Surname StemUp Model Solution	Centre Number	Candidate Number
Other Names		0

GCSE – NEW

3310U30-1

S17-3310U30-1

MATHEMATICS – NUMERACY
UNIT 1: NON-CALCULATOR
INTERMEDIATE TIER

THURSDAY, 25 MAY 2017 – MORNING

1 hour 45 minutes

ADDITIONAL MATERIALS

The use of a calculator is not permitted in this examination.

A ruler, a 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 continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14.

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.

In question **3**, the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	4	
2.	3	
3.	10	
4.	11	
5.	9	
6.	3	
7.	6	
8.	7	
9.	7	
10.	6	
11.	6	
12.	8	
Total	80	

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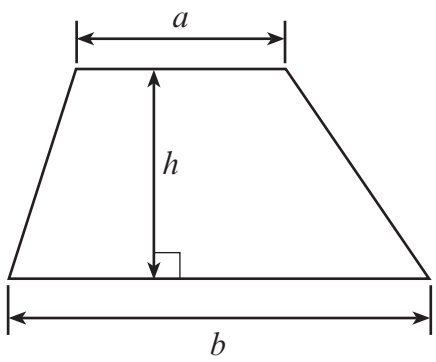
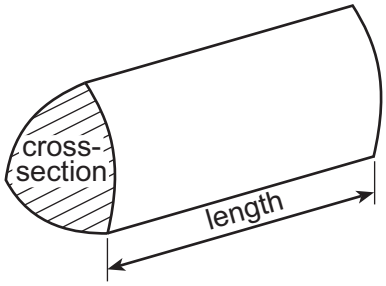
Formula List – Intermediate Tier

Area of trapezium $= \frac{1}{2}(a + b)h$



Volume of prism = area of cross-section × length



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1. Siân wrote the following:

'For the last 7 days I have recorded the number of cars parked in my local car park at 10 a.m. each day. This is what I found.

- The car park always had some cars parked in it.
- The greatest number of cars was 11.
- The range was 8 cars.
- The median was 9 cars.
- The mode was 10 cars.
- On one day, there were 6 cars in the car park.
- On another day, there were 7 cars in the car park.'

Gareth asked,
'What was the mean number of cars in the car park at 10 a.m. for these 7 days?'

Complete Siân's reply to Gareth's question.
You must list the 7 numbers Siân recorded and show all your working.

'The mean number of cars in the car park at 10 a.m. for these 7 days was

8 cars.'

[4]

Greatest = 11 and range = 8, so smallest = 11 − 8 = 3 cars

Mode = 10, so 10 appears at least twice; median (4th value) = 9

The 7 numbers in order: 3, 6, 7, 9, 10, 10, 11

Total = 3 + 6 + 7 + 9 + 10 + 10 + 11 = 56

Mean = 56 ÷ 7 = 8 cars

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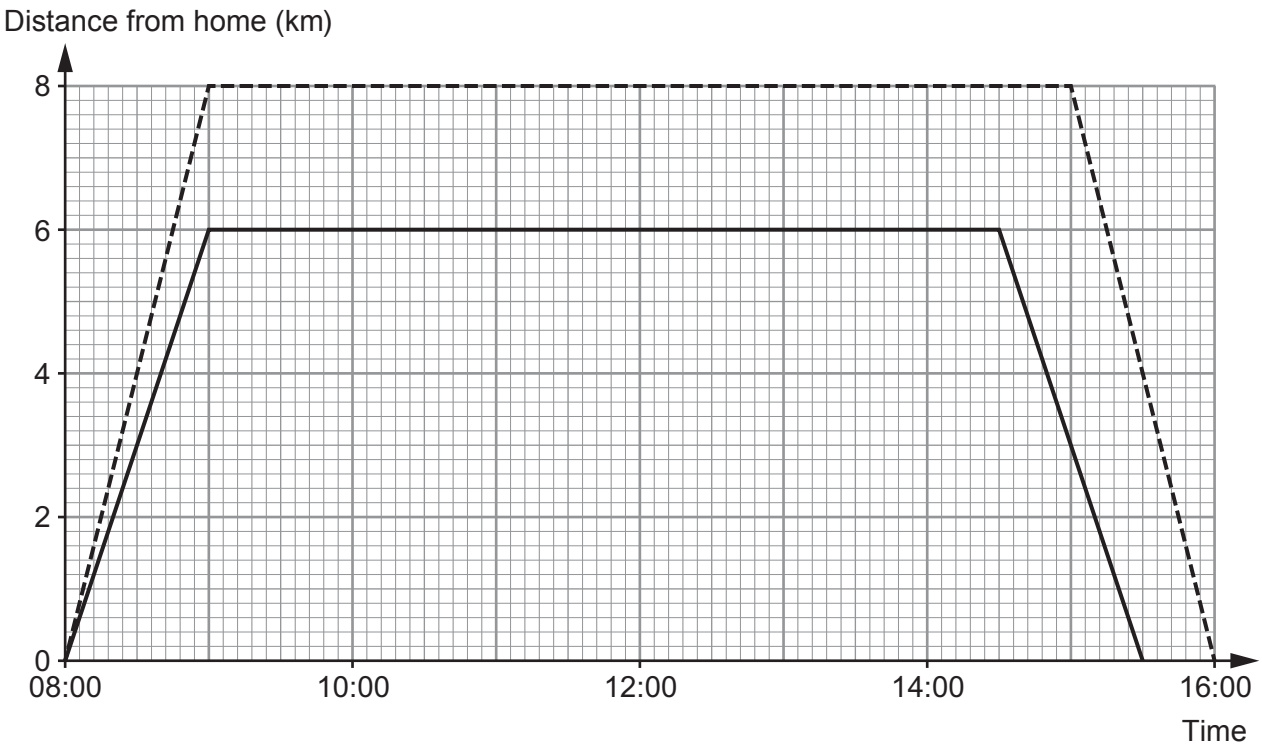
2. Eleri and Yvon are sisters.
They both live at *Cwm Uchel*.
They do not go to the same school.
The graph represents each of their journeys to school and back.

