Paper 2H
GCSE MATHEMATICS

CM

Practice Set A (AQA Version)   Calculator   Time allowed: 1 hour 30 minutes

Instructions to candidates:

• In the boxes above, write your centre number, candidate number, your surname, other names and signature.

• Answer ALL of the questions.

• You must write your answer for each question in the spaces provided.

• You may use a calculator.

Information to candidates:

• Full marks may only be obtained for answers to ALL of the questions.

• The marks for individual questions and parts of the questions are shown in square brackets.

• There are 18 questions in this question paper. The total mark for this paper is 80.

Advice to candidates:

• You should ensure your answers to parts of the question are clearly labelled.

• You should show sufficient working to make your workings clear to the Examiner.

• Answers without working may not gain full credit.

Answer **all** questions in the spaces provided.

1 Which of the following points does **not** lie on the line with equation $y = 2x - 1$.

Circle your answer.

[1 mark]

$(0, -1)$ $(1, 1)$ $(-2, -3)$ $(3, 5)$

2 Factorise fully $2m^2 + 8m + 6$

Circle your answer.

[1 mark]

$2(m + 3)(m + 1)$ $(2m + 6)(m + 1)$ $(m + 3)(2m + 2)$ $2(m - 3)(m - 1)$

3 Here are four mathematical statements:

Statement **A**: angles in a triangle add together to give 180°
Statement **B**: the hypotenuse is the longest side of a right-angled triangle
Statement **C**: a square is a rectangle
Statement **D**: the number 1 is a prime number

Which of the above statements is **false**?
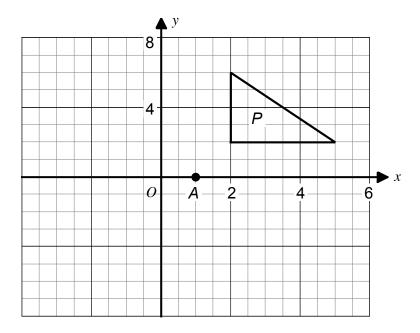
Circle your answer.

[1 mark]

A **B** **C** **D**

4 The shape *P* is shown on the coordinate axes below.

4 (a) Write down the coordinates of the point *A*.

[1 mark]

Answer _____

4 (b) On the axes above, rotate the shape *P* by 180 degrees about the point *A*.
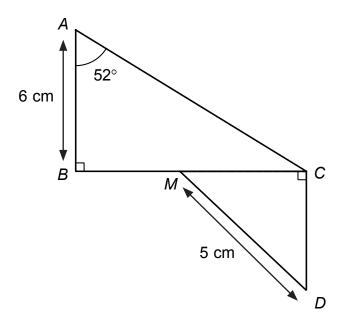
Label your rotated shape *P**.

[3 marks]

Turn over ▶

5   Alice and her friends ordered a take-away meal.

Part of their bill is shown below.

Tasty Meals	
chicken	£5.60
rice	£3.40
fries	£2.35
sweetcorn	£1.20
ice cream	£2.10
drinks	?
subtotal	?
VAT	20% of subtotal
total	£22.50

Find the total cost of the drinks ordered by Alice and her friends.

[3 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Answer _____ pounds

6 Two right-angled triangles, *ABC* and *MCD*, are shown in the diagram below.

Not drawn accurately

The point *M* is the midpoint of *BC*.

Find the length of the side *CD*.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Answer _____ centimetres

Turn over ▶

7 Across 25 football matches, a football team has a mean score of 2.80 goals per match.

The team have one more match left in the tournament.

They want to raise their mean number of goals per match to 3.00 for this tournament.

How many goals does the football team need to score in their final match to achieve this?

[3 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Answer _____ goals

8 In the space below, construct an equilateral triangle of side length 3 cm.

You must show all of your construction lines.

[2 marks]

Turn over for the next question

Turn over ▶

9 A unfair die has four sides, labelled 1 to 4.

When the die is thrown,

the probability of it landing on a 4 is twice the probability of it landing on a 1

the probability of it landing on a 1, 2 or 3 is the same.

In a round, Amir rolls this die twice and adds together the scores on the die.

Amir plays a hundred rounds.

Calculate the expected number of rounds where his sum is 8.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Answer _____ rounds

10 $\mathbf{a} = \begin{bmatrix} -3 \\ 2 \end{bmatrix}$ and $\mathbf{b} = \begin{bmatrix} 1 \\ 5 \end{bmatrix}$.

10 (a) Describe the geometrical relationship between the vectors **b** and –**b**.

[2 marks]

_____

_____

_____

10 (b) Find **a** – 3**b**.

[2 marks]

_____

_____

_____

_____

Answer _____

Turn over ▶

11   Two measurements, x and y, are made, where

x = 2.1 rounded to 1 decimal place

and y = 4.6 truncated to 1 decimal place

11 (a) (i)   Write down the error interval for x.

[1 mark]

Answer _____

11 (a) (ii)   Write down the error interval for y.

[1 mark]

Answer _____

11 (a) (iii)   Write down the error interval for $y - x$.

