

First Name	
Last Name	
Date	
Total Marks	/ 100 marks

MathsMadeEasy

GCSE Mathematics  
Non-Calculator  
Higher Tier  
Free Practice Set 6  
1 hour 45 minutes



Answers at:

<http://www.mathsmadeeasy.co.uk/gcsemathspapers-free.htm>

### Instructions

Write your name and other details in the boxes above.

Answer all the questions

Take  $\pi$  to be 3.142

### Information

Marks are shown in brackets for each question (2)

**Calculators may not be used**

### Advice

Don't spend too long on one question

Show all your working in calculations for full marks

You will get marks for method even if your answer is incorrect

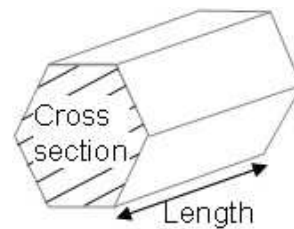
Leave a question until later if you cannot answer it

### Materials needed for examination

Ruler marked in centimetres and millimetres,  
protractor, compasses, pen, pencil, rubber  
Tracing paper may be used

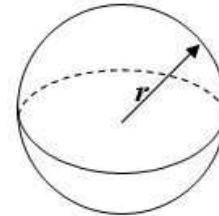
## Formulae sheet — Higher tier

**Volume of prism** = area of cross-section  $\times$  length



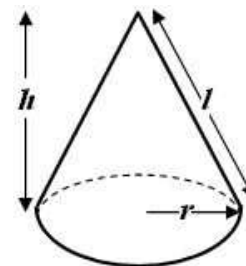
**Volume of sphere** =  $\frac{4}{3} \pi r^3$

**Surface area of sphere** =  $4\pi r^2$



**Volume of cone** =  $\frac{1}{3} \pi r^2 h$

**Curved surface area of cone** =  $\pi r l$

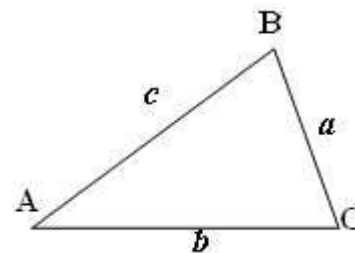


**In any triangle ABC**

**Sine Rule:**  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

**Cosine Rule:**  $a^2 = b^2 + c^2 - 2bc \cos A$

**Area of a triangle** =  $\frac{1}{2} ab \sin C$



**The Quadratic Equation**

The solutions of  $ax^2 + bx + c = 0$ , where  $a \neq 0$ , are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

### Authors Note

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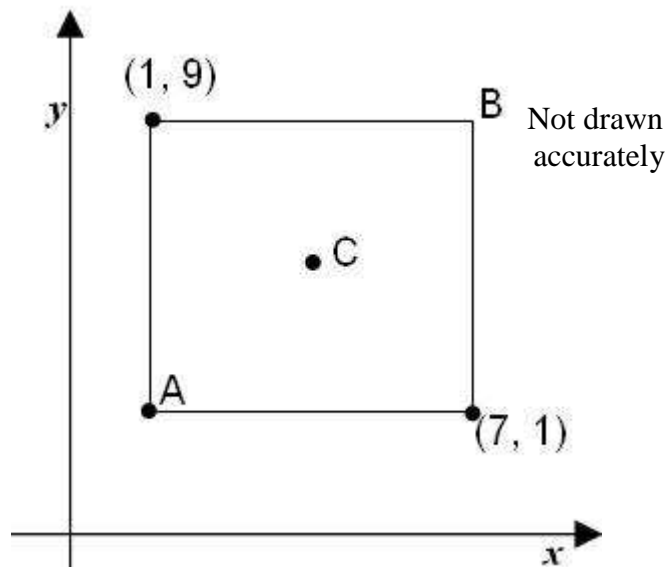
Question	Type of question	Marks
1	Co-ordinates	4
2	Algebra, simplify, expand, factorise, subject	14
3	3 D elevation	2
4	Angles, bearings	3
5	Calculations, percentages, VAT	6
6	Solve equations	3
7	BODMAS, estimate	4
8	Formula substitution	4
9	Fractions	4
10	Line equations, perpendicular gradient	3
11	Cumulative frequency	4
12	Plotting $x^3$ graph	4
13	Similar volumes	3
14	Proportionality	5
15	Probability	4
16	Subject of Formula	3
17	Recurring decimal to fraction	2
18	Expressions length, area, volume	2
19	Area sector	2
20	Complete square	5
21	Standard form	5
22	Vectors	6
23	Transforming graphs	4
24	Histogram	4

Answer ALL questions.