Key:

- - - - - - - - represents Eleri's journeys ——— represents Yvon's journeys



(a) At what time did Yvon arrive home from school?
Circle your answer. [1]

14:45 15:15 15:30 15:45 16:00

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(b) Eleri cycles along a straight road to school and back.
How far does she cycle when going to school and back in one day?
Circle your answer. [1]

6 km 8 km 9 km 12 km 16 km

(c) Martha looks at the graph and says,

'The school Eleri attends is 2 km from Yvon's school.'

Is this true?

Certainly true ☐ Certainly false ☐ Can't tell ☑

Give a reason for your answer. [1]

Can't tell: the graph only shows distance from home, not direction.
The sisters may travel in different directions, so the schools
could be anywhere from 2 km up to 14 km apart.

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3. *In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

Maes Alun Camping
Charges

Tents covering ground area:

- less than or equal to 12 m^2 cost £14 per night
- greater than 12 m^2 cost £16 per night

AND

Charge per person: £4 per night

Stay 5 nights and get the next night **completely free**.
This means **no charge** for tents or people on **every 6th night.**

Rhodri and Lars are planning a camping holiday, staying at *Maes Alun Camping*.
They are going to

- take only one tent between them,
- take a tent covering a rectangular ground area, measuring 2·5 metres by 4·4 metres,
- both stay for a total of 12 nights.

Their holiday is just 8 weeks away.
They **each** plan to save £15 per week from now until their holiday in 8 weeks' time.

Will the amount they save be enough to pay for their holiday?
You must show all your working. [8 + 2 OCW]

Ground area of tent = 2·5 × 4·4

= 2·5 × 4 + 2·5 × 0·4 = 10 + 1 = 11 m^2

11 m^2 is less than or equal to 12 m^2, so the tent costs £14 per night.

They stay 12 nights: the 6th and 12th nights are free,

so they pay for 10 nights only.

Cost of tent = 10 × £14 = £140

Cost for people = 2 people × 10 nights × £4 = £80

Total cost of holiday = £140 + £80 = £220

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Amount each person saves = 8 weeks × £15 = £120

Total amount saved = 2 × £120 = £240

Compare: £240 saved is more than the £220 cost (£240 − £220 = £20 spare).

Conclusion: Yes, the amount they save (£240) will be enough to pay for their holiday (£220), with £20 left over.

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4. Lazar wants to send a package to Germany.
He looks at pricing charts for three different companies, *ParcelMax*, *DirectGo* and *Pack2save*.

ParcelMax
Total cost = Sum of the 3 dimensions in cm × £0.60

DirectGo
Total cost = Volume measured in cm^3 × £0.01

Pack2save
Total cost = Total area of all 6 faces measured in cm^2 × £0.02

Lazar's parcel is a cuboid measuring 10 cm by 20 cm by 30 cm.

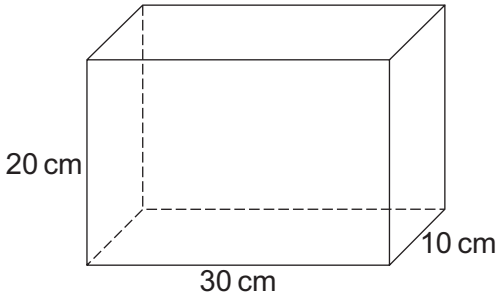

Diagram not drawn to scale

(a) Find the cost of sending the parcel for each of the three different companies.
Give each of your answers in pounds (£).

