

Tuesday 21 May 2019 – Morning

GCSE (9–1) Mathematics

J560/01 Paper 1 (Foundation Tier)

Time allowed: 1 hour 30 minutes

You may use:

- a scientific or graphical calculator
- geometrical instruments
- tracing paper



Please write clearly in black ink. **Do not write in the barcodes.**

Centre number

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Candidate number

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First name(s)

Last name

INSTRUCTIONS

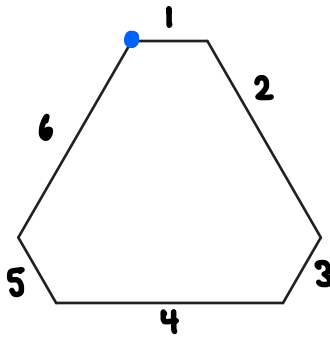
- Use black ink. You may use an HB pencil for graphs and diagrams.
- Answer **all** the questions.
- Read each question carefully before you start to write your answer.
- Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).

INFORMATION

- The total mark for this paper is **100**.
- The marks for each question are shown in brackets [].
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- This document consists of **16** pages.

Answer **all** the questions.

- 1 (a) Write down the mathematical name of this polygon.



(a) **Irregular hexagon** [1]

- (b) Write down the order of rotation symmetry of the polygon.

(b) **3** [1]

- 2 (a) Write down each of the following.

- (i) An odd number.

(a)(i) **5** [1]

- (ii) A factor of 25.

1, 5, 25

(ii) **25** [1]

- (iii) A prime number between 20 and 30.

23, 29

(iii) **23** [1]

- (b) Show that 55 is **not** a square number. [2]

$$\sqrt{55} = 7.416... \text{ is not an integer}$$

3 Complete this table of fractions, decimals and percentages.

Fraction		Decimal		Percentage
$\frac{1}{4}$	$1 \div 4$ =	0.25	=	25%
$\frac{7}{100}$	=	0.07	$\times 100$ =	7%
$\frac{13}{10}$	=	1.3	=	130%

$$\frac{130}{100}$$

[3]

4 Here are the first four terms of a sequence.

$$3 \quad 8 \quad 13 \quad 18$$

$$+5 \quad +5 \quad +5$$

(a) (i) Write down the next term of the sequence.

(a)(i) **23** [1]

(ii) Explain how you worked out your answer.

..... **Add 5** [1]

(b) Explain why 534 is **not** a term in this sequence.

..... **The terms in the sequence end with 3 or 8** [1]

5 Lev (L), Maria (M) and Nicholas (N) sit in a row of three seats.

- (a) Use the table to list all the different orders in which they could sit. One possible order is already shown in the table. You may not need to use all the rows in the table.

Seat 1	Seat 2	Seat 3
L	M	N
L	N	m
m	L	N
m	N	L
N	L	m
N	m	L

[2]

- (b) All possible orders in which they could sit are equally likely.

What is the probability that Lev (L) sits next to Maria (M)?

(b) $\frac{4}{6}$ [1]

- 6 (a) Multiply out.

$$4(3x + 2)$$

$$12x + 8$$

(a) $12x + 8$ [1]

- (b) Factorise.

$$3c - 6d$$

HCF of 3 and 6 = 3

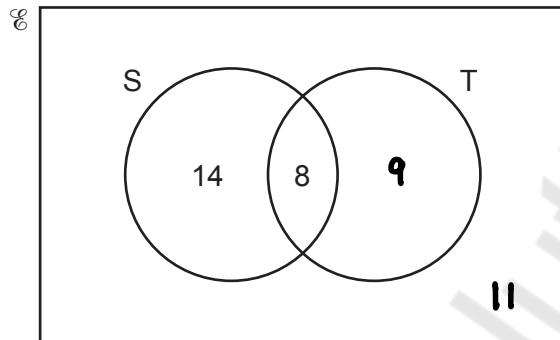
$$3(c - 2d)$$

(b) $3(c - 2d)$ [1]

7 A survey asked whether some students went swimming (S) or played tennis (T) last month.

- 17 played tennis.
- 11 did not go swimming and did not play tennis.
- 22 went swimming. ✓
- 8 went swimming and played tennis. ✓

Some of this information is shown on the Venn diagram below.



