Examiner only

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

x 45 75 105 135 165 ✓

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

405
2475
3990
1080
330
} 8280 ✓

÷90 ✓

✓ = 92g

Examiner only

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]

1 : 3 : 1.5 ✓

✓

Jan : Freda : Pieter = 2 : 6 : 3

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

3/11 ✓

Edugas - H - '22 - Summer P21

Examiner only

3.

Edudig Digger
£35950

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 10000 hours. [5]

$10000 \div 1250 = 8$ ✓

✓✓ 35950×0.82^{8}

$= £7348.69$ ✓

$dec = 35950 - 7348.69$

$= £28601.31$ ✓

Examiner only

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

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

$\frac{42 \times 360}{60}$ ✓

$= 252°$ ✓

✓

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

Spins at a constant speed ✓

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

If it spun slower, angle would reduce ✓

Examiner only

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

$-6 = 3x$ ✓

$-2 = x$ ✓

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

Give your answer as a fraction. [3]

$8x - 3x - 1 = 2$ ✓

$5x = 3$ ✓

$x = \frac{3}{5}$ ✓

Examiner only

(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."

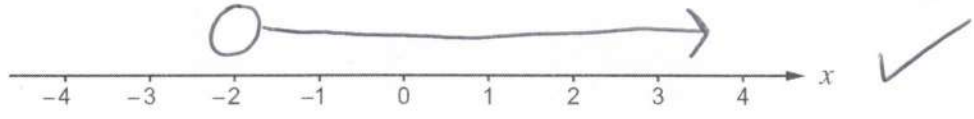
Is Ali correct?

Yes ✓ No ☐

Show clearly how you decide. [1]