Write your answers in the spaces provided.  
Do NOT use a Calculator

You must write down all stages in your working.

1. A rectangle is drawn on an x-y axis below with co-ordinates for opposite corners.



- a) What are the coordinates of point A?

A is ( ..... , ..... )  
(1)

- b) Point C is halfway between the sides of the rectangle

What are the coordinates of point C?

C is ( ..... , ..... )  
(1)

- c) What is the length of the diagonal AB of the rectangle?

AB = .....  
(2)

2. a) Simplify  $10x + q - 6x - 3q$

.....  
(1)

b) Simplify  $5s + 7y - 6s - 6y$

.....  
(1)

c) Simplify  $6x^2 - 5x^2$

.....  
(1)

d) Expand and simplify:

$$3(x + y) + 4(3x - 2y)$$

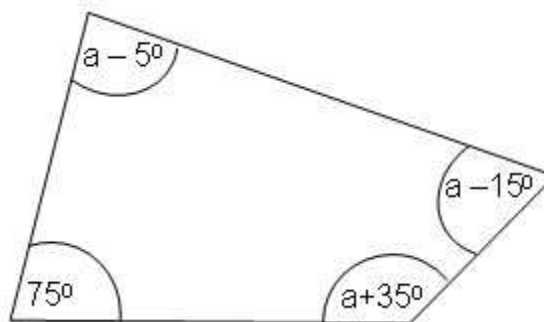
.....  
(2)

e) Make b the subject of the formula

$$a = 4b + 3c$$

.....  
(2)

f) Four angles are shown in the quadrilateral below.



Write an equation for the total angles in the quadrilateral in terms of a.

.....  
(2)

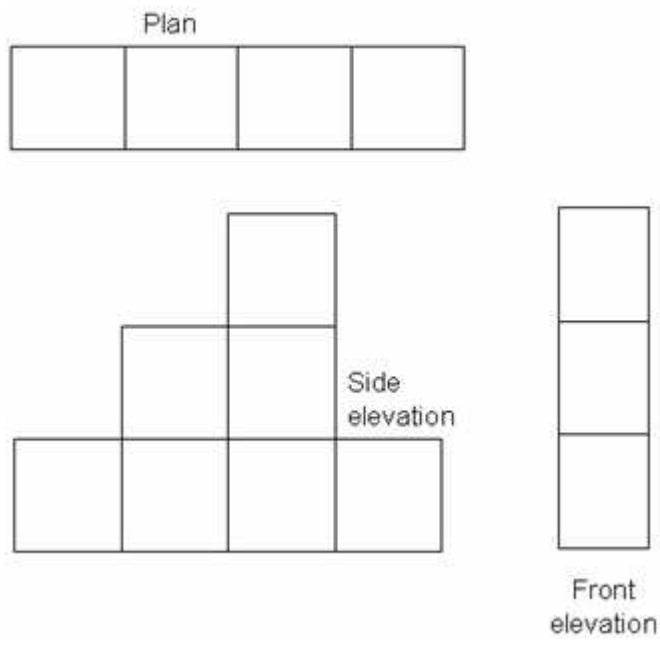
**g)** Factorise  $9y^2 - 25$

**h)** Simplify  $\frac{3x^2 - 16x - 12}{x^2 - 2x - 24}$

.....  
(1)

.....  
(4)

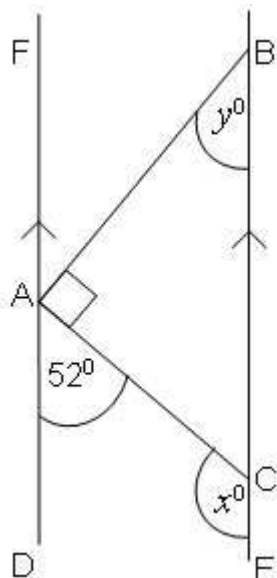
3. The plan, front elevation and side elevation of a 3-D shape are shown below.