How many students were in the survey?

$$14 + 8 + 9 + 11 = 42$$

42

[3]

8 Kim is paid £9.40 per hour for the first 35 hours she works each week. After 35 hours she is paid at one and a quarter times the hourly rate.

One week Kim works 42 hours.

Calculate how much she is paid for that week.

First 35 hours

$$35 \times 9.40 = \text{£}329$$

$$42 - 35 = 7 \text{ extra hours}$$

$$1 \frac{1}{4} \times 9.40 = \text{£}11.75 \text{ per hour}$$

$$7 \times 11.75 = \text{£}82.25$$

$$\text{Total} = \text{£}329 + \text{£}82.25$$

$$= \text{£}411.25$$

£ 411.25 [6]

- 9 Mike drinks $\frac{2}{5}$ of a litre of juice each day.
Juice costs £4.40 for a 2 litre carton and £2.60 for a 1 litre carton.

Mike buys enough juice to last for 7 days.

What is the lowest price Mike can pay for this juice?
Show how you decide.

$$7 \times \frac{2}{5} = 2.8 \text{ L needed}$$

2 2L cartons needed

$$2 \times 4.40 = \text{£}8.80$$

3 3L cartons needed

$$3 \times \text{£}2.60 = \text{£}7.80$$

£ 7.80 [4]

- 10 Mr and Mrs Wilde have five children who are all **different** ages.

- The mean age is 6.4.
- The range is 9. ✓
- The median is 6. ✓
- The oldest child is 12. ✓

Work out the ages of the children.
Write their ages from youngest to oldest.

