GCSE

Write your name here

Surname	Other names

Centre Number	Candidate Number

GCSE

Mathematics A

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Higher Tier

Time: 1 hour 45 minutes	Paper Reference 1MA0/2H

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

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.*
- **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 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

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.

Turn over ▶

1

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

.....

(2)

(b) Factorise fully $4x^2 + 8xy$

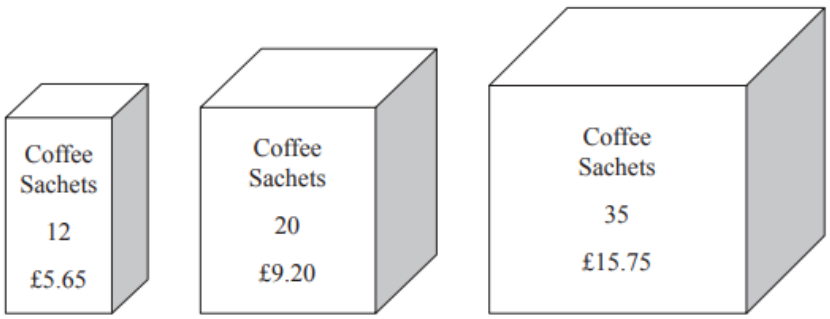
.....

(2)

2

a)

Coffee sachets are sold in three different sizes of box.



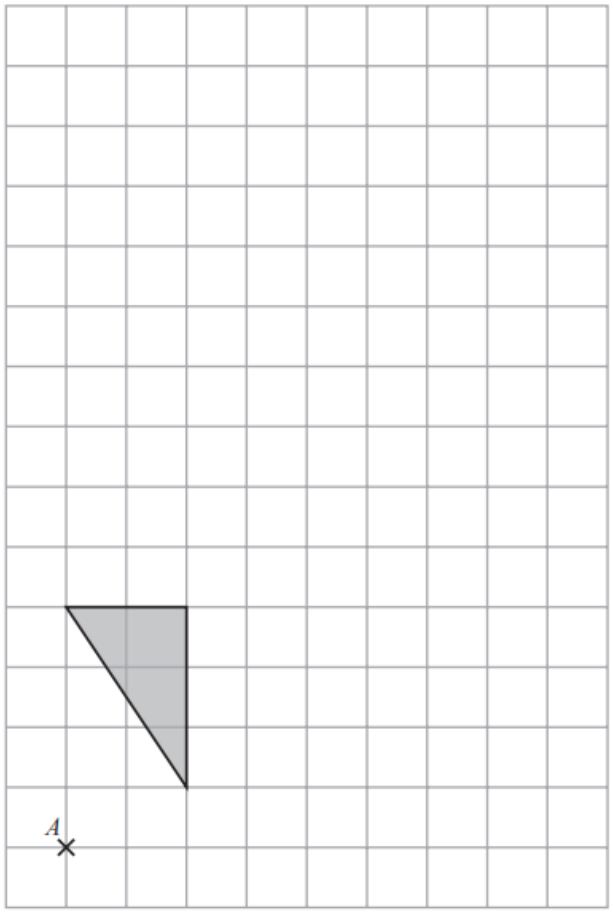
A small box has 12 coffee sachets and costs £5.65
A medium box has 20 coffee sachets and costs £9.20
A large box has 35 coffee sachets and costs £15.75

Work out which size of box gives the best value for money.
You must show all your working.

(3)

b)

A shaded shape is shown on the grid.



On the grid, enlarge the shape by a scale factor of 2, centre A.

(2)

3

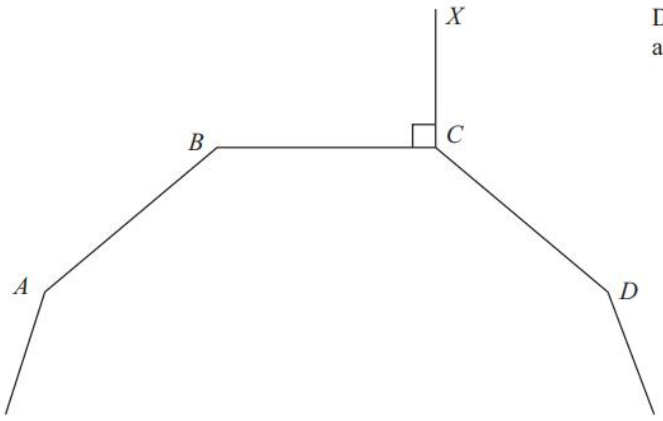


Diagram **NOT** accurately drawn

A, B, C and D are four vertices of a regular 10-sided polygon.
Angle $BCX = 90°$.

