Surname		Centre Number	Candidate Number
First name(s)			0

GCSE

wjec cbac

C300UB0-1

Z22-C300UB0-1

eduqas
Part of WJEC

TUESDAY, 7 JUNE 2022– MORNING

MATHEMATICS – Component 2
Calculator-Allowed Mathematics
HIGHER TIER

2 hours 15 minutes

ADDITIONAL MATERIALS

An additional formulae sheet.
A calculator will be required for this examination.
A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

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

If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·142 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the need for good English and orderly, clear presentation in your answers.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	4	
2.	3	
3.	5	
4.	5	
5.	7	
6.	6	
7.	5	
8.	4	
9.	4	
10.	5	
11.	4	
12.	3	
13.	4	
14.	3	
15.	5	
16.	7	
17.	4	
18.	3	
19.	5	
20.	5	
21.	5	
22.	5	
23.	10	
24.	9	
Total	120	

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Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

(C300UB0-1)

1. The table shows the mass of 90 carrots grown by a gardener.

Mass, m (grams)	Number of carrots
$30 < m \leqslant 60$	9
$60 < m \leqslant 90$	33
$90 < m \leqslant 120$	38
$120 < m \leqslant 150$	8
$150 < m \leqslant 180$	2

Calculate an estimate for the mean mass of these carrots. [4]

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C300UB01
03

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2. Jan, Freda and Pieter share some money.

Freda gets 3 times as much as Jan.
Pieter gets half as much as Freda.

(a) Write down the ratio of the amounts of money that they each get.
Give your answer in its simplest form. [2]

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Jan : Freda : Pieter = ... : .... : ....

(b) What fraction of the money does Pieter get? [1]

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3.

Edudig Digger
£35 950

Samir buys this digger and expects to use it for 1250 hours each year.
The digger will decrease in value at a yearly rate of 18% of its value at the end of the previous year.

Use this information to calculate the decrease in value of Samir's digger when it has been used for 10 000 hours. [5]

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4. A circular wheel makes 42 complete turns each minute.

(a) How many degrees does it turn through in one second? [3]

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(b) (i) State **one** assumption you have made in your answer to part (a). [1]

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(ii) How would your answer to part (a) change if this assumption was not correct? [1]

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(C300UB0-1)

Turn over.

8

5. (a) Solve $2x + 5 = 11 + 5x$. [2]

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(b) Solve $8x - (3x + 1) = 2$.

Give your answer as a fraction. [3]

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(c)   Tansy is trying to solve $1 < x + 2 \leqslant 5$ where x is a whole number.
Here is her work.

$1 - 2 < x$ and $x \leqslant 5 - 2$
$-1 < x$ and $x \leqslant 3$
$-1 < x \leqslant 3$
x is –1, 0, 1, 2 or 3.

Ali says,

"You have made an error."

Is Ali correct?

Yes ☐   No ☐

Show clearly how you decide.   [1]

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(d)   Represent the inequality $x > -2$ on the number line below.   [1]

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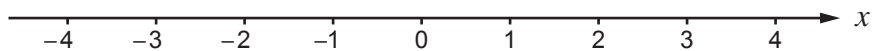
6. In an experiment, a scientist records the temperature, y °C, of an object as it is heated for x seconds.

The scientist thinks that the equation $y = mx + c$ is a good fit for this data.