3 4 6 7 12

$$\begin{aligned} \text{Youngest} &= 12 - 9 \\ &= 3 \end{aligned}$$

$$\frac{3 + x + 6 + y + 12}{5} = 6.4$$

$$3 + x + 6 + y + 12 = 32$$

$$x + y + 21 = 32$$

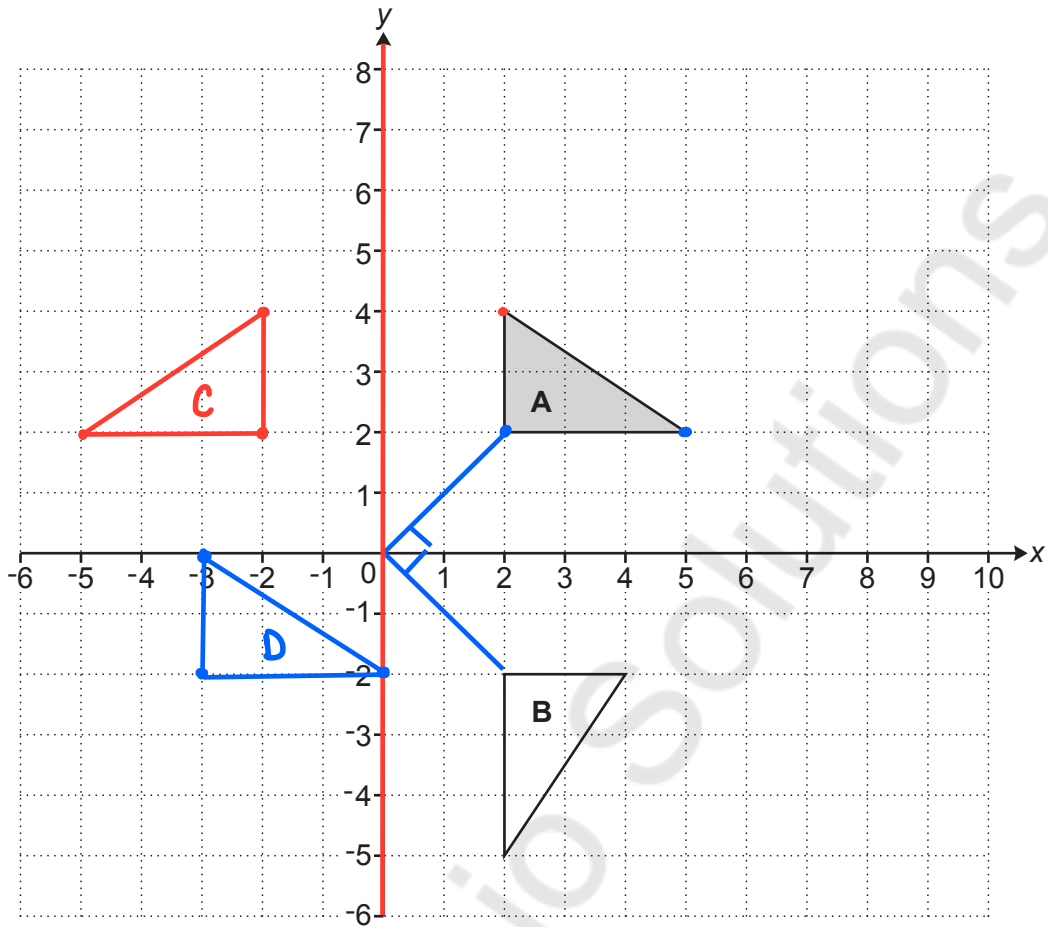
$$x + y = 11$$

3 4 6 7 12
youngest oldest

~~1 + 11~~
~~2 + 9~~
~~3 + 8~~
4 + 7
~~5 + 6~~

[4]

11 Triangles **A** and **B** are drawn on the coordinate grid.



(a) Describe fully the **single** transformation that maps triangle **A** onto triangle **B**.

..... **Rotation 90° clockwise about $(0,0)$**

..... [3]

(b) (i) On the grid, reflect triangle **A** in the line $x = 0$.

Label the image **C**.

[2]

(ii) On the grid, translate triangle **A** by vector $\begin{pmatrix} -5 \\ -4 \end{pmatrix}$.

$\begin{matrix} \leftarrow \rightarrow & 5 \text{ left} \\ \updownarrow & 4 \text{ down} \end{matrix}$

Label the image **D**.

[2]

- 12 Jack and Alex take rubbish to be recycled.
Jack takes 520 kilograms, 87% of which can be recycled.
Alex takes 750 kilograms, 61% of which can be recycled.

Calculate who takes the greatest amount of rubbish that can be recycled and by how much.

Jack

$$87\% \rightarrow 0.87$$

$$0.87 \times 520 = 452.4 \text{ kg}$$

Alex

$$61\% \rightarrow 0.61$$

$$0.61 \times 750 = 457.5 \text{ kg}$$

$$457.5 - 452.4 = 5.1 \text{ kg}$$

..... **Alex** by **5.1** kg [3]

- 13 Calculate the area of a circle with radius 14 cm.

$$A = \pi r^2$$

$$= \pi(14)^2$$

$$= 615.752\dots$$

$$\approx 615.8$$

..... **615.8** cm² [2]

- 14 (a) (i) Round $\overset{\uparrow}{356}$ to the nearest ten.

(a)(i) **360** [1]

- (ii) Round $\overset{\uparrow}{356.052}$ to 1 decimal place.

$$\mathbf{356.1}$$

(ii) **356.1** [1]

- (b) Find the value of y in each of the following.

$$\begin{aligned} \text{(i)} \quad 3 \times 3 \times 3 \times 3 &= 3^y \\ &= 3^4 \end{aligned}$$

(b)(i) $y = \dots \mathbf{4} \dots$ [1]

$$\begin{aligned} \text{(ii)} \quad 6^3 \times 6^5 &= 6^y \\ &= 6^{3+5} \\ &= 6^8 \end{aligned}$$

(ii) $y = \dots \mathbf{8} \dots$ [1]

- 15 Anna and Paddy take part in the same fun run.