Work out the size of angle DCX.

(2)

4

There are only r red counters and g green counters in a bag.

A counter is taken at random from the bag.

The probability that the counter is green is $\frac{3}{7}$

The counter is put back in the bag.

2 more red counters and 3 more green counters are put in the bag.

A counter is taken at random from the bag.

The probability that the counter is green is $\frac{6}{13}$

Find the number of red counters and the number of green counters that were in the bag originally.

(5)

5

$$T = \sqrt{\frac{w}{d^3}}$$

$w = 5.6 \times 10^{-5}$
$d = 1.4 \times 10^{-4}$

(a) Work out the value of T.
Give your answer in standard form correct to 3 significant figures.

(2)

(b)

$100^a \times 1000^b$ can be written in the form 10^w

Show that $w = 2a + 3b$

(2)

6

A number, n, is rounded to 2 decimal places.
The result is 4.76

Using inequalities, write down the error interval for n.

(2)

7

Solve $\frac{3x-2}{4} - \frac{2x+5}{3} = \frac{1-x}{6}$

(4)

8

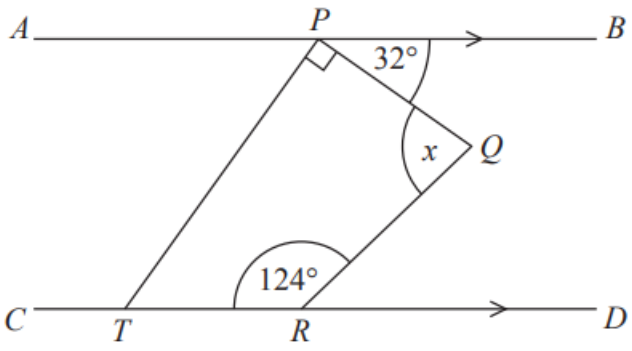


Diagram **NOT** accurately drawn

APB is parallel to *CTRD*.
PQRT is a quadrilateral.

Work out the size of the angle marked x.
You must show your working.

(2)

9

The table shows some information about the times, in minutes, 60 people took to get to work.

Time (x minutes)	**Frequency**		
$0 < x \leqslant 10$	5		
$10 < x \leqslant 30$	11		
$30 < x \leqslant 50$	23		
$50 < x \leqslant 80$	13		
$80 < x \leqslant 100$	8		

(a) Calculate an estimate for the mean.

