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Answer ALL TWENTY FIVE questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1. There are 3 red pens, 4 blue pens and 5 black pens in a box. Sameena takes a pen, at random, from the box.

(a) Write down the probability that she takes a black pen.

$$3 + 4 + 5 = 12$$

$$\frac{5}{12} \text{ are black}$$

$$\frac{5}{12} \checkmark$$

.....  
(2)

2

(b) Write down the probability that Sameena takes a pen that is **not** black.

$$P(\text{not Black}) = 1 - \frac{5}{12}$$

$$= \frac{7}{12}$$

$$\frac{7}{12} \checkmark$$

.....  
(1)

1

(Total 3 marks)

Q1  
3

2. Use your calculator to work out

$$\frac{22.4 \times 14.5}{8.5 \times 3.2}$$

Write down all the figures on your calculator display.

11.9411764705882352

✓

11.9411764705882352

.....

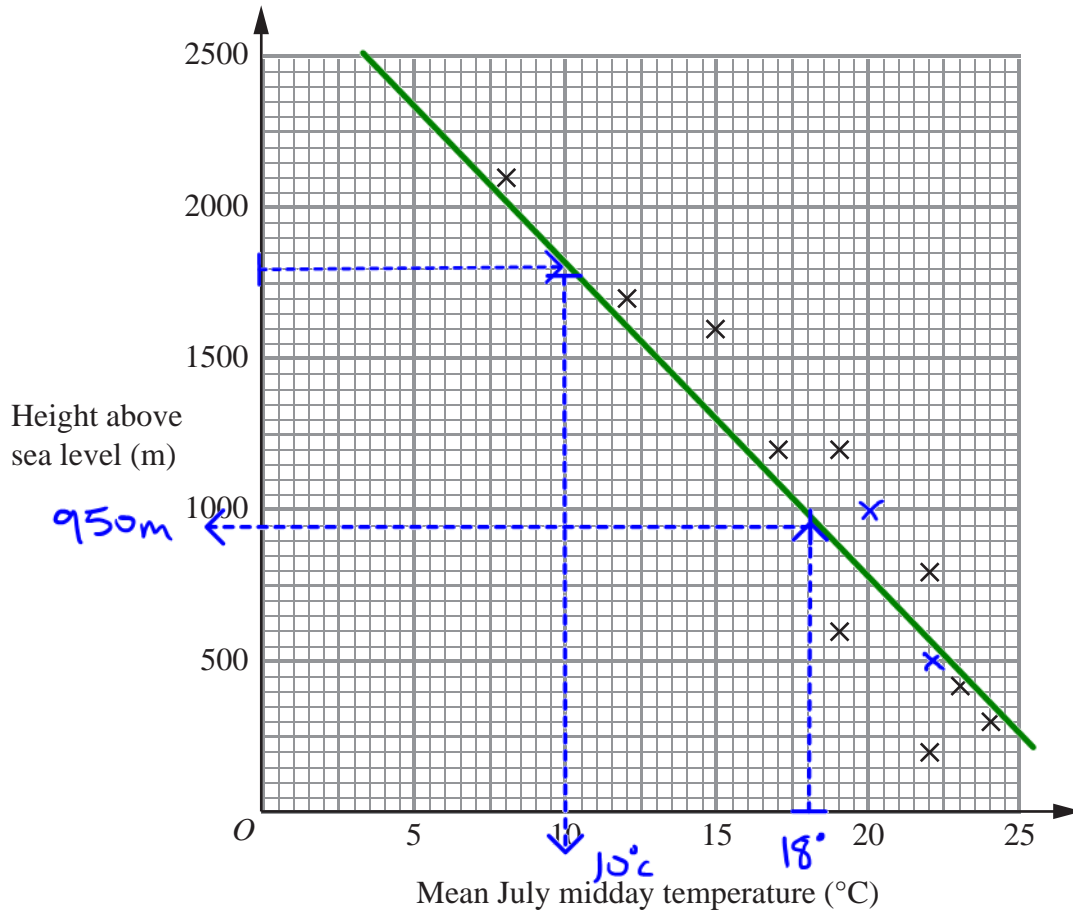
2

(Total 2 marks)

Q2  
2



3. The scatter graph shows information for some weather stations. It shows the height of each weather station above sea level (m) and the mean July midday temperature ( $^{\circ}\text{C}$ ) for that weather station.



The table shows this information for two more weather stations.

Height of weather station above sea level (m)	1000	500
Mean July midday temperature ( $^{\circ}\text{C}$ )	20	22

- (a) Plot this information on the scatter graph. (1)
- (b) What type of correlation does this scatter graph show?  
 NEGATIVE ..... (1)
- (c) Draw a line of best fit on the scatter graph. (1)



Leave blank

A weather station is 1800 metres above sea level.