Anna completed the fun run in 2 hours.
Her average speed was 6 kilometres per hour.

Paddy completed the fun run in 90 minutes, $60 + 30 = 1.5\text{h}$

D
S T

- (a) Work out Paddy's average speed in kilometres per hour.

$$D = S \times T$$

Anna

$$\begin{aligned} D &= 6 \times 2 \\ &= 12 \text{ km} \end{aligned}$$

Paddy

$$\begin{aligned} D &= 12 \text{ km} \\ T &= 1.5 \text{ h} \\ S &= \frac{D}{T} = \frac{12}{1.5} \\ &= 8 \end{aligned}$$

(a) 8 km/h [4]

- (b) Anna says

Because I stopped for drinks, my average running speed was faster than 6 kilometres per hour.

Give one reason to support Anna's statement.

..... If she didn't stop, her time would be less than 2 hours,
..... which would increase her speed. [1]

- 16 The volume of a piece of wood is 620 cm^3 .
Its density is 0.85 g/cm^3 .

m
D v

Work out its mass.

$$\begin{aligned} m &= D \times v \\ &= 0.85 \times 620 \\ &= 527 \end{aligned}$$

..... 527 g [2]

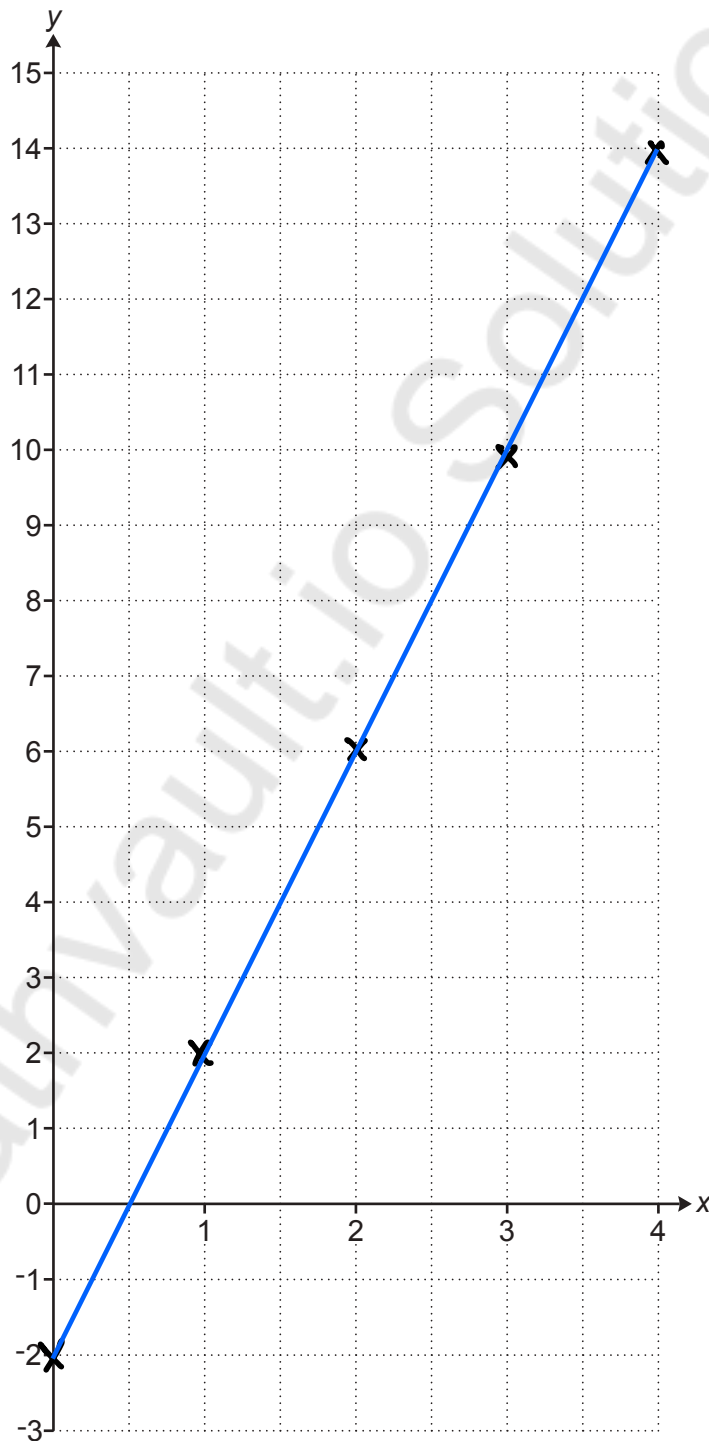
17 (a) Complete this table for $y = 4x - 2$.

