OCR
Oxford Cambridge and RSA

Model Solutions

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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 ☐☐☐☐☐   Candidate number ☐☐☐☐

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.

OCR is an exempt Charity

Turn over

Answer **all** the questions.

1 **(a)** Write down the mathematical name of this polygon.
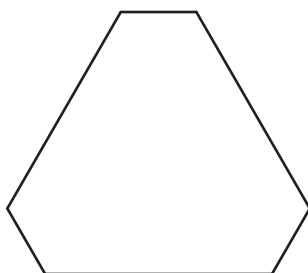
Has 6 sides.

(a) 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.

Not divisible by 2 to get a whole number.

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

(ii) A factor of 25.

$25 = 1 \times 25$
$25 = 5 \times 5$

(ii) 5 .... **[1]**

(iii) A prime number between 20 and 30.

factors are 1 and 23 only

(iii) 23 .... **[1]**

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

consecutive whole numbers

$$7^2 < 55 < 8^2$$

$$49 < 55 < 64$$

$\sqrt{55}$ is not a whole number

$\therefore$ 55 is not a square number.

3 Complete this table of fractions, decimals and percentages.

Fraction		Decimal		Percentage
$\frac{1}{4}$	=	0·25	=	25%
$\frac{7}{100}$	=	0.07	=	7%
$\frac{13}{10}$	=	1.3	=	130%

$\frac{7}{100} \times 100\% = 7\%$

[3]

4 Here are the first four terms of a sequence.

+5   +5   +5   +5

3   8   13   18

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

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

(ii) Explain how you worked out your answer.

...Value of the term is '5' added to previous term.. [1]

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

3 , 8 , 13 , 18 , 23 , 28 , 33 , 38

...The terms in the sequence end with a 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	4
L	N	M	
M	L	N	1
M	N	L	
N	M	L	2
N	L	M	3

[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)?

4 out of 6 combinations they sit together.

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

6 (a) Multiply out.

$4(3x+2)$

$12x+8$

(a) $12x+8$ [1]
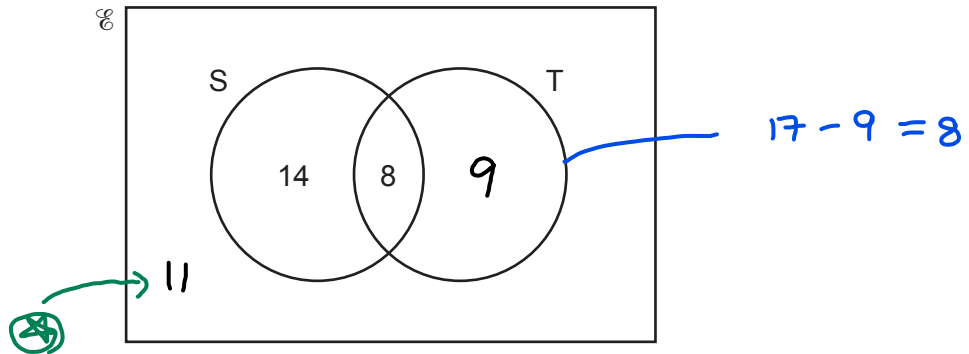
(b) Factorise.

$3c-6d$

$3(c-2d)$

3 is common for both

(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.

$\mathcal{E}$

S 14 8 9 T

$17 - 9 = 8$

11

How many students were in the survey?

$14 + 8 + 9 + 11$

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.

$1\frac{1}{4} = 1.25$

Calculate how much she is paid for that week.

Normal hours

35 h

Pay = 35 × £9.40 = £329

Overtime hours

Total → 42 − 35 = 7h ← normal

Overtime rate = 1.25 × £9.40 = £11.75

Pay = 7 × £11.75 = £82.25

Total pay = £329 + £82.25
= £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.