..... minutes

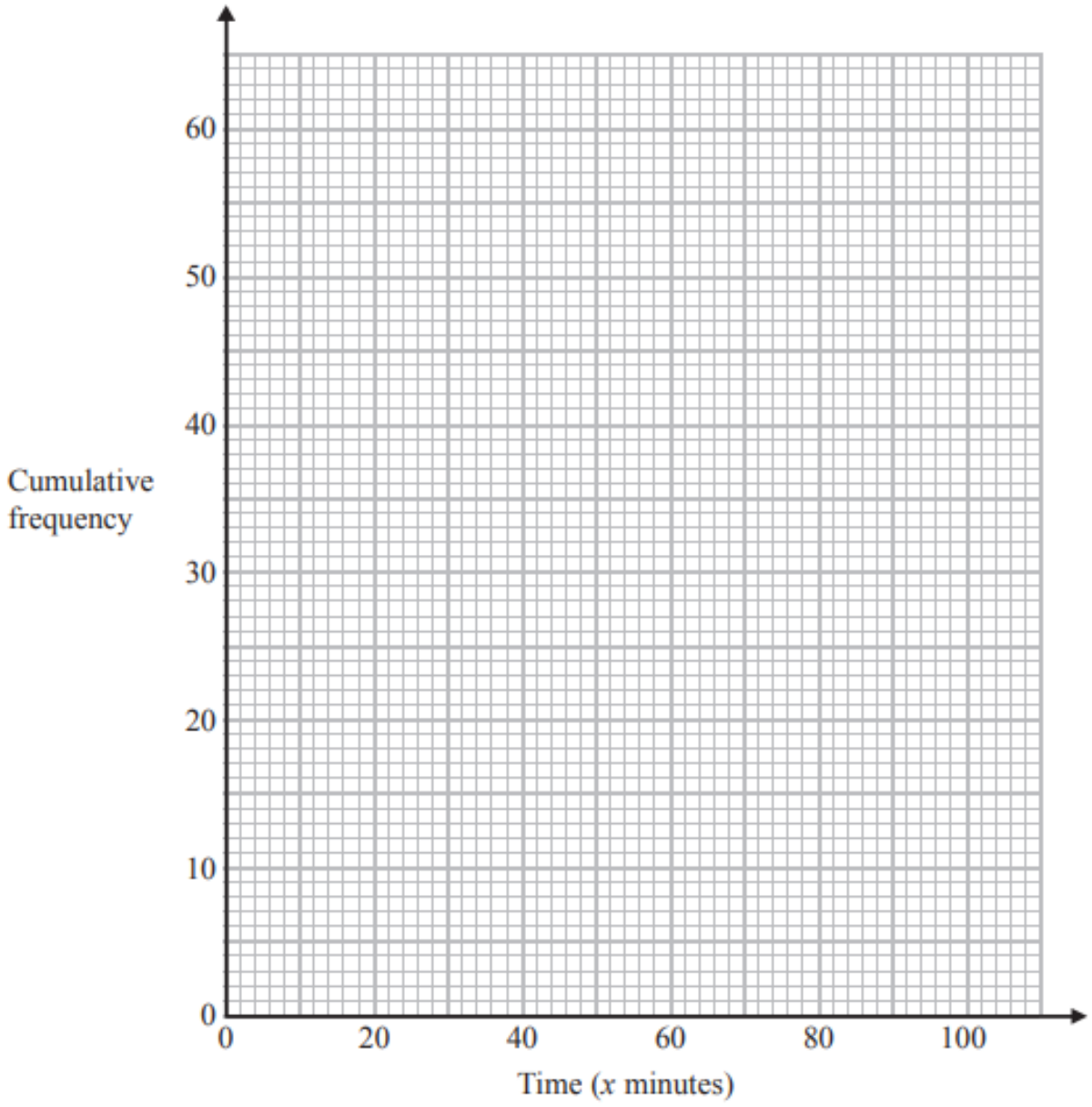
(4)

(b) Complete the cumulative frequency table.

Time (x minutes)	Cumulative frequency
$0 < x \leqslant 10$	
$0 < x \leqslant 30$	
$0 < x \leqslant 50$	
$0 < x \leqslant 80$	
$0 < x \leqslant 100$	

(1)

(c) On the grid draw a cumulative frequency graph for your table.



(2)

(d) Find an estimate for the number of people who took **more** than 1 hour to travel to work.

.....

(2)

(9)

10

Anil wants to invest £25 000 for 3 years in a bank.

Personal Bank	**Secure Bank**
Compound Interest	Compound Interest
2% for each year	4.3% for the first year 0.9% for each extra year

Which bank will give Anil the most interest at the end of 3 years?
You must show all your working.

(3)

11

p is inversely proportional to t.