(d) Estimate the mean July midday temperature for this weather station.

10<sup>x</sup> 11-13  
 ..... °C  
 (1)

0

At another weather station the mean July midday temperature is 18°C.

(e) Estimate the height above sea level of this weather station.

850-1150  
 950 ✓  
 ..... m  
 (1)

1

Q3

(Total 5 marks)

4

4.

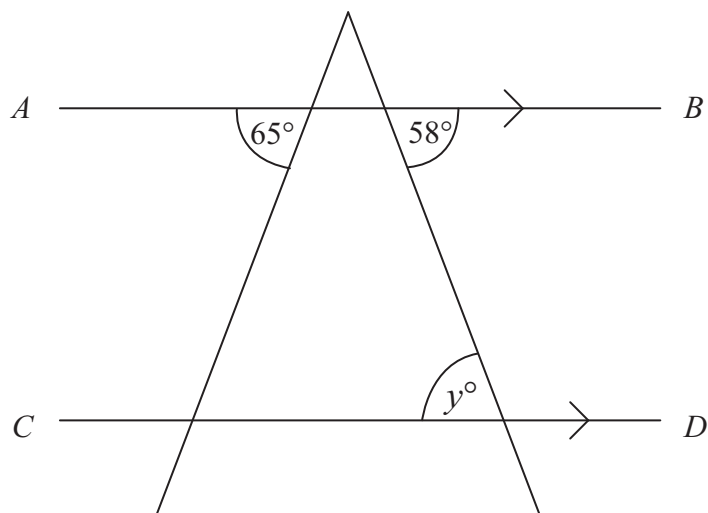


Diagram NOT accurately drawn

AB is parallel to CD.

(i) Write down the value of  $y$ .

58° ✓  
 .....

(ii) Give a reason for your answer.

$y^\circ$  is an ALTERNATE angle to  $58^\circ$  ✓  
 .....

(Total 2 marks)

Q4

2

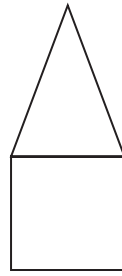
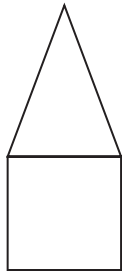


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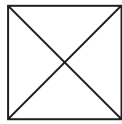
5. Here are the front elevation, side elevation and the plan of a 3-D shape.

Front elevation

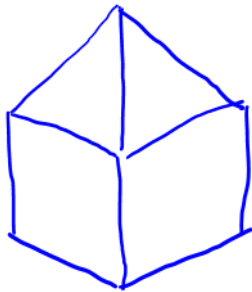
Side elevation



Plan



In the space below, draw a sketch of the 3-D shape.



2

Q5

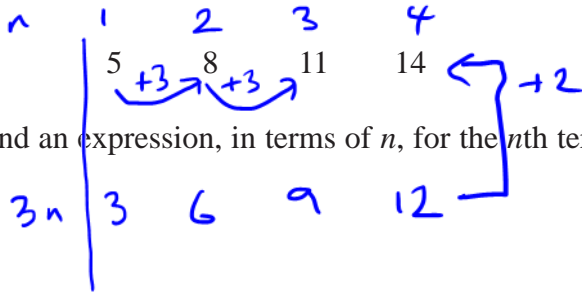
2

(Total 2 marks)



Leave blank

6. Here are the first four terms of an arithmetic sequence.



Find an expression, in terms of  $n$ , for the  $n$ th term of the sequence.

$$3n+2$$

$$3n+2$$

Q6

2

(Total 2 marks)

7. The equation

$$x^3 + 2x = 26$$

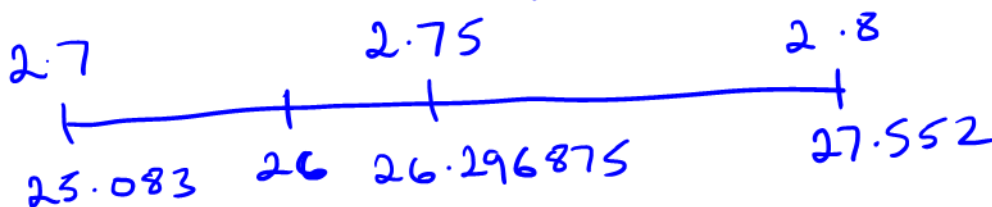
has a solution between 2 and 3

Use a trial and improvement method to find this solution.

Give your answer correct to one decimal place.

You must show all your working.