Juice for 7 days: $\frac{2}{5} \times 7 = \frac{14}{5} = \frac{28}{10} = 2.8$ litres

≈ 3 litres

carton options:

(2) 2 litre cartons

$2 \times £4.40$
$= £8.80$

(3) 1 litre cartons

$3 \times £2.60$
$= £7.80$

(1) 2 litre and (1) 1 litre cartons

$£4.40 + £2.60$
$= £7.00 \rightarrow$ Lowest

£ .... 7.00 .... **[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. → E = 12

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

→ age increases

Let children be: A, B, C, D, E

↳ Median = C $\left(\frac{n+1}{2}\text{th}, \frac{5+1}{2} = 3^{rd}\right)$

✵ E=12 $\quad$ E − A = 9

$6 = C$

$12 - A = 9$
$3 = A$ $\Big)$ + A − 9

$\frac{A+B+C+D+E}{5} = 6.4$ $\Big)$ × 5

×5 $\Big($ $3 + B + 6 + D + 12 = 32$

$B + D = 11$

...3... ...4... ...6... ...7... ...12...
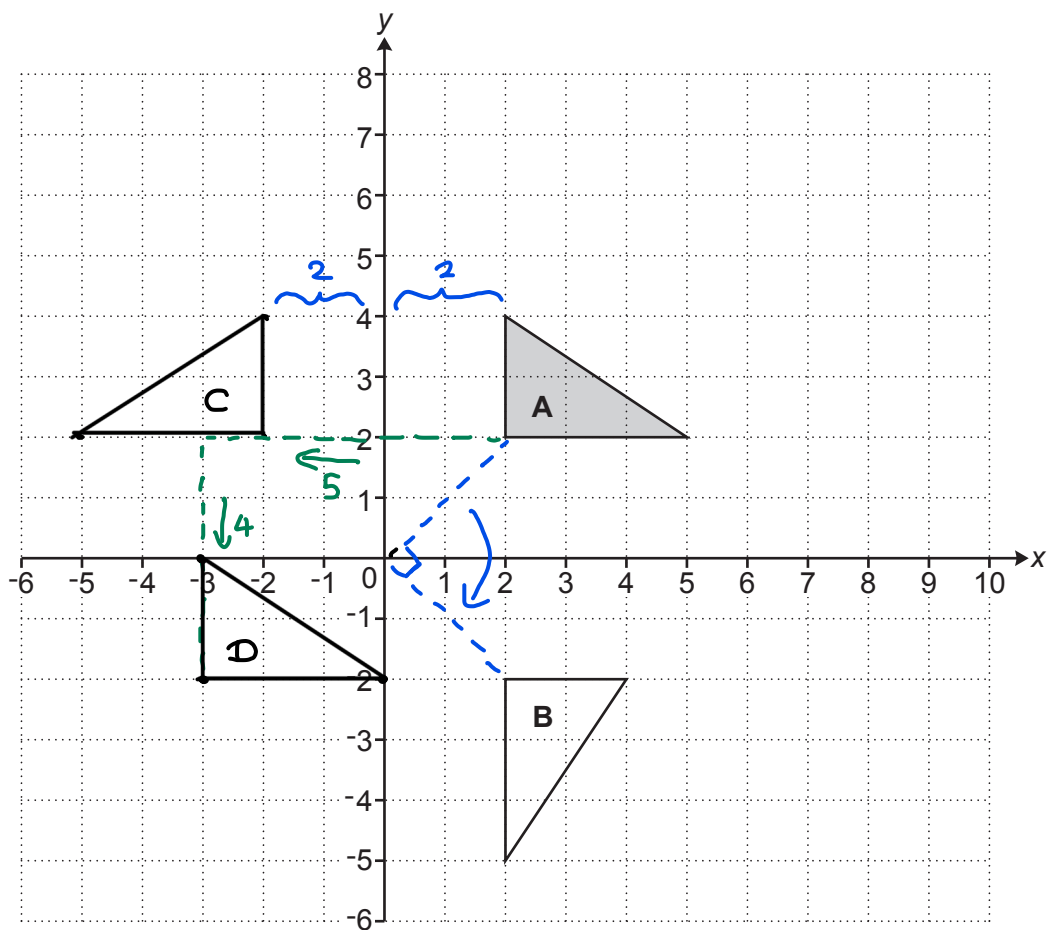*youngest* $\qquad\qquad$ *oldest*

[4]

$3 < B < 6$ + $6 < D < 12$ + B & D should be different.

