Level 1 / Level 2 GCSE (9 – 1)

MATHEMATICS

Paper 2 (Calculator)

Higher Tier

Time : 1 hour 30 minutes   **Paper : 1 MA1 / 2H**

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- You must **show all your working.**
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1. a. Write 48 as a product of its prime factors.

………………………………..

(2)

b. Find the highest common factor of 40 and 48.

……………………………….
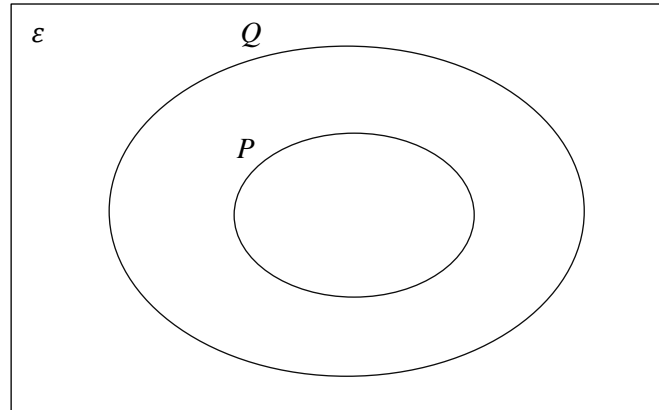
(2)

(Total for Question 1 is 4 marks)

2. $\varepsilon = \{20, 21, 22, 23, 24, 25, 26, 27, 28, 29\}$
$P = \{\text{prime numbers}\}$
$Q = \{\text{odd numbers}\}$

a. Complete the Venn diagram for this information.

(2)

A number is chosen at random from the universal set ε.
a. Find the probability that this number is in the set $P' \cap Q$

………………………….

(2)

(Total for Question 2 is 4 marks)

3. Michelle puts chocolates into small chocolate gift boxes and large chocolate gift boxes.

She puts 12 chocolates into each small box.

She puts 30 chocolates into each large box.

Michelle puts a total of 4800 chocolates into boxes so that

   number of chocolates in small boxes : number of chocolates in large boxes = 2 : 3

Michelle says that more than 60% of the boxes filled with chocolates are small boxes.

Is Michelle correct?

You must show all your working.

....

(Total for Question 3 is 5 marks)

4. a. Complete the table of values for $y = x^3 + 2$.

x	-2	-1	0	1	2
y		1			

(2)

b. On the grid below, draw the graph of $y = x^3 + 2$ for values of x for –2 to 2

(2)

…………………………………………..
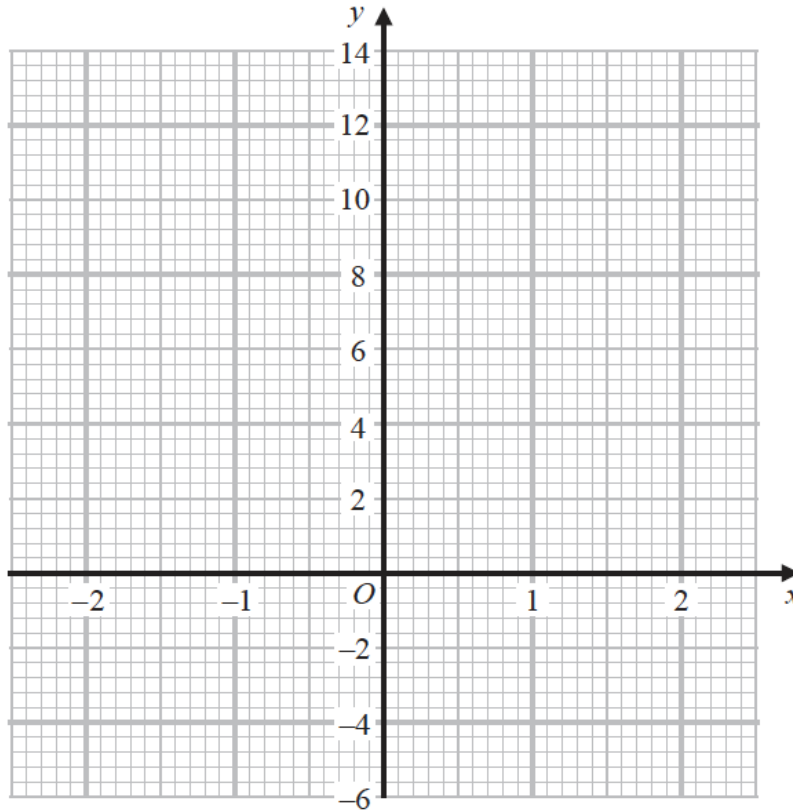
(Total for Question 4 is 4 marks)