$x$	$x^3$	$2x$	$x^3 + 2x$	too high / too low
2	8	4	12	too low
3	27	6	33	too high
2.7	19.683	5.4	25.083	too low
2.8	21.952	5.6	27.552	too high
2.75	20.797	5.5	26.296875	too high



$$x = 2.7$$

Q7

4

(Total 4 marks)

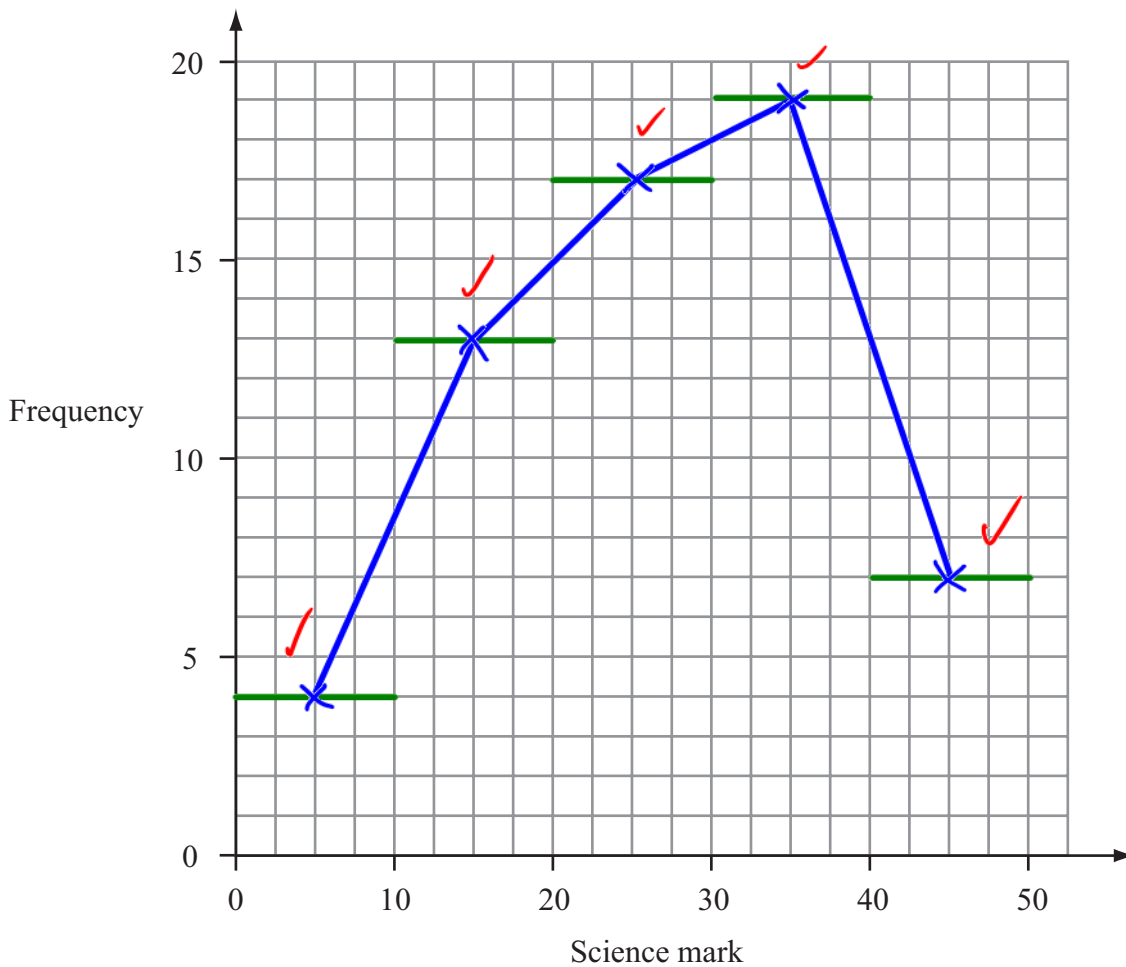


8. 60 students take a science test.  
The test is marked out of 50.

This table shows information about the students' marks.

Science mark	0-10	11-20	21-30	31-40	41-50
Frequency	4	13	17	19	7

On the grid, draw a frequency polygon to show this information.



(Total 2 marks)

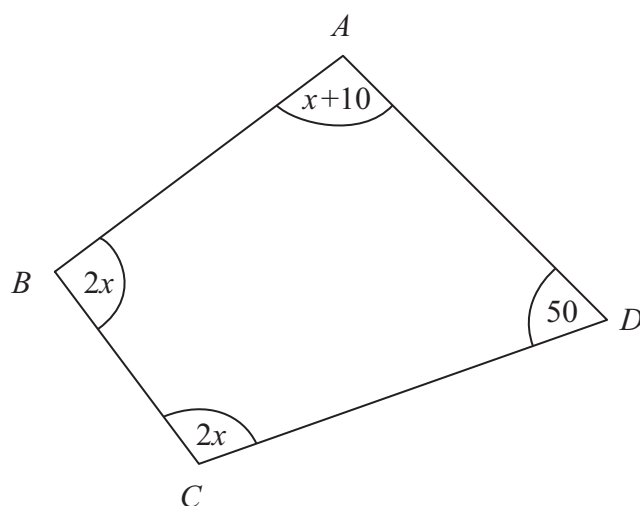
Q8

2

TIP: mark the centre of where the tops of the bars would be if you were drawing a bar chart



9.