The diagram shows his results on a scatter graph and his line of best fit.
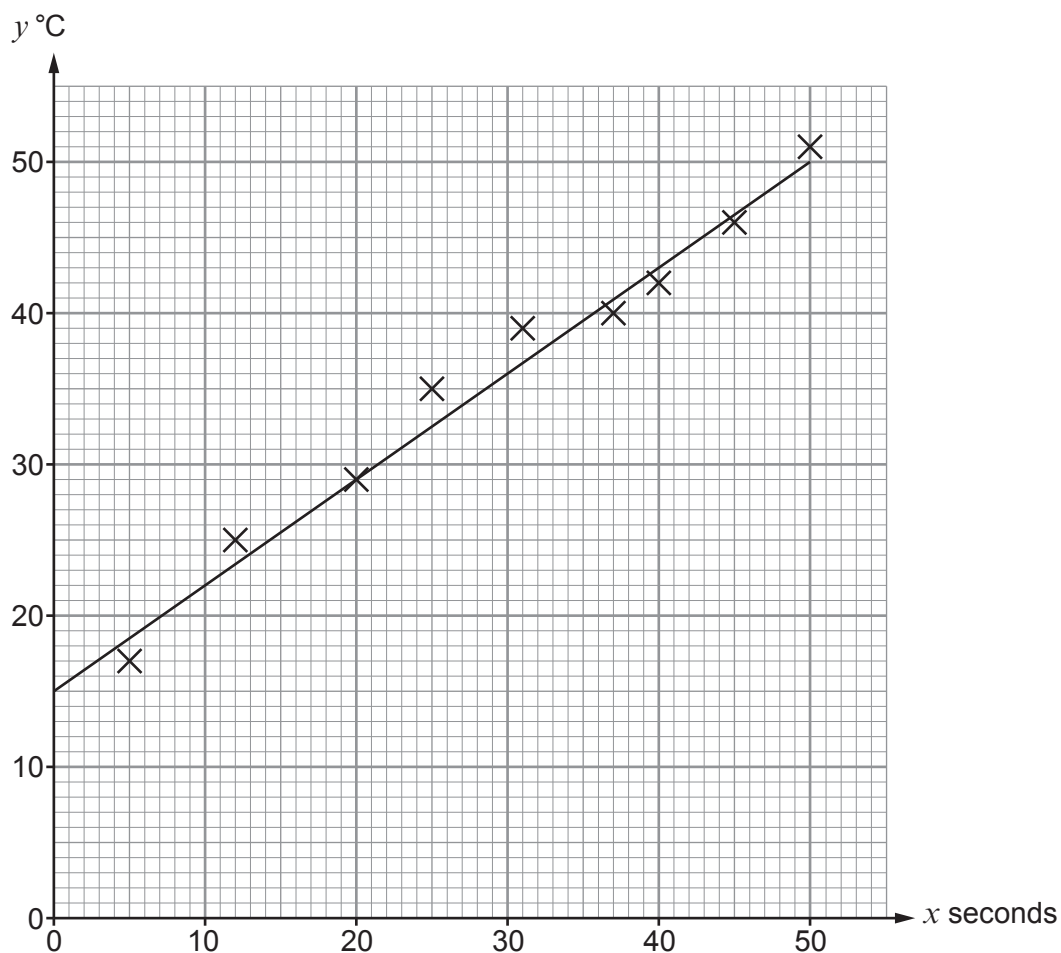
(a) Estimate the number of seconds for which the object has been heated when its temperature is 27 °C. [1]

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(b) When $x = 70$ seconds, the scientist measures the value of y to be 52°C.

Use this information to decide whether the line of best fit is likely or unlikely to give reliable predictions for values of y when x is greater than 50 seconds.

Likely ☐   Unlikely ☐

Explain how you decide. [1]

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(c) The line of best fit passes through the points (0, 15) and (10, 22).

Find the equation of the line of best fit.
Give your answer in the form $y = mx + c$. [3]

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(d) Explain what the gradient of the line of best fit represents in this context. [1]

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C300UB01
11

7.

A

57°

4·8 cm

B ⌐   C

Diagram not drawn to scale

ABC is a right-angled triangle.
AB = 4·8 cm and $B\hat{A}C$ = 57°

Calculate the area of triangle *ABC*. [5]

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Area = ... cm^2

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8.
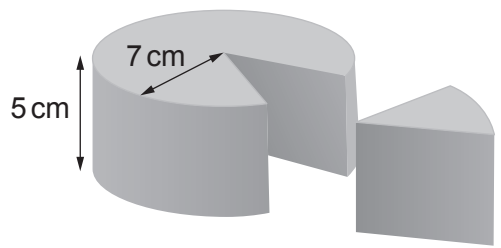
**Diagram not drawn to scale**

A wedge is cut from a cylinder of cheese of radius 7 cm and height 5 cm.
The volume of this wedge is 154 cm³.

What percentage of the whole cheese is this wedge? [4]

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C300UB01
13

9. Bronny takes part in a triathlon.

In this race she:

- swims 1·5 km in $\frac{3}{4}$ hour,

- cycles at an average speed of 27 km/h for 1 hour and 30 minutes,

- runs 9 km in 1 hour.

The average speed of the winner of the triathlon is 16·1 km/h.

Show that Bronny does not win the race. [4]

10.

