

GCSE Mathematics
Non-Calculator
Higher Tier
Mock 2, paper 1
ANSWERS
1 hour 45 minutes



Authors Note

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1. a) Work out $3\frac{2}{3} \div 1\frac{1}{2}$

$$\frac{11}{3} \times \frac{2}{3} = \frac{22}{9}$$

$$\frac{22}{9}$$

(2)

b) Work out $3\frac{2}{3} \times 2\frac{1}{4}$

Give your answer in its simplest form

$$\frac{11}{3} \times \frac{9}{4} = \frac{33}{4}$$

$$\frac{33}{4}$$

(2)

2. a) Expand $y(y^3 - 3y)$

$$y^4 - 3y^2$$

(2)

b) Expand and simplify $(2x - 1)(3 - x)$

$$7x - 3 - 2x^2$$

(2)

c) $-3 \leq y < 2$
Write down the integer values of y

$$-3, -2, -1, 0, 1$$

(1)

d) Solve $5 - 7a = 3(a - 1)$

$$\begin{aligned} 5 - 7a &= 3a - 3 \\ 8 &= 10a \\ a &= \frac{4}{5} \end{aligned}$$

(2)

$a =$

e) Factorise $7y + 21$

$$7(y + 3)$$

(1)

d) Simplify $\frac{9 - b^2}{3 - b}$

$$\begin{aligned} \frac{(3 - b)(3 + b)}{3 - b} \\ = 3 + b \end{aligned}$$

(2)

3. Work out

a) 0.2×0.4

$$0.08$$

(1)

b) $50 \div 0.2$

$$250$$

(1)

c) Estimate $\frac{4.9 \times 29.7}{15.1}$

$$(5 \times 30) / 15$$

$$= 10$$

(1)

d) $4 - 2 \div \frac{1}{2} + 1$

BODMAS do $2 \div \frac{1}{2} = 4$ first

$$4 - 4 + 1 = 1$$

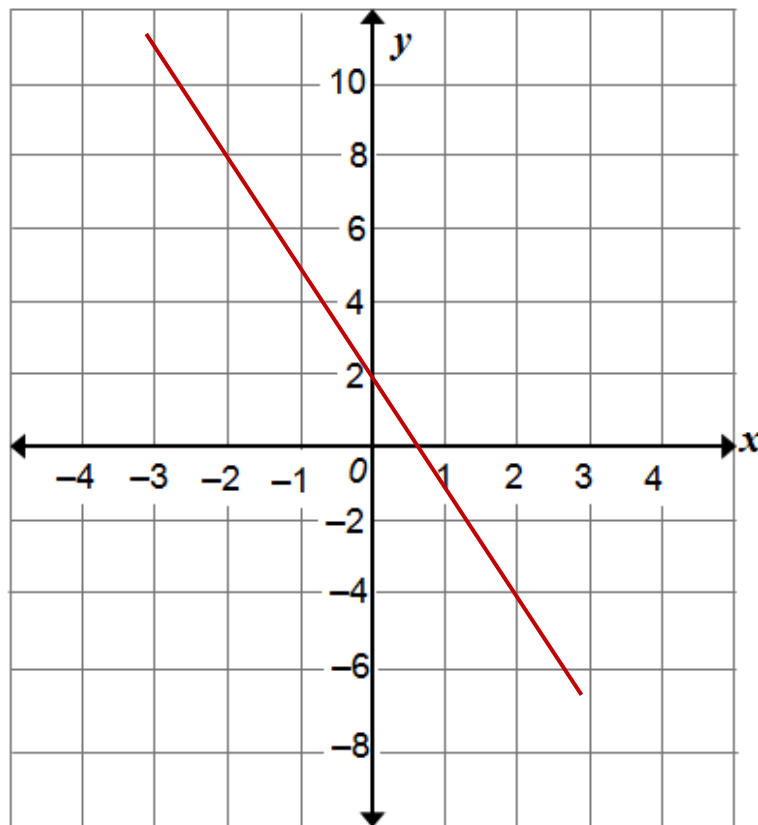
(1)