Diagram **NOT**  
accurately drawn

In this quadrilateral, the sizes of the angles, in degrees, are

$x + 10$   
 $2x$   
 $2x$   
 $50$

(a) Use this information to write down an equation in terms of  $x$ .

$$2x + 2x + x + 10 + 50 = 360^\circ$$

$$5x + 60^\circ = 360^\circ$$

$$5x = 300^\circ$$

.....  
(2)

2

(b) Work out the value of  $x$ .

$$x = 300 \div 5$$

$$= 60^\circ$$

$$x = 60^\circ \checkmark$$

.....  
(3)

3

(Total 5 marks)

Q9

5



10. A garage sells British cars and foreign cars.

The ratio of the number of British cars sold to the number of foreign cars sold is 2 : 7

The garage sells 45 cars in one week.

(a) Work out the number of British cars the garage sold that week.

$$2+7=9 \text{ shares}$$

$$1 \text{ share} = 45 \div 9 = 5$$

$$2 \text{ shares} = 5 \times 2 = 10$$

10 cars ✓

(2)

2

A car tyre costs £80 plus VAT at  $17\frac{1}{2}\%$ .

(b) Work out the total cost of the tyre.

$$17\frac{1}{2}\% = 0.175$$

Percentage multiplier to add 17.5%  
=  $1 + 0.175 = 1.175$

$$= 1 + 0.175 = 1.175$$

$$£80 \times 1.175 = £94$$

£ 94 ✓

(3)

3

The value of a new car is £12000

The value of the car depreciates by 20% per year.

(c) Work out the value of the car after 2 years.

$$20\% = 0.2$$

Percentage multiplier to DECREASE by 20%

$$= 1 - 0.2 = 0.8$$

→ 2 years

$$£12,000 \times 0.8^2$$

$$= £7680$$

£ 7680 ✓

(3)

3

(Total 8 marks)

Q10

8





Leave blank

11. (a) Simplify  $4a + 3c - 2a + c$

$$4a - 2a + 3c + c =$$

$$2a + 4c$$

(1)

(b)  $S = \frac{1}{2}at^2$

Find the value of  $S$  when  $t = 3$  and  $a = \frac{1}{4}$

$$S = \frac{1}{2} \times \frac{1}{4} \times 3^2$$

$$= 1.125$$

← type this in your calculator!

$$S = 1.125$$

(2)

(c) Factorise  $x^2 - 5x$

Highest Common Factor is  $x$

$$x(x - 5)$$

$$x(x - 5)$$

(2)

(d) Expand and simplify  $(x + 3)(x + 4)$

$$\begin{array}{r} \text{F} \quad x^2 \\ \text{O} \quad 4x \\ \text{I} \quad 3x \\ \text{L} \quad 12 \\ \text{S} \quad x^2 + 7x + 12 \end{array}$$

$$x^2 + 7x + 12$$

(2)

(e) Factorise  $y^2 + 8y + 15$

$1 \times 15$   
 $3 \times 5$

$$(y + 3)(y + 5)$$

$$(y + 3)(y + 5)$$

(2)

(Total 9 marks)

Q11

9



12. A shop sells mobile phones.

The table shows the number of mobile phones sold each month from January to May.

Jan	Feb	Mar	Apr	May
70	64	73	85	91

(a) Work out the percentage increase in the number of mobile phones sold from April to May.

Give your answer correct to 3 significant figures.

$$\begin{aligned} \text{Percentage change} &= \frac{\text{change}}{\text{original}} \times 100\% = \frac{6}{85} \times 100\% \\ &= 7.06\% \end{aligned}$$

(3)

(b) Work out the 3-month moving averages for the information in the table.  
The first one has been worked out for you.

$$\begin{aligned} 64 + 73 + 85 &= 222 & 222 \div 3 &= 74 \\ 73 + 85 + 91 &= 249 & 249 \div 3 &= 83 \end{aligned}$$

(2)

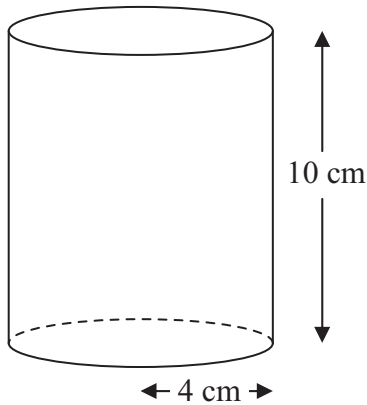
(Total 5 marks)

Q12

5



13.