-1 should be excluded ✓

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



✓

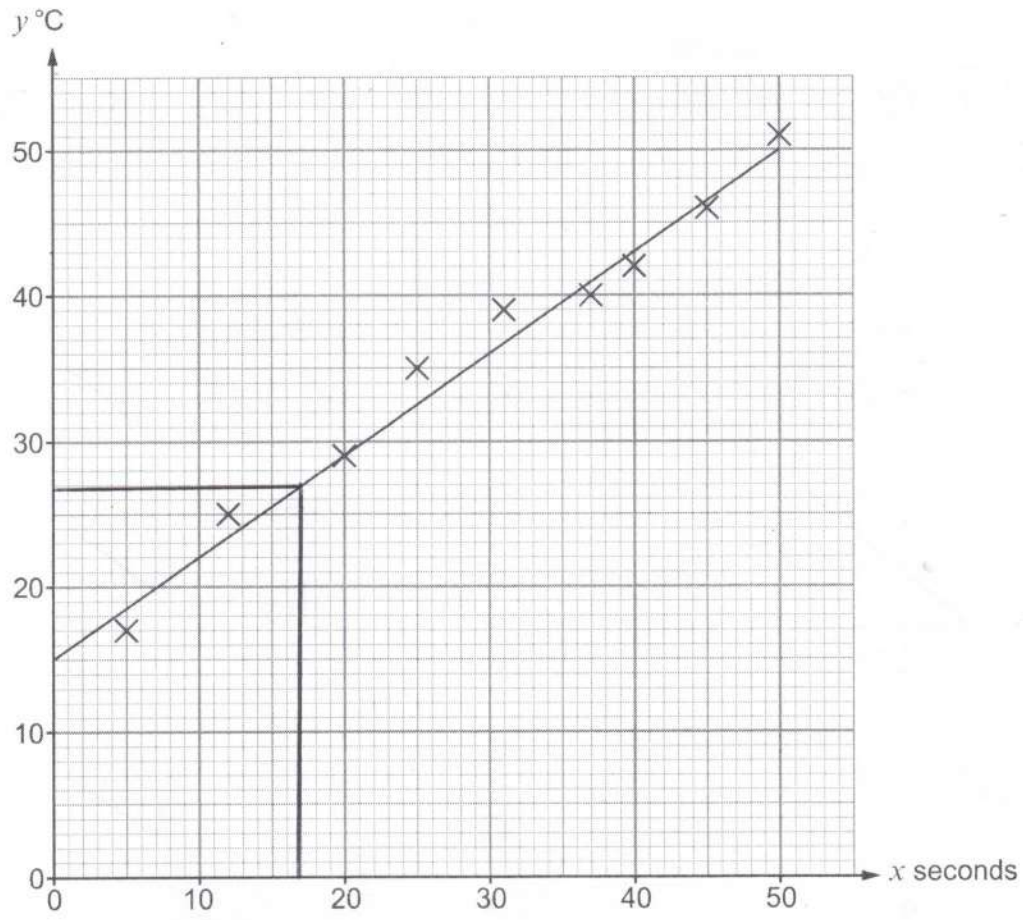
C300UB01 09

Examiner only

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]

17 ✓

[ms 17→17.4]

Examiner only

(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.

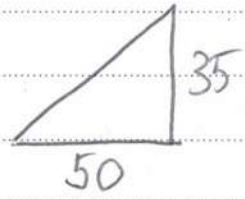
Likely ☐ Unlikely ☑

Explain how you decide. [1]

Temp is already ≈ 50 at $x = 50$ so will be much higher

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

Find the equation of the line of best fit. $C = 15$ ✓
Give your answer in the form $y = mx + c$. [3]



$m = \frac{35}{50} = \frac{7}{10}$ ✓

$y = \frac{7}{10}x + 15$ ✓

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

Increase in temperature per second ✓

Examiner only

7.

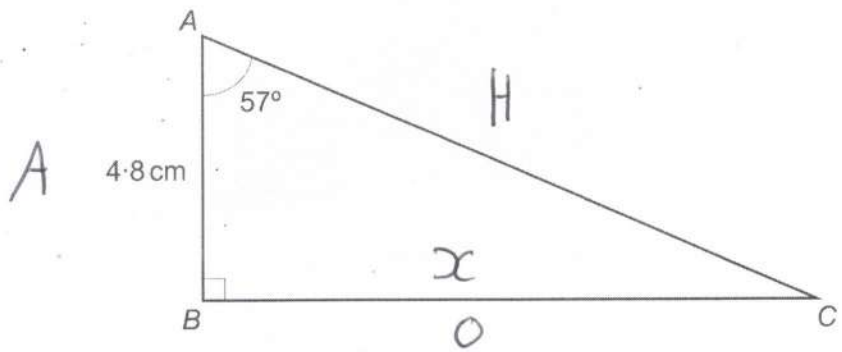


Diagram not drawn to scale

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

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

O
TOA $x = \tan(57) \times 4{\cdot}8$ ✓✓
$= 7{\cdot}39$ ✓

$A = \frac{1}{2} \times 7{\cdot}39 \times 4{\cdot}8$ ✓

Area = 17·7 cm^2 ✓

Examiner only

8.

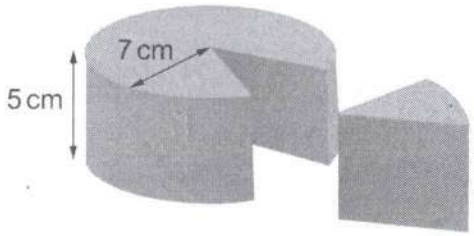


Diagram not drawn to scale

A wedge is cut from a cylinder of cheese of radius 7 cm and height 5 cm.
The volume of this wedge is 154 cm^3.

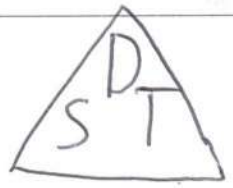
What percentage of the whole cheese is this wedge? [4]

Whole = $\pi \times 7^2 \times 5 = 245\pi$ ✓ ✓

$\% = \frac{154}{245\pi} \times 100 = 20\%$ ✓ ✓

Examiner only

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]

