CALC G

GCSE Mathematics · Higher Tier

40 marks · 45 minutes · Calculator

Name ..... **Class** .....

Answer all questions. Show all your working. Diagrams are NOT accurately drawn unless stated.

1 Ali and Bea buy a van for £8400

They pay for the van in the ratio 4 : 3

Two years later they sell the van for £6090

They share the £6090 in the ratio 4 : 3

(a) Work out the percentage loss when they sell the van.

..... %

(2)

(b) Work out how much money Ali gets from the sale of the van.

£ .....

(1)

(Total for Question 1 is 3 marks)

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2 Light travels at a speed of 3.0×10^8 metres per second.

The distance from the Sun to the Earth is 1.5×10^{11} metres.

The distance from the Sun to Neptune is 4.5×10^{12} metres.

(a) Write 1.5×10^{11} as an ordinary number.

.....

(1)

(b) Work out how many more minutes light takes to travel from the Sun to Neptune than from the Sun to the Earth.

Give your answer correct to 3 significant figures.

..... minutes

(3)

(Total for Question 2 is 4 marks)

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3 The table gives information about the times, in minutes, that customers waited to be served at Garage **A** last week.

Mean	Range
18 minutes	25 minutes

Here are the times, in minutes, that 8 customers waited to be served at Garage **B** last week.

12 **15** **9** **22** **14** **11** **17** **12**

(a) Work out the mean and the range of the times for Garage **B**.

mean ..... range .....

(2)

(b) Compare the times customers waited at Garage **A** with the times customers waited at Garage **B**.

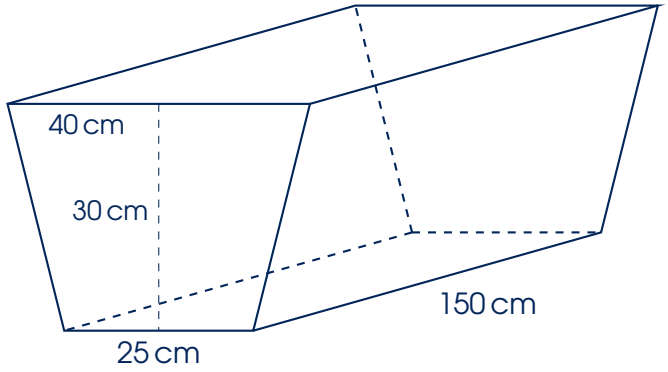
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(2)

(Total for Question 3 is 4 marks)

4 The diagram shows a water trough in the shape of a prism.



The cross-section of the trough is a trapezium.

The trough is empty. Water flows into the trough at a rate of 9 litres per minute.

1 litre $= 1000\ \text{cm}^3$

Work out how long it takes to fill the trough completely.

Give your answer in minutes and seconds.

..... minutes ..... seconds

(Total for Question 4 is 3 marks)

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5 Solve the simultaneous equations

$$4x + 3y = 18.5$$
$$6x - 5y = 4$$

$x =$ ..... $y =$ .....

(Total for Question 5 is 3 marks)

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6 The probability that a train is late on any day is 0.15

Whether the train is late on one day is independent of whether it is late on any other day.

Mo catches this train on Monday, Tuesday and Wednesday.

Mo says,

"The probability that the train is late on at least one of these three days is more than 0.4"

Is Mo correct? You must show how you get your answer.

(Total for Question 6 is 3 marks)

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7 Using $x_{n+1} = \sqrt[3]{7 - 2x_n}$ with $x_0 = 1.5$

find the value of x_3

Give your answer correct to 4 decimal places.

$x_3 =$ .....

(Total for Question 7 is 3 marks)

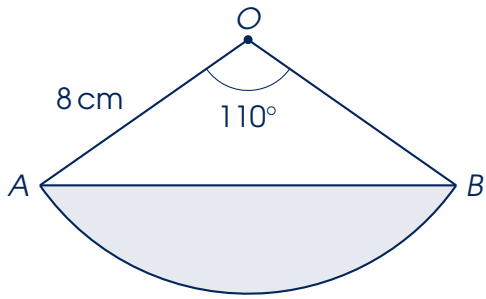
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8 Jo invests £4000 in a savings account for 5 years.
The account pays compound interest at a rate of r% per year.
At the end of the 5 years, the value of Jo's investment is £4773.74
Work out the value of r.
Give your answer correct to 1 decimal place.

$r =$ .....

(Total for Question 8 is 3 marks)

9 The diagram shows a sector OAB of a circle, centre O.



The radius of the circle is 8 cm. Angle $AOB = 110°$.
Show that the area of the shaded segment is 31.4 cm^2, correct to 3 significant figures.

(Total for Question 9 is 3 marks)

10 The force, F newtons, between two magnets is inversely proportional to the square of the distance, d cm, between them.

The distance between the magnets is increased by 20%.

Work out the percentage decrease in the force between the magnets.

Give your answer correct to 1 decimal place.

..... %

(Total for Question 10 is 3 marks)

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11 Two bottles, **P** and **Q**, are mathematically similar.

The volume of bottle **P** is 400 cm^3. The volume of bottle **Q** is 1350 cm^3.

The surface area of bottle **P** is 360 cm^2.

Lia says,

*"The surface area of bottle **Q** is less than 800 cm^2."*

Is Lia correct? You must show how you get your answer.

(Total for Question 11 is 3 marks)

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12 The functions f and g are such that

$$f(x) = 3x - 5 \qquad g(x) = x^2 + 1$$

(a) Find $f^{-1}(x)$

$f^{-1}(x) =$ .....

(2)

(b) Solve $fg(x) = gf(x)$

Give your solutions correct to 2 decimal places.

.....

(3)

(Total for Question 12 is 5 marks)

TOTAL FOR PAPER IS 40 MARKS