A solid cylinder has a radius of 4 cm and a height of 10 cm.

- (a) Work out the volume of the cylinder.  
Give your answer correct to 3 significant figures.

$$\begin{aligned}
 \text{Volume of cylinder} &= \pi r^2 h \\
 &= \pi \times 4^2 \times 10 \\
 &= 160\pi \\
 &= 503 \checkmark
 \end{aligned}$$

..... cm<sup>3</sup>  
(2) 2

The cylinder is made from wood.  
The density of the wood is 0.6 grams per cm<sup>3</sup>.

- (b) Work out the mass of the cylinder.  
Give your answer correct to 3 significant figures.

$$\begin{aligned}
 \text{each cm}^3 \text{ weighs } &0.6 \text{ grams} \\
 \text{so mass} &= 503 \times 0.6 \\
 &= 302 \text{ g (3sf)} \checkmark
 \end{aligned}$$

..... grams  
(2) 2

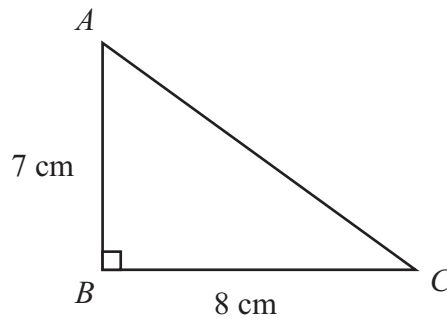
(Total 4 marks) 4

Q13

4



14.

Diagram **NOT**  
accurately drawn $ABC$  is a right-angled triangle. $AB = 7$  cm, $BC = 8$  cm.

(a) Work out the area of the triangle.

$$\begin{aligned} \text{Area } \triangle &= \frac{1}{2}bh \\ &= \frac{1}{2} \times 8 \times 7 \\ &= 28 \text{ cm}^2 \end{aligned}$$

.....  $28$  ✓  $\text{cm}^2$   
(2)

2

(b) Work out the length of  $AC$ .

Give your answer correct to 2 decimal places.

$$\text{PYTHAGORAS } c^2 = a^2 + b^2$$

$$\begin{aligned} AC^2 &= 7^2 + 8^2 \\ &= 49 + 64 = 113 \end{aligned}$$

$$AC = \sqrt{113} = 10.63$$

.....  $10.63$  ✓  $\text{cm}$   
(3)

3



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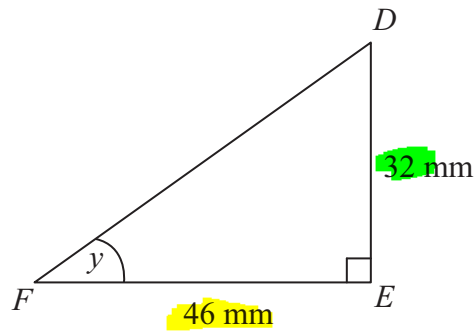


Diagram NOT accurately drawn

DEF is another right-angled triangle.  
 DE = 32 mm,  
 FE = 46 mm.

S O H C A H T O A

- (c) Calculate the size of angle  $y$ .  
 Give your answer correct to 1 decimal place.

$$\tan y^\circ = \frac{32}{46}$$

$$y = \tan^{-1}\left(\frac{32}{46}\right) = 34.8^\circ$$

34.8<sup>o</sup> ✓  
 .....  
 (3)

(Total 8 marks)

3

Q14

8



Answer ALL TWENTY SEVEN questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1. Here are the ingredients for making cheese pie for 6 people.

Cheese pie for 6 people

180 g flour

240 g cheese

80 g butter

4 eggs

160 ml milk

Bill makes a cheese pie for 3 people.

- (a) Work out how much flour he needs.

$$180\text{g} \div 2 = 90\text{g}$$

90 ✓  
..... g  
(2)

2

Jenny makes a cheese pie for 15 people.

- (b) Work out how much milk she needs.

$$\frac{15}{6} = 2\frac{1}{2}$$

$$160\text{ml} \times 2\frac{1}{2} = 400\text{ml}$$

400 ✓  
..... ml  
(2)

2

(Total 4 marks)

Q1

4



Leave  
blank

2. Use a calculator to work out

$$\sqrt{\frac{21.6 \times 15.8}{3.8}}$$

(a) Write down all the figures on your calculator display.

9.476841579

9.476841579 ✓

2

(2)

(b) Give your answer to part (a) correct to 3 significant figures.