S •

• R

T •

• Y

Path

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A
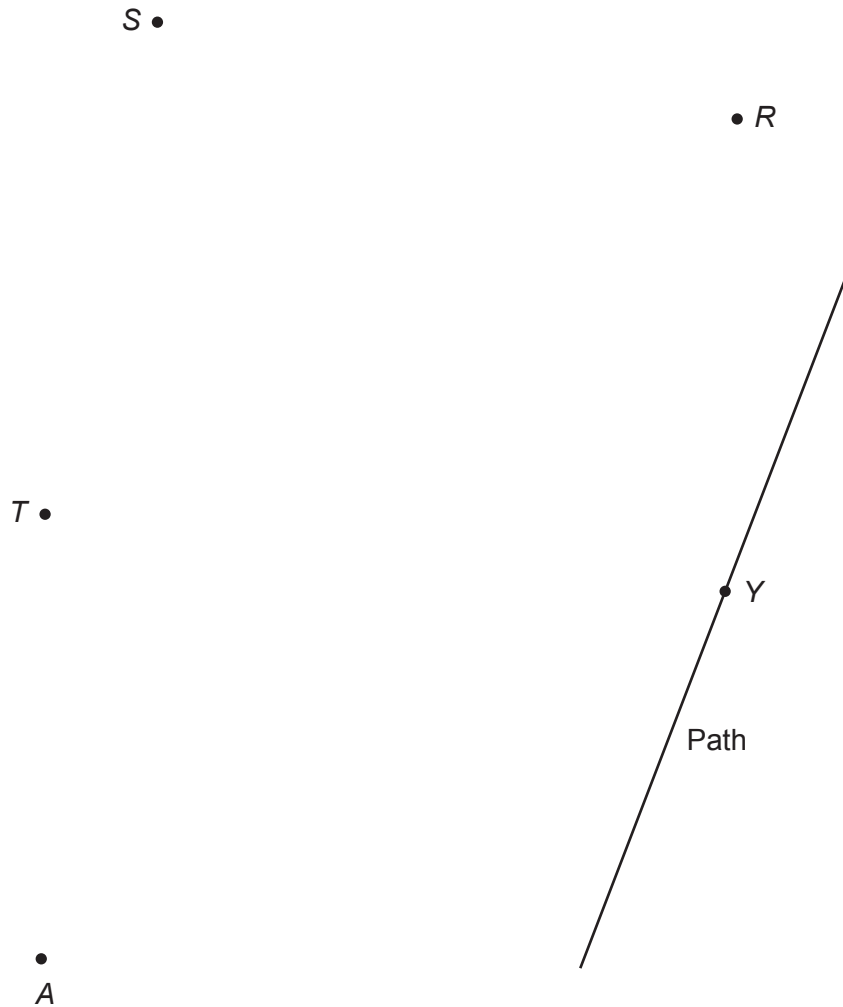
David is trying archery for the first time.
He stands at *A* and tries to shoot an arrow at the target *T* but misses.

The arrow lands at a point *X* such that:
• *X* is equidistant from *S* and *R*,
• *XY* is perpendicular to the path.

Construct accurately the position of *X* and measure by how many degrees David's shot is inaccurate.
You must use a ruler and a pair of compasses to construct suitable arcs and lines. [5]