Draw a picture of the 3-D shape

(2)

4. The diagram shows two parallel lines DF and EB and a triangle ABC.



- a) Work out the sizes of angles  $x$  and  $y$

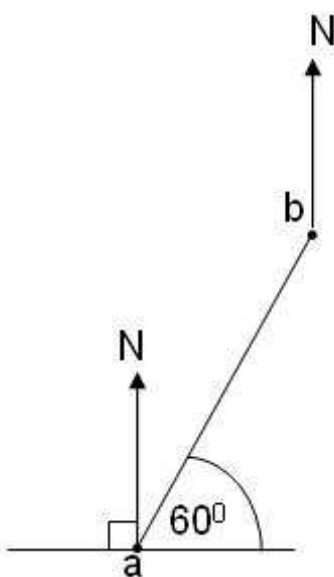
$$x = \dots\dots\dots^\circ \quad y = \dots\dots\dots^\circ$$

**(1)**

- b) Explain how you got your answer

.....  
**(1)**

- c) What is the bearing of 'a' from 'b' in the diagram below.



$$\text{Bearing a from b} = \dots\dots\dots^\circ$$

**(1)**



5. A mobile phone cost £120 *excluding* VAT.  
VAT on the mobile phone is 15 %

a) How much does the mobile phone cost *including* VAT?

£.....  
(2)

b) Text messages cost 8p each.  
In one month Sunita sent 150 text messages.  
Sunita gets 100 free text messages per month.  
How much did Sunita spend on text messages?

£.....  
(2)

c) Sunita sent 150 text messages to her friends Bill, Jack and Ram in the ratio 1 : 4 : 5  
How much did she send to each person?

Bill ..... Jack ..... Ram .....  
(2)

6. Kathleen is  $x$  years old.

Her daughter Jane is half Kathleen's age.

The total age of both Kathleen and Jane is 63 years.

a) Write an equation for their total age in terms of  $x$ .

.....  
(1)

b) Solve the equation you wrote above to find  $x$  (Kathleen's age)

.....years  
(2)

7. What is

a)  $\frac{8 \times 6 + 2}{0.5}$

.....  
(1)

b)  $\frac{45 \times 7 \times 16}{9 \times 4}$

.....  
(1)

c) Estimate  $\frac{149.8 \times 9.9}{0.26}$

.....  
(2)

8. The formula  $s = ut + \frac{1}{2}at^2$  gives the distance  $s$  an object moves

a) Find the value of  $s$  when  $u = 7$ ,  $a = 10$  and  $t = 3$

.....  
(2)

b) If  $s = 145$ ,  $u = 4$  and  $t = 5$  find  $a$

.....  
(2)

9. What is:

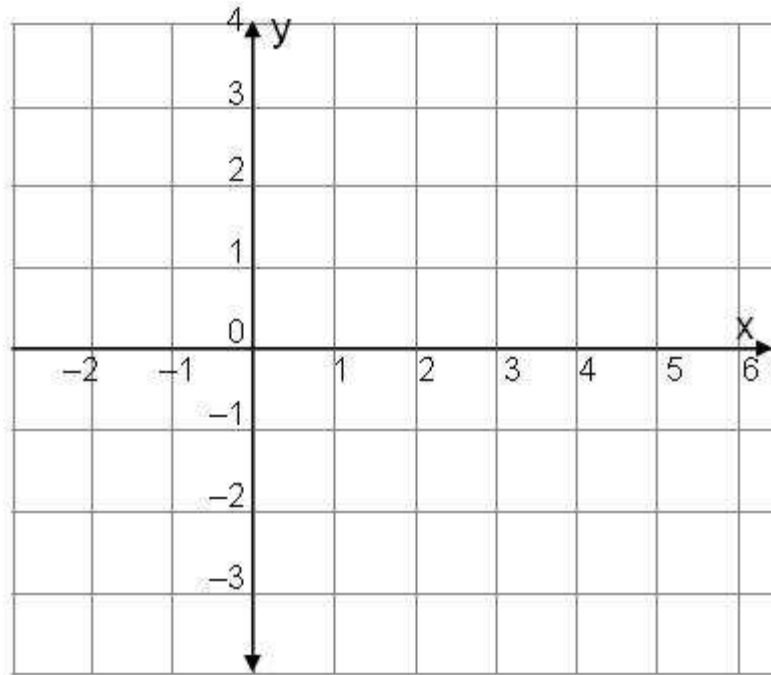
a)  $3\frac{1}{3} \div 2\frac{4}{5}$

.....  
(2)

b)  $3\frac{2}{3} + 2\frac{3}{5}$

.....  
(2)