(i) *ParcelMax* [2]

Sum of the 3 dimensions = 10 + 20 + 30 = 60 cm

Cost = 60 × £0.60 = £36

(ii) *DirectGo* [3]

Volume = 10 × 20 × 30 = 6000 cm^3

Cost = 6000 × £0.01 = 6000 ÷ 100

= £60

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(iii) *Pack2save* [4]

Areas of faces: $10 \times 20 = 200$, $20 \times 30 = 600$, $10 \times 30 = 300$ cm^2

Total area of all 6 faces $= 2 \times (200 + 600 + 300)$

$= 2 \times 1100 = 2200$ cm^2

Cost $= 2200 \times £0.02 = 2200 \times 2 \div 100$

$= £44$

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(b) What is the **percentage saving** that Lazar will make by choosing the cheapest option rather than the most expensive option? [2]

Cheapest = £36 (ParcelMax), most expensive = £60 (DirectGo)

Saving = £60 − £36 = £24

Percentage saving $= 24 \div 60 \times 100 = 0.4 \times 100$

$= 40\%$

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5.

(a) Jasmine entered herself, Sophie and Bryn as a group in a talent contest.
Bryn only had a minor part.

Bryn, Sophie and Jasmine won the contest.
They shared the prize money in the ratio 2 : 6 : 7, with Bryn getting the smallest share.
Jasmine won £560, the largest share.

(i) How much money did Bryn and Sophie each win? [4]

Jasmine's share = 7 parts = £560

1 part = £560 ÷ 7 = £80

Bryn = 2 × £80 = £160

Sophie = 6 × £80 = £480

Bryn receives £ 160

Sophie receives £ 480

(ii) Jasmine gave 15% of her winnings to charity.
How much did Jasmine have left? [2]

10% of £560 = £56, 5% of £560 = £28

15% of £560 = £56 + £28 = £84

Jasmine has left £560 − £84 = £476

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(b) The talent contest is held once a year.
Every year, the cost of putting on the talent contest increases by 10% of the previous year's cost.
In summer 2014 the cost was £6600.

Calculate the cost of putting on the summer 2017 talent contest.
You must show all your working. [3]

10% of 6600 = 660

2015 cost = £6600 + £660 = £7260

10% of 7260 = 726

2016 cost = £7260 + £726 = £7986

10% of 7986 = 798.60

2017 cost = £7986 + £798.60 = £8784.60

The summer 2017 talent contest costs £8784.60

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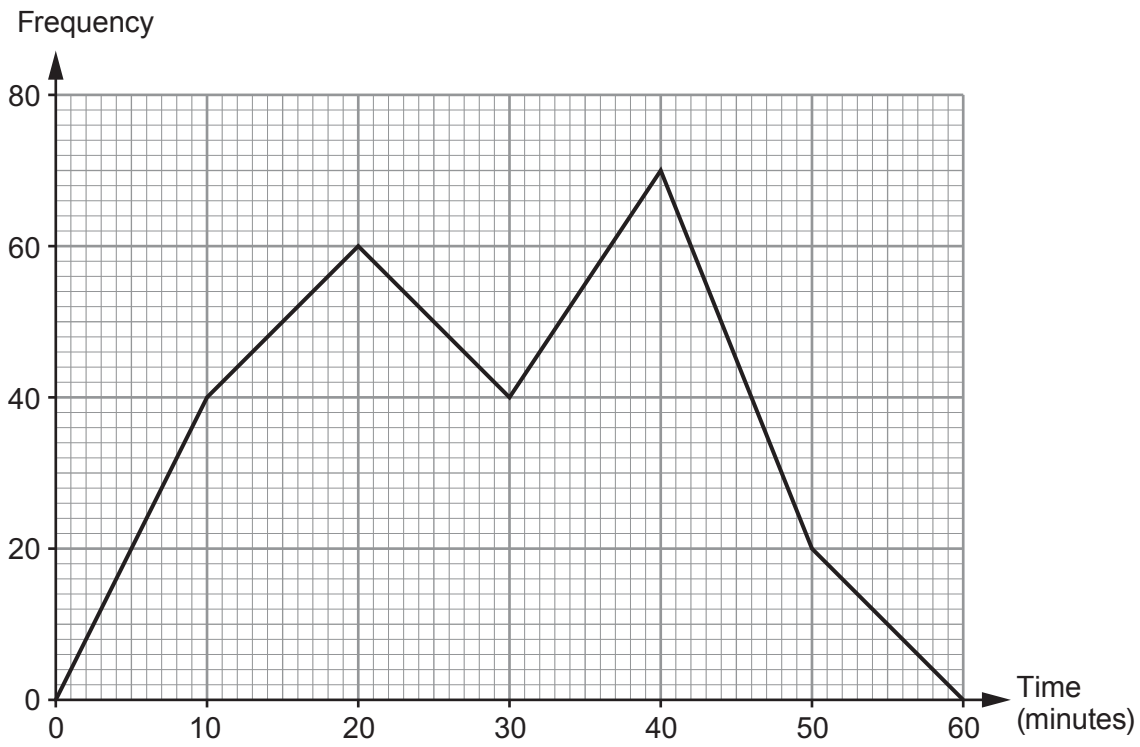
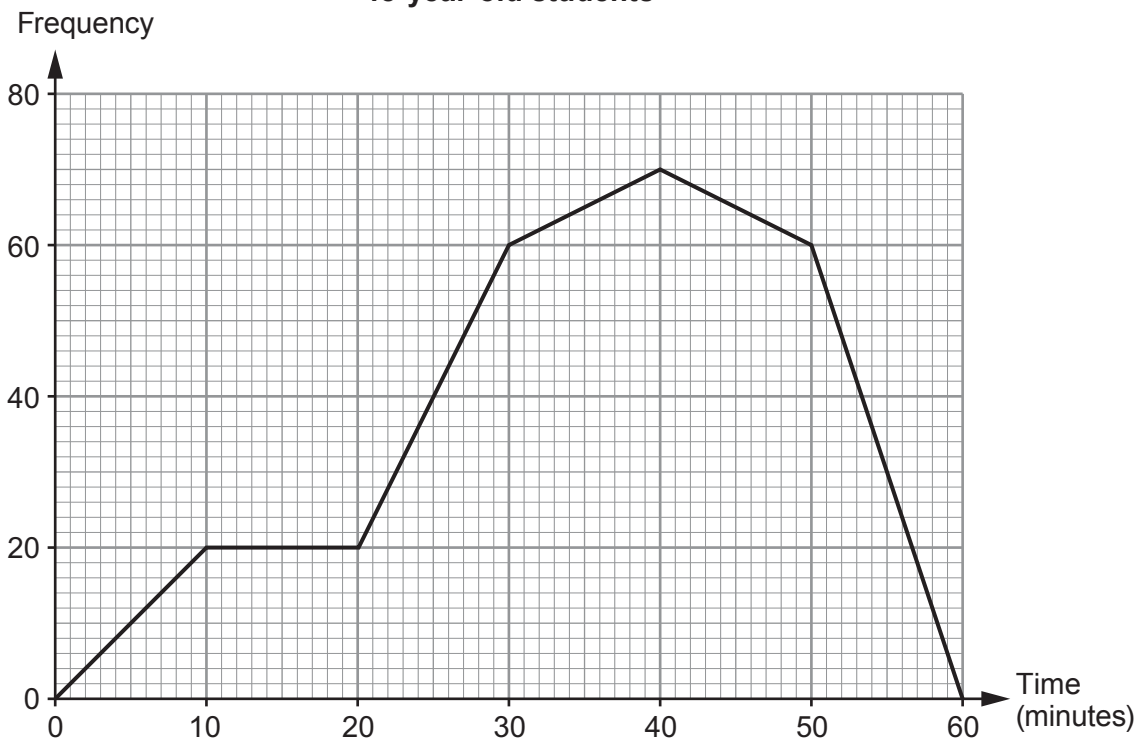
6. A survey was carried out to find how much time a group of 16-year-old students and a group of 18-year-old students spent using social media.
The frequency polygons below, which use equal time intervals, illustrate the results.

