

# GCSE MATHEMATICS

## HIGHER PAPER

## NON-CALCULATOR

## NO. 1

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GCSE MATHEMATICS : HIGHER TIER (Non-Calculator) – 2 HOURS

Answer all 21 questions. Show all working.

1. a) Expand and simplify:  $(x - 3)(x + 5)$

Answer: .....(2 marks)

b) Expand:  $q^2(q - 2)$

Answer: .....(1 mark)

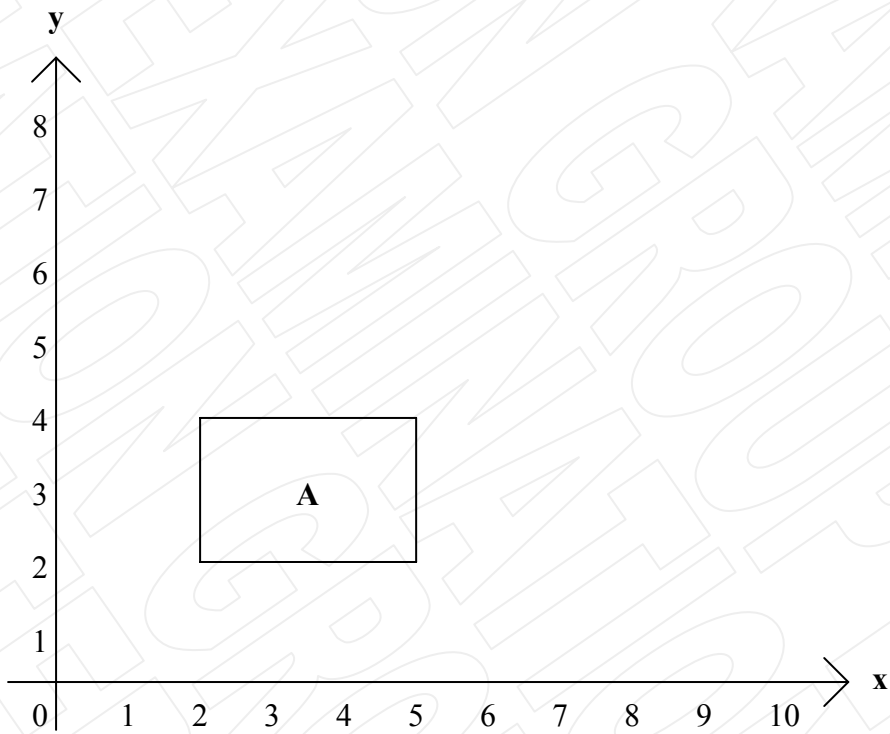
c) Factorise:  $t^2 - 4t$

Answer: .....(1 mark)

d) Factorise completely:  $12cd + 8c^2$

Answer: .....(2 marks)

2.



a) Reflect rectangle **A** in the line  $x = 6$ . Draw the resulting rectangle on the grid above, and label it **B**.

(2 marks)

b) Reflect rectangle **B** in the line  $y = 4$ . Draw the resulting rectangle on the grid above, and label it **C**.

(2 marks)

3. a) Write the answers to the following as powers of 4.

(i)  $4^3 \times 4^1$

Answer: .....(1 mark)

(ii)  $4^2 - 4^0$

Answer: .....(1 mark)

b) Find the value of  $x$  and  $y$  from the following expressions, where  $x$  and  $y$  are whole numbers.

$$\begin{aligned}x^2 - y^3 &= 1 \\x^1 + y^3 &= 11\end{aligned}$$

Answer: .....(3 marks)

4. a) Solve for  $y$ :  $2y + 5 = 3(y - 1)$

Answer: .....(2 marks)

b) If  $p$  is an integer, the find all its possible values from the following inequality.

$$2 \geq p > -4$$

Answer: .....(2 marks)

5. Design a suitable questionnaire you could use to find out whether people are eating the five portions of fruit and/or vegetables a day as recommended by the government.