5.

y cm

82 cm

175 cm
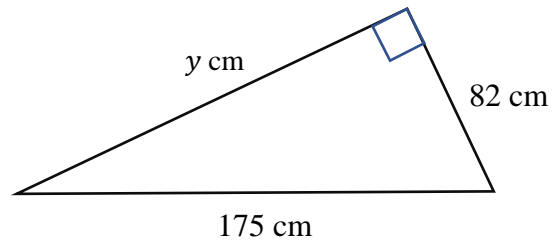
Work out the value of y.

Give your answer correct to 3 significant figures.

…………………………………………….

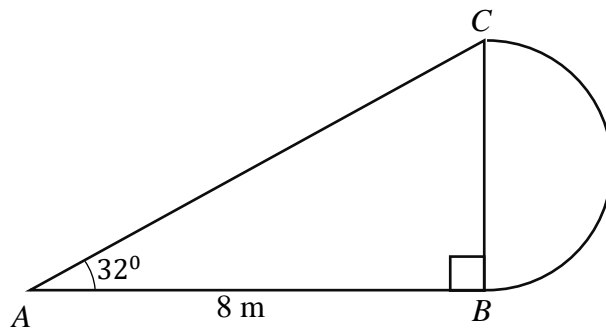**(Total for Question 5 is 2 marks)**

6. $\mathbf{p} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ $\qquad$ $\mathbf{q} = \begin{pmatrix} 4 \\ -3 \end{pmatrix}$

Find $3\mathbf{p} - 2\mathbf{q}$ as a column vector.

…………………………………….

(Total for Question 6 is 2 marks)

7. The diagram shows a right-angled triangle and a semicircle.

The right-angled triangle ABC has angle $ABC = 90^0$.
$AB = 8$ m and angle $CAB = 32^0$
BC is the diameter of a semicircle.

Work out the area of the semicircle.
Give your answer correct to 3 significant figures.
You need to show all your working.

....

(Total for Question 7 is 4 marks)

8. In a sale, normal prices are reduced by 15%.

The sale price of the jacket is £68.
Work out the normal price of the jacket.

……………………………………………….

(Total for Question 8 is 2 marks)

9. Thomas invests $8000 in a saving account for 3 years.

The account pays compound interest at a rate of 1.2% per year for the first 2 years.
The compound interest rate changes for the third year.
At the end of 3 years, there is a total of $8316 in the account.
Work out the compound interest rate for the third year.
Give your answer correct to 1 decimal place.

……………………………………………….

(Total for Question 9 is 3 marks)

10. Barbie is going to a party.

There are 8 night dresses, 6 pairs of shoes in her wardrobe and 5 pieces of jewellery in her jewellery box.

Barbie is going to choose one night dress, 1 pair of shoes and one jewellery box.
She puts each item on after she has picked it.
In how many ways can she put on a full outfit?

……………………………..

(Total for Question 10 is 2 marks)

11. a. Find the value of x in $250^x = 1$

…………………………….

(1)

b. Simplify $\frac{4(y+2)}{(y+2)^2}$

…………………………….