16-year-old students



18-year-old students



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(a) How many 16-year-old students took part in the survey?
Circle your answer. [1]

60 70 210 230 2300

0 + 40 + 60 + 40 + 70 + 20 + 0 = 230

(b) How many more 16-year-old students than 18-year-old students spent between 15 minutes and 25 minutes using social media?
Circle your answer. [1]

20 40 60 100 250

At 20 minutes: 60 − 20 = 40

(c) Wesley says,

'The 16-year-old students generally spent about the same time using social media as the 18-year-old students.'

Using the frequency polygons, how would you explain to Wesley that his statement is not true? [1]

At 50 minutes there were 60 18-year-olds but only 20 16-year-olds.

The 18-year-old polygon is higher for the longer times, so the 18-year-olds generally spent more time using social media.

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7. Kari is making a jigsaw puzzle.
She has designed the pattern on a piece of paper.
Kari plans to make each piece of the jigsaw a different colour.

Part of her plan is shown below.

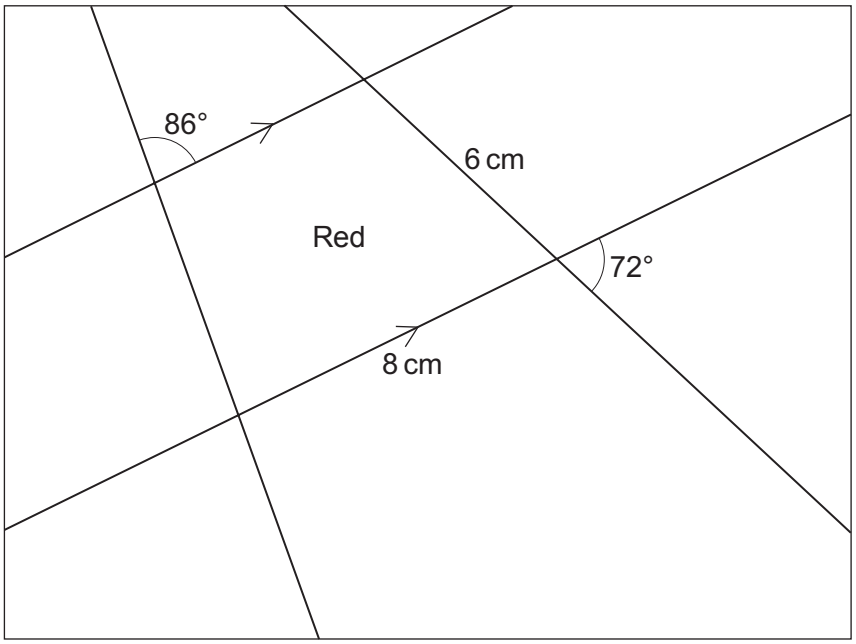

Diagram not drawn to scale

Kari now sketches a diagram of the red piece of the jigsaw, which is shown below.
She shows some extended lines and indicates all the angles she needs to find.

