GCSE Mathematics

Paper 1 (non-calculator) · Higher tier

In the style of AQA Higher tier papers · Set A · Paper code LWF-AQAH1-A

Time allowed	90 minutes
Total marks	80
Materials	You must not use a calculator. Ruler, protractor and compasses may be used.

Name _____ Date _____

Instructions

- Answer all questions in the spaces provided.
- Show your working. Marks are available for method as well as for correct answers.
- The marks for each question are shown in brackets.
- Diagrams are not accurately drawn unless otherwise stated.
- When you have finished, mark your work using the mark scheme that comes with this paper.

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Formulae you may need

- Circumference of a circle = $2\pi r = \pi d$; area of a circle = πr^2
- Area of a trapezium = $\frac{1}{2}(a + b)h$
- Volume of a prism = area of cross section × length
- Curved surface area of a cone = πrl; volume of a cone = $\frac{1}{3}\pi r^2 h$
- Surface area of a sphere = $4\pi r^2$; volume of a sphere = $\frac{4}{3}\pi r^3$
- Pythagoras: $a^2 + b^2 = c^2$
- Right-angled triangle: $\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$

  $\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$

  $\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$
- Quadratic formula, for $ax^2 + bx + c = 0$: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- In triangle ABC, with sides a, b, c opposite angles A, B, C: area = $\frac{1}{2}ab \sin C$
- Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
- Cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$
- Compound interest: total after n periods = $P\left(1 + \frac{r}{100}\right)^n$, where P is the amount invested and r is the percentage rate for each period

1

Work out the value of $5 + 2^3 \times 3$

Circle your answer.

A 23 **B** 29 **C** 39 **D** 1029

[1 mark]

2

Simplify $4a \times 0.5a$

Circle your answer.

A $2a$ **B** $4.5a$ **C** $2a^2$ **D** $4.5a^2$

[1 mark]

3

Each exterior angle of a regular polygon is 22.5°
How many sides does the polygon have?

Circle your answer.

A 8 **B** 12 **C** 15 **D** 16

[1 mark]

4

The probability that a delivery van arrives late on any day is 0.15

What is the probability that the van does not arrive late on a given day?

Circle your answer.

A 0.15 **B** 0.75 **C** 0.85 **D** 1.15

[1 mark]

5

At an allotment, seed potatoes cost £2.85 per kilogram.
Work out the cost of 3.6 kg of seed potatoes.

Answer £ _____

[2 marks]

6

Sam and Nadia each run laps of a running track.
The distance Sam runs and the distance Nadia runs are in the ratio 3 : 5
Nadia runs 4.8 km further than Sam.

Work out the total distance they run altogether.
You must show your working.

Answer _____ km

[3 marks]

7

An adult ticket for a theatre show costs £x.
A child ticket costs £3.50 less than an adult ticket.
A family buys 2 adult tickets and 3 child tickets.
The total cost is £71.50

Work out the cost of an adult ticket.
You must show your working.

Answer £ _____

[3 marks]

8

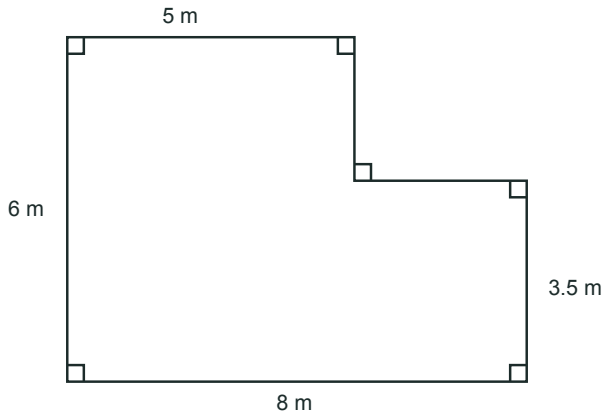
A mobile data plan allows 3.5×10^9 bytes of data each month.