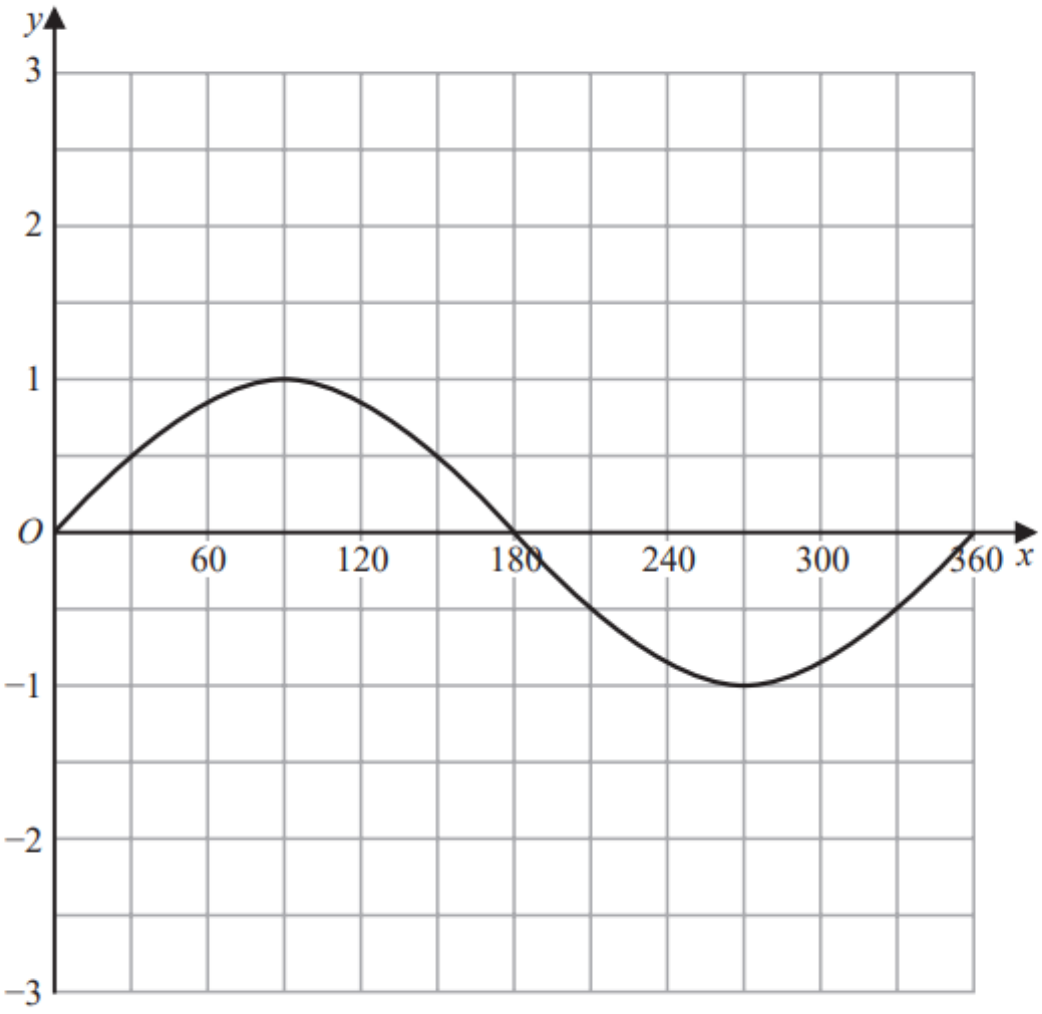
When $t = 4$, $p = 12$

Find the value of p when $t = 6$

(3)

12

The graph of $y = \sin x°$ for $0 \leqslant x \leqslant 360$ is drawn on the grid.



(a) On the grid, draw the graph of $y = 2\sin(x + 30)°$ for $0 \leqslant x \leqslant 360$

(2)

(b) (i) Write $x^2 - 6x + 10$ in the form $(x - a)^2 + b$ where a and b are integers.