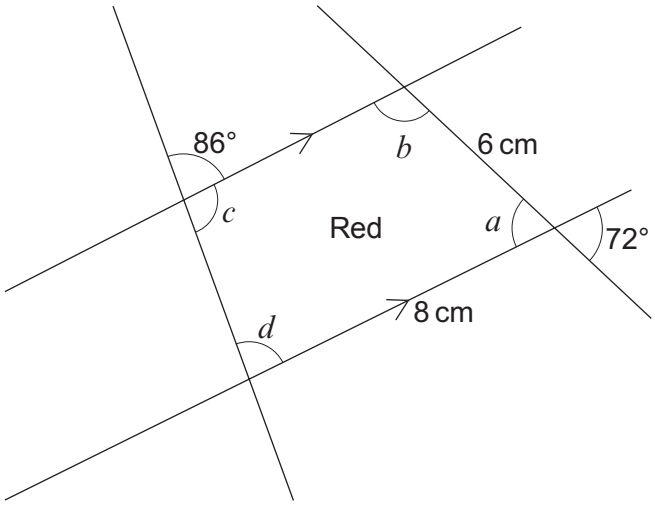

Diagram not drawn to scale

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Find the 4 missing angles in the red piece of the jigsaw.
Draw the red piece of Kari's jigsaw accurately.
One side has been drawn for you. [6]

$a = 72°$ (vertically opposite angles)

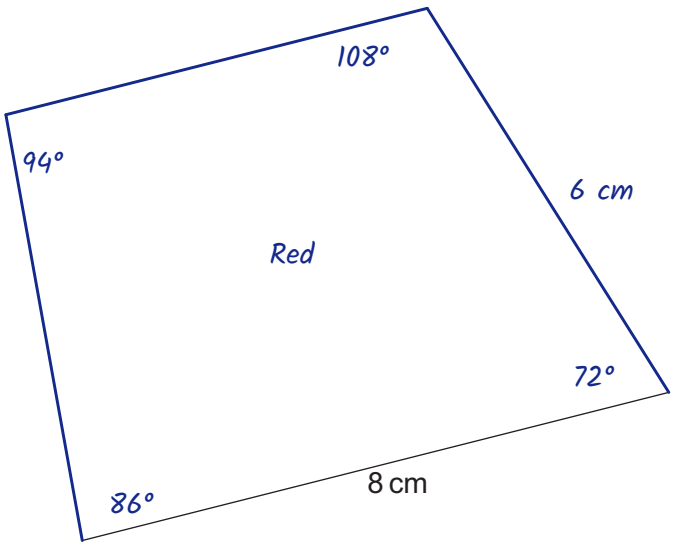
$b = 180° - 72° = 108°$ (co-interior angles, parallel lines)

$c = 180° - 86° = 94°$ (angles on a straight line)

$d = 180° - 94° = 86°$ (co-interior angles, parallel lines)

a = 72 °, b = 108 °, c = 94 °, d = 86 °

Space for drawing the red piece of jigsaw:



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8. Bethan builds a rectangular sheep pen.

(a) The perimeter fence of the sheep pen is 18 m long.
It costs her £1.10 for every 0·5 metres of fencing used to make the sheep pen.

(i) Calculate the cost of the fencing used to make this sheep pen. [2]

Number of 0·5 m lengths = 18 ÷ 0·5 = 36

Cost = 36 × £1.10 = £39.60

Cost is £ 39.60

(ii) The length of Bethan's sheep pen is two times its width.
Find the length and width of this sheep pen.
You must show your working. [2]

Let width = w m, so length = 2w m

w + 2w + w + 2w = 18

6w = 18, so w = 3

Length = 2 × 3 = 6 m

Length is 6 metres

Width is 3 metres

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(b) Bethan decides to build a new sheep pen.
The perimeter fence of the new sheep pen is 16 m long.
The length of the new sheep pen is 3 metres longer than the width.