Work out the total amount of data allowed in one year.
Give your answer in standard form.

Answer _____ bytes

[2 marks]

9



Not drawn accurately

The diagram shows the floor plan of the tea tent at a village fete.

Work out the area of the floor.

Answer _____ m²

[3 marks]

10

At the start of last season a football club increased the price of a season ticket by 20%.

At the start of this season the club reduced the price of a season ticket by 15%.

A season ticket now costs £306.

Work out the price of a season ticket before the 20% increase.

You must show your working.

Answer £ _____

[4 marks]

11

Expand and simplify $(x + 3)(x - 2)(2x - 1)$

Answer _____

[3 marks]

12

A market stall sells bags of oranges.
The table shows the number of oranges in each bag sold one Saturday.

Number of oranges in bag	4	5	6	7
Number of bags	3	x	8	5

The mean number of oranges per bag is 5.6

Work out the value of x.
You must show your working.

Answer _____

[3 marks]

13

Part of a train timetable is shown.

Millbrook depart 08:52
Kingsford arrive 10:16

The distance from Millbrook to Kingsford is 126 km.

Show that the average speed of the train is 25 m/s.
You must show your working.

[3 marks]

14

Solve the simultaneous equations

$3x + 4y = 23$

$5x - 2y = 8$

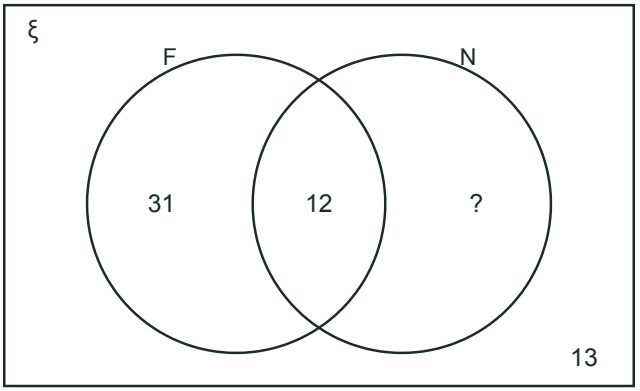
You must show your working.

$x =$ _____ $y =$ _____

Answer _____

[4 marks]

15



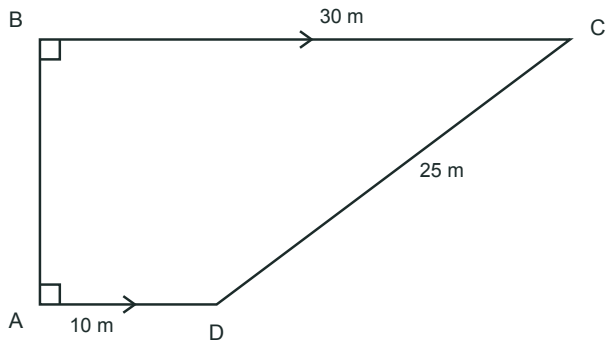
80 customers in a bookshop were asked whether they bought a fiction book (F) or a non-fiction book (N).
The Venn diagram shows some of the results.

One of the customers who bought a non-fiction book is chosen at random.
Work out the probability that this customer also bought a fiction book.
You must show your working.

Answer _____

[3 marks]

16



Not drawn accurately

ABCD is a field on a farm.
AD is parallel to BC.
Angle DAB = angle ABC = 90°
AD = 10 m, BC = 30 m and CD = 25 m

A straight fence is to be built from A to C.

Work out the length of the fence.
Give your answer as a surd in its simplest form.
You must show your working.

Answer _____ m

[4 marks]

17

Write $(\sqrt{12} + 6)/(\sqrt{3} - 1)$ in the form $a + b\sqrt{3}$, where a and b are integers.
You must show your working.