	D	S	T
S	1·5		0·75
C	40·5 ← 27 x 1·5		✓✓
R	9		1

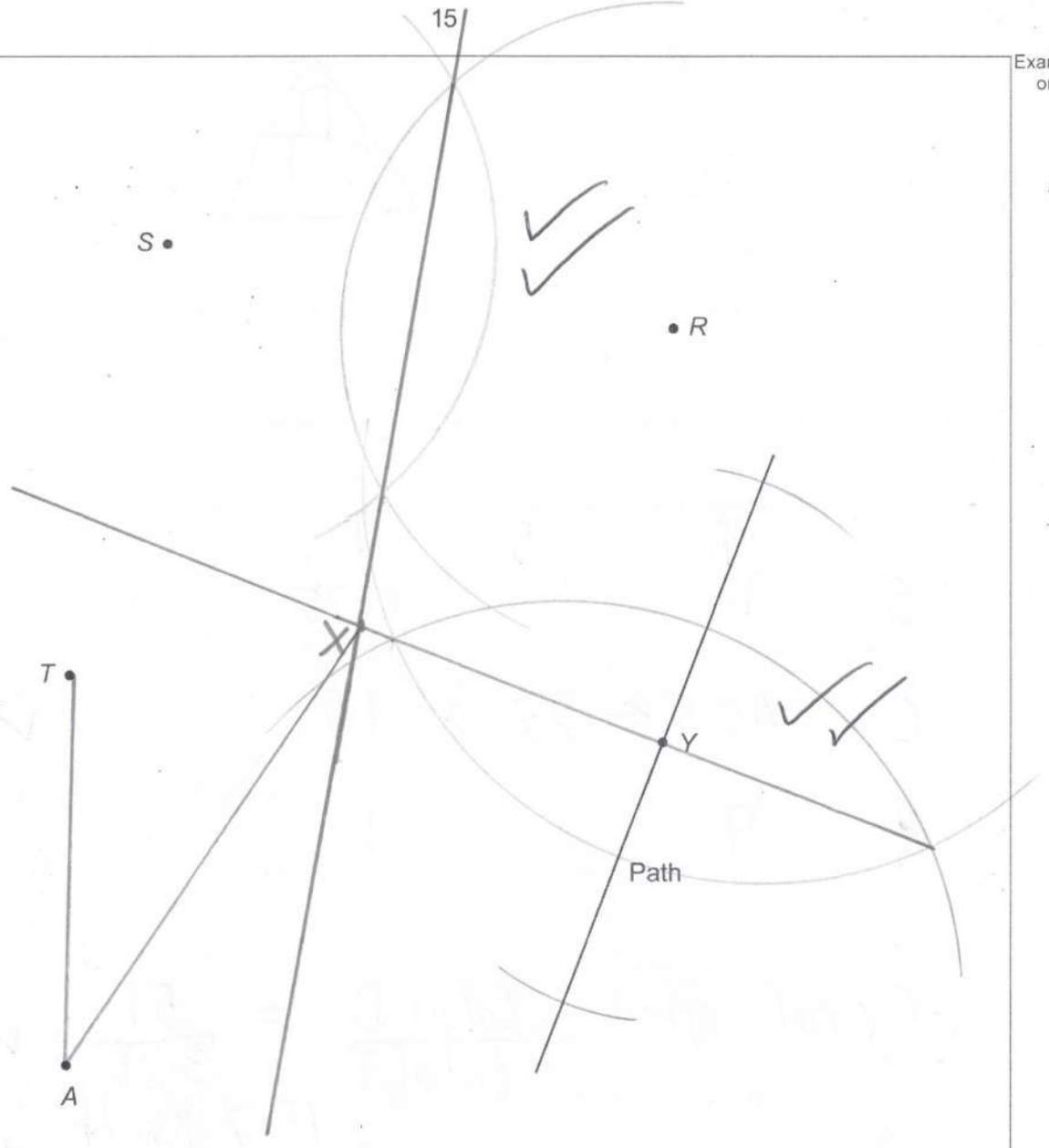
Overall speed = $\frac{\text{total D}}{\text{total T}} = \frac{51}{3·25}$ ✓

= 15·7 km/h ✓

which is slower

Examiner only

10.



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.

