

**GCSE – NEW 3310U50-1**

**MATHEMATICS – NUMERACY**

**UNIT 1: NON – CALCULATOR**

**HIGHER TIER**

**THURSDAY, 25 MAY**

**2017 – MORNING**

**1 hour 45 minutes**

**(plus your additional  
time allowance)**

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	9	
2.	3	
3.	5	
4.	4	
5.	6	
6.	6	
7.	8	
8.	5	
9.	11	
10.	13	
11.	10	
<b>Total</b>	<b>80</b>	

**THE USE OF A  
CALCULATOR IS  
NOT PERMITTED IN  
THIS EXAMINATION**

<b>Surname:</b>	
<b>Other Names:</b>	
<b>Centre Number:</b>	
<b>Candidate Number:</b>	<b>0</b>

**ADDITIONAL MATERIALS**

**A ruler, a protractor and a pair of compasses may be required.**

**ITEMS INCLUDED WITH QUESTION PAPER**

**A separate Formula List.**

**A separate Diagram Booklet.**

**A spare Diagram Booklet.**

**Model for Question 11.**

**(Turn over)**

**INSTRUCTIONS TO CANDIDATES**

**Use black ink, black ball – point pen, black felt tip or your usual method.**

**Write your name, centre number and candidate number in the spaces on the front cover.**

**Answer ALL questions.**

**Write your answers in the spaces provided.**

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

**Take  $\pi$  as 3.14**

**(Turn over)**

**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 1 (b), the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.**

**(Turn over)**

1. (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.

How much money did Bryn and Sophie each win?

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(Turn over)



**Question 1 continued**

- 1. (b) IN THIS PART OF THE QUESTION, YOU WILL BE ASSESSED ON THE QUALITY OF YOUR ORGANISATION, COMMUNICATION AND ACCURACY IN WRITING.**

**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**

**Continued on the next page . . .**

**(Turn over)**

**Question 1 (b) continued**

**Calculate the cost of putting  
on the summer 2017 talent  
contest.**

**You must show all your  
working.**

**[3 marks + 2 marks OCW]**

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**(Turn over)**



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- 2. Look at the diagrams for Question 2 in the separate Diagram Booklet.**

**The diagrams show frequency polygons.**

**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.**

**Diagram (i) shows the frequency polygon for 16 – year – old students and Diagram (ii) shows the frequency polygon for 18 – year – old students.**

**continued on the next page . . .**

**(Turn over)**

**Question 2 continued**

The frequency polygons, which use equal time intervals, illustrate the results.

- (a) How many 16 – year – old students took part in the survey?

Circle your answer.

60	70	210	230	2300
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[1 mark]

(Turn over)

**Question 2 continued**

**2. (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.**

<b>20</b>	<b>40</b>	<b>60</b>	<b>100</b>	<b>250</b>
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**[1 mark]**

**(Turn over)**

**Question 2 continued**

**2. (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?**

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**(Turn over)**



3. Bethan builds a rectangular sheep pen.

The diagram is NOT drawn to scale.



- (a) The perimeter fence of the sheep pen is 18 m long.  
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.

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**Length is \_\_\_\_\_ metres**

**Width is \_\_\_\_\_ metres**

**[2 marks]**

**continued on the next page . . .**

**(Turn over)**

**Question 3 continued**

**3. (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.**

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**(Turn over)**

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**Length is \_\_\_\_\_ metres**

**Width is \_\_\_\_\_ metres**

**[3 marks]**

**(Turn over)**

4. **Look at the diagram for Question 4 in the separate Diagram Booklet.**

**Josef has a job in a workshop that makes decorations.**

**He has made the three decorations shown in the diagram 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.**

**continued on the next page . . .**

**(Turn over)**

**Question 4 continued**

- 4. (a) How many MORE squares would he need to make pattern P22 than to make pattern P18?**

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**[1 mark]**

**(Turn over)**

**Question 4 continued**

**4. (b) 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.**

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**(Turn over)**

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[1 mark]

4. (c) 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.

**P** \_\_\_\_\_

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(Turn over)

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**[2 marks]**

**(Turn over)**

5. Look at the diagram for Question 5 in the separate Diagram Booklet. The diagram is a cumulative frequency diagram.

**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.

(Turn over)

**Question 5 continued**

5. (a) Estimate the median time taken by the passengers to leave the plane.

\_\_\_\_\_ seconds

[1 mark]

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

10	20	30	40	50
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[1 mark]

(Turn over)

**Question 5 continued**

- 5. (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.**

**(Turn over)**



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**[4 marks]**

**(Turn over)**

**6. Look at the diagram for Question 6 in the separate Diagram Booklet. The diagram is a set of box and whisker plots.**

**The box and whisker plots show the flow of water through a drain, measured in  $\text{m}^3/\text{s}$**

**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?**

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**(Turn over)**

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[1 mark]

6. (b) In which of the five months was the range of the flow of water the greatest?

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[1 mark]

continued on the next page . . .