x	0	1	2	3	4
y	-2	2	6	10	14

$$\begin{aligned} y &= 4(3) - 2 \\ &= 12 - 2 \end{aligned}$$

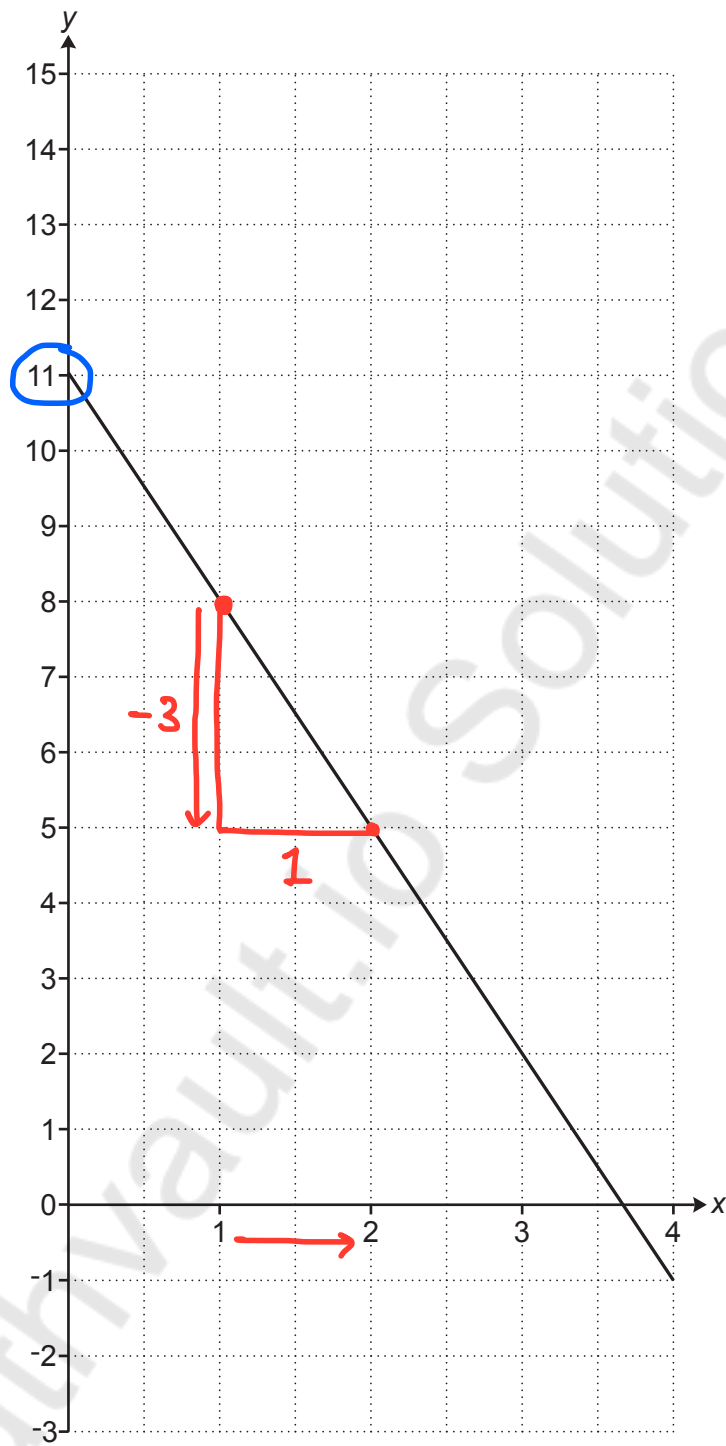
[1]

(b) On the grid below, draw the graph of $y = 4x - 2$ for values of x from 0 to 4.