9.476841579  
 ↑  
 more than 5

9.48 ✓

1

(1)

(Total 3 marks)

Q2  
33. The cost of a radio is the list price plus VAT at  $17\frac{1}{2}\%$ .

The list price of a radio is £240

Work out the cost of the radio.

$$17\frac{1}{2}\% = 0.175$$

$$\text{Multiplier } 1 + 0.175 = 1.175$$

$$240 \times 1.175 = 282$$

£ 282 ✓

(Total 3 marks)

Q3  
3

Leave blank

4. (a) Expand  $4(x - 3)$

$$4(x-3) = 4x - 12$$

$$4x - 12 \checkmark$$

.....  
(1)

(b) Solve  $4t + 1 = 19$

$$(-1) \quad 4t = 18$$

$$(\div 4) \quad t = 4.5$$

$$t = 4.5 \checkmark$$

.....  
(2)

(Total 3 marks)

Q4  
3

5. The  $n$ th term of a sequence is  $n^2 + 4$

Alex says

“The  $n$ th term of the sequence is always a prime number when  $n$  is an odd number.”

Alex is wrong.

Give an example to show that Alex is wrong.

$n$	1	3	5	7	9
$n^2$	1	9	25	49	81
$n^2 + 4$	5	13	29	53	85

when  $n = 9$   
 $n^2 + 4 = 85$   
 85 is NOT prime

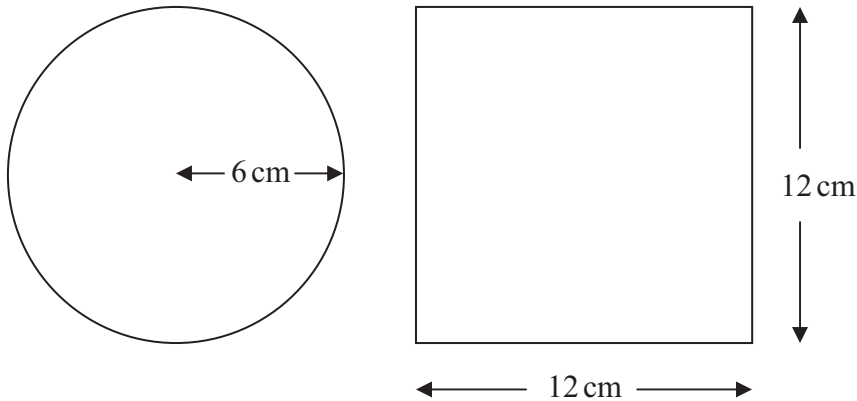
(Total 2 marks)

Q5  
2





6.

Diagram NOT  
accurately drawn

A circle has a radius of 6 cm.

A square has a side of length 12 cm.

Work out the difference between the area of the circle and the area of the square.

Give your answer correct to one decimal place.

Area of circle

$$= \pi r^2$$

$$= 36\pi$$

Difference

$$144 - 36\pi$$

$$= 30.90266447$$

$$= 30.9 \text{ cm}^2 \text{ (1dp)}$$

$$\dots\dots\dots 30.9 \text{ cm}^2$$

Area of square

$$= 12^2 = 144$$

(Total 4 marks)

Q6

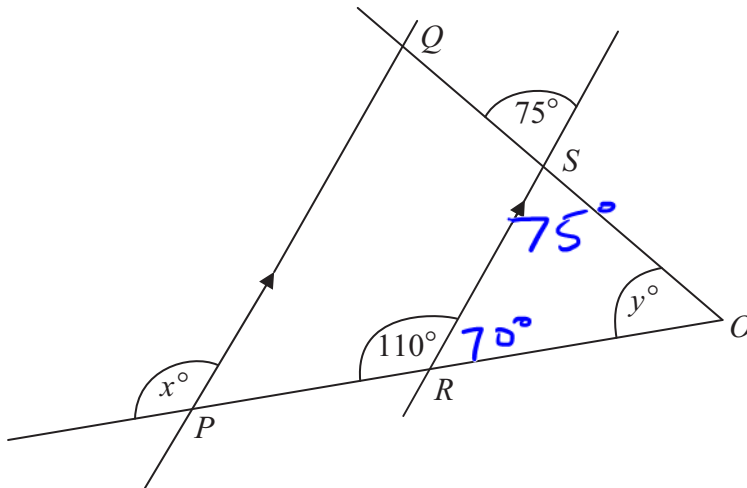
4



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7.

Diagram NOT accurately drawn



$PQ$  is parallel to  $RS$ .

$OSQ$  and  $ORP$  are straight lines.

(a) (i) Write down the value of  $x$ .

$x = 110^\circ$  ✓

(ii) Give a reason for your answer.