10. a) Draw the straight line equation  $y = \frac{1}{2}x - 1$  on the grid below.  
 What are the co-ordinates of the point where  $y = \frac{1}{2}x - 1$  cuts the **x-axis**



(1)

Point where cuts x-axis (....., .....) (1)

- b) What is the gradient of the *perpendicular* line to  $y = \frac{1}{2}x - 1$

..... (1)

11. 120 batteries were tested to see how long they lasted.

The table below shows how long in hours the batteries lasted.

Time (t hours)	Frequency
$0 \leq t < 6$	1
$6 \leq t < 12$	11
$12 \leq t < 18$	40
$18 \leq t < 24$	48
$24 \leq t < 30$	12
$30 \leq t < 36$	8

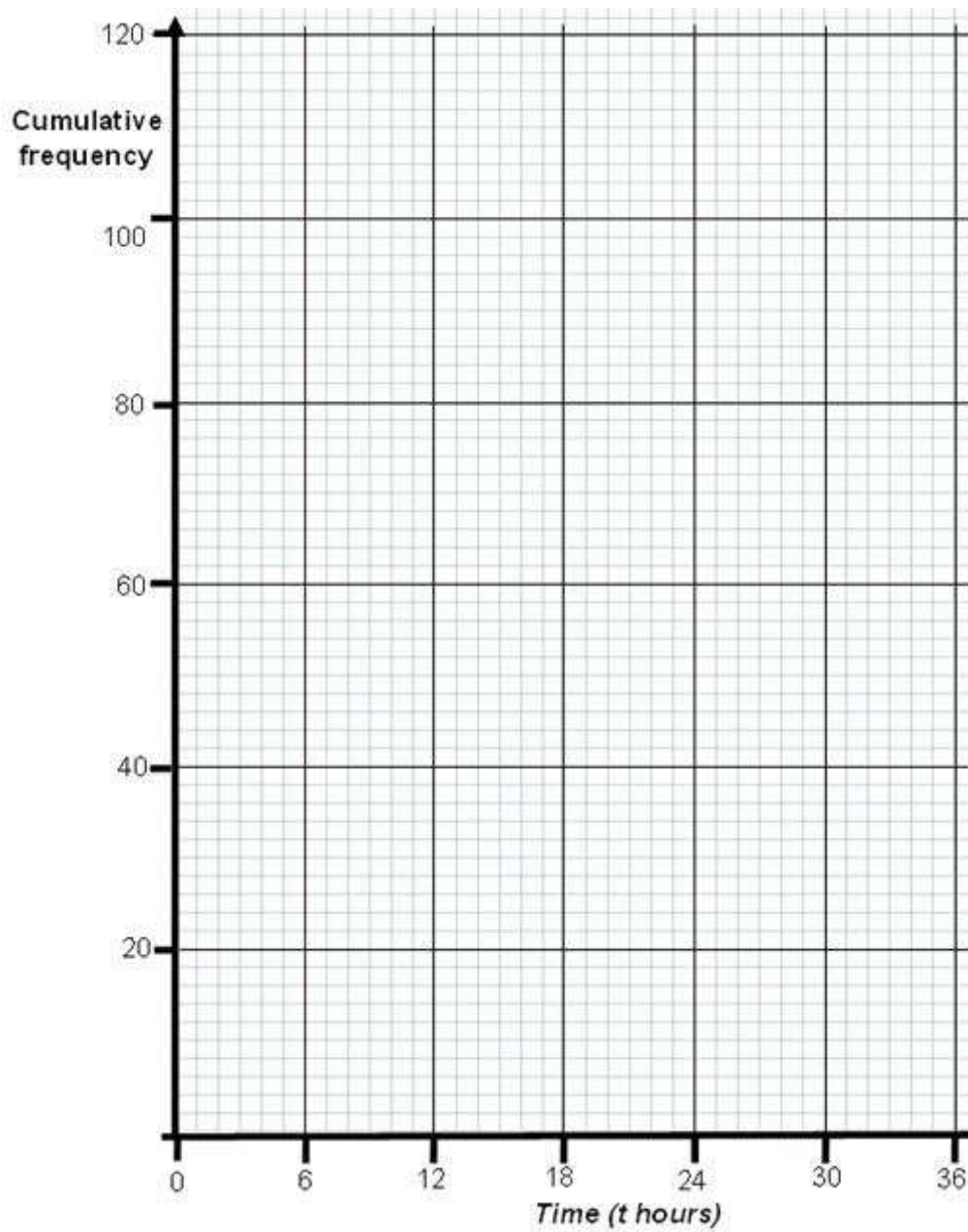
- a) Complete the cumulative frequency table