4. Complete this table of values for $3x = -y + 2$

x	-3	-2	-1	0	1	2
y	11	8	5	2	-1	-4

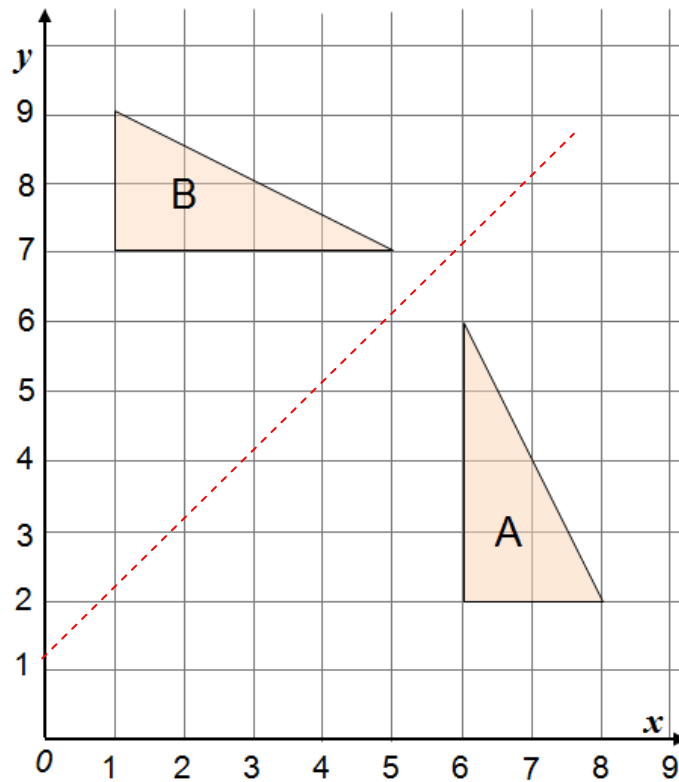
(2)

On the grid draw the graph of $3x = -y + 2$



(2)

5a)

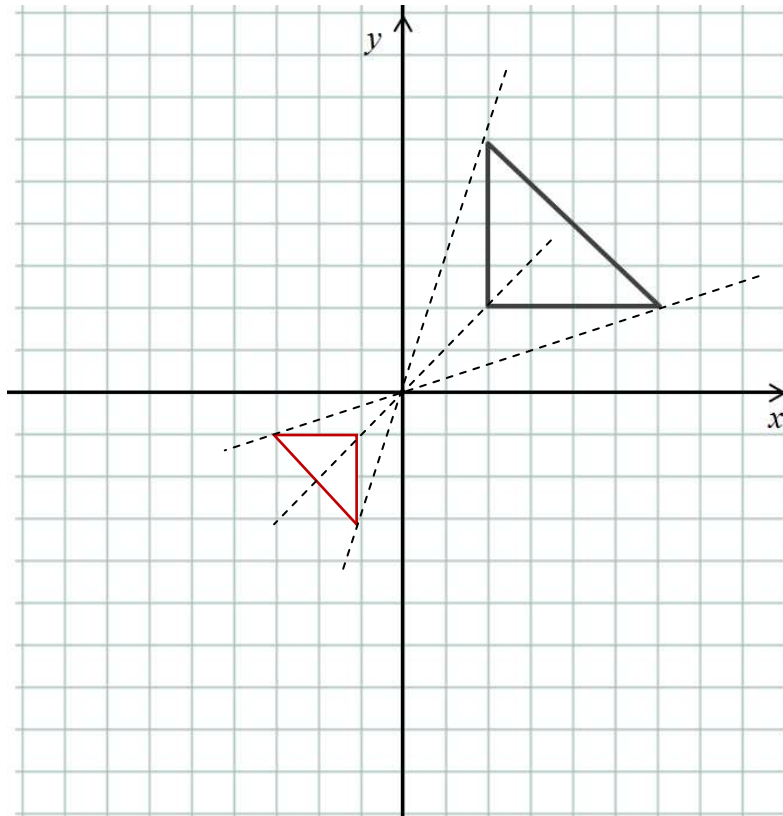


Triangle A and triangle B have been drawn on the grid
Describe the single transformation which maps triangle A to B