Form an equation and solve it to find the dimensions of this new sheep pen. [3]

Let width = x m, so length = x + 3 m

$x + (x + 3) + x + (x + 3) = 16$

$4x + 6 = 16$

$4x = 10$

$x = 2.5$, so width = 2.5 m

Length = 2.5 + 3 = 5.5 m

Length is 5.5 metres

Width is 2.5 metres

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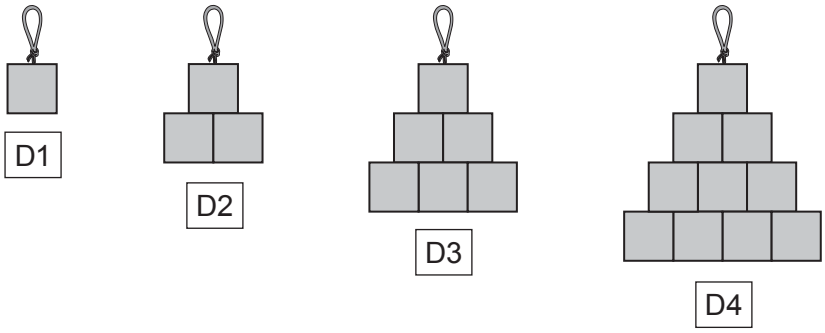
9. Ollie and Josef both have jobs in a workshop that makes decorations.

They make decorations using small squares of stained glass.

(a) Ollie has made the following decorations.



He labels the first decoration D1.
He labels the next 3 decorations in order, D2, D3 and D4.

He continues to make decorations and labels following this pattern.

(i) After making decoration D5, Ollie notices he only has 10 small squares of stained glass left.
How many **more** squares of stained glass will Ollie need to make decoration D6? [2]

D5 uses 5 + 4 + 3 + 2 + 1 = 15 squares

D6 uses 6 + 5 + 4 + 3 + 2 + 1 = 21 squares

More squares needed = 21 − 10 = 11 squares

(ii) Ollie uses a rule to work out how many squares he needs for each decoration.
He states that to make decoration D10 he would need 55 squares.
Is Ollie correct?
You must show your working. [1]

D10 uses 10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 55 squares

Yes, Ollie is correct.

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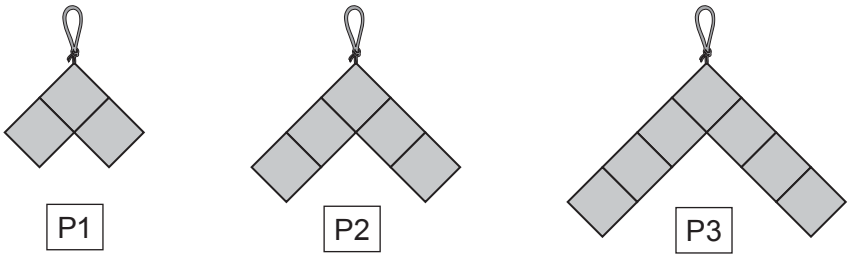
(b) Josef has made the following three decorations using small squares of stained glass.



Josef labels these patterns P1, P2 and P3 in order.

Josef continues to make decorations following the pattern he has started.

(i) How many **more** squares would he need to make pattern P22 than to make pattern P18? [1]

P1 = 3, P2 = 5, P3 = 7, so Pn uses 2n + 1 squares

P22 = 45, P18 = 37, 45 − 37 = 8 more squares

(ii) Josef has 22 squares.

Josef states,

'I think I can make one complete decoration using **all** 22 squares, with none left over.'

Is Josef correct?

Yes ☐ No ☑

Give a reason for your answer. [1]

Every pattern uses an odd number of squares (2n + 1) and 22 is even;

P10 uses 21 and P11 uses 23, so there is always one left over or short.

(iii) Each small square of stained glass measures 0·5 cm by 0·5 cm.
The perimeter of one of Josef's decorations is 10 cm.
Complete the label that Josef would use for this decoration. [2]