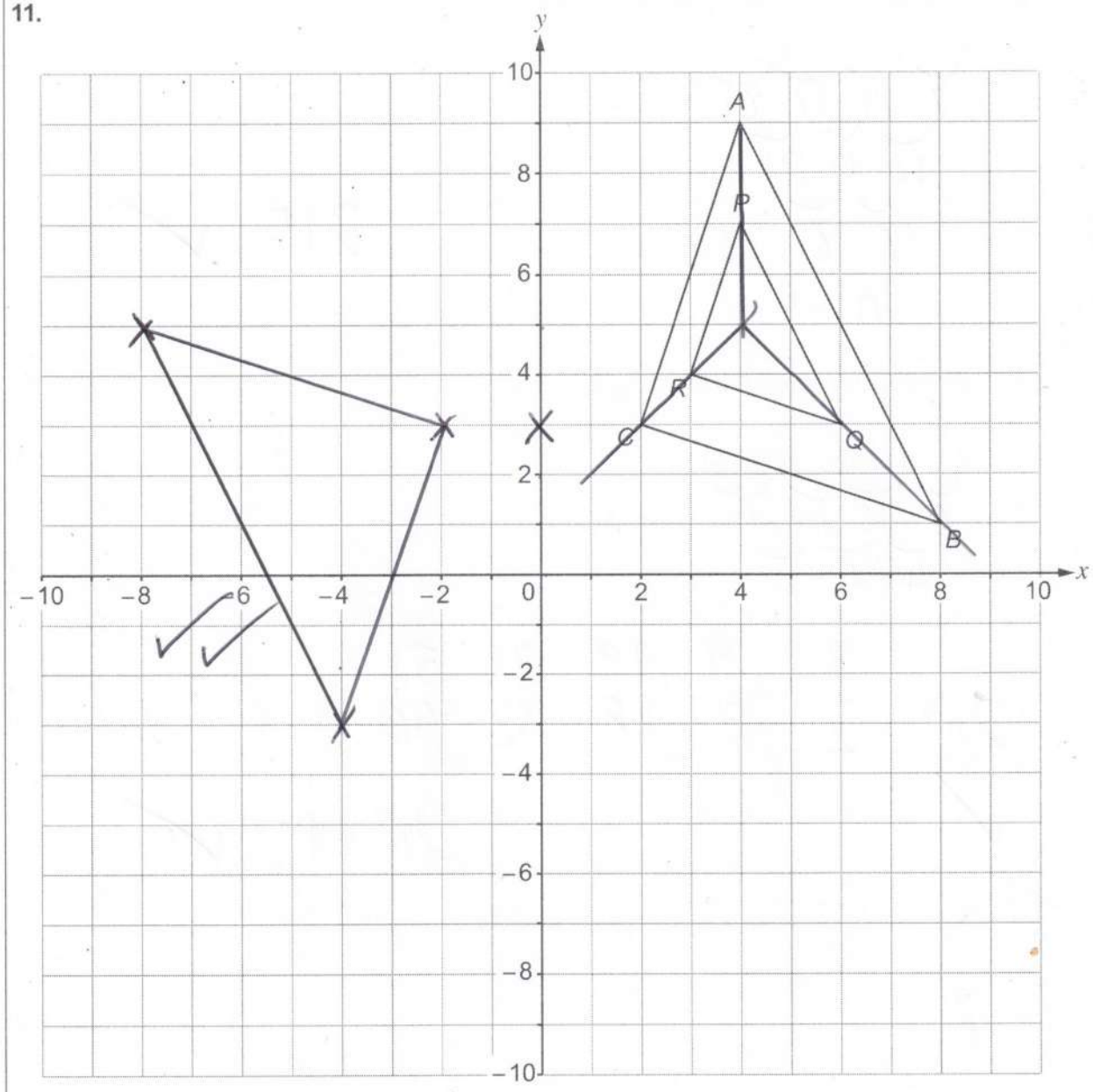
Construct accurately the position of *X* and measure by how many degrees David's shot is inaccurate.
You must use a ruler and a pair of compasses to construct suitable arcs and lines. [5]

David's shot is inaccurate by 33 °. (for me!)

[ms 32 → 36]

Examiner only

11.