Reflection in line $y = x + 1$ NOT $y = x$

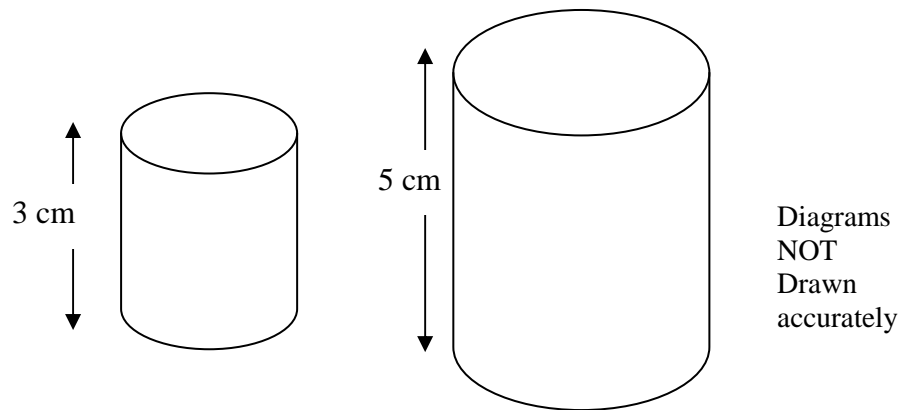
(2)

5b). Enlarge triangle A by scale factor of $-\frac{1}{2}$, centre O .



(3)

6. Two mathematically similar cylinders are shown



The volume of the smaller cylinder is 54 cm^3
Calculate the volume of the larger cylinder.

$$\text{scaling factor for length} = \frac{5}{3}$$

$$\text{scaling factor for volume} = \frac{125}{27}$$

$$\text{Large volume} = \frac{125}{27} \times 54 = 250$$

..... cm^3

(3)

7. Cyril had a 6 sided dice and a spinner marked with the numbers 1 to 5. He threw the dice and spun the spinner once and added up the two scores to get a total. What is the probability of getting a total score of 8 or more.

Draw a table of outcomes

Spinner/die	1	2	3	4	5	6
1						
2						✓
3					✓	✓
4				✓	✓	✓
5			✓	✓	✓	✓

Probability of getting total of 8 or more = $\frac{10}{30} = \frac{1}{3}$

.....

(2)

Now Cyril threw the dice and spun the spinner 90 times.
Work out an estimate for the number of times he gets a total score of exactly 8.

Probability of getting total of exactly 8 = $\frac{4}{30} \times 90 = 12$

.....

(2)

8. A school had 200 pupils in Year 11.
Each pupil needed a copy of a Maths, English and Science text book.

Book	In stock now		Cost per book
Maths	140	order 60 more	£1.25
English	80	order 120 more	£2
Science	200	order none	£3

A 25% discount was given for any book where more than 100 copies were ordered.

What was the total cost of the book order the school needed to make.

$$\text{Maths: } 60 \times \text{£}1.25 = \text{£}75$$

$$\begin{aligned} \text{English: } & 120 \times \text{£}2.00 = \text{£}240 \\ \text{get 25\% off} & = \text{£}60 \text{ so pay } \text{£}180 \end{aligned}$$

£255

(4)

9. Sylvia made some bricklaying mortar using these proportions:

- 1 part cement
- $\frac{1}{4}$ part lime
- 3 parts sand

She made 8.5 kg of mortar.

Work out the proportions for each

Ratio is 1 : $\frac{1}{4}$: 3 change everything to $\frac{1}{4}$'s
 4 : 1 : 12 = 17 parts

$8.5 \div 17 = 0.5$ so 1 part is $\frac{1}{2}$ kg

Cement ..	2	.. kg
Lime ..	$\frac{1}{2}$.. kg
Sand ..	6	.. kg

(3)

10.