[1 mark]

Answer _____

11 (b)   The quantity S is given by

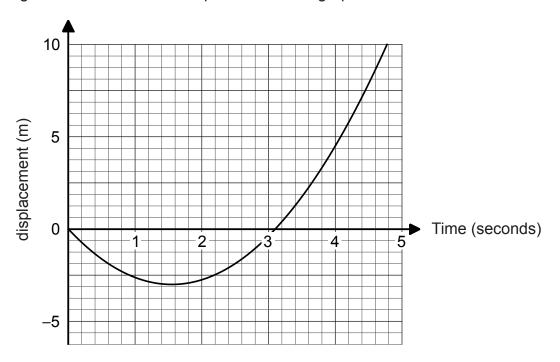$$S = \frac{3x - 2}{y}$$

Find the upper and lower bounds of S.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

11 (b) **[Extra space]**

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Upper bound = _____

Lower bound = _____

Turn over for the next question

Turn over ▶

12 The diagram below shows the displacement-time graph for the motion of a car.

12 (a) Find an estimate for the velocity of the car after 4 seconds.

[3 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Answer _____ metres per second

12 (b) Is your answer to part (a) an over-estimate or an under-estimate?

Circle your answer and explain your reasoning.

[2 marks]

over-estimate   under-estimate

Reason _____

_____

_____

13 Show that the equation $x^3 + 2x^2 + 3x - 4 = 0$ has a solution between $x = 0$ and $x = 1$.

[3 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Turn over ▶

14 Solve the equation $4x^2 - 5x = 1$.

Give your answers to two decimal places.

[3 marks]

_____

_____

_____

_____

_____

_____

_____

_____
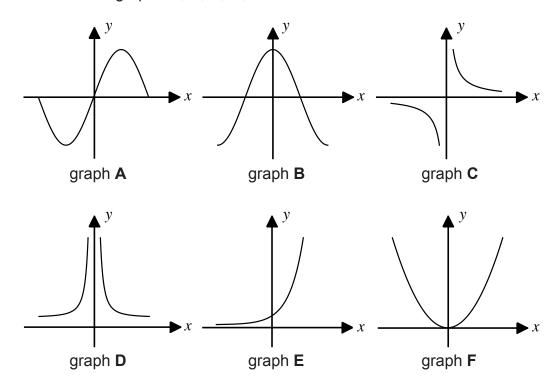
_____

_____

_____

$x = $ _____

15 Two rectangular cuboids **A** and **B** are mathematically similar.

The cross-sectional areas of **A** and **B** are in the ratio 1:2.

The volume of **A** is 1000 cm³.

Find the volume of **B**.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Answer _____ cm³

16 Sketches of the graphs **A**, **B**, **C**, **D**, **E** and **F** are shown below.

graph **A**

graph **B**

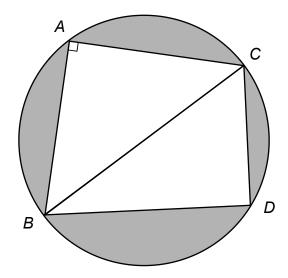graph **C**

graph **D**

graph **E**

graph **F**

Complete the table below by matching each function with its corresponding graph.

The first row has been completed for you.

[5 marks]

Function	Corresponding graph
$y = x^2$	graph **F**
$y = 2^x$	
$y = \sin x$	
$y = x^{-1}$	
$y = \cos x$	
$y = \dfrac{1}{x^2}$	

17 The triangles *ABC* and *BCD* are inscribed within the circle *P*, as shown in the diagram below.

Not drawn accurately

17 (a) Which of the following terms **best** describes the line *BC*.

Circle your answer.

[1 mark]

segment   radius   diameter   chord

17 (b) Given that *BC* = 10 cm, the angle *ABC* = 35$^\text{o}$ and the angle *BCD* = 63$^\text{o}$, find the area of the shaded region.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____
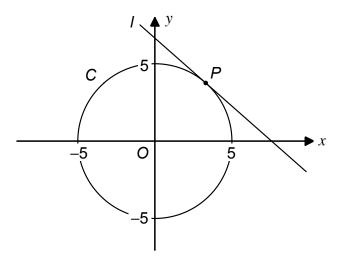
Answer _____ cm²

Turn over ▶

18 When a particle travels at high speeds, its mass changes according to the formula

$$m = \frac{m_0}{\sqrt{1 - \dfrac{v^2}{c^2}}}$$

where m is the mass of the particle, in kg, when it is moving with velocity v m/s

m_0 is the mass of the particle, in kg, when it is at rest

c is a constant.

18 (a) Make c the subject of the formula.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Answer _____

18 (b) A particle *P* has rest mass 1.67×10^{-27} kg.

When it travels at 2.85×10^8 m/s, its mass is 5.35×10^{-27} kg.

Find the mass of *P* when it travels at 2.31×10^8 m/s.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Answer _____ kg

Turn over ▶

19 The diagram below shows a sketch of the circle *C* with centre *O*.

19 (a) The circle has the equation $x^2 + y^2 = k$, where k is a constant.

Write down the value of k.

[1 mark]

Answer _____

19 (b) The line *l* is a tangent to the circle at the point *P*.
The x coordinate of the point *P* is 3.
By considering the gradient of the line segment *OP*, find the gradient of *l*.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

Answer _____

19 (c) Find the equation of the line *l*.

Give your answer in the form $y = mx + c$.

[3 marks]

_____

_____

_____

_____

Answer _____

Turn over for the next question

20 Show in clear stages that

$$\sqrt{125} - 2\sqrt{5} + \frac{5(1-\sqrt{5})}{\sqrt{5}} \equiv a + b\sqrt{5}$$

[5 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

END OF QUESTIONS

BLANK PAGE

DO NOT WRITE ON THIS PAGE