$x^\circ$  is a corresponding angle to  $110^\circ$  (2)

(b) Work out the value of  $y$ .

$$y^\circ = 180^\circ - (70^\circ + 75^\circ)$$

$$= 180^\circ - 145^\circ$$

$$= 35^\circ$$

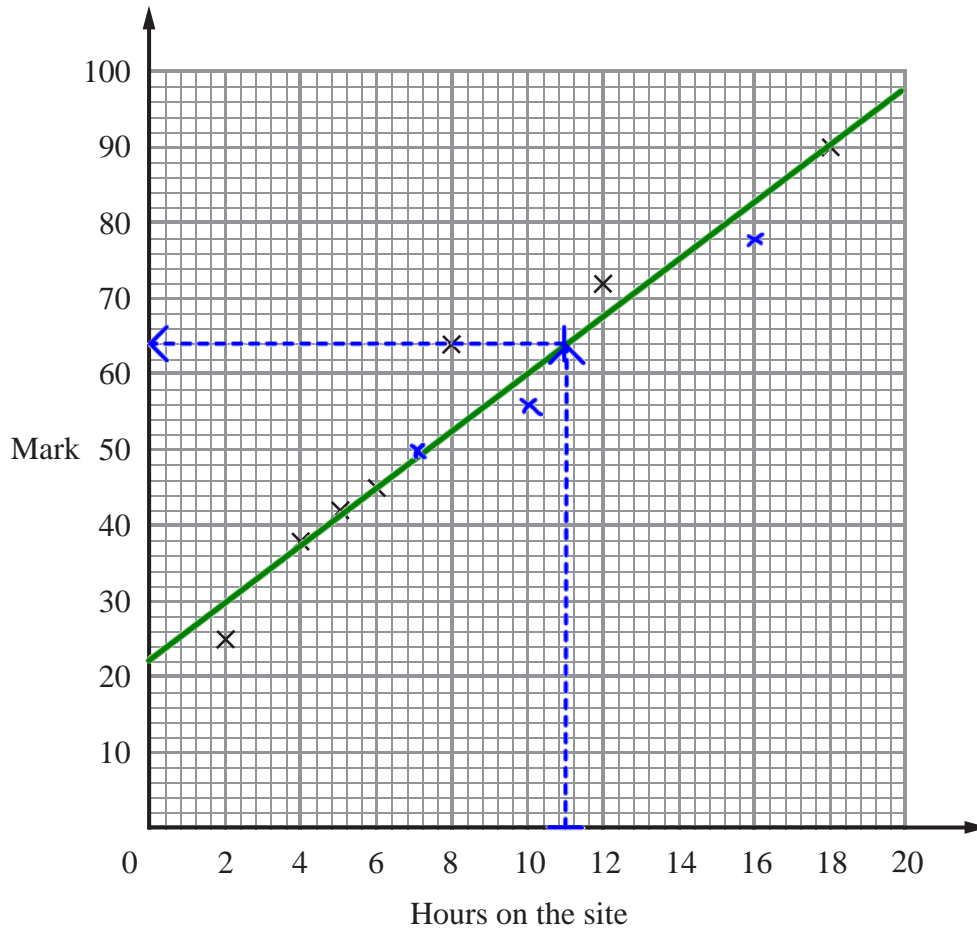
$y = 35^\circ$  ✓ (2)

(Total 4 marks)

Q7  
4



8. Some students revised for a mathematics exam. They used an internet revision site. The scatter graph shows the times seven students spent on the internet revision site and the marks the students got in the mathematics exam.



Here is the information for 3 more students.

Hours on the site	7	10	16
Mark	50	56	78

- (a) Plot this information on the scatter graph. (1)
- (b) What type of correlation does this scatter graph show? (1)
- POSITIVE ✓
- 
- (c) Draw a line of best fit on the scatter graph. (1)



A student spent 11 hours on the internet revision site.

(d) Use the line of best fit to estimate this student's mathematics exam mark.

62-67  
64 ✓

(1)

(Total 4 marks)

Leave blank

1

Q8

4

9. Jack invests £3000 for 2 years at 4% per annum compound interest.

Work out the value of the investment at the end of 2 years.

$4\% = 0.04$

Multiplier = 1.04

$£3000 \times 1.04^2 = 3244.80$

£ 3244.80 ✓

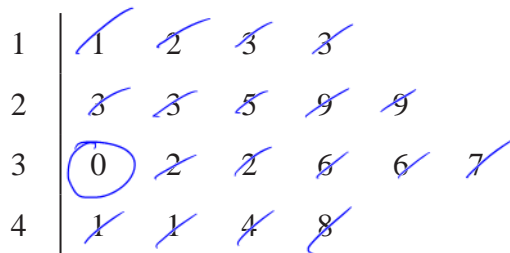
(Total 3 marks)

Q9

3

10. Jason collected some information about the heights of 19 plants.

This information is shown in the stem and leaf diagram.