The table shows some expressions.

a , b , c and d represent lengths.

π and 3 are numbers which have no dimensions

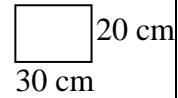
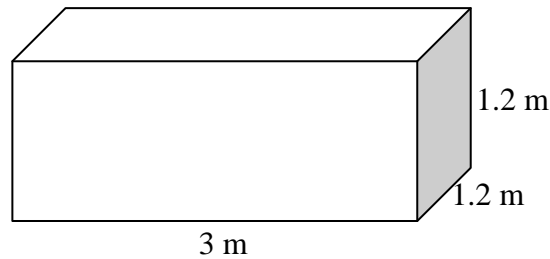
$3a$	πab^2	πab	$ac + b^2d$	$3(a^2+b^2)$	$3(c+d)^3$	$\frac{2abcd}{5ac}$
		✓		✓		✓

Tick (✓) the boxes underneath the **three** expressions which could represent areas.

(3)

11. Jess wants to cover a cuboid with some tiles

Diagram NOT
drawn accurately



The cuboid is 3 m wide and 1.2 m high and 1.2 m deep.
The tiles are 20cm high and 30 cm long

Tiles come in boxes of 25.
How many boxes of tiles will she need.

On $3\text{m} \times 1.2\text{m}$ face can put $10 \times 6 = 60$ tiles. There are 4 faces like this
On $1.2\text{m} \times 1.2\text{m}$ face can put $4 \times 6 = 24$ tiles there are 2 faces like this

Total = $240 + 48 = 288$ tiles.
 $288 \div 25 = 12$ boxes

12

(4)

She wants to paint the front face of the cuboid (3m by 1.2 m)
A tin of paint covers 3600 cm^2
How many tins will she need

$300\text{cm} \times 1200\text{cm} \div 3600\text{cm}^2 = 10$ tins

(1)

12. Two cars drove around a 10 mile circuit.
They started together.
Car A took 8 minutes for each circuit and Car B took 15 minutes.

How many miles did each car travel before they passed the start line together again.

Find LCM of 8 and 15 is 120mins so after 2 hours they cross.
Car A speed = 10 miles/8/60 hour = 75mph
Car B speed = 10 miles/15/60 hour = 40mph

Car A 150miles (4)
Car B 80miles

13. a) Find the value of

- i) 7^0 1
- ii) $49^{1/2}$ 7
- iii) $125^{-2/3}$

The cubed root of 125 is 5.
This squared is 25. Then we reciprocate to give $\frac{1}{25}$

b) $4 \times \sqrt{64} = 4^n$

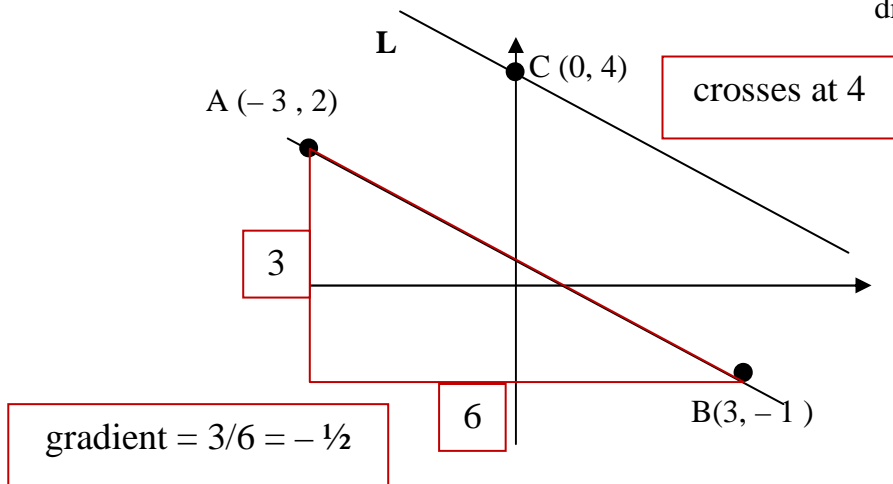
Find the value of n

$$4 \times \sqrt{64} = 4 \times \sqrt{4 \times 16} = 4 \times 4 \times \sqrt{4} = 4^1 \times 4^1 \times 4^{1/2} = 4^{2.5} \text{ or } 4^{5/2}$$

$n = \dots\dots\dots$ (2)

14.