(1)

13

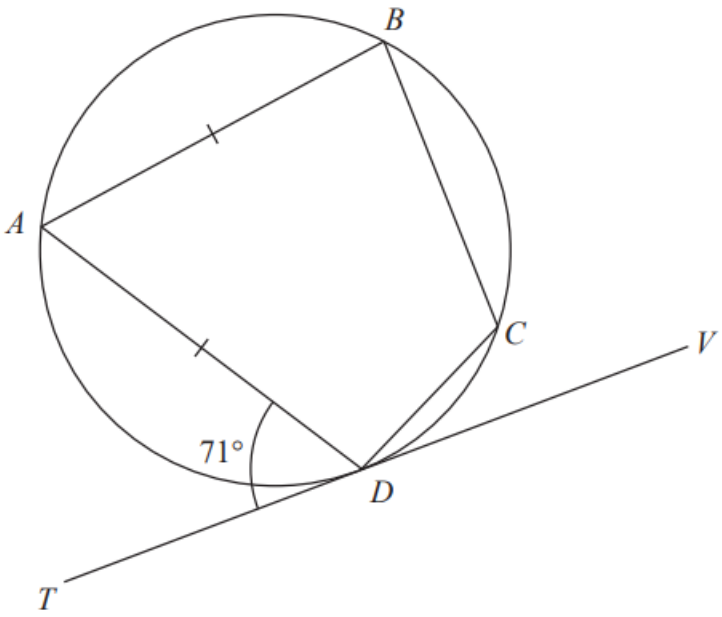


Diagram **NOT** accurately drawn

A, B, C and D are points on a circle.
TDV is the tangent to the circle at D.

$AB = AD$
Angle $ADT = 71°$

Work out the size of angle BCD.
Give a reason for each stage of your working.

(3)

14

The straight line **L** has equation $y = 2x - 5$

Find an equation of the straight line perpendicular to **L** which passes through (–2, 3).

(2)

15

Here are the first five terms of a sequence.

4 11 22 37 56

Find an expression, in terms of n, for the nth term of this sequence.

(3)

16

The functions f and g are such that

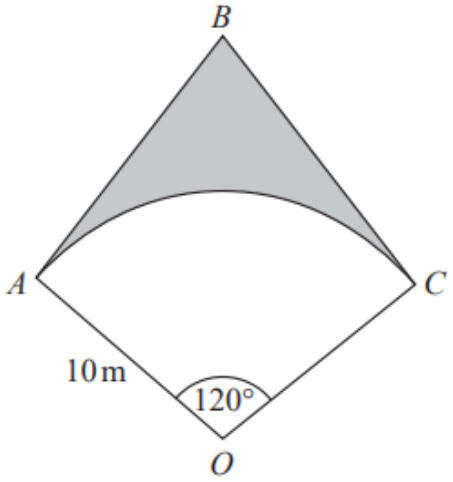
$$f(x) = 5x + 3 \qquad g(x) = ax + b \qquad \text{where } a \text{ and } b \text{ are constants.}$$

$g(3) = 20$ and $f^{-1}(33) = g(1)$

Find the value of a and the value of b.

(4)

17



OAC is a sector of a circle, centre *O*, radius 10 m.

BA is the tangent to the circle at point *A*.
BC is the tangent to the circle at point *C*.

Angle *AOC* = 120°

Calculate the area of the shaded region.
Give your answer correct to 3 significant figures.

(4)

18

Show that $6 + \left[(x + 5) \div \frac{x^2 + 3x - 10}{x - 1} \right]$ simplifies to $\frac{ax - b}{cx - d}$ where a, b, c and d are integers.

(4)

19

C is a circle with centre the origin.

A tangent to **C** passes through the points (–20, 0) and (0, 10)

Work out an equation of **C**.
You must show all your working.

(5)

20

A shop sells packs of black pens, packs of red pens and packs of green pens.

There are
2 pens in each pack of black pens
5 pens in each pack of red pens
6 pens in each pack of green pens

On Monday,

$$\text{number of packs of black pens sold} : \text{number of packs of red pens sold} : \text{number of packs of green pens sold} = 7:3:4$$

A total of 212 pens were sold.

Work out the number of green pens sold.

(4)

21

(a) Show that the equation $x^3 + x = 7$ has a solution between 1 and 2

(2)

(b) Show that the equation $x^3 + x = 7$ can be rearranged to give $x = \sqrt[3]{7 - x}$

(c) Starting with $x_0 = 2$,
use the iteration formula $x_{n+1} = \sqrt[3]{7 - x_n}$ three times to find an estimate for a solution of $x^3 + x = 7$

(2)

(3)

(5)

Total paper is of 80 Marks

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