**

13 Here are the ticket prices for a zoo when bought at the gate.

Adult	£22
Child	£18
Family ticket (2 adults and up to 4 children)	£80

(a) Mr and Mrs Khan take their four children to the zoo.
They buy their tickets at the gate.

How much do Mr and Mrs Khan save by buying a family ticket?

Full price = (2x22) + (4x18) ✓
= 44 + 72 = £116 ✓

✓
116 - 80
= 36 ✓

(a) £ ..... **[4]**

(b) All ticket prices are reduced by 15% if bought online rather than at the gate.
Mr and Mrs Morris take their one child to the same zoo.
They buy their tickets online.

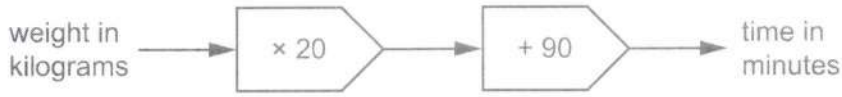
What is the lowest possible **total cost** of their tickets?

(22 + 22 + 18) x 0.85 = 52.7
✓ ✓✓

52.70 ✓

(b) £ ..... **[4]**

14 Here is a rule to work out the time, in minutes, needed to cook a turkey.



(a) Ling's turkey takes 150 minutes to cook.

Use the rule to work out the weight of Ling's turkey.

150 − 90 = 60 ✓

60 ÷ 20 = 3 ✓

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

(b) James cooks a different turkey.
His turkey weighs 6 kg.
James wants to take his turkey out of the oven at 1:15 pm.

Use the rule to work out at what time James should put his turkey in the oven.
You must show your working.

6 x 20 = 120 ✓

120 + 90 = 210 mins ✓

= 3 hrs 30 m ✓

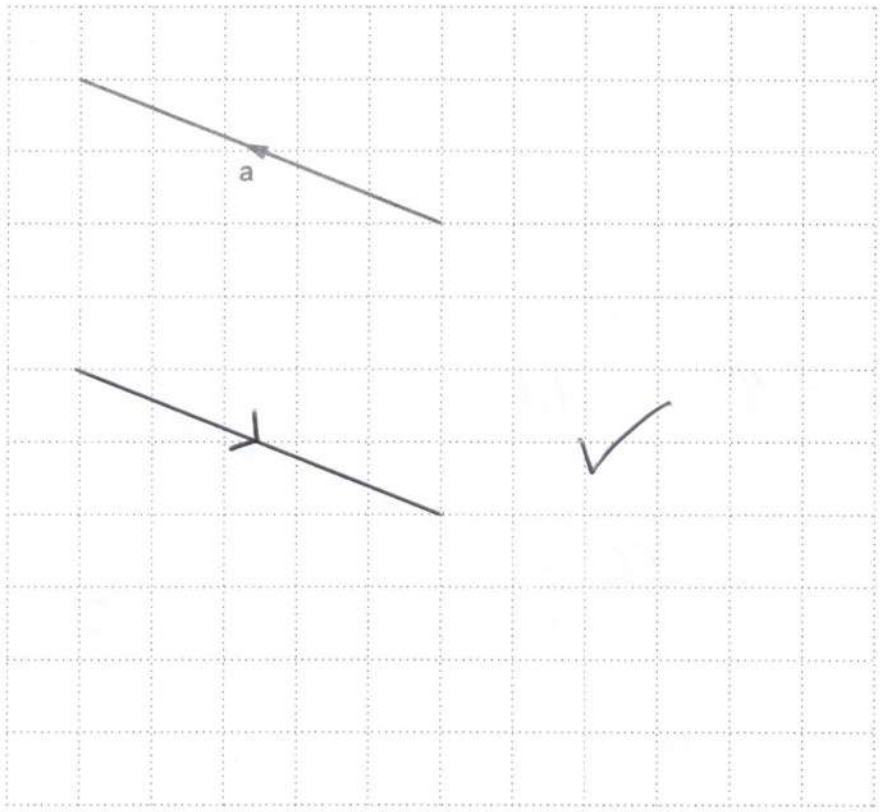
1:15 pm
− 3 hrs
10:15 am

− 30 mins ✓

9:45 am ✓

(b) ..... **[5]**

15 Vector **a** is drawn on this grid.



(a) Write vector **a** as a column vector.