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

scale factor = ½ centre (4, 5)

enlargement ✓2 ✓3

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

Examiner only

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

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

7 19 37 61

12 18 24

6 6

$n^3 - 1$

215 ✓

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

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

6 10 14 18

4 4 4

3 9 19 33 51

$2n^2$ 2 8 18 32 50

✓

$2n^2 + 1$ ✓

Examiner only

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]

D M V

Copper $D = \frac{2150.4}{240} = 8.96$ ✓✓

Mass of Sphere $= D \times V$

$= 8.96 \times \frac{4}{3}\pi x^3$ ✓

$= 37.53.. x^3$ ✓ $(< 38x^3)$

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

$= \frac{5^5 x^{10} y^5}{y^6}$ ✓

$= 3125x^{10}y^{-1}$ ✓✓ OE

Examiner only

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]

275
250 < 250
225

275 × 3 = 825

(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]

152·5
150 < 147·5

87·5
85 < 82·5

370 < 372·5
367·5

min max max
O_{min} = 367·5 − 152·5 − 87·5

= 127·5

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	23
$60 < p \leqslant 80$	15	38
$80 < p \leqslant 100$	7	45

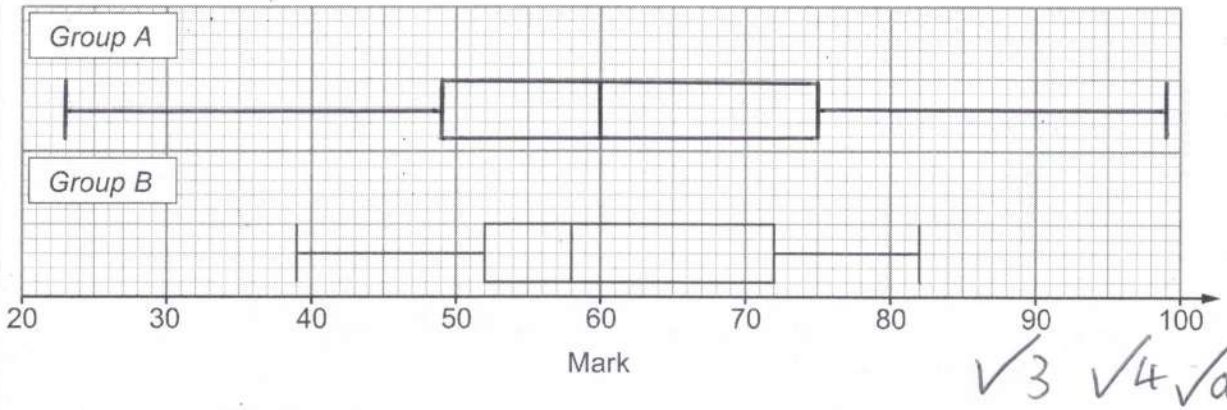
(i) Complete the cumulative frequency column. ✓ [1]

Almost half are below etc ✓

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

Examiner only

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



✓3 ✓4 ✓all

(i) For the people in *Group A*:

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

99

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

(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
On average, group A did better
Median 60 > 58 ✓