Answer _____

[3 marks]

18

The straight line L has equation $3x + 2y = 8$

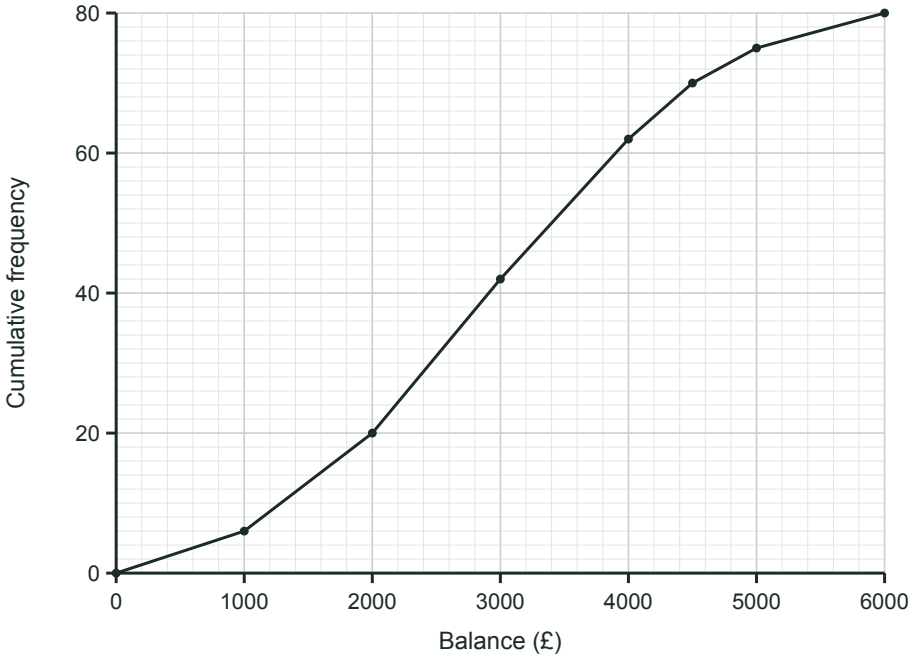
The straight line M is perpendicular to L and passes through the point (6, 1).

Work out the coordinates of the point where M crosses the x-axis.
You must show your working.

Answer _____

[3 marks]

19



The cumulative frequency graph shows information about the balances of 80 savings accounts at a bank.

The bank pays a bonus to every account with a balance of more than £4500.

Estimate the percentage of the 80 accounts that receive the bonus.
You must show your working.

Answer _____ %

[3 marks]

20

The time taken to paint a hall is inversely proportional to the number of painters working.
All painters work at the same rate.

6 painters would take 10 hours to paint the hall.

6 painters start painting the hall at 8 am.
At 12 noon, 2 more painters join them.

Work out the time at which the hall is finished.
You must show your working.

Answer _____

[3 marks]

21 The curve $y = 2x^2 - 12x + 5$ has a turning point M.

(a) Write $2x^2 - 12x + 5$ in the form $a(x - b)^2 + c$ where a, b and c are integers.

Answer _____

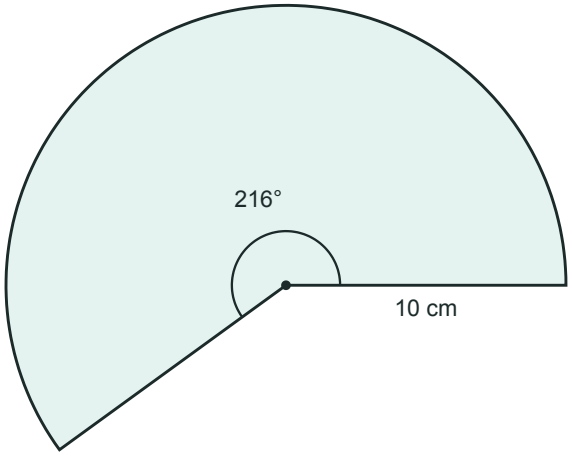
[3 marks]

(b) Write down the coordinates of M.

Answer _____

[1 mark]

22



Not drawn accurately

The diagram shows a sector of a circle of radius 10 cm.
The angle of the sector is 216°.