(2 marks)

6. Give your answers to parts a) and b) below, as fractions in their simplest form.

a)  $\frac{2}{3} \times \frac{5}{8}$

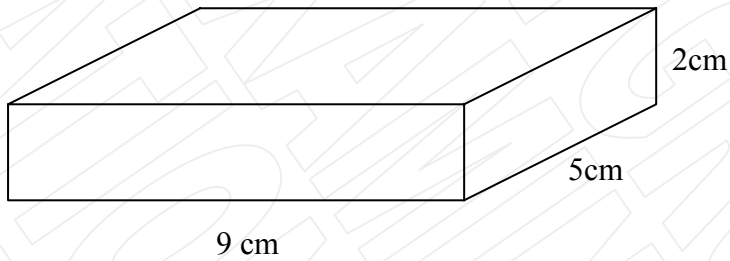
Answer: .....(2 marks)

b)  $3\frac{1}{4} + 2\frac{7}{8}$

Answer: .....(3 marks)

7. Calculate the surface area of the cuboid shown below.

*This is a sketch.  
Not accurately drawn.*



Answers: .....(3 marks)

8. In the expressions shown in the table below, the letters **p**, **q** and **r** represent lengths.  $\pi$ , 2 and 3 are dimensionless (numbers that act as multiples).

$2\pi r$	$pqr$	$\pi r^2$	$p^2q$	$\frac{3pq}{r}$	$2pq$	$\frac{3pq^2r}{\pi qr}$

Tick the boxes under the three expressions that represent areas.

(3 marks)

9. A dice numbered from 1 to 6 is *biased*. The probabilities of it landing on any of the numbers are shown in the table below.

Number on dice	1	2	3	4	5	6
Probability	0.3	$y$	0.2	$y$	0.1	$2y$

- a) Calculate the value of  $2y$ , the probability that the dice will land on a 6.

Answer: .....(2 marks)

- b) If the dice is rolled 50 times, estimate how many times you could expect it to land on an odd number.

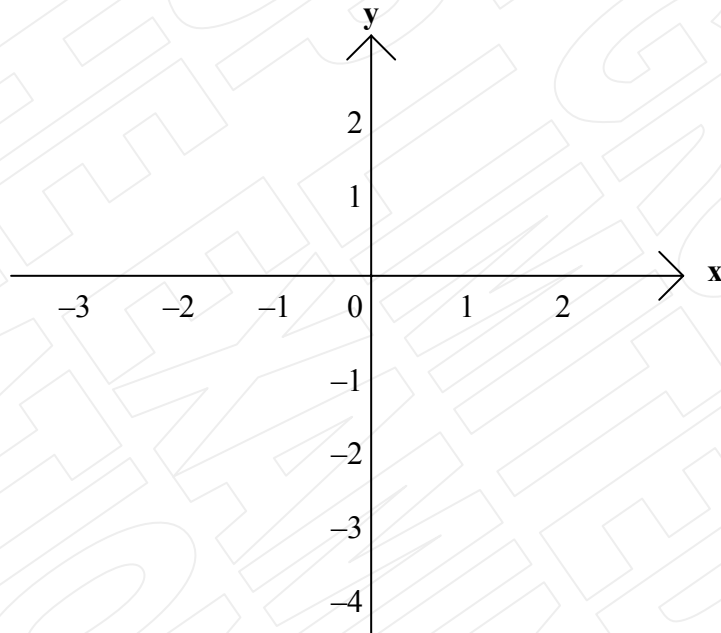
Answer: .....(2 marks)

10. a) Complete the table below for the expression:  $y = x^2 + x - 4$

<b>x</b>	-3	-2	-1	0	1	2
<b>y</b>	2		-4		-2	

(3 marks)

b) Using co-ordinates deduced from the table, plot six points and join them up to form the graph of:  $y = x^2 + x - 4$  using the grid below.