(Turn over)

**Question 6 continued**

**6. (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**

**\_\_\_\_\_ and**

**\_\_\_\_\_ were the same.'**

**[1 mark]**

**(ii) '25% of the results in March show the flow of water was greater than**

**\_\_\_\_\_ m<sup>3</sup>/s.' [1 mark]**

**(Turn over)**

**Question 6 continued**

- 6. (d) Look at the table for Question 6 (d) in the separate Diagram Booklet.**

**Circle either TRUE or FALSE for each of the statements shown.**

**[2 marks]**

**(Turn over)**

7. (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.

$8 \times 10^4$
$8 \times 10^{-4}$
$8 \times 10^{-3}$
$8 \times 10^3$
$8 \times 10^{-5}$

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[1 mark]  
(Turn over)

**Question 7 continued**

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

**(i) Calculate how many  
pieces of card there are  
in the stack.**

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**(Turn over)**

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**[2 marks]**

**continued on the next page . . .**

**(Turn over)**

**Question 7 (b) continued**

**7. (b) (ii) What assumption  
have you made in  
answering (b) (i)?**

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**[1 mark]**

**(Turn over)**

**Question 7 continued**

- 7. (c) In 2012 it was recorded that**
- the total mass of the paper used for printing newspapers, in the world, was  $2.88 \times 10^7$  TONNES,**
  - the world population was approximately  $7.2 \times 10^9$  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.**

**(Turn over)**





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Mass of paper:

\_\_\_\_\_ kg per person

[4 marks]

(Turn over)

8. On a new housing estate, teams of painters paint the walls and ceilings of houses once they are built.

(a) It takes a team of 5 painters 10 hours to paint a house that has a total wall and ceiling area of  $500 \text{ m}^2$

A new house on the estate has a total wall and ceiling area of  $600 \text{ m}^2$

This house has to be painted in 8 hours.

continued on the next page . . .

(Turn over)



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**[4 marks]**

**continued on the next page . . .**

**(Turn over)**

**Question 8 continued**

**8. (b) What assumption have you made in answering part (a)?**

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**[1 mark]**

**(Turn over)**

9. (a) Look at the diagram for Question 9 (a) in the separate Diagram Booklet.

The time taken to run 400 m was recorded for each member of a running club.

A histogram of the results for the members who are under 30 years of age is shown.

- (i) Calculate how many members of the running club are under 30 years of age.

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(Turn over)

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**[2 marks]**

**continued on the next page . . .**

**(Turn over)**

**Question 9 continued**

- 9. (a) (ii) Calculate an estimate of the median time taken by the under – 30s to run 400 m.**

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**[4 marks]**  
**(Turn over)**

**Question 9 continued**

9. (b) The frequency table below shows the results for the members who are 30 years of age or over.

<b>Time, <math>t</math> (seconds)</b>	<b>Number of people</b>	<b>Frequency density</b>
<b><math>50 &lt; t \leq 54</math></b>	<b>4</b>	
<b><math>54 &lt; t \leq 58</math></b>	<b>10</b>	
<b><math>58 &lt; t \leq 60</math></b>	<b>16</b>	
<b><math>60 &lt; t \leq 62</math></b>	<b>18</b>	
<b><math>62 &lt; t \leq 70</math></b>	<b>12</b>	

**continued on the next page . . .**

**(Turn over)**

**Question 9 (b) continued**

**Complete the table on the previous page, and draw a histogram to illustrate this data on the graph paper provided for Question 9 (b) in the separate Diagram Booklet.**

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**[4 marks]**

**continued on the next page . . .**

**(Turn over)**

**Question 9 continued**

**9. (c) On average, which of the two groups was faster at running 400 m?**

**Give a reason for your answer.**

**Your reason must be based on your interpretation of the histograms.**

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**[1 mark]**

**(Turn over)**

**10. Look at the diagram for Question 10 in the separate Diagram Booklet.**

**The graph shows a 120 – second section of Iestyn’s car journey to work this morning.**

- (a) (i) At  $t = 50$  seconds, estimate the acceleration of Iestyn’s car in  $\text{m/s}^2$**   
**Leave your answer as a fraction.**

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**(Turn over)**

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[3 marks]

10. (a) (ii) At another time, Iestyn calculated the acceleration of the car to be  $0.2\dot{4} \text{ m/s}^2$   
Write this recurring decimal as a fraction.

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[2 marks]  
(Turn over)

**Question 10 continued**

**10. (b) (i) Calculate an estimate of the distance travelled by Iestyn's car in the first 80 seconds of his journey.**

**You must consider the speed of the car when  $t = 0, 20, 40, 60$  and  $80$  seconds.**

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**(Turn over)**



**Question 10 (b) continued**

**10. (b) (ii) Hence, calculate an estimate of the average speed of Iestyn's car for this entire 120 – second section of his car journey.  
Give your answer in m/s.**