[2]

(c) The diagram below shows part of another straight line.



Find the equation of this straight line.

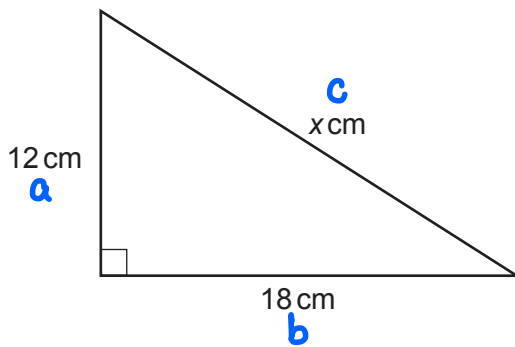
$$y = mx + c$$

$$m = \frac{-3}{1} \quad c = 11$$

$$= -3$$

(c) $y = -3x + 11$ [3]

- 18 Here is a right-angled triangle.



Not to scale

Work out the value of x .

$$a^2 + b^2 = c^2$$

$$12^2 + 18^2 = x^2$$

$$\sqrt{12^2 + 18^2} = x$$

$$21.6333... = x$$

$$x \approx 21.6$$

$$x = \dots 21.6 \dots [3]$$

- 19 (a) Anne, Barry and Colin share a prize in the ratio 3 : 4 : 5.
Colin gives $\frac{1}{3}$ of his share to a charity.

What fraction of the whole prize does Colin give to the charity?

$$A : B : C$$

$$3 : 4 : 5$$

$$C = \frac{5}{3+4+5} = \frac{5}{12}$$

$$\frac{1}{3} \times \frac{5}{12} = \frac{5}{36}$$

$$(a) \dots \frac{5}{36} \dots [3]$$

- (b) Delia, Edwin and Freya share some money in the ratio 5 : 7 : 8.
Freya's share is £1600.

How much money did they share?

$$D : E : F$$

$$5 : 7 : 8 \quad \downarrow \times 200$$

$$\text{£1600}$$

$$(5 + 7 + 8) \times 200$$

$$20 \times 200 = 4000$$

$$(b) \text{ £ } \dots 4000 \dots [2]$$

20 Luke is an office receptionist.

Each day, for 60 days, he records the number of people visiting the office.

Number of people, (n)	Frequency	midpoint	midpoints \times freq.
$0 \leq n \leq 5$	20	2.5	50
$5 < n \leq 10$	14	7.5	105
$10 < n \leq 20$	11	15	165
$20 < n \leq 40$	15	30	450

(a) Calculate an estimate of the mean number of people visiting the office.

$$\begin{aligned} \text{Total midpoint} \times \text{frequency} &= 50 + 105 + 165 + 450 \\ &= 770 \end{aligned}$$

$$\text{Total frequency} = 60$$

$$\begin{aligned} \text{Mean} &= 770 \div 60 = 12.8\bar{3} \\ &\approx 12.8 \end{aligned}$$

(a) 12.8 [4]

(b) Luke says the range is 40.

Explain why he may be wrong.

..... The highest number may not be 40, and the lowest
..... may not be 0. [1]

- 21 James and Elizabeth buy some clothes.

James buys 5 shirts and 4 jumpers. He pays £163.
Elizabeth buys 3 shirts and 2 jumpers. She pays £89.

Assume that each shirt has the same cost and that each jumper has the same cost.