∴ $B = 4$ $\quad D = 7$

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 $x = 0$. ← y-axis

Label the image **C**. **[2]**

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

Label the image **D**. * **[2]**

Turn over

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   Alex $a\% = \dfrac{a}{100}$

$520 \times \dfrac{87}{100} = 452.4 \text{ kg}$ $750 \times \dfrac{61}{100} = 457.5 \text{ kg}$

$457.5 > 452.4 \text{ kg} ; \text{ Alex} > \text{Jack}$

difference:

$457.5 - 452.4$

$= 5.1 \text{ kg}$

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

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

area of circle $= \pi r^2$

$\pi (14)^2 = 196 \times \pi$

$= 615.75$

$\approx 616 \ (3 \text{ sf})$

................**616**................ cm² **[2]**

14 (a) (i) Round 356 to the nearest ten.

↳ $6 \geqslant 5$ so round up

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

(ii) Round 356.052 to 1 decimal place.

↳ $5 \geqslant 5$ so round up

(ii) ....**356.1**................ **[1]**

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

(i) $3 \times 3 \times 3 \times 3 = 3^y$

⊛ $a^b \times a^c = a^{b+c}$

$3^{1+1+1+1} = 3^4$

(b)(i) $y =$ ....**4**................ **[1]**

(ii) $6^3 \times 6^5 = 6^y$

$6^{3+5} = 6^8$

(ii) $y =$ ....**8**................ **[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.

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

length of : $\text{Speed} = \dfrac{\text{distance}}{\text{time}}$ $90 \text{ minutes} = \dfrac{90}{60} \text{ hrs} = 1.5 \text{ hr}$
fun run

$$6 = \dfrac{d}{2}$$ *60 min per hour.*

$$d = 12 \text{ km}$$

Speed of : $S = \dfrac{d}{t} = \dfrac{12}{1.5} = 8 \text{ km/h}$
paddy

(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.

The time spent running is less. As time is the denominator
in the speed time eq^n, decreasing the denominator [1]
increases the value.

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

Work out its mass.