(1)

c. Simplify $(16p^4 q^6)^{\frac{1}{2}}$
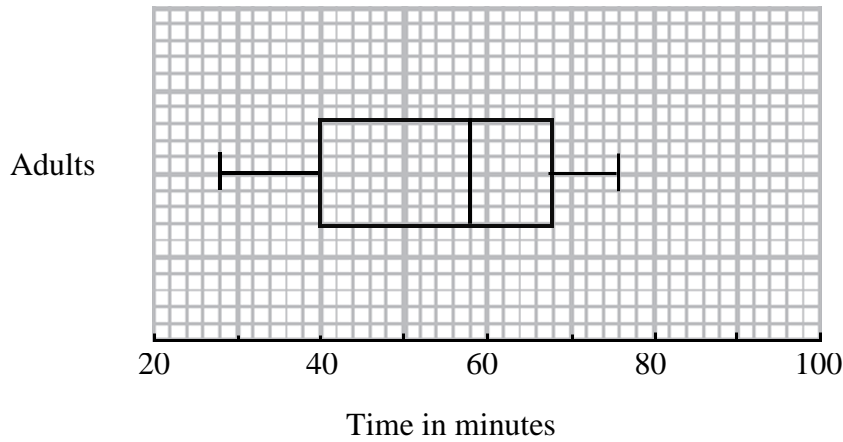
……………………………..

(2)

(Total for Question 11 is 4 marks)

12. James records the times, in seconds, taken for a group of children and a group of adults to complete puzzle.
The box plot shows information about the times taken for the adults to complete the puzzle.


Adults

20   40   60   80   100

Time in minutes

Find the interquartile range of the times taken for the adults to complete the puzzle.

……………………………..

(2)

The table and part of the box plot shows some information about the times, in seconds, taken for the children to complete the puzzle.