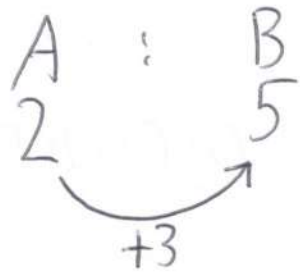
5 ← 2 ↑

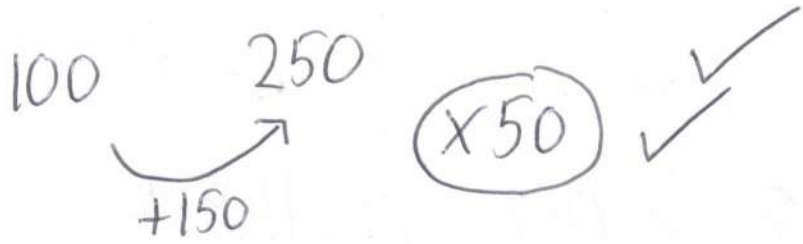
(a) $\begin{pmatrix} -5 \\ 2 \end{pmatrix}$ ..... **[2]**

(b) On the grid above, draw the vector $^{-}$**a**. **[1]**

16 Alex and Blake share some money in the ratio 2 : 5.
Blake receives £150 more than Alex.

How much money does Alex receive?



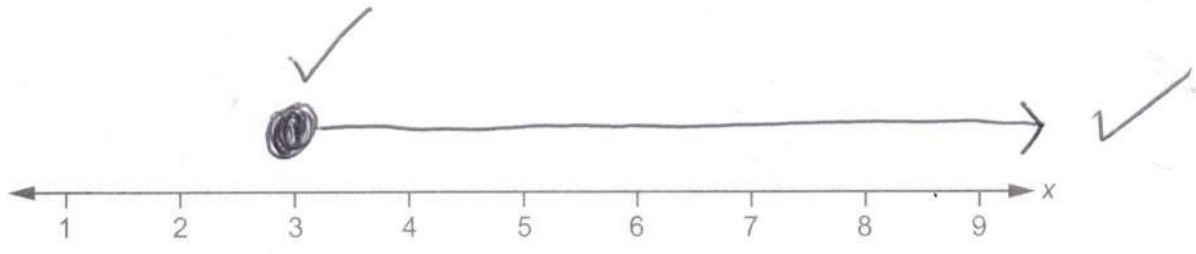


£ 100 ✓ [3]

17 Solve $2x + 5 \geqslant 11$.
Show your solution on the number line.

$2x \geqslant 6$ ✓

$x \geqslant 3$ ✓



[4]

18 **(a)** Write 6 050 000 in standard form.

(a) 6.05×10^6 ✓ [1]

(b) Write 4.58×10^{-3} as an ordinary number.

(b) 0.00458 ✓ [1]

19 A coat is on sale in a shop at a special price of £149.40.
The shop says this is a saving of 17% on their normal price.

Work out the shop's normal price for the coat.

$? \times 0.83 = 149.4$ ✓

$? = 149.4 \div 0.83$ ✓

$= 180$ ✓

£ [3]

20 This list represents four numbers.

127 x $x + 1$ $2x$

The **mean** of the four numbers is 180.

Work out the numbers.
You must show your working.