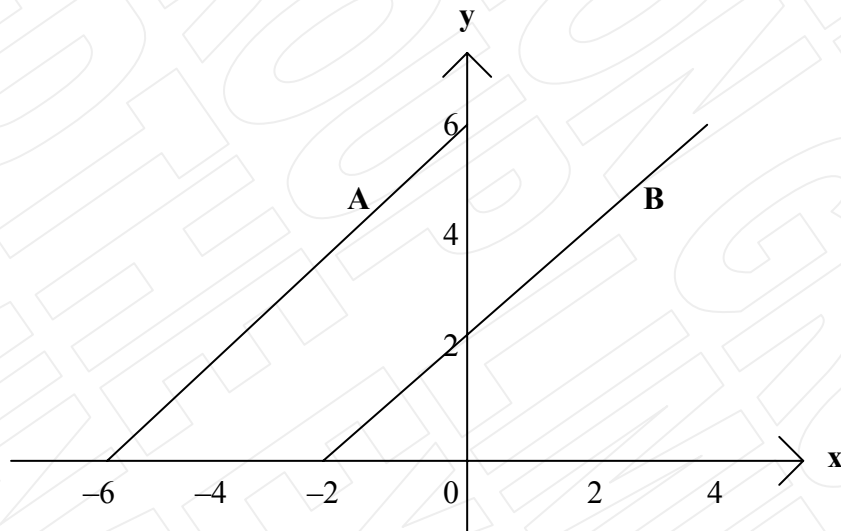


(2 marks)

11. If **a** and **b** are prime numbers, what are their values if the number 63 is written as:  $3^a \times b$

Answer: .....(2 marks)

12. The two lines **A** and **B**, shown on the grid below, are parallel. Find the equations of each line.

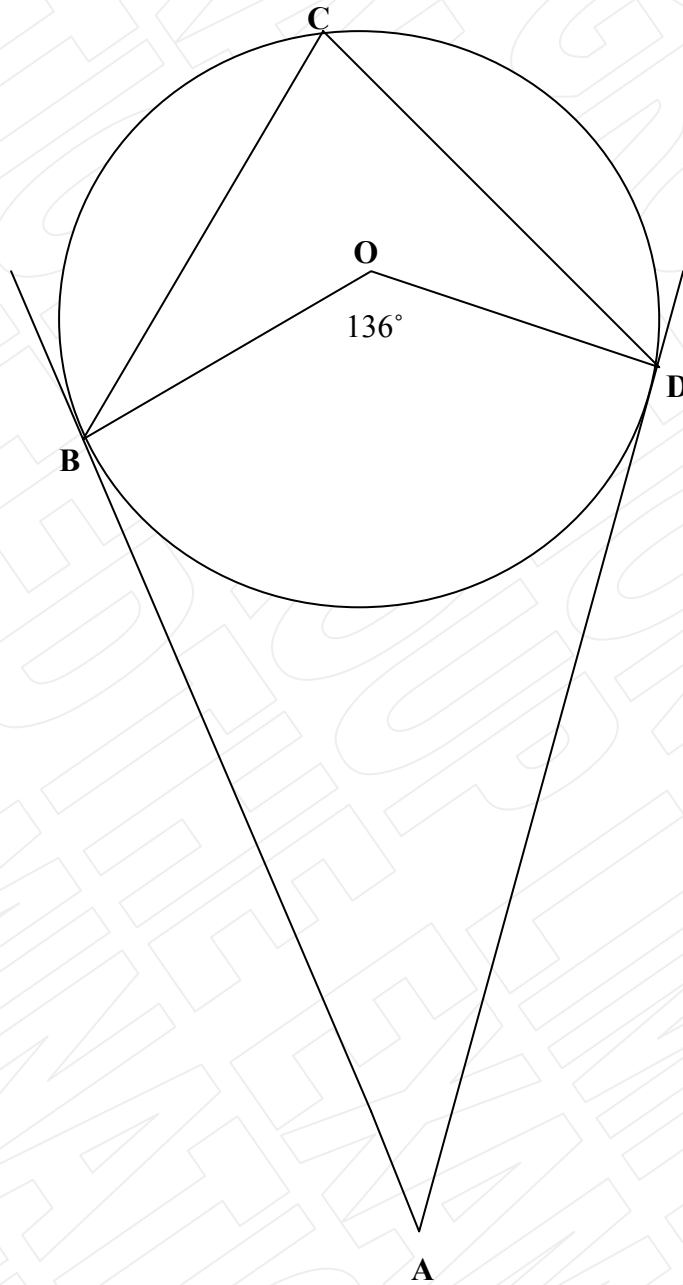


Answers: .....(4 marks)



14. The points **B**, **C** and **D** lie on the circumference of the circle, centre **O**, shown below. The lines **AB** and **AD** are Tangents, and angle **BOD** =  $136^\circ$

*This is a sketch.  
Not accurately Drawn.*



- a) (i) Work out the size of angle **BCD**.

Answer: .....(1 mark)

(ii) State a reason for your answer.