(1)

Time (t hours)	Cumulative Frequency
$0 \leq t < 6$	1
$0 \leq t < 12$	
$0 \leq t < 18$	
$0 \leq t < 24$	
$0 \leq t < 30$	
$0 \leq t < 36$	

- b) Using your completed table draw a cumulative frequency graph on the grid

(2)



c) Using the completed graph estimate the median time

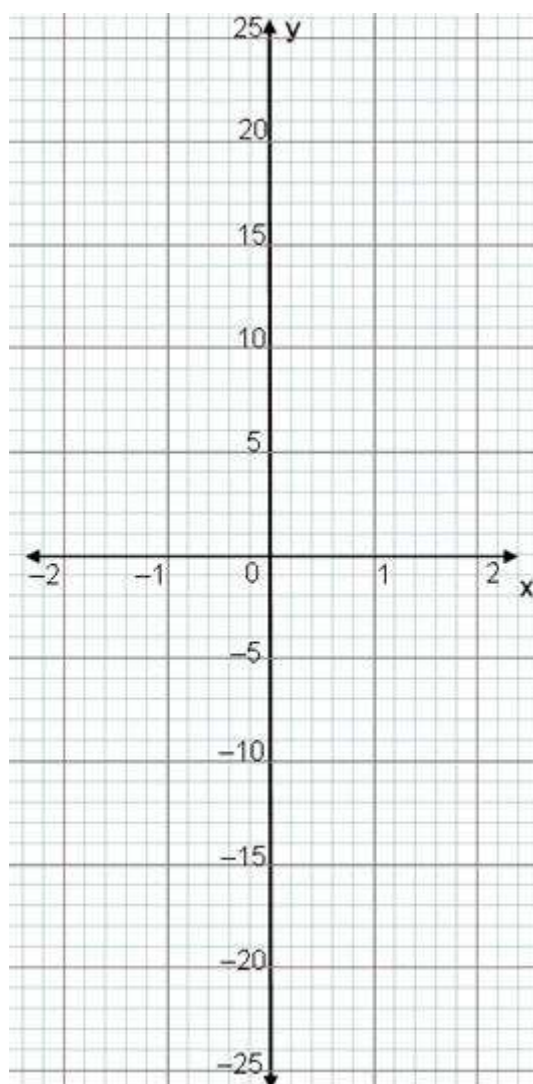
.....  
(1)

12. a) Complete the table of values for  $y = 3x^3 - 1$  below.  
Some of the working out has been done for you

x	-2	-1	0	1	2
$3x^3$				3	
- 1				-1	
= y				2	

(2)

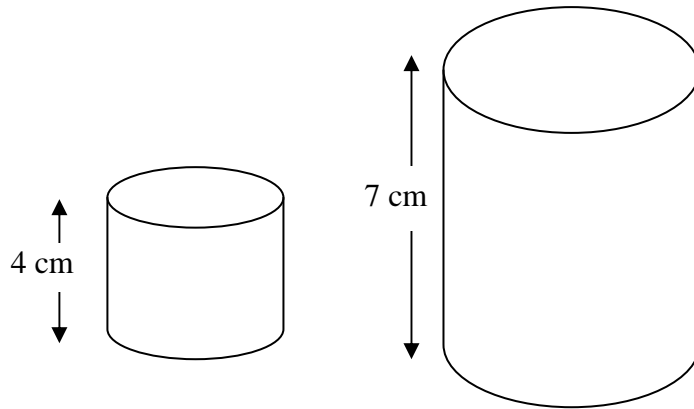
- b) Plot the graph for  $y = 3x^3 - 1$



(2)



13. Two mathematically similar cylinders are shown



Diagrams NOT  
drawn accurately

The volume of the smaller cylinder is  $64 \text{ cm}^3$   
Calculate the volume of the larger cylinder.