$127 + x + x + 1 + 2x = 4 \times 180$ ✓ ✓

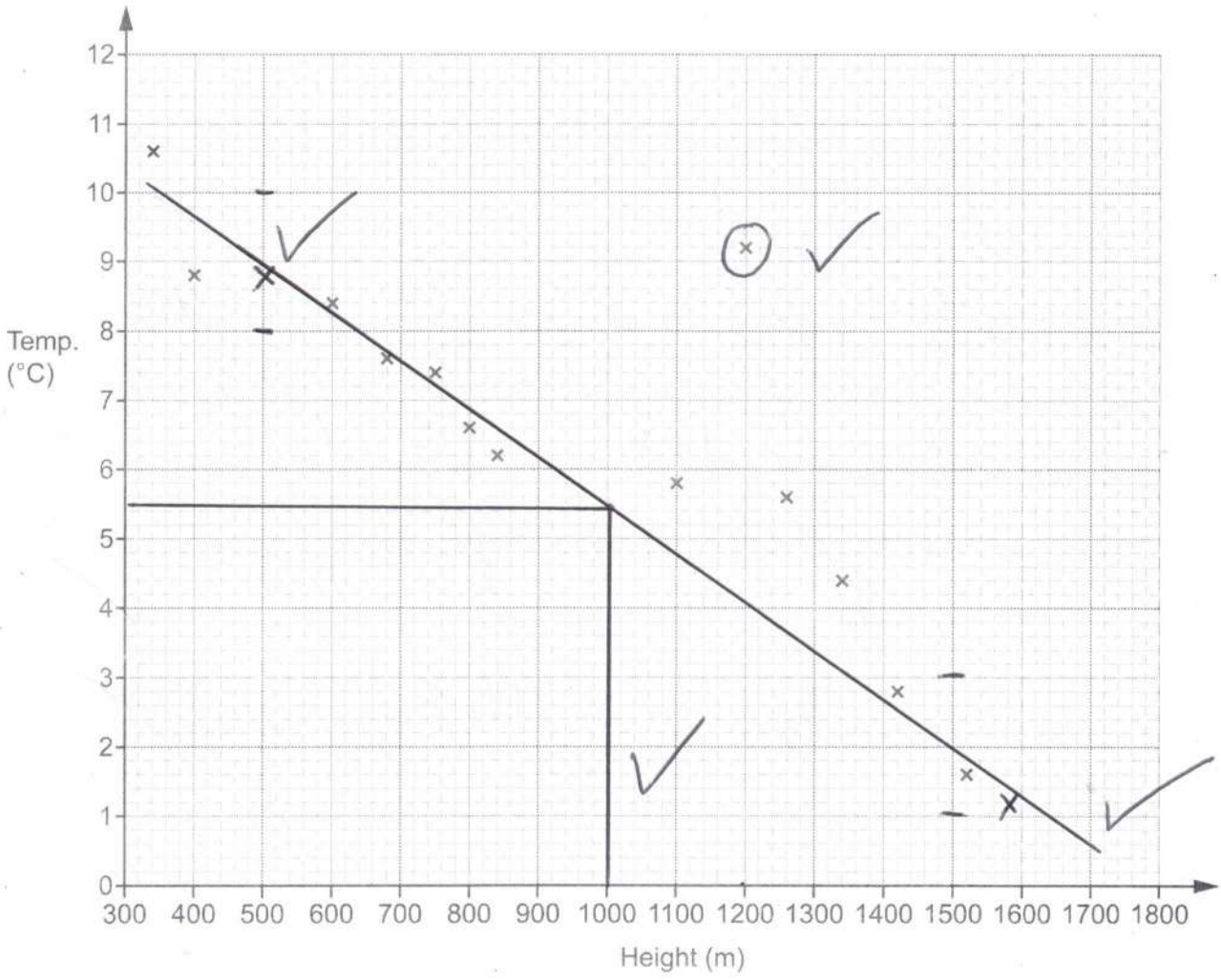
$4x + 128 = 720$

$4x = 592$ ✓

$x = 148$ ✓

127 148 149 296 ✓ [5]

21 The scatter diagram shows the midday temperature at 13 different heights on a mountain.



(a) The table has the information for 2 more heights.

Plot these on the scatter diagram.

Height (m)	500	1580
Temperature (°C)	8.8	1.2

[2]

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

(b) negative ✓ **[1]**

(c) By drawing a line of best fit, estimate the temperature at 1000 m.