Answer: .....  
.....(1 mark)

b) (i) Work out the size of Angles **ABO** and **ADO**.

Answer: .....(2 marks)

(ii) State a reason for your answer.

Answer: .....  
.....(1 mark)

15. a) Write the fraction  $\frac{2}{3}$  as a decimal.

Answer: .....(1 mark)

b) Write the recurring decimal  $0.54\overline{}$  as a fraction in its simplest form.

Answer: .....(3 marks)

16. When  $c = 4$ ,  $d = 5$  and  $c$  is inversely proportional to the square of  $d$ .

a) Find an expression for  $c$  in terms of  $d$ .

Answer: .....(3 marks)

b) Find the value of  $c$  when  $d = 2$ .

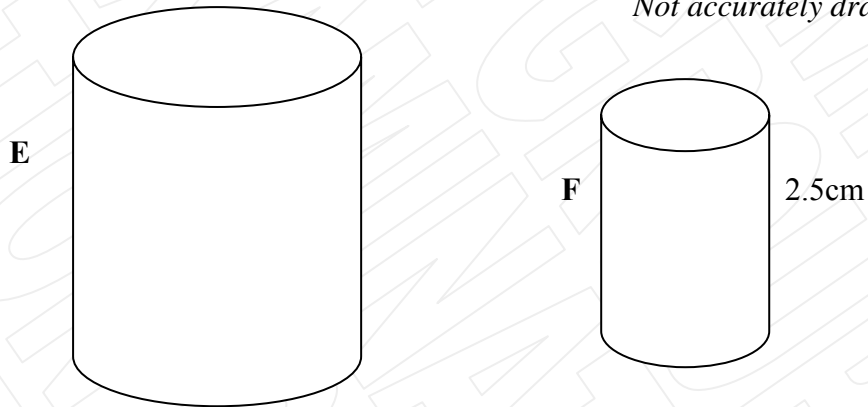
Answer: .....(1 mark)

c) Find the value of  $d$  when  $c = 6\frac{1}{4}$ .

Answer: .....(2 marks)

17. Two cylinders **E** and **F** are mathematically similar. The surface area of **E** is  $40\pi \text{ cm}^2$  and the surface area of **F** is  $640\pi \text{ cm}^2$ . Cylinder **F** has a height of 2.5cm.

*These are sketches.  
Not accurately drawn.*



- a) Calculate the height of cylinder **F**.

Answer: .....(3 marks)

- b) If cylinder **E** has a volume of  $30\pi \text{ cm}^3$ , then calculate the volume of cylinder **F**, giving your answer in terms of  $\pi$ .

Answer: .....(3 marks)

18. a) What are the values of the following:

(i)  $49^1$

Answer: .....(1 mark)

(ii)  $25^{\frac{1}{2}}$

Answer: .....(1 mark)

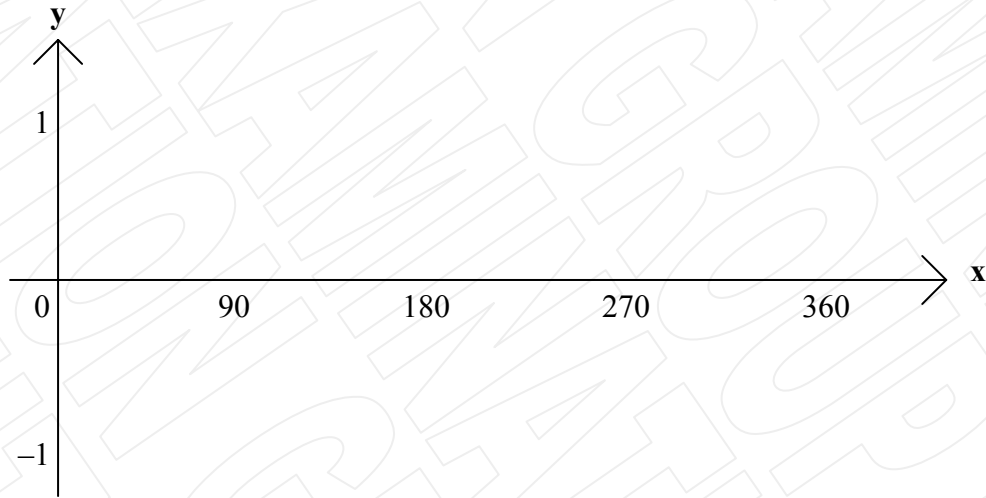
(iii)  $16^{-\frac{3}{4}}$

Answer: .....(2 marks)

b) Find the value of **a** if:  $25 \times \sqrt{125} = 5^a$

Answer: .....(3 marks)

19. a) On the grid below draw the graphs of  $y = \sin x$  and  $y = \cos x$ . Label each graph clearly.