$$\text{density} = \dfrac{\text{mass}}{\text{volume}}$$

$$0.85 = \dfrac{\text{mass}}{620}$$ ×620

×620

$$527 = \text{mass}$$

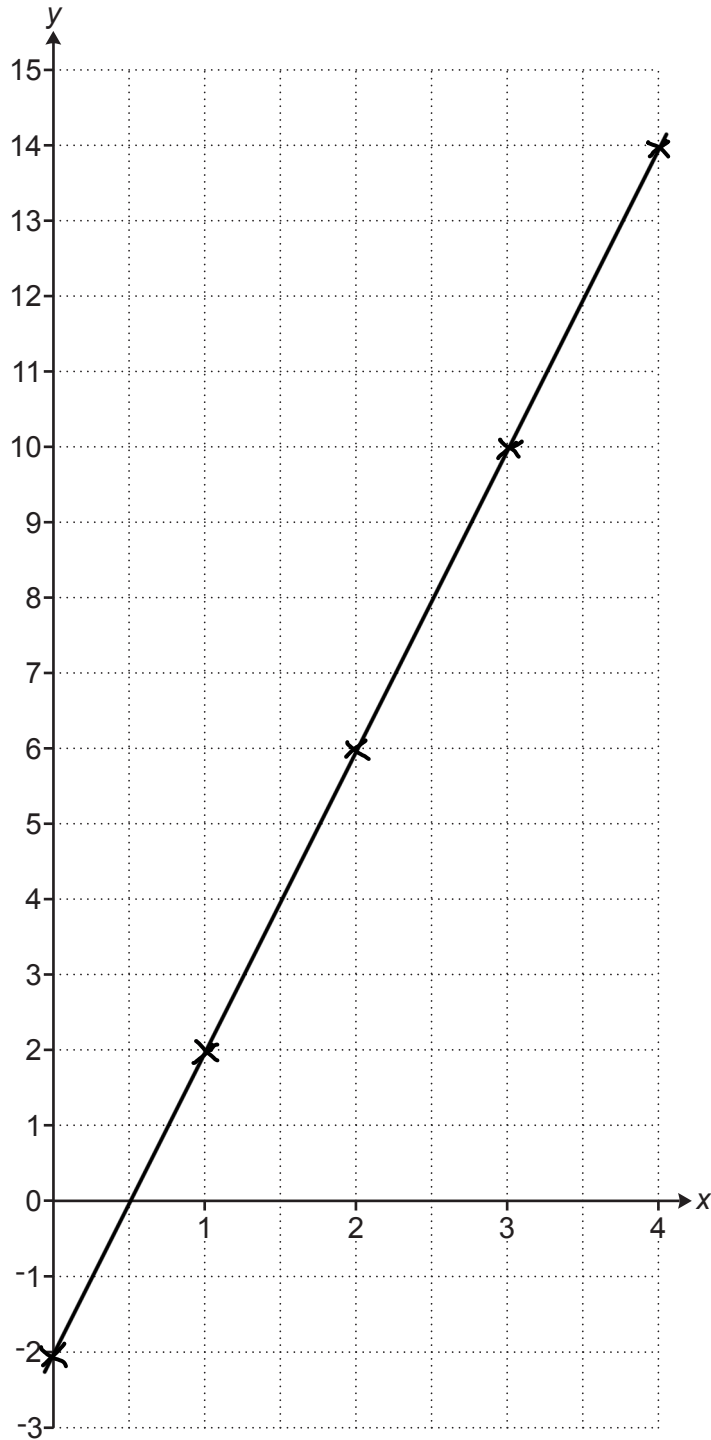.................... 527 .... g **[2]**

Turn over

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

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

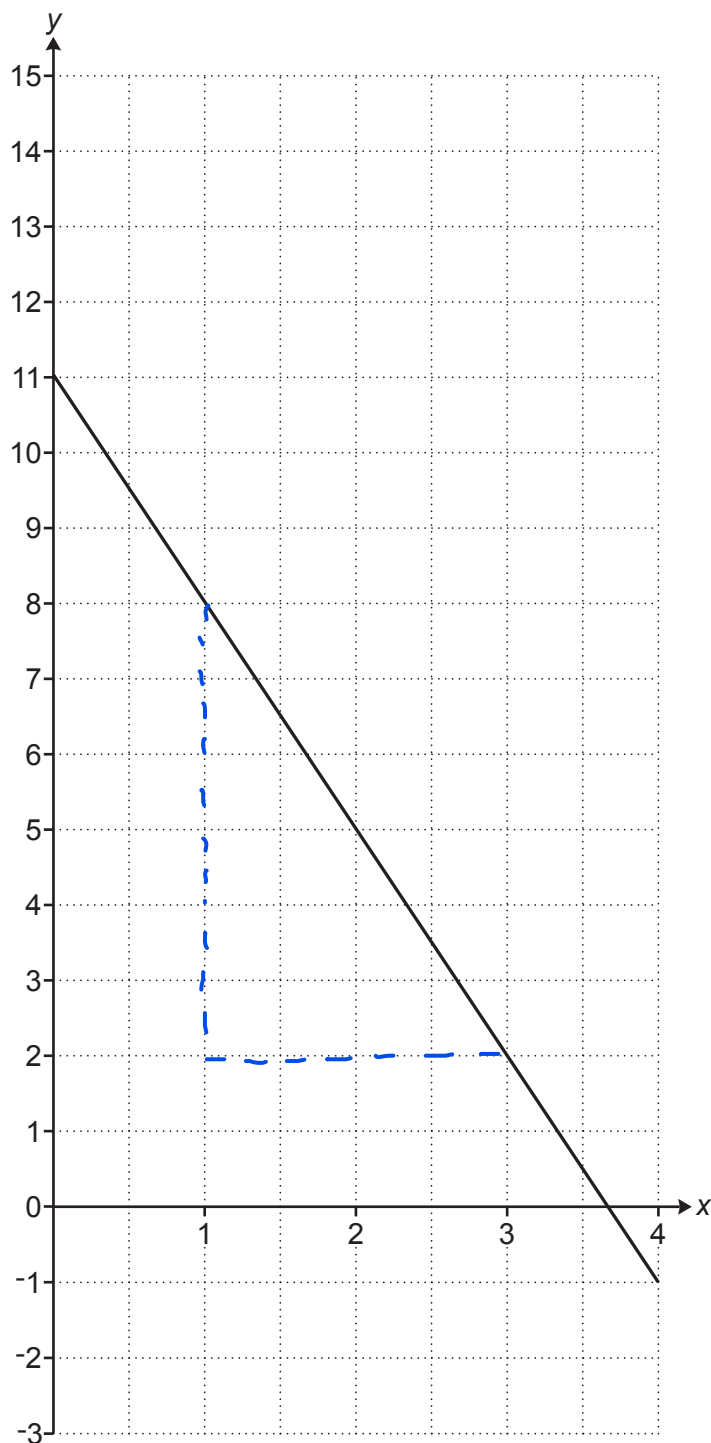$$y = 4(3) - 2 = 12 - 2 = 10$$

[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.

Gradient
y-intercept

$y = mx + c$ is the standard line equation

gradient $= \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{8 - 2}{1 - 3} = \dfrac{6}{-2} = -3$ $\therefore$ $y = -3x + c$

Subs. $x = 1$, $y = 8$ in $y = -3x + c$

$+3 \Big(\begin{array}{l} 8 = -3(1) + c \\ 11 = c \end{array} \Big) +3$