Interquartile range	22
Upper quartile	70
Median	48
Greatest height	82
Range	48

Children

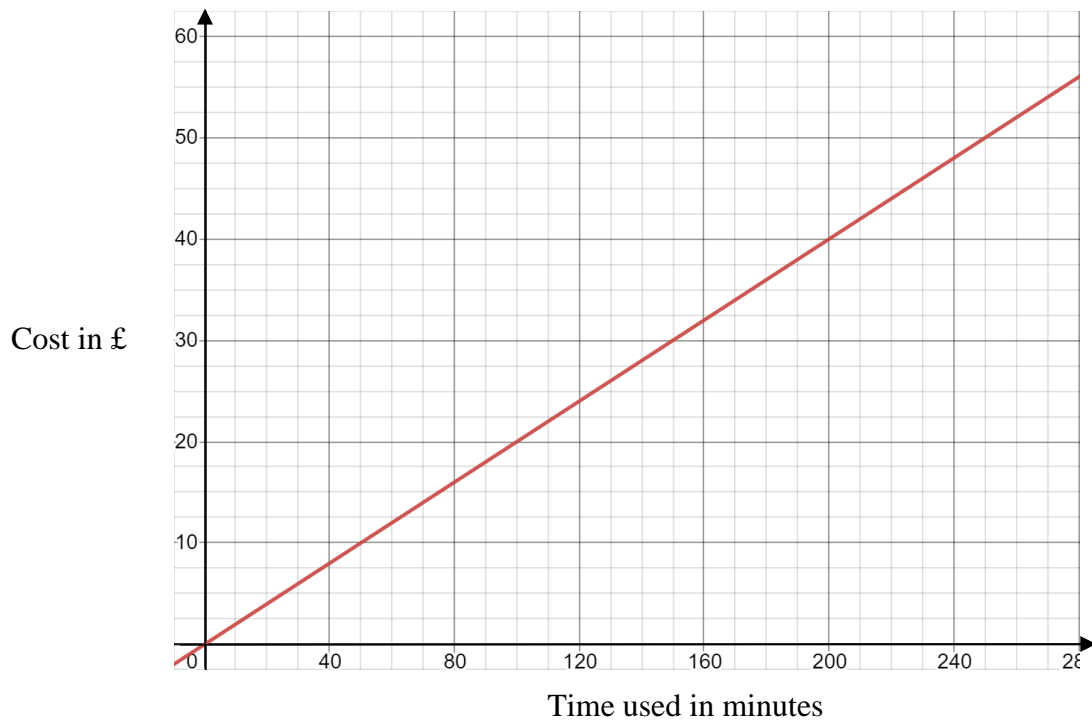20   40   60   80   100

Time in minutes
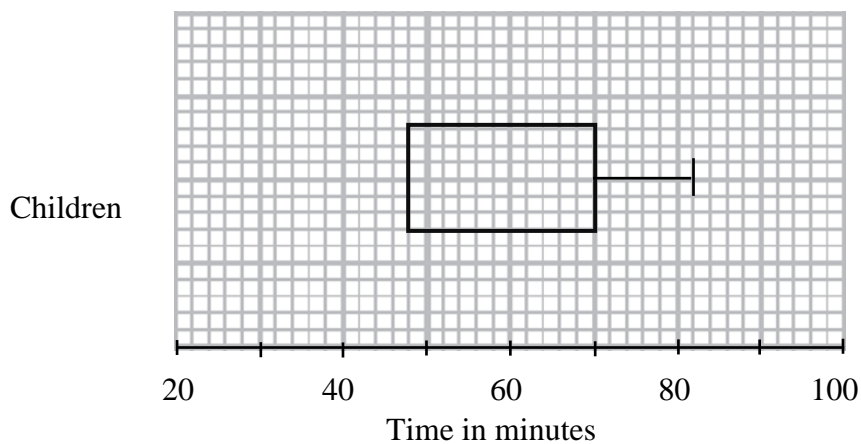
Use the above information to complete the box plot.

(2)

(Total for Question 12 is 4 marks)

13. The graph shows the cost of using internet broadband for one month with tariff 1.

Cost in £

Time used in minutes

    a.   Find the gradient of the graph.
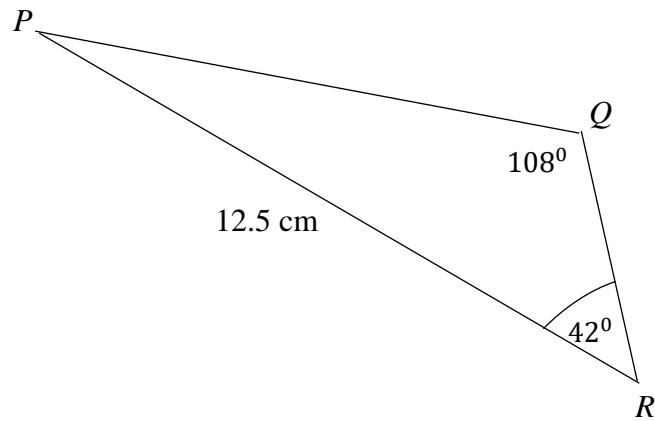
…………………………..

(2)

    b.   Interpret what the gradient of the graph represents.

…………………………….

(1)

(Total for Question 13 is 3 marks)

14.

Work out the perimeter of triangle *PQR*.
Give your answer to 3 significant figures.

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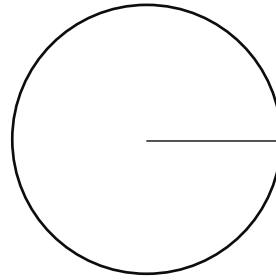**(Total for Question 14 is 5 marks)**

15. Here are two circles, *P* and *Q*.
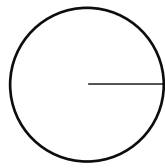
                    P   *Q*

The radius of circle *P* is 5 cm smaller than the radius of circle *Q*.
The area of circle *Q* is 50π cm^2 greater than the area of circle *P*.