David's shot is inaccurate by .... °

C300UB01
15

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11.
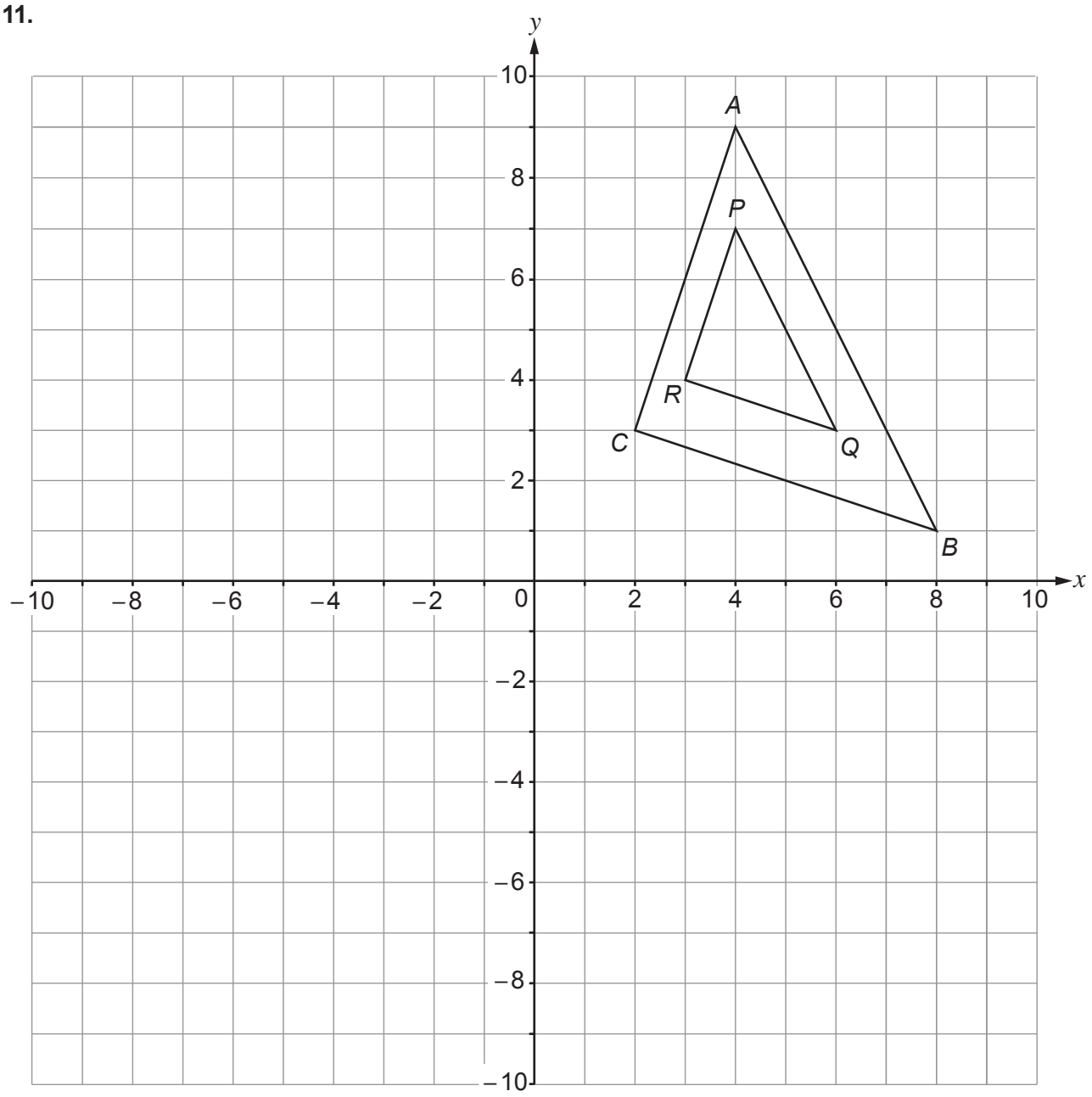
(a)   Describe the single transformation that maps triangle *ABC* to triangle *PQR*.   [2]

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(b)   On the grid above, draw the enlargement of triangle *ABC*, scale factor –1, centre (0, 3).
[2]

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12. (a) Find the next term of the following sequence. [1]

0, 7, 26, 63, 124, ...

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(b) Find the nth term of the following sequence. [2]

3, 9, 19, 33, 51, ...

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13. A cuboid of copper has a mass of 2150·4 grams and a volume of 240 cm^3.
A sphere of copper has a radius of x cm.

Show that the mass, in grams, of the sphere is less than $38x^3$. [4]

14. Simplify $\dfrac{(5x^2y)^5}{y^6}$. [3]

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15. (a) Jim squeezes 1 pink grapefruit.
He obtains 250 ml of juice, **correct to the nearest 50 ml**.

Jim thinks he will obtain a maximum of 900 ml of juice if he squeezes 3 pink grapefruit.

Assuming each pink grapefruit is the same size, is Jim likely to be correct?

Yes ☐   No ☐

Show how you decide.   [2]

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(b) The mass of a red grapefruit is 150 grams, **correct to the nearest 5 grams**.
The mass of a lemon is 85 grams, **correct to the nearest 5 grams**.

The total mass, **correct to the nearest 5 grams**, of this
red grapefruit, lemon and an orange is 370 grams.

Calculate the minimum mass of the orange.   [3]

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Turn over.

Examiner only

16. As part of an experiment two groups of people, *A* and *B*, took the same general knowledge test.

The test had a maximum of 100 marks.

(a) The first two columns of the table summarise the results of the test for the 45 people in *Group A*.