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

Turn over

18 Here is a right-angled triangle.

b
12 cm

a
x cm

Not to scale

18 cm

c
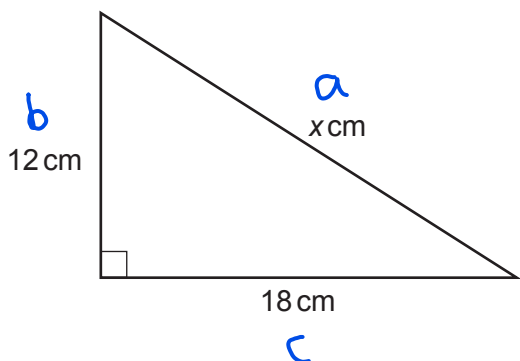
Work out the value of *x*.

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

$$x^2 = (12)^2 + (18)^2$$
$$x^2 = 468$$
$$x = \sqrt{468}$$
$$= 21.633$$
$$\approx 21.6 \text{ cm}$$

x = ... 21.6 cm .... **[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   → Total = 3+4+5 = 12 parts

Colin's charity = $\frac{1}{3} \times 5 = \frac{5}{3}$ parts

As a fraction = $\frac{5}{3} \div 12 = \frac{5}{3} \times \frac{1}{12}$
From total

(a) .... $\frac{5}{36}$ .... **[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   → Total = 5+7+8 = 20 parts

8 parts = £1600) ÷8
1 part = £200)