Find the area of circle *Q*.
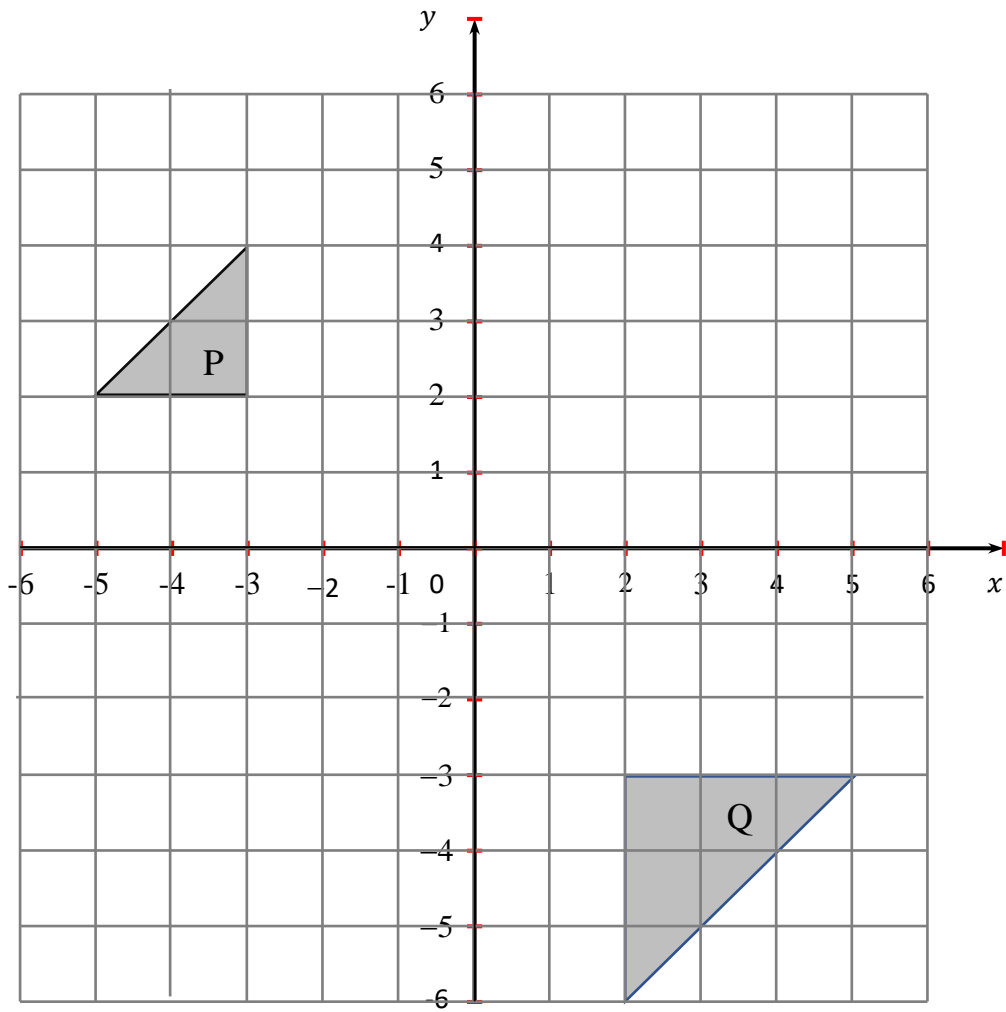Give your answer correct to 3 significant figures.
You must show all your working.

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(Total for Question 15 is 4 marks)

16.

Describe fully the single transformation that maps triangle **P** onto triangle **Q**.

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

(Total for Question 16 is 2 marks)

17. A quadratic sequence starts

$$-6, -5, -2, 3, 10$$

a. Show that the nth term is $n^2 - 2n - 5$

(3)

b. Hence find the term that has value 115.

……………………………………………….