Comment 2
Group B was less varied
IQR 43 < 76 ✓

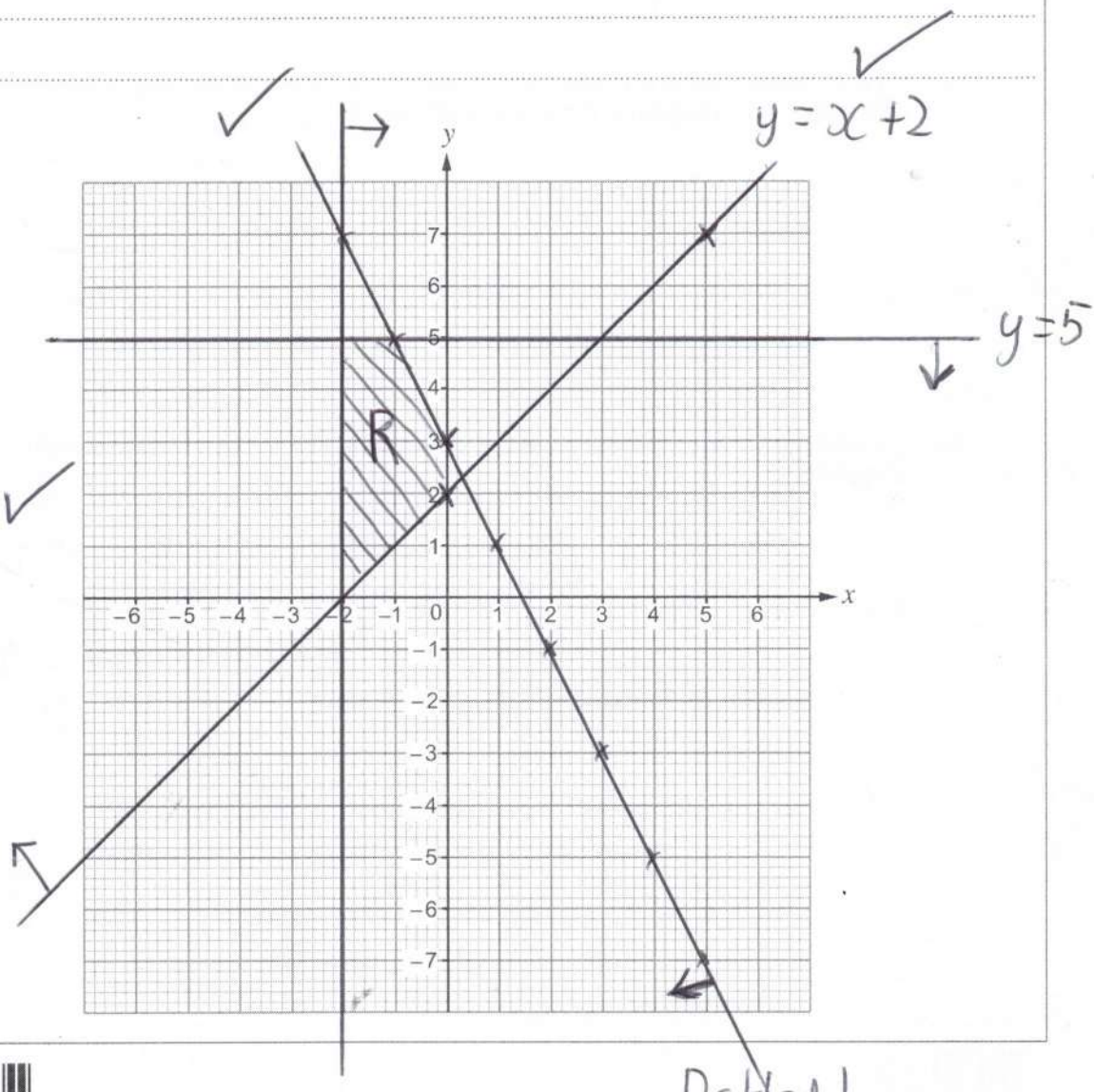
Examiner only

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

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

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

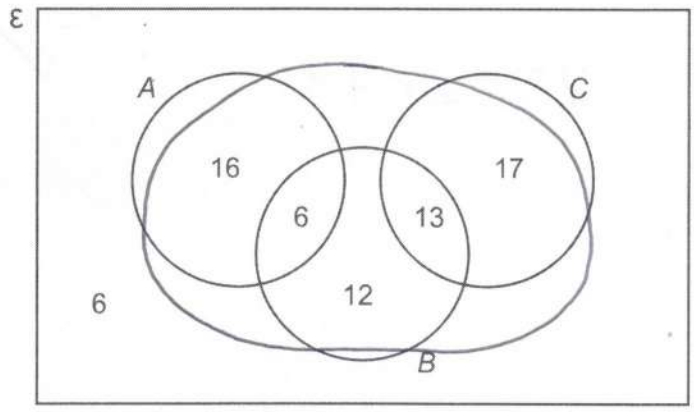
$y = -2x + 3$



Examiner only

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]

16+17 33/70 ✓

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

6+12+13 31 ✓
64 ✓

Examiner only

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]

$4x = 5 - y$

$y = -4x + 5$

so $m = -4$ ✓

$y = mx + c$

$-1 = -4 \times 1 + c$ ✓

$c = 3$

$y = -4x + 3$ ✓

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

so $c = 7$

$m = -\frac{1}{5}$

$m_{\perp} = 5$ ✓

$y = 5x + 7$ ✓

Examiner only

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

When P is 50, R is 0·02.