Work out the cost of one shirt and the cost of one jumper.
You must show your working.

$$\begin{array}{r}
 5s + 4j = 163 \quad \times 3 \\
 3s + 2j = 89 \quad \times 5 \\
 \hline
 15s + 12j = 489 \\
 15s + 10j = 445 \\
 \hline
 2j = 44 \\
 \div 2 \quad \div 2 \\
 j = 22
 \end{array}$$

$$5s + 4j = 163$$

$$5s + 4(22) = 163$$

$$\begin{array}{r}
 5s + 88 = 163 \\
 - 88 \quad - 88 \\
 \hline
 5s = 75
 \end{array}$$

$$\begin{array}{r}
 5s = 75 \\
 \div 5 \quad \div 5 \\
 s = 15
 \end{array}$$

Cost of one shirt £ 15.....

Cost of one jumper £ 22..... [5]

- 22 Claudia invests £25 000 at a rate of 2% per year compound interest.

Calculate the total amount of **interest** she will have earned after 5 years.
Give your answer correct to the nearest penny.

$$\text{Final amount} = \text{investment} \times \text{multiplier}^n$$

$$\text{Multiplier} = 100\% + 2\%$$

$$= 102\%$$

$$\downarrow \div 100$$

$$1.02$$

$$\begin{aligned}
 \text{Final amount} &= 25000 \times 1.02^5 \\
 &= 27602.02
 \end{aligned}$$

$$\begin{aligned}
 \text{Interest} &= 27602.02 - 25000 \\
 &= 2602.02
 \end{aligned}$$

£ 2602.02..... [4]

23 A bus timetable shows the following information.

- A bus following route T leaves for the train station every 20 minutes.
- A bus following route A leaves for the airport every 18 minutes.
- A bus following route T and a bus following route A both leave at 8.37 am.

(a) When is the next time one of each bus is timetabled to leave at the same time?

T : 20 40 60 80 100 120 140 160 180...

A : 18 36 54 72 90 108 126 144 162 180

LCM = 180 mins

↓ ÷ 60

3 hours

8.37 am + 3 hours = 11.37 am

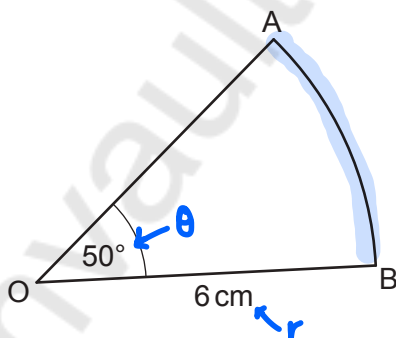
(a) 11:37 am [4]

(b) Write down one assumption that was necessary to solve this problem.

..... Buses keep to the timetable OR no delays.

..... [1]

24 AOB is a sector of a circle, centre O.



Not to scale

$$\frac{\theta}{360} \times 2\pi r$$

Show that the length of arc AB is 5.24 cm, correct to 3 significant figures. [3]

$$\frac{50}{360} \times 2 \times \pi \times 6 = 5.23598...$$

$$\approx 5.24 \text{ (3sf)}$$

Turn over for Question 25

- 25 Bennie is 7 years older than Ayesha.
Chloe is twice as old as Bennie.
The sum of their three ages is 57.

Work out the ages of Ayesha, Bennie and Chloe.

$$\text{Ayesha} = x$$

$$\text{Bennie} = x + 7$$

$$\begin{aligned} \text{Chloe} &= 2(x + 7) \\ &= 2x + 14 \end{aligned}$$

$$x + x + 7 + 2x + 14 = 57$$

$$\begin{array}{r} 4x + 21 = 57 \\ -21 \quad -21 \end{array}$$

$$\begin{array}{r} 4x = 36 \\ \div 4 \quad \div 4 \\ x = 9 \end{array}$$

$$\begin{aligned} \text{Bennie} &= 9 + 7 \\ &= 16 \end{aligned}$$

$$\begin{aligned} \text{Chloe} &= 2(9) + 14 \\ &= 18 + 14 \\ &= 32 \end{aligned}$$

Ayesha's age is **9**

Bennie's age is **16**

Chloe's age is **32** [6]

END OF QUESTION PAPER

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