Diagram NOT
drawn accurately



The diagram shows three points A (- 3 , 2) , B (3 , - 1) and C (0 , 4)
The Line L is parallel to AB and passes through C

Find the equation of the line L

$$y = -\frac{1}{2}x + 4$$

(4)

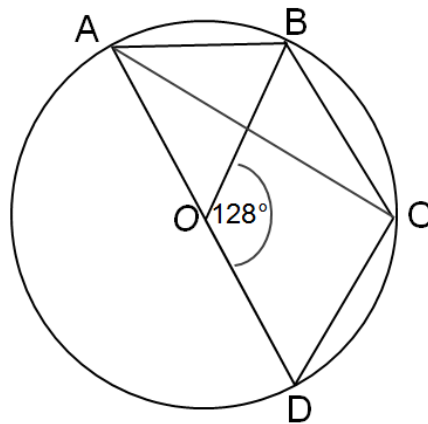
15. Prove that $0.\dot{2}\dot{7}\dot{9} = \frac{11}{37}$

$$\begin{aligned} 0.\dot{2}\dot{7}\dot{9} \times 1000 &= 279.\dot{2}\dot{7}\dot{9} \\ 0.\dot{2}\dot{7}\dot{9} \times 1 &= 0.\dot{2}\dot{7}\dot{9} - \\ \hline 0.\dot{2}\dot{7}\dot{9} \times 999 &= 279.0. \end{aligned}$$

$$\frac{279}{999} = \frac{33}{111} = \frac{11}{37}$$

(3)

16.



In the diagram, A,B,C and D are points on the circumference of a circle with centre O.

Angle BOD = 128° .

(a) (i) Work out the size of angle OAB.

64

(ii) Give a reason for your answer.

angle at centre is twice angle at circumference

(b) Work out the size of angle BCA.

opposite angle to OAB = 116 (cyclic quadrilateral)
 $\angle ACD = 90$ (angle in semi-circle)
 So $\angle BCS = 116 - 90 = 26$

(2)

(3)

17. Given that $x^2 - 10x - 7 = (x - a)^2 - b$ find a and b

Complete the square
 $(x - 5)^2 - 25 - 7 \rightarrow (x - 5)^2 - 32$

a = $\boxed{5}$ b = $\boxed{32}$ (3)

Hence solve $x^2 - 10x - 7 = 0$
Give your answer in the form $c \pm d\sqrt{2}$

$(x - 5)^2 = 32$ so $(x - 5) = \pm\sqrt{32}$
 $x = 5 \pm \sqrt{32}$ $x = 5 \pm 4\sqrt{2}$

$\boxed{x = 5 \pm 4\sqrt{2}}$
x = (3)

18. Rationalise the denominator of $\frac{1}{8\sqrt{8}}$

Give your answer in the form $\frac{\sqrt{2}}{m}$ where m is a positive integer

$\boxed{\frac{\sqrt{2}}{32}}$
..... (2)

- 18.** The resistance R of a wire is inversely proportional to the cross sectional area A of the wire.