P 4

Number of square edges round the outside = 10 ÷ 0·5 = 20

P1 has 8 edges, P2 has 12, P3 has 16, P4 has 20

So the decoration is P4

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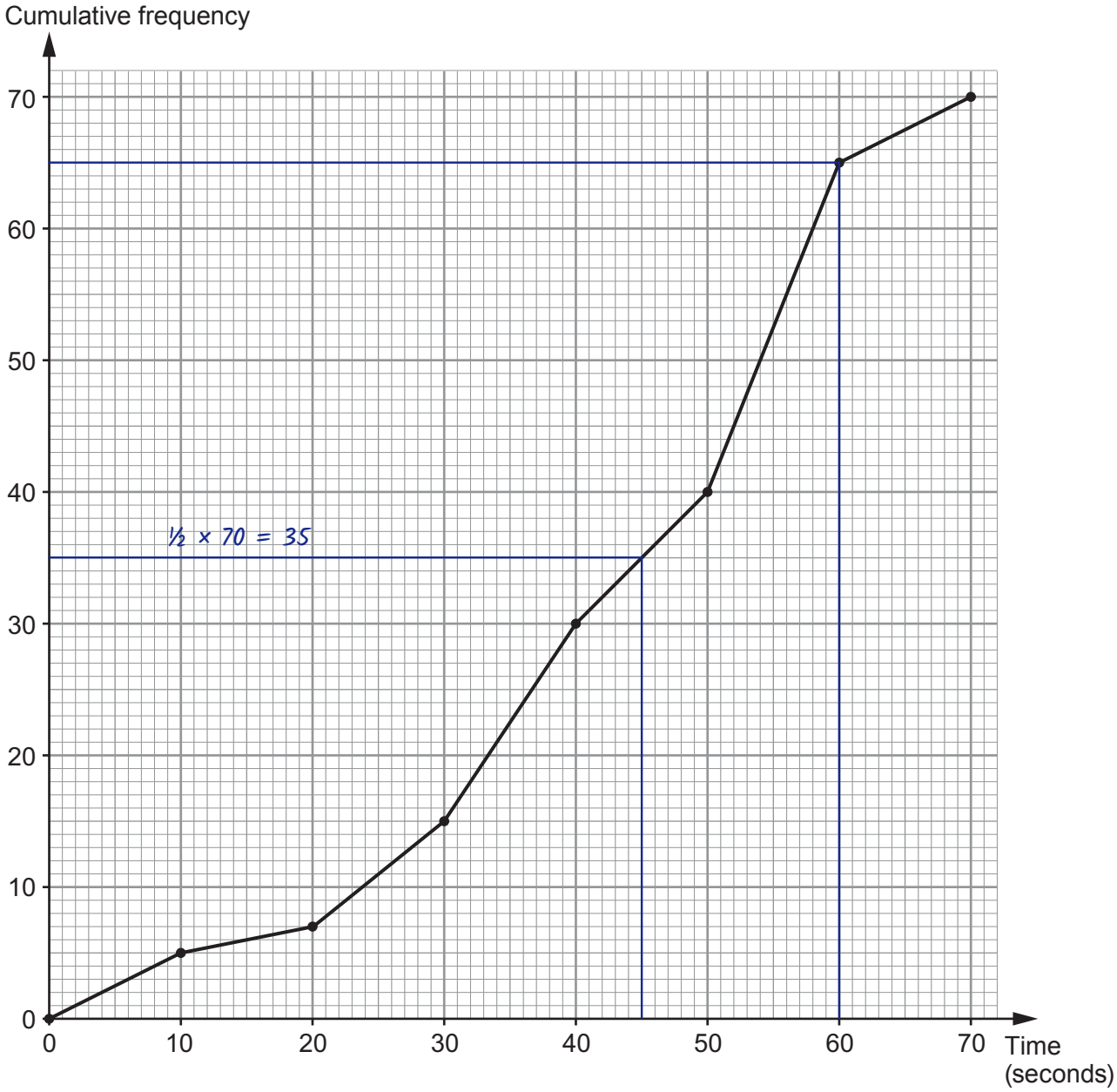
10. *Cambria Airlines* has planes that can carry up to 70 passengers.
For safety, the crew practise the emergency exit procedures with a group of 70 passengers.
Every 10 seconds the safety officer records the total number of passengers who have left the plane.
He has displayed the results in the cumulative frequency diagram shown below.



(a) Estimate the median time taken by the passengers to leave the plane. [1]

.....45..... seconds

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(b) How many passengers took more than 50 seconds to leave the plane?
Circle your answer. [1]

10 20 30 40 50

(c) *Cambria Airlines* has a policy that states the following.

'In the event of an emergency exit procedure, at least 90% of the 70 passengers must have left the plane within 1 minute.'

Did the practice emergency exit procedure meet the requirements of the airline's policy?
You must show all your working. [4]

90% of 70 = 0·9 × 70 = 63 passengers must leave within 1 minute.

From the graph, at 60 seconds (1 minute) 65 passengers had left.

65 passengers is more than 63 passengers (65/70 is about 93%).

Conclusion: Yes, the practice emergency exit procedure met the requirements of the airline's policy.