(2 marks)

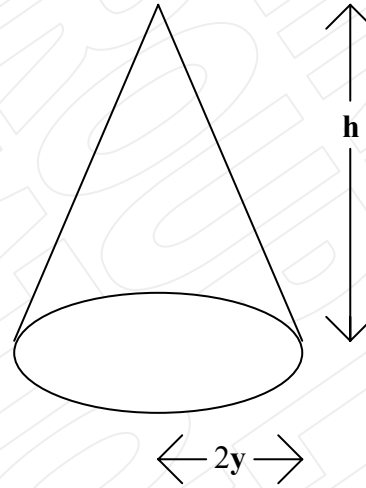
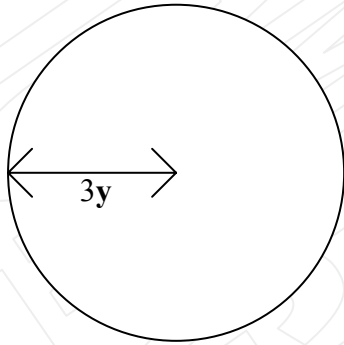
- b) On the grid below draw the graphs of  $y = \frac{1}{2} \sin 2x$  and  $y = \frac{1}{2} \cos 2x$ . Label each graph clearly.



(4 marks)

20. A sphere has a radius of  $3y$ . A cone has a base radius of  $2y$  and a height of  $h$ . Given that the volume of the sphere is twice the volume of the cone, then find an expression for  $h$  in terms of  $y$ .

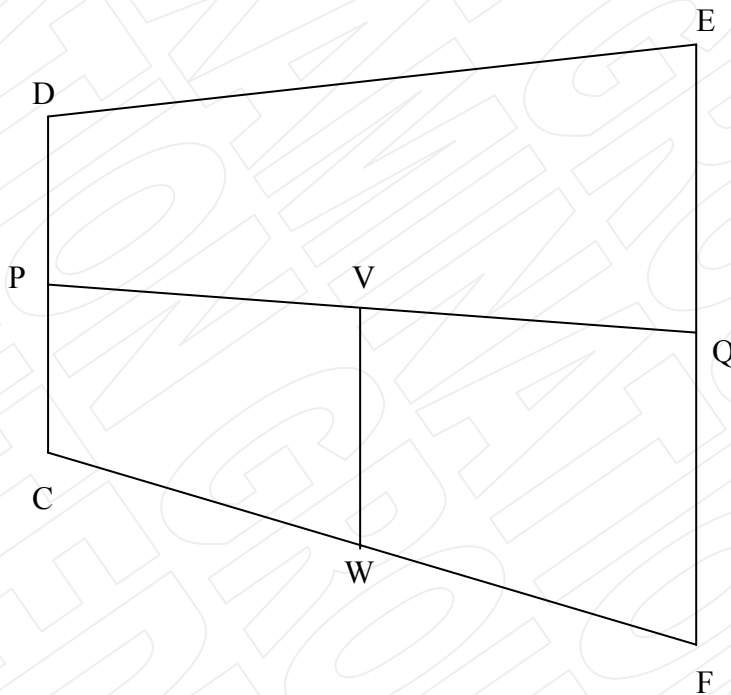
*There are sketches.  
Not accurately drawn.*



Answer: .....(5 marks)

21. The diagram CDEF shown below has sides CD and EF , parallel. The mid-point of CD is P and the midpoint of EF is Q .

$$\vec{CD} = 2\mathbf{a} , \vec{ED} = 3\mathbf{b} , \vec{FE} = 4\mathbf{a}$$



- a) Find the Vector  $\vec{PQ}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$  .

Answer: .....(2 marks)

- b) If the mid-point of PQ is V and the mid-point of CF is W ,then prove that VW and EF are parallel.

Answer: .....(4 marks)

**END OF EXAMINATION : TOTAL 100 MARKS**

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