(2)

(Total for Question 17 is 5 marks)

18. Write down the coordinates of the turning point on the graph $y = 8 - 2(x - 3)^2$

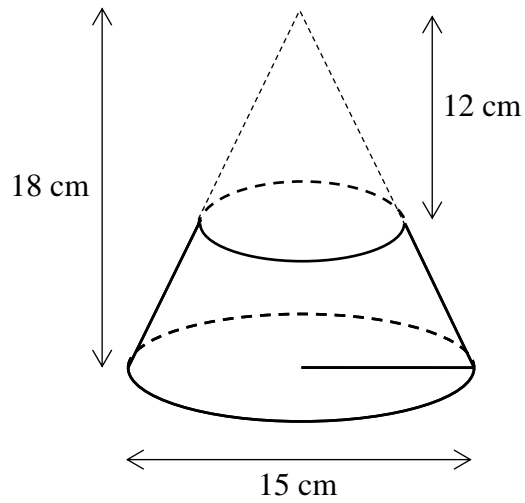(……………… , ………………)

(Total for Question 18 is 1 mark)

19.

18 cm

12 cm

15 cm

A frustum is made by removing a small cone from a similar large cone.

The height of the small cone is 12 cm.

The height of the large cone is 18 cm.

The diameter of the base of the large cone is 15 cm.

Work out the volume of the frustrum.

Give your answer correct to 3 significant figures.

…………………………………………….cm^3

(Total for Question 19 is 4 marks)

20. In a bag there are *n* counters.

Four of these are blue and the rest of the counters are red.

Betty is going to remove two counters at random from the bag. She will not put them back.

Given that the probability that both counters she takes will be red is $\frac{1}{3}$.
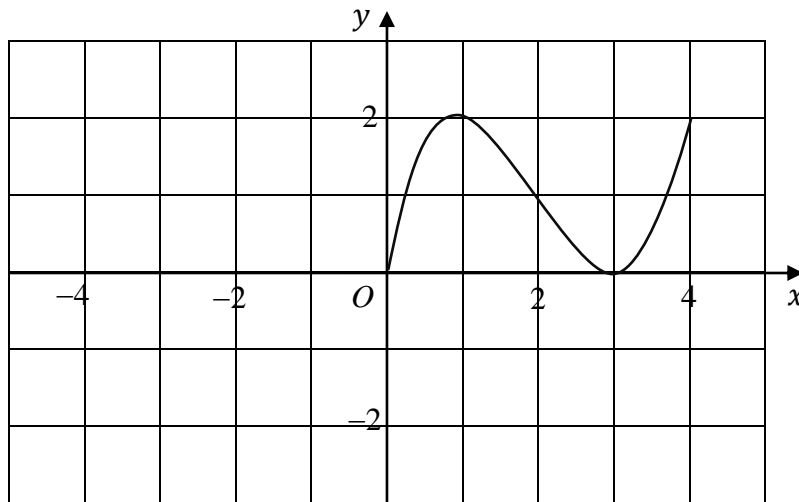
Work out the number of red counters in the bag.

…………………………………….

(Total for Question 20 is 5 marks)

21. The graph of the curve with equation $y = f(x)$ is shown on the grid below.

a. On the grid above, sketch the graph of the curve with equation $y = -f(x)$.

(2)

b. The graph of $y = \cos x$ is translated by the vector $\begin{pmatrix} 60 \\ 0 \end{pmatrix}$.

Write down the equation of the new graph.

………………………………..

(2)

(Total for Question 21 is 4 marks)

22. *C* is a circle with centre the origin.

A tangent to *C* crosses the *x*-axis at $\left(4\sqrt{3}, 0\right)$ and *y*-axis at $(0, -4)$

Work out an equation of *C*

You must show all your working.

…………………………………………….

(Total for Question 22 is 5 marks)

23. A scientist is studying a population of birds.
The number of birds, P_t, in the population, t years after the start of the study is modelled by the equation

$$P_{t+1} = 1.02P_t$$

Given that there were 240 birds at the start of Year 1, work out the number of birds at the start of year 4.

…………………………………………….

(Total for Question 23 is 2 marks)

TOTAL FOR PAPER IS 80 MARKS