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

$R = K \times P\left(1-\frac{P}{100}\right)$

$0.02 = K \times 50(1-0.5)$

$K = 0.0008$ or $\frac{1}{1250}$

$R = \frac{P}{1250}\left(1-\frac{P}{100}\right)$ ✓OE

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

$0 = \frac{P}{1250}\left(1-\frac{P}{100}\right)$ ✓

$P = 0$ (reject) or $1-\frac{P}{100} = 0$

so $P = 100$ ✓

Examiner only

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]

✓ $8! = 40320$ ✓

(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]

$\frac{1}{8} \times \frac{1}{7} = \frac{1}{56}$

✓ ✓

Examiner only

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]

$f(0.5) = -0.375 \ (<0)$
$f(0.75) = 0.171875 \ (>0)$
So $0.5 < x < 0.75$

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

'between 0·625 and 0·75'. [1]

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

$f(0.6875) = 0.012... > 0$
so $0.625 < x < 0.6875$ ✓

$f(0.65625) = -0.0611... < 0$

so $0.65625 < x < 0.6875$

$= 0.7$ (1dp) ✓

Examiner only

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	$\frac{7}{x}$
Butter	9	$4-x$	$\frac{9}{4-x}$ ✓

(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]

$\frac{7}{x} + 5 = \frac{9}{4-x}$ ✓

$7(4-x) + 5x(4-x) = 9x$ ✓

$28 - 7x + 20x - 5x^2 - 9x = 0$ ✓

$-5x^2 + 4x + 28 = 0$ ✓

$5x^2 - 4x - 28 = 0$ ✓

Examiner only

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

$5x^2 - 4x - 28 = 0$ $\quad ac = -140$

$5x^2 + 10x \mid -14x - 28 = 0$

$5x(x+2) \mid -14(x+2) = 0$

$(5x - 14)(x+2) = 0$ ✓✓

$x = \frac{14}{5}$ or $x = -2$ (reject) ✓

Kg flour $= \frac{7}{14/5} = £2.50$ ✓

Examiner only

24.

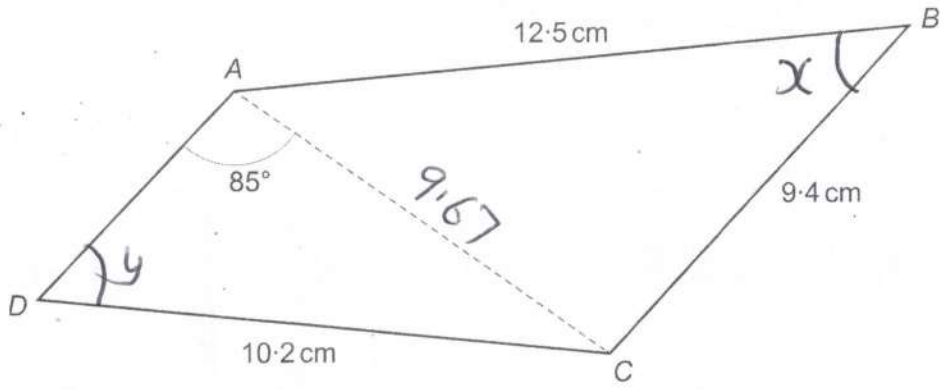


Diagram not drawn to scale

$A\hat{B}C$ is acute.
The area of triangle ABC is 45·0 cm^2.

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

(ABC) $\frac{1}{2} \times 12.5 \times 9.4 \times \sin x = 45$ ✓✓

$\sin x = 36/47$

$x = \sin^{-1}\left(\frac{36}{47}\right) = 49.99°$ ✓ $(= 50)$

$AC^2 = 12.5^2 + 9.4^2 - 2 \times 12.5 \times 9.4 \times \cos 50$ ✓✓

$AC = \sqrt{93.55}$

$= 9.67$ (2dp) ✓

$\frac{\sin y}{9.67} = \frac{\sin 85}{10.2}$ ✓✓

$y = \sin^{-1}(0.9446\ldots) = 70.85\ldots$

$= 70.9$

[ms 70.8 → 71.33] ✓

END OF PAPER