Key 4|8 means 48 mm

Find the median.

30 ✓  
..... mm

(Total 2 marks)

Q10

2



Leave blank

11. (a) Complete the table of values for  $y = x^2 - 4x - 2$

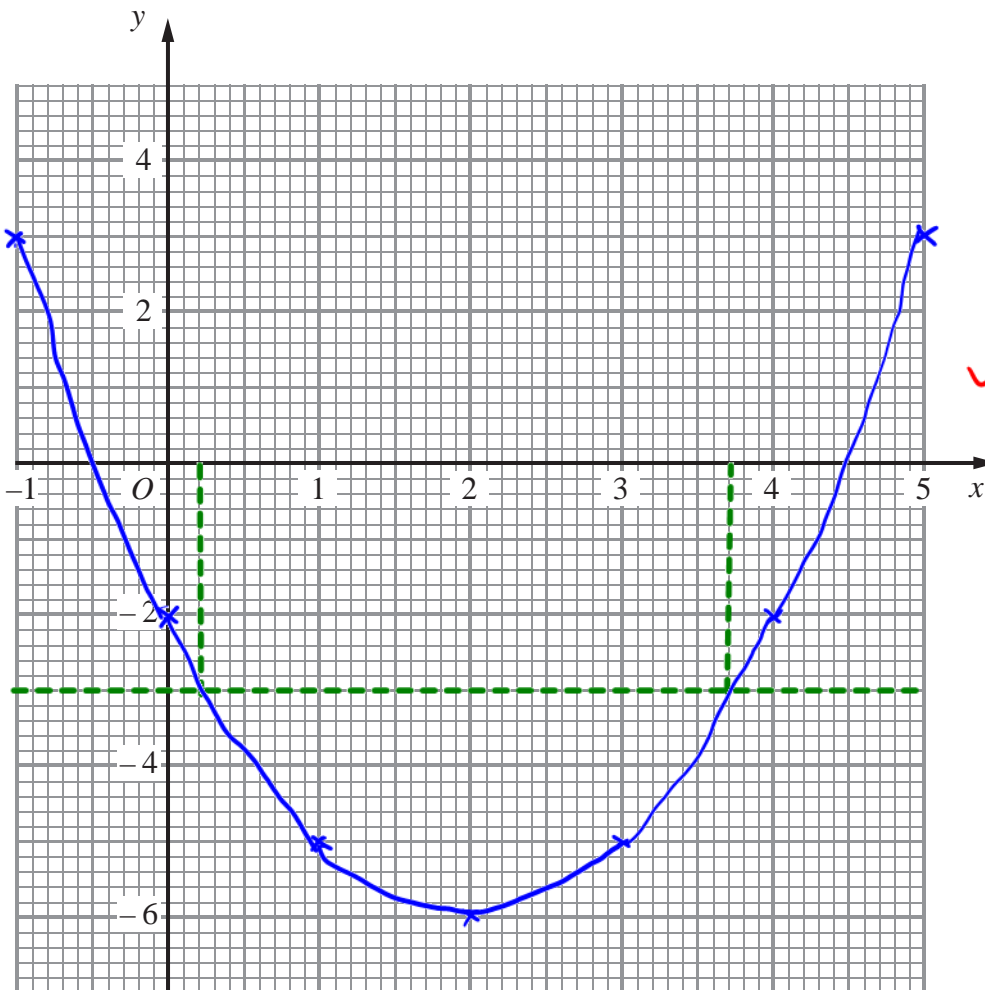
x	-1	0	1	2	3	4	5
y	3 ✓	-2	-5	-6 ✓	-5 ✓	-2	3

$x^2$	1	0	1	4	9	16	25
$-4x$	4	0	-4	-8	-12	-16	-20
$-2$	-2	-2	-2	-2	-2	-2	-2

(2)

2

(b) On the grid, draw the graph of  $y = x^2 - 4x - 2$



✓

2

(2)

(c) Use your graph to estimate the values of  $x$  when  $y = -3$

0.2 - 0.4  
 0.2 ✓  
 $x = \dots\dots\dots$   
 3.7 ✓  
 $x = \dots\dots\dots$   
 3.6 - 3.8 (2)

2

(Total 6 marks)

Q11  
6



12. (a) Draw the locus of all points which are equidistant from the points  $A$  and  $B$ .

$A \times$

$\times B$

(2)

(b) Draw the locus of all points that are exactly 3 cm from the line  $PQ$ .

$P$

$Q$

(2)

Q12

(Total 4 marks)