Mark	Frequency	Cumulative Frequency
$0 < p \leqslant 20$	0	0
$20 < p \leqslant 40$	3	3
$40 < p \leqslant 60$	20	
$60 < p \leqslant 80$	15	
$80 < p \leqslant 100$	7	

(i) Complete the cumulative frequency column. [1]

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(ii) Explain why 60 is a reasonable estimate of the median mark. [1]

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(b)   This box plot shows the distribution of the marks of the people in *Group B*.
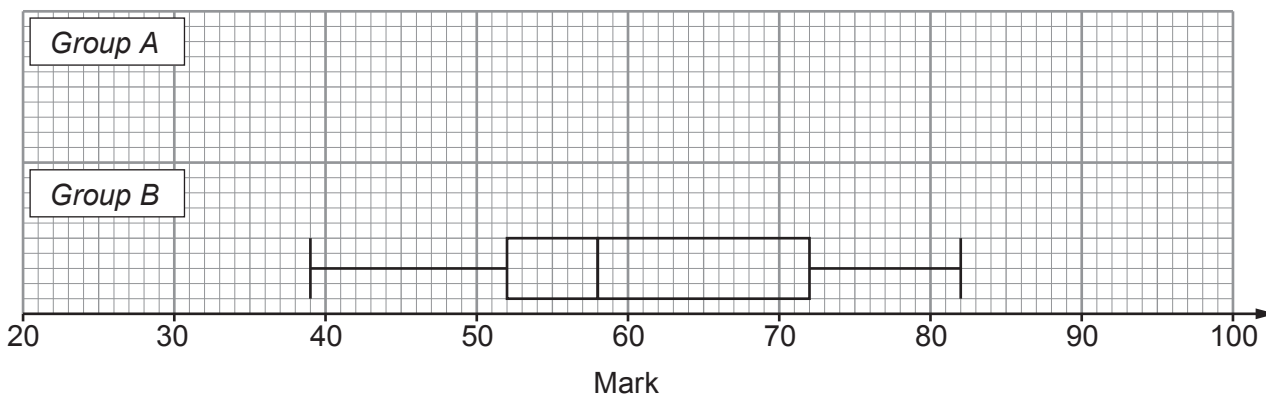
(i)   For the people in *Group A*:

Minimum mark	Range	Lower Quartile	Median	Upper Quartile
23	76	49	60	75

Draw the box plot for *Group A* on the grid above.   [3]

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(ii)   Make **two** comments to compare the results of *Group A* and *Group B*.
One comment must include an appropriate average.
The other comment must include a measure of spread.   [2]

Comment 1 ....

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Comment 2 ....

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17. On the graph paper below, draw the region which satisfies all of these inequalities.

$$y \leqslant 5 \qquad y < 3 - 2x \qquad y \geqslant x + 2 \qquad x \geqslant -2$$

Indicate clearly the region that is your answer. [4]

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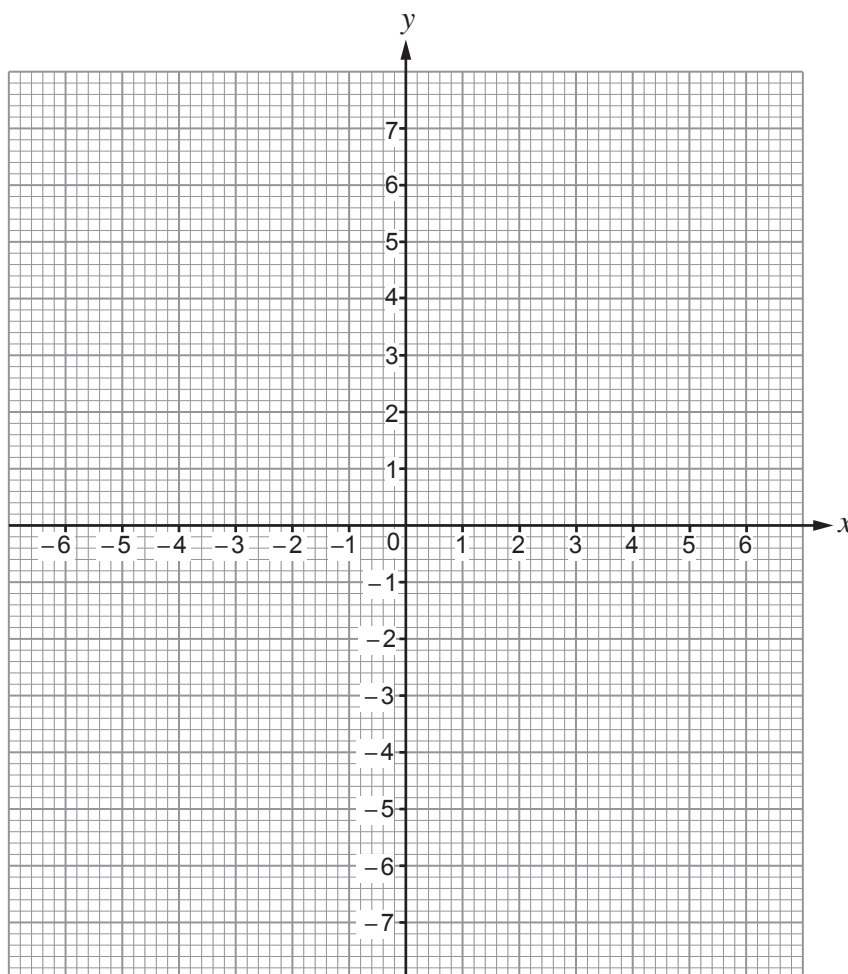
18. At a hotel, 70 guests completed a feedback survey.
The survey had 3 statements, *A*, *B* and *C*.
Guests could tick 0, 1, 2 or all 3 of these statements.