The sector is folded so that the two straight edges meet, making a hollow cone with no base.

Work out the volume of the cone.
Give your answer in terms of π.
You must show your working.

Answer _____ cm³

[4 marks]

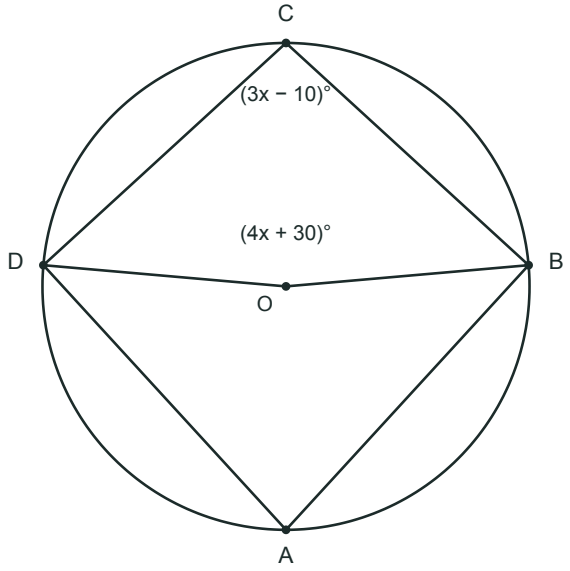
23

Write $0.3\dot{1}\dot{8}$ as a fraction in its simplest form.
You must show your working.

Answer _____

[3 marks]

24



Not drawn accurately

A, B, C and D are points on the circumference of a circle, centre O.
Angle BOD = (4x + 30)° and angle BCD = (3x − 10)°
Work out the size of angle BAD.
You must give a reason for each step of your working.

Answer _____ °

[4 marks]

25

Two grain silos, A and B, on a farm are mathematically similar.
Silo A holds 6400 litres of grain.
Silo B holds 21 600 litres of grain.
The outside surface of silo A has an area of 12 m².
Paint for the outside surface of a silo costs £8.50 per square metre.
Work out the cost of the paint needed for the outside surface of silo B.
You must show your working.

Answer £ _____

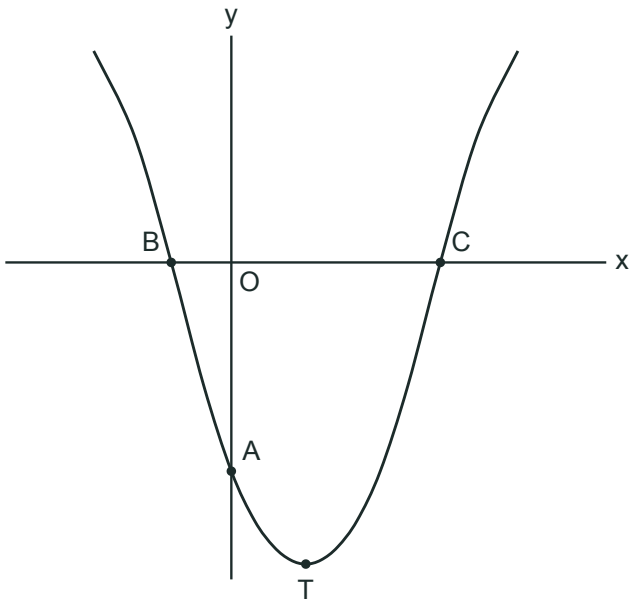
[4 marks]

26

Prove algebraically that the sum of the squares of any two consecutive odd numbers is always 2 more than a multiple of 8.

[3 marks]

27



Not drawn accurately

The diagram shows a sketch of the curve $y = x^2 + px + q$, where p and q are integers.

The turning point of the curve is T (2, −9).

The curve crosses the y-axis at A and crosses the x-axis at B and C.

Work out the area of triangle ABC.

You must show your working.

Answer _____ square units

[5 marks]

END OF QUESTIONS

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