When $A = 0.2$, $R = 270$

a) Find R when $A = 0.5$

$$R = \frac{K}{A} \text{ so } 270 = \frac{K}{0.2} \text{ so } K = 54$$

$$R = \frac{54}{0.5} = 108\Omega$$

$R = \dots\dots\dots$ (3)

19. ACDEF is a trapezium with DE parallel to CF

$$\overrightarrow{CD} = 3\mathbf{b}, \overrightarrow{DE} = 3\mathbf{a} \text{ and } \overrightarrow{CF} = 7\mathbf{a}$$

P is the midpoint of DE and Q is the midpoint of CF

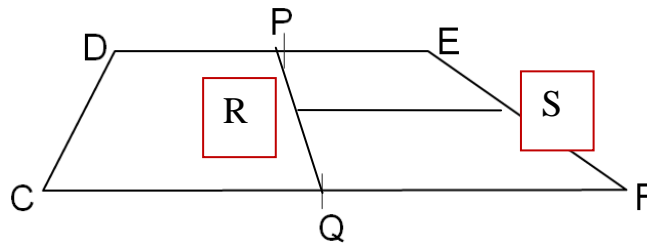


Diagram NOT drawn accurately

a) Find the vector \overrightarrow{PQ} in terms of a and b

$$\overrightarrow{PQ} = \overrightarrow{PD} + \overrightarrow{DC} + \overrightarrow{CQ} = -\frac{3\mathbf{a}}{2} - 3\mathbf{b} + \frac{7\mathbf{a}}{2} = 2\mathbf{a} - 3\mathbf{b}$$

\overrightarrow{PQ} (2)

R is the midpoint of PQ and S is the midpoint of EF

b) Prove that CF and RS are parallel

$$\overrightarrow{FE} = -7\mathbf{a} + 3\mathbf{b} + 3\mathbf{a} = 3\mathbf{b} - 4\mathbf{a}$$

$$\overrightarrow{RS} = \frac{1}{2} \overrightarrow{PQ} + \frac{1}{2} \overrightarrow{QF} + \overrightarrow{FS} = \frac{1}{2} (2\mathbf{a} - 3\mathbf{b}) + \frac{1}{2} 7\mathbf{a} + \frac{1}{2} (3\mathbf{b} - 4\mathbf{a})$$

$$\overrightarrow{RS} = \mathbf{a} - \frac{3\mathbf{b}}{2} + \frac{7\mathbf{a}}{2} + \frac{3\mathbf{b}}{2} - 2\mathbf{a} = \frac{9\mathbf{a}}{2}$$

*CF and RS both only have an a vector so they are parallel
CF is twice the magnitude of RS*

(2)

20. A survey of 100 pupil showed how long they spent revising in the month before their maths exams.

The table below shows how long in hours the pupils spent.

Time (t hours)	Frequency
$0 \leq t < 4$	5
$4 \leq t < 8$	17
$8 \leq t < 12$	47
$12 \leq t < 16$	25
$16 \leq t < 20$	6

- a) Complete the cumulative frequency table

Time (t hours)	Cumulative Frequency
$0 \leq t < 4$	5
$0 \leq t < 8$	22
$0 \leq t < 12$	69
$0 \leq t < 16$	94
$0 \leq t < 20$	100

- b) Using your completed table draw a cumulative frequency graph on the grid
- c) Using the cumulative frequency graph to estimate how many pupils spent 11 or more hours revising in a month.