..... $\text{cm}^3$   
(3)

14. The mass of a solid sphere ( $M$  gm) is proportional to its radius ( $R$  cm) cubed.

When  $R = 4$ ,  $M = 1280$  gms

a) Find a formula for  $M$  in terms of  $R$

$M = \dots\dots\dots$   
(3)

b) Find the value of  $M$  when  $R = 5$

$\dots\dots\dots$   
(2)

15. Cyril played a game of tennis and then a game of squash.

The probability that he will win the game of tennis is 40%

The probability that he will win the game of squash is  $\frac{3}{11}$

Assume that he only won or lost

a) Draw a probability tree to show this information

b) What is the probability that Cyril will win one game

(2)

.....  
(2)

16. Make x the subject of the formula  $\frac{1}{y} = \frac{y-6x}{xy-7}$

17. Prove that  $0.\dot{2}\dot{3}\dot{4}$  is  $\frac{26}{111}$  as a fraction in its simplest form

.....  
(3)

..... (2)

18 In the table below are some expressions

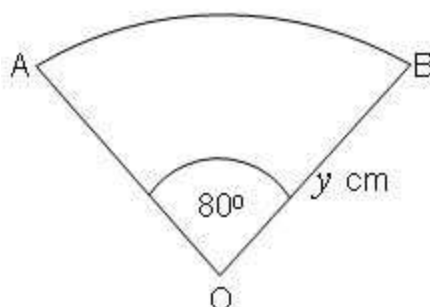
The letters a, b and c represent lengths  
The numbers have no dimensions

Tick the table to show whether each expression is a Length, Area, Volume, or None of these.

Expression	Length	Area	Volume	None of these
$5b^2 c$				
$2a + 4b + 3c$				
$6a^2 + 6a$				
$3b(a + 2c)$				

(2)

19.



A sector of a circle is shown below with a radius of y cm and centre O.

a) Write an expression for the arc length AB in terms of y and  $\pi$

.....  
(1)

b) Write an expression for the sector area in terms of y and  $\pi$

.....  
(1)

20. a) Factorise  $y^2 + 6y + 7$  by completing the square.

.....  
(3)

b) Hence solve  $y^2 + 6y + 7 = 0$ . Give your answer in the form  $a \pm \sqrt{2}$ .

$y =$  .....  
(2)

21. a) Write  $4.3 \times 10^5$  as an **ordinary number**

.....  
(1)

b) Write 0.00043 in **standard form**

.....  
(1)

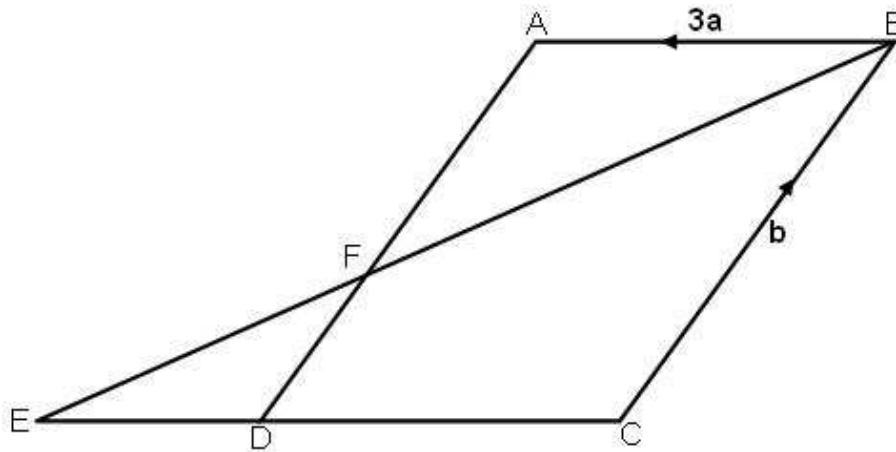
c) Work out :

$$(4 \times 10^3)^2 + 3.5 \times 10^7$$

Give your answer in **standard form**.

.....  
(3)

22.