The Venn diagram shows the numbers of the 70 guests who ticked each statement.
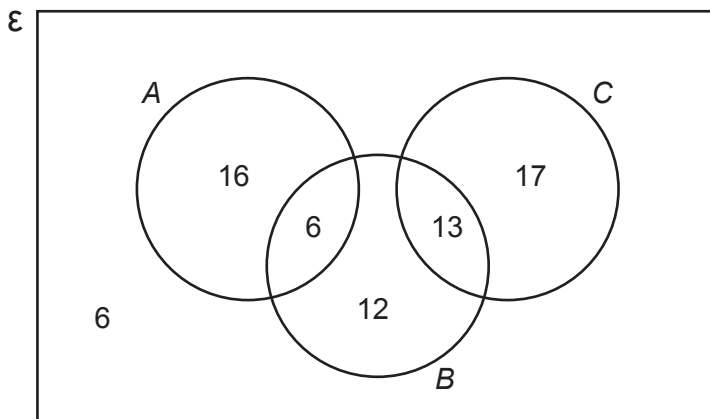
(a) One of these guests is chosen at random. Find the probability that this guest ticked statement *A* or statement *C* but not statement *B*. [1]

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(b) Given that a guest ticked at least one statement, find the probability that this guest ticked statement *B*. [2]

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24

19. (a) Find the equation of the line parallel to $4x = 5 - y$ which passes through the point $(1, -1)$. Give your answer in the form $y = mx + c$. [3]

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(b) Find the equation of the line perpendicular to $y = 1 - \dfrac{x}{5}$ which passes through the point $(0, 7)$. [2]

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20. R is proportional to $P\left(1 - \dfrac{P}{100}\right)$.

When P is 50, R is 0·02.

(a) Find a formula for R in terms of P. [3]

(b) Find the positive value of P for which R is 0. [2]

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21. There are 8 seats in the front row of a theatre.
8 friends sit down in this row.

(a) When each friend can sit in any of the 8 seats, find the number of different seating arrangements possible. [2]

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(b) Liesa and Todd are 2 of the 8 friends.

Find the probability that Liesa is sitting in the first seat on the left and Todd is sitting next to her. [3]

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22. A solution, x, of the equation $x^3 + x - 1 = 0$ lies in the interval 'between 0·5 and 1'.
Kate uses the method of interval bisection to find the solution correct to one decimal place.

(a)   Show that Kate's second interval for x is 'between 0·5 and 0·75'.   [2]

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(b)   Complete Kate's third interval for x,

'between .... and 0·75'.   [1]

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(c)   Continue Kate's method of interval bisection to show that the solution is $x = 0·7$ correct
to one decimal place.   [2]

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23. Debra buys a total of 4 kg of flour and butter at a market.
She pays £7 for her flour and £9 for her butter.

She buys x kg of flour.

(a)   Complete this table.   [1]

	Total cost (£)	Number of kg bought	Cost per kg (£)
Flour	7	x	$\dfrac{7}{x}$
Butter	9	$4 - x$	

(b)   The cost per kilogram of her butter is £5 more than the cost per kilogram of her flour.

Use this information and the table in part (a) to show that

$$5x^2 - 4x - 28 = 0.$$ [5]

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(c) Use an algebraic method to find the cost of a kilogram of her flour.
You must show all your working. [4]

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24.

Diagram not drawn to scale

$A\hat{B}C$ is acute.
The area of triangle ABC is $45\cdot0\,\text{cm}^2$.

Show that $A\hat{B}C = 50°$ correct to the nearest integer and hence calculate $A\hat{D}C$. [9]

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END OF PAPER

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.	Examiner only

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