20 parts = £200×20
= £4000

(b) £ .... 4000 .... **[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	frequency × Midpoint
$0 \leqslant n \leqslant 5$	20	$\frac{0+5}{2} = 2.5$	$20 \times 2.5 = 50$
$5 < n \leqslant 10$	14	$\frac{5+10}{2} = 7.5$	$14 \times 7.5 = 105$
$10 < n \leqslant 20$	11	$\frac{10+20}{2} = 15$	$11 \times 15 = 165$
$20 < n \leqslant 40$	15	$\frac{20+40}{2} = 30$	$15 \times 30 = 450$

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

$$\frac{50 + 105 + 165 + 450}{\rightarrow (20 + 14 + 11 + 15)} = \frac{770}{60} = 12.83 \approx 12.8$$

addition
of frequencies

(a) .... 12.8 .... **[4]**

(b) Luke says the range is 40.

Explain why he may be wrong.

There may not be 40 people as the highest and 0 may not be the lowest visiting the office .... **[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.

S - Shirts   J - Jumpers

$$5S + 4J = £163 — ①$$
$$3S + 2J = £89 — ②$$

Making the coefficient of J equal to eliminate J.

$$② × 2 \quad 6S + 4J = £178 — ③$$
$$③ - ① \quad S \qquad = £15$$

Subs $S = £15$ in ②

$$3(15) + 2J = 89$$
$$45 + 2J = 89$$
$$-45 \qquad 2J = 44$$
$$÷2 \qquad J = £22$$

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.

P - Principal amount
r - Rate of interest
n - time duration

$$\text{compound Intrest} : \quad P\left(1 + \frac{r}{100}\right)^n$$

Total amount
$$= £25000\left(1 + \frac{2}{100}\right)^5$$

$$= £25000\left(\frac{51}{50}\right)^5$$

Interest:
$$£27602.02 - £25000$$
$$= £2602.02$$

$$= £27602.020$$
$$≈ £27602.02$$

£ ....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)

They both leave at the same time every 180 minutes.

180 min = $\frac{180}{60}$ hrs = 3 hrs.

8.37 am + 3.00 hrs = 11.37 am

(a) ....11.37 am............ **[4]**

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

..All the buses leave according to the timetable.........

.... **[1]**

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

A

Not to scale

50°

O ____ 6 cm ____ B
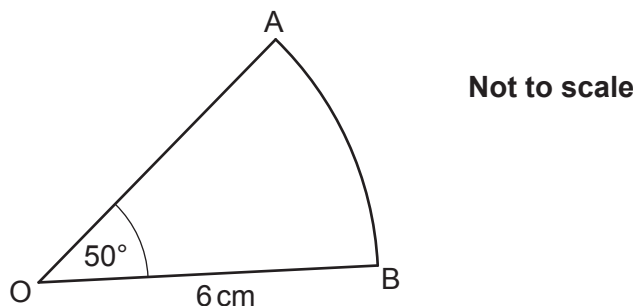
Show that the length of arc AB is 5.24 cm, correct to 3 significant figures. **[3]**

circumference = 2πr   arc AB = $\frac{50}{360}$ × 2 × π × 6
of a circle

= $\frac{5\pi}{3}$ = 5.235 ≈ 5.24 cm

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.

$$A \qquad B \qquad C$$

$$B = 7 + A \quad \rightarrow \quad A = B - 7 \qquad \text{write A in terms of B}$$

$$C = 2B$$

$$A + B + C = 57$$

Subs $A = B - 7$ and $C = 2B$

$$(B - 7) + B + (2B) = 57$$

$$4B - 7 = 57$$

$$4B = 64$$

$$B = 16$$

Subs. $B = 16$ in $A = B - 7$ and $C = 2B$

$$A = (16) - 7$$
$$= 9$$

$$C = 2(16)$$
$$= 32$$

Ayesha's age is ....9..................

Bennie's age is ....16..................

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

END OF QUESTION PAPER