ABCD is a parallelogram  
 AF: FD is in the ratio 3:2  
 CD:DE is in the ratio 3:2

$\vec{BA} = 3\mathbf{a}$        $\vec{CB} = \mathbf{b}$

a) Find the following vectors in terms of  $\mathbf{a}$  and  $\mathbf{b}$

i)  $\vec{AC}$

.....  
 (1)

ii)  $\vec{BF}$

.....  
 (1)

iii)  $\vec{FE}$

.....  
 (1)

b) Hence prove that BFE is a straight line

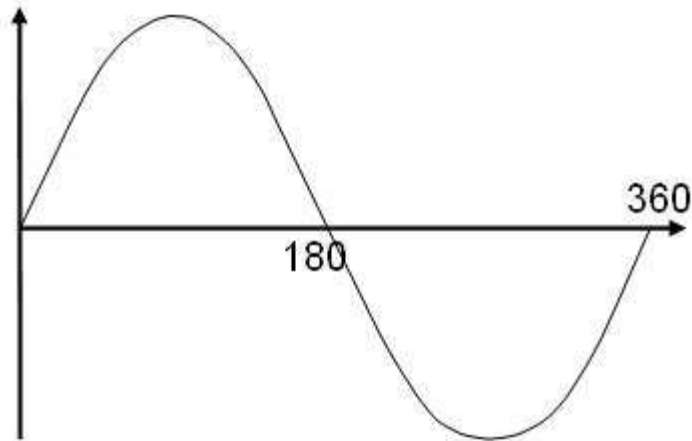
.....  
 (2)

c)  $BF = 6 \text{ cm}$   
 Find the length of BE

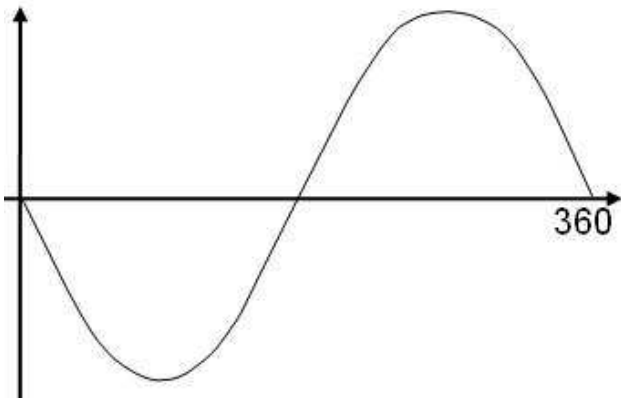
..... **cm**  
 (1)



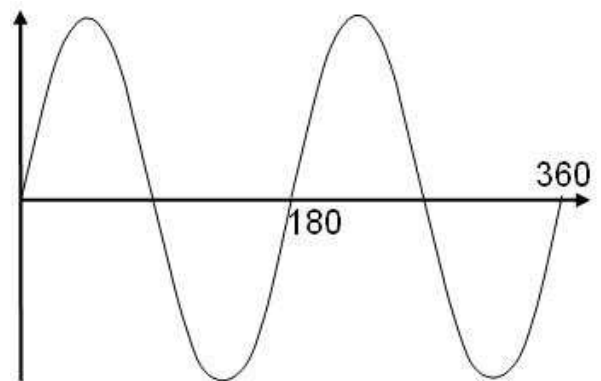
23. The graph of  $y = \sin x^\circ$  is shown for values from  $x = 0^\circ$  to  $360^\circ$



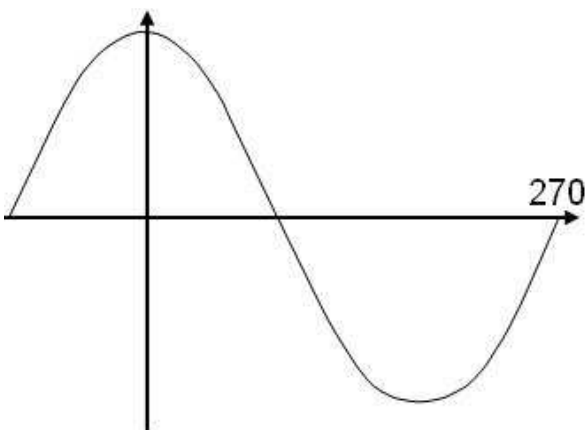
Each of the curves below has been transformed from  $y = \sin x$ . Write down the equation for each.