42±2

- d) Work out the inter-quartile range

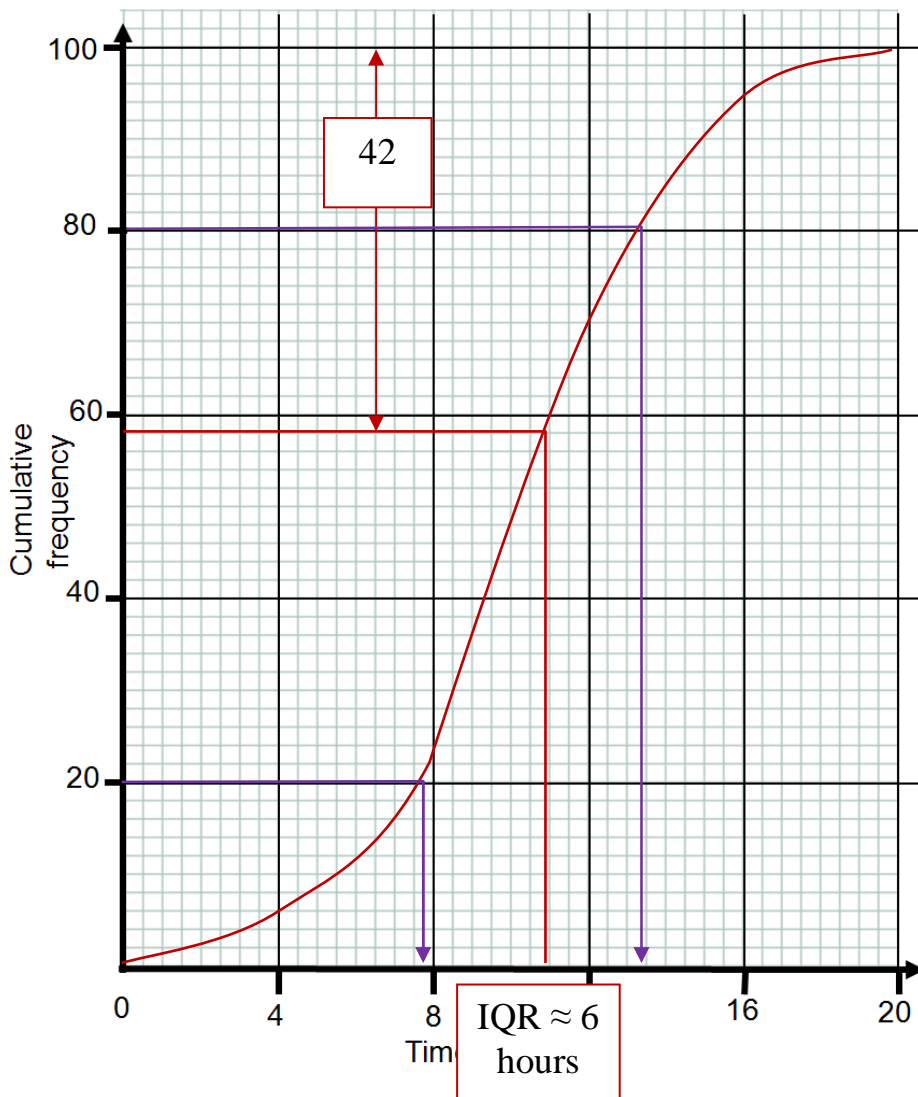
6 hours± 30min

(1)

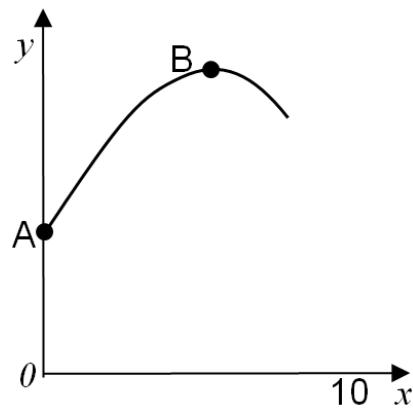
(2)

(1)

(1)



21. The diagram shows a sketch of the graph $y = 16 - \frac{(x-6)^2}{4}$ for $0 \leq x \leq 10$



A and B are points on the graph
 A is the point where the graph meets the y axis
 B is the point at which y has its maximum value.