[ms: 5 → 6.5]

(c) ....5.5 ✓........ °C **[2]**

(d) Circle the outlier on the scatter diagram. **[1]**

(e) Explain why using the scatter diagram to estimate the temperature at 1800 m may be unreliable.

There's no data for heights >1600 ✓ etc

.... **[1]**

(f) Find the percentage of the 15 temperatures which are below 6 °C.

$\frac{6}{15} \times 100$ ✓✓

(f) ....40 ✓........ % **[3]**

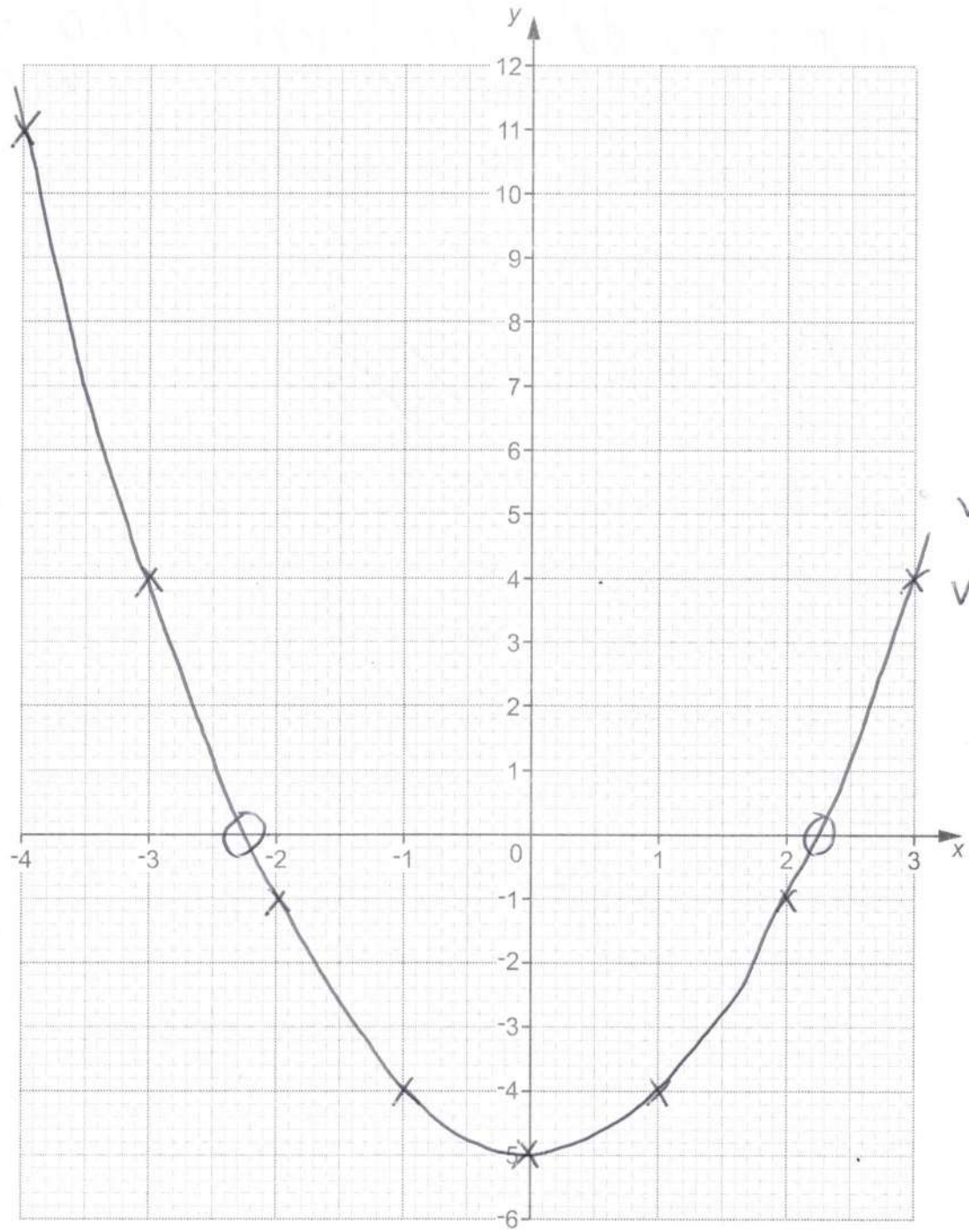
22 **(a)** Complete this table for $y = x^2 - 5$.