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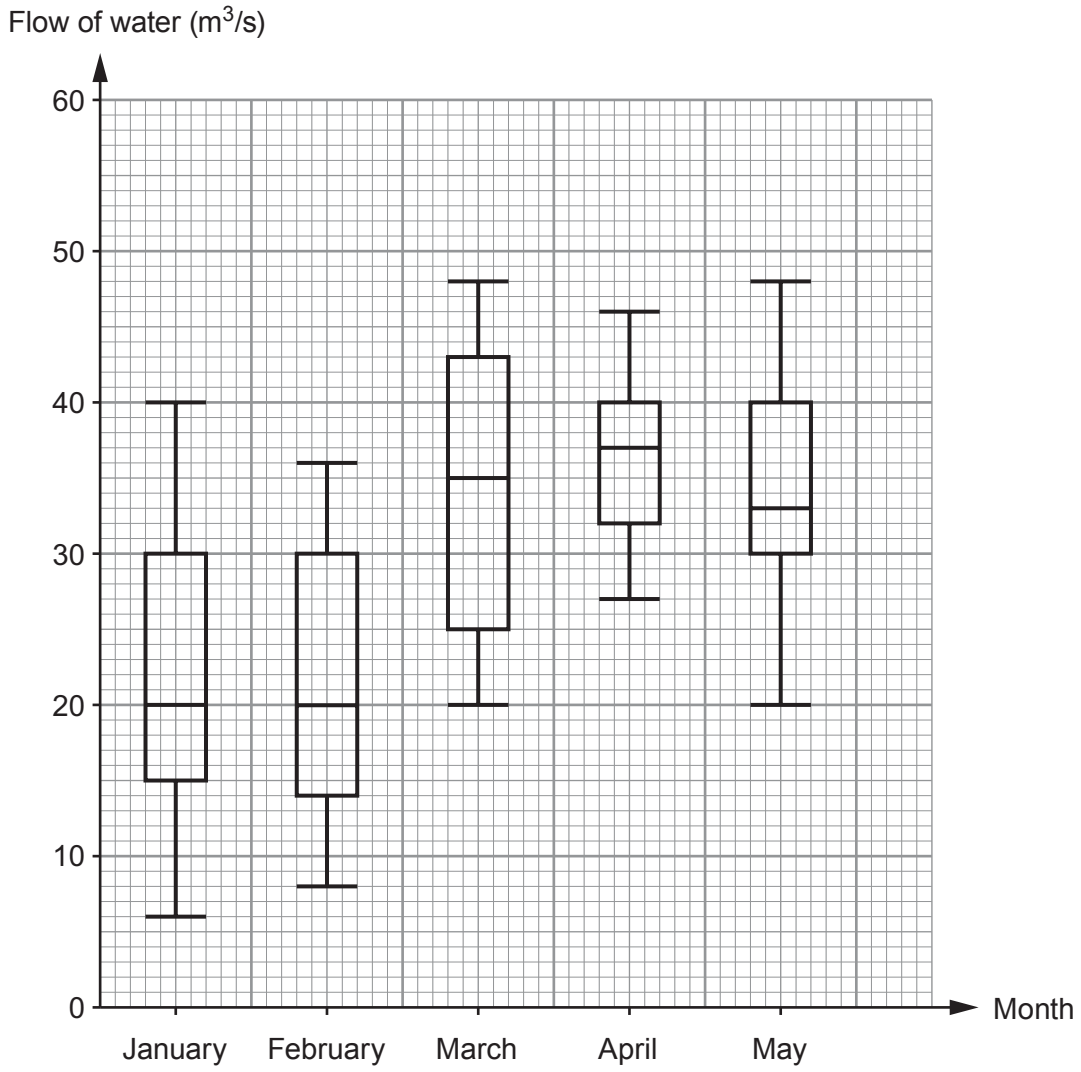
11. The following box and whisker plots show the flow of water through a drain, measured in m^3/s. The flow of water was measured at 11 a.m. each day for the first 5 months of the year.



(a) In which of the five months was the median flow of water the greatest? [1]

April

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(b) In which of the five months was the range of the flow of water the greatest? [1]

January

(c) Iona is writing some statements for a report on the flow of water through the drain. Complete each of the statements given below.

(i) 'Both the upper quartiles and medians in the months of January and February were the same.' [1]

(ii) '25% of the results in March show the flow of water was greater than 43 m^3/s.' [1]

(d) Circle either TRUE or FALSE for each of the following statements. [2]

25% of the results in January show the flow of water was less than 6 m^3/s.	TRUE	FALSE
The units, m^3/s, measure the volume of water passing through the drain each second.	TRUE	FALSE
The mean flow of water in April was **certainly** greater than 36 m^3/s.	TRUE	FALSE
The month with the greatest difference between the lower quartile and the median was May.	TRUE	FALSE

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12. *(a)* A standard piece of A4 paper is usually 0·08 mm thick.
What is 0·08 mm written in **metres** in standard form?
Circle your answer. [1]

8×10^4 8×10^{-4} 8×10^{-3} 8×10^3 8×10^{-5}

$0{\cdot}08$ mm $= 0{\cdot}08 \div 1000$ m $= 0{\cdot}00008$ m $= 8 \times 10^{-5}$ m

(b) A piece of card is 1 mm thick.
A stack of these pieces of card is 3×10^{-2} metres high.

(i) Calculate how many pieces of card there are in the stack. [2]

3×10^{-2} m $= 0{\cdot}03$ m $= 0{\cdot}03 \times 1000$ mm $= 30$ mm

Number of pieces $= 30$ mm $\div 1$ mm $= 30$

30 pieces of card

(ii) What assumption have you made in answering *(b)*(i)? [1]

There are no gaps between the pieces of card and every piece of card is exactly 1 mm thick.

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(c) In 2012 it was recorded that
- the total mass of the paper used for printing newspapers, in the world, was $2{\cdot}88 \times 10^7$ **tonnes**,
- the world population was approximately $7{\cdot}2 \times 10^9$ people.

Use this information to calculate the mass of paper per person used to print newspapers in 2012.
Give your answer in **kg per person**. [4]

1 tonne = 1000 kg

Mass of paper = $2{\cdot}88 \times 10^7 \times 1000 = 2{\cdot}88 \times 10^{10}$ kg

Mass per person = $2{\cdot}88 \times 10^{10} \div (7{\cdot}2 \times 10^9)$

$= (2{\cdot}88 \div 7{\cdot}2) \times 10^{10-9}$

$= 0{\cdot}4 \times 10$

= 4 kg per person

Mass of paper: 4 kg per person

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