a) What are the co-ordinates of

i) A

0, 7

ii) B

6, 16

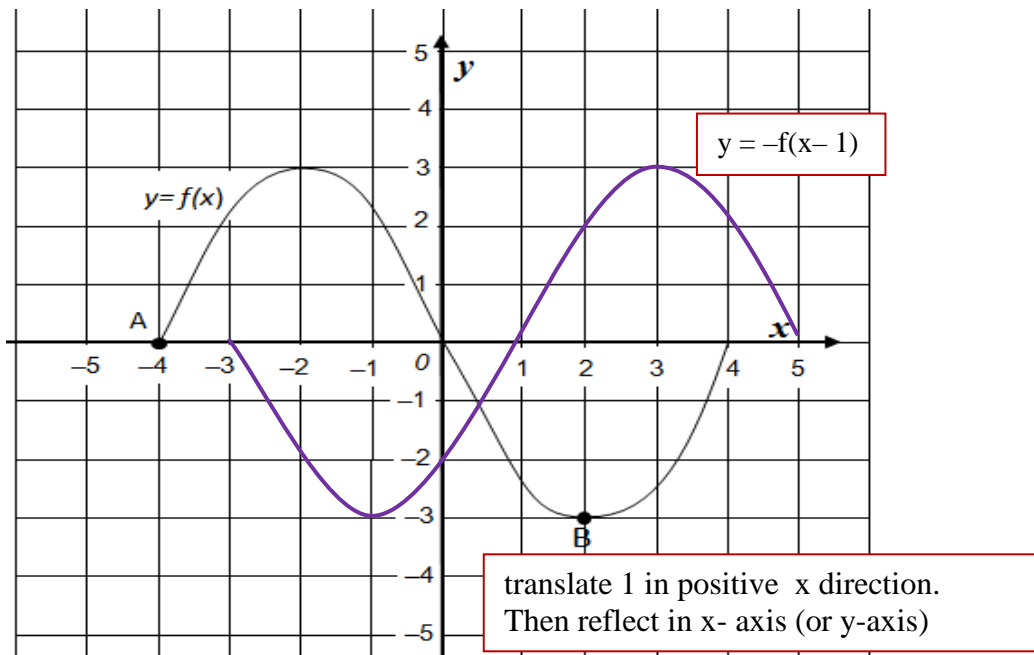
(2)

b) Show that $16 - \frac{(x-6)^2}{4} = \frac{(2+x)(14-x)}{4}$

$$16 - \frac{(x-6)^2}{4} = \frac{64 - (x^2 - 12x + 36)}{4} = \frac{28 + 12x - x^2}{4} = \frac{(2+x)(14-x)}{4}$$

(3)

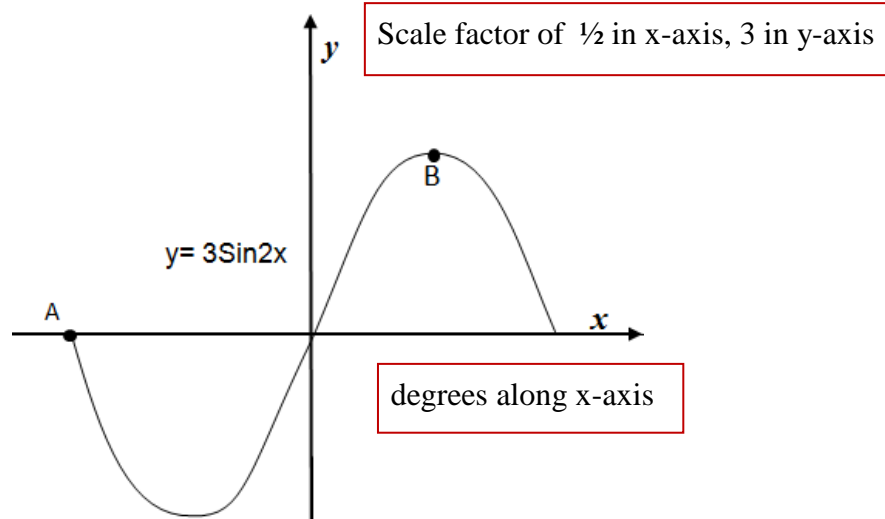
22. The diagram shows a sketch of $y = f(x)$.



a) Sketch the graph of $y = -f(x-1)$ on the grid showing the co-ordinates of points A and B.

A (, ..)
 B (, ..) (2)

The diagram shows part of the graph of $y = 3\sin 2x^\circ$



Write down the co-ordinates of A and B

A (, ..)
 B (, ..) (2)