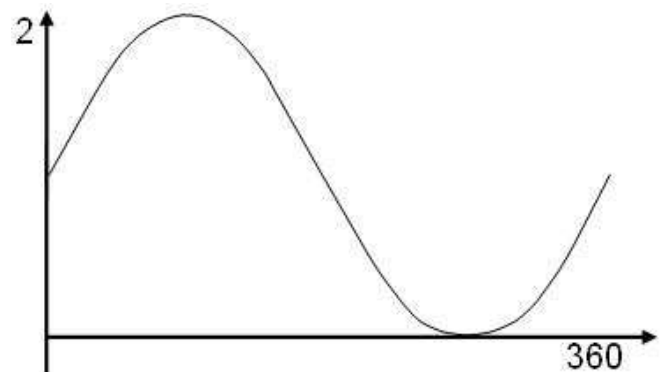
$y = \dots\dots\dots$



$y = \dots\dots\dots$



$y = \dots\dots\dots$



$y = \dots\dots\dots$

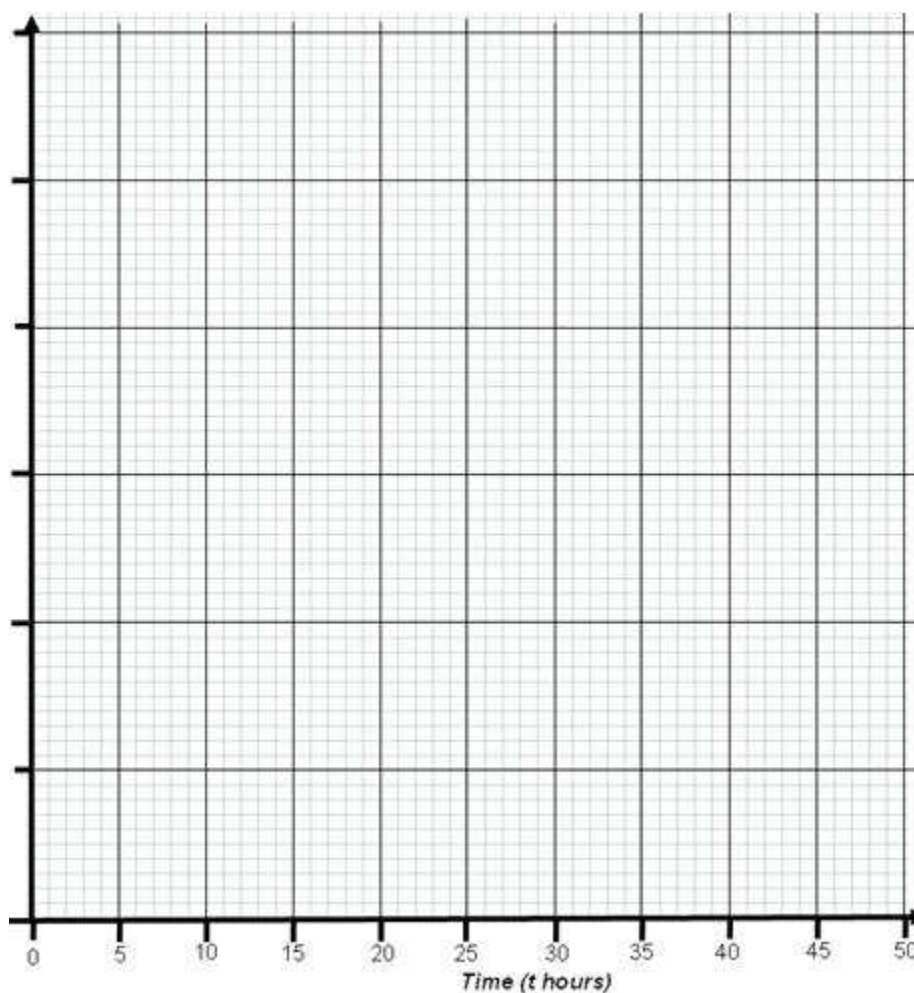
(4)

24. A survey of 84 children was made to see how long they spent revising for their GCSE exams in the term before the exam.

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

Time (t hours)	Frequency
$0 < t < 10$	8
$10 < t < 15$	15
$15 < t < 25$	24
$25 < t < 40$	21
$40 < t < 45$	10
$45 < t < 50$	6

Draw a histogram of this information on the grid below.



(4)

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**TOTAL FOR PAPER: 100 MARKS**  
**END**