x	-4	-3	-2	-1	0	1	2	3
y	11	4	-1	-4	-5	-4	-1	4

16-5

[2]

(b) Draw the graph of $y = x^2 - 5$ for the values of x from -4 to 3.



√5/6
√√ 7/8
√√√ All, curve, ±½

[3]

(c) Use the graph to solve the equation $x^2 - 5 = 0$.
Give your answers to **1** decimal place.

(c) $x =$ -2·25 = -2·3 or $x =$ 2·25 = 2·3 **[2]**

[ms -2·3 → -2·2 / 2·2 - 2·3]

23 Four friends are going on holiday together.
They each take a suitcase.
The weight of each suitcase is 25 kg, correct to nearest kilogram.

(a) Complete the error interval for the weight, w kg, of **one** suitcase.

(a) 24·5 ✓ $\leqslant w <$ 25·5 ✓ **[2]**

(b) The friends must pay extra if the total weight of their four suitcases is more than 102.4 kg.

Can the friends be certain that they will **not** have to pay extra?
Show how you decide.

Upper bound = 25·5 × 4 ✓
= 102 at most ✓

Yes because 102 < 102·4 ✓

[3]

24 A machine can dig, on average, 2 cm of tunnel each minute.
It operates 24 hours each day.

(a) Work out how many days it should take to dig a tunnel of length 3.5 km.
Give your answer to the nearest day.

$$\frac{3.5 \times 1000 \times 100}{2 \times 60 \times 24} \quad \checkmark \quad \checkmark$$

$$= 121.5\ldots \quad \checkmark$$

(a) 122 ✓ days **[4]**

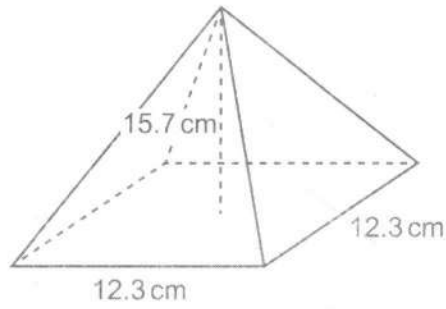
(b) The machine actually digs an average of 2.5 cm of tunnel each minute for most of the time and an average of 1.5 cm each minute for the rest of the time.

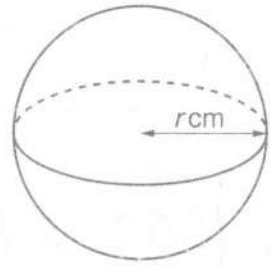
How would this affect your answer to part **(a)**?

It digs more so will take less than 122 days ✓

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

25 The diagram shows a square-based pyramid and a sphere.





The pyramid has base length 12.3 cm and perpendicular height 15.7 cm.
The sphere has radius r cm.

The pyramid and the sphere have the same volume.

Work out the radius of the sphere.
You must show your working.

[The volume of a pyramid is $\frac{1}{3}$ × area of base × perpendicular height.

The volume V of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

(P) $V = \frac{1}{3} \times 12.3^2 \times 15.7$ ✓

$= 791.751$ ✓

(5) $V = \frac{4}{3} \times \pi \times r^3 = 791.751$ ✓

$r = \sqrt[3]{\frac{791.751}{\frac{4}{3} \times \pi}}$ ✓

$= 5.7389...$

$= 5.74$ ✓

..... cm **[5]**

END OF QUESTION PAPER