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**(Turn over)**

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**[4 marks]**

**(Turn over)**

**11. Ask for the model for Question 11.  
The model is NOT made to scale.**

**The model represents a wooden  
end – piece for a curtain pole.**

**It is in the shape of a cone with  
a vertical height of 12 cm, and  
a base diameter of 10 cm.**

**Look at the diagram for  
Question 11 in the separate  
Diagram Booklet.**

**The diagram is NOT drawn to scale.**

**The diagram is a simplified  
2D diagram of the model.**

**continued on the next page . . .**

**(Turn over)**

**Question 11 continued**

**The curtain pole sits in a cylindrical hole that has been drilled into the end – piece.**

**The hole is of radius 3 cm and depth 4 cm.**

**(a) Show that the volume of wood that remains is  $64\pi\text{cm}^3$**

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**(Turn over)**

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**[4 marks]**

**continued on the next page . . .**

**(Turn over)**

**Question 11 continued**

**11. (b) The surface area of the end – piece is to be painted, except for the area inside the hole.**

**Calculate the surface area that is to be painted.**

**Give your answer in terms of  $\pi$**

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**(Turn over)**











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**3310U50-1**



**MATHEMATICS – NUMERACY**

**UNIT 1: NON – CALCULATOR**

**HIGHER TIER**

**THURSDAY, 25 MAY 2017 – MORNING**

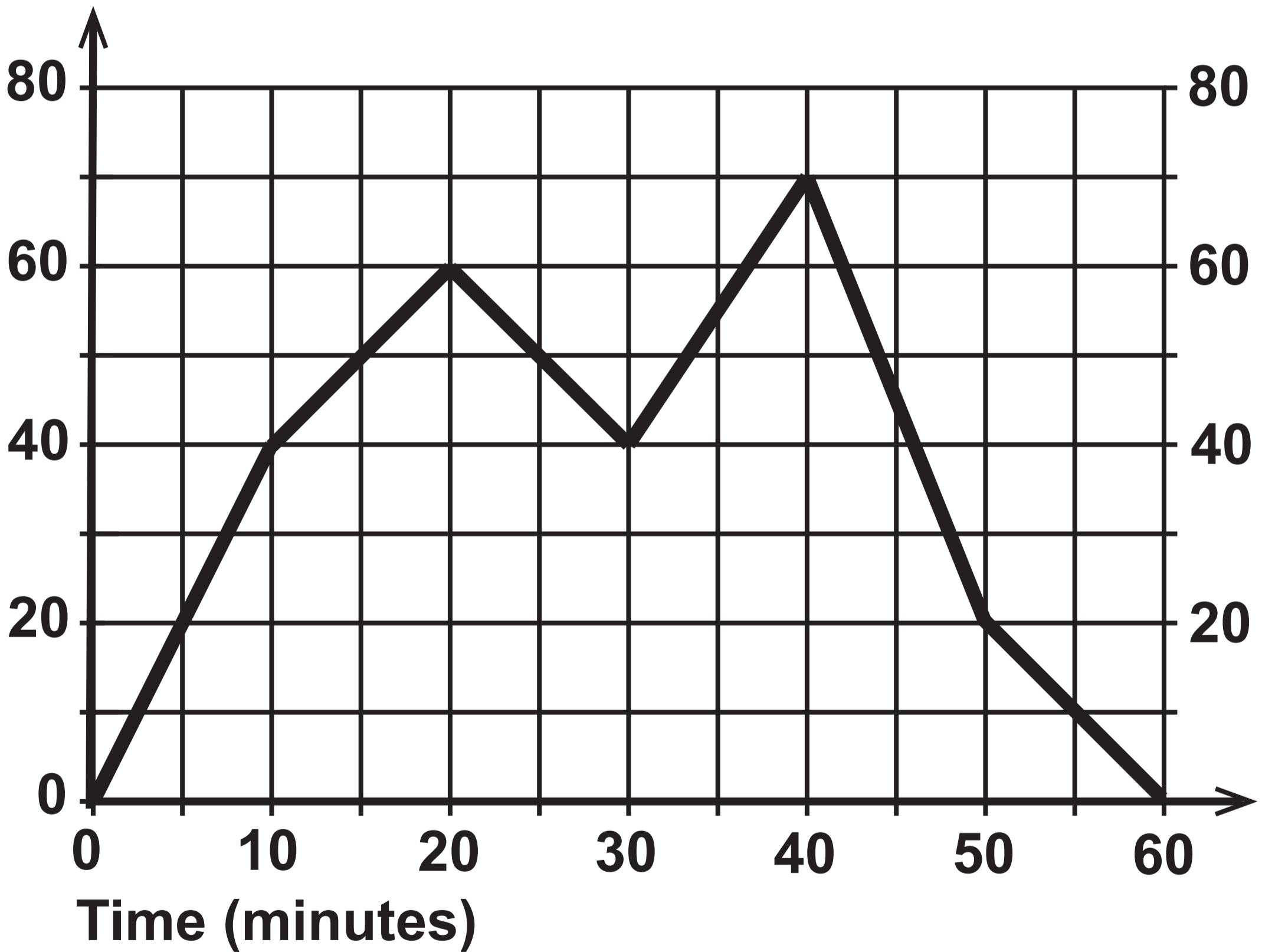
# **Diagram Booklet**

<b>Surname:</b>	
<b>Other Names:</b>	
<b>Centre Number:</b>	
<b>Candidate Number:</b>	<b>0</b>

**Question 2**  
**Diagram (i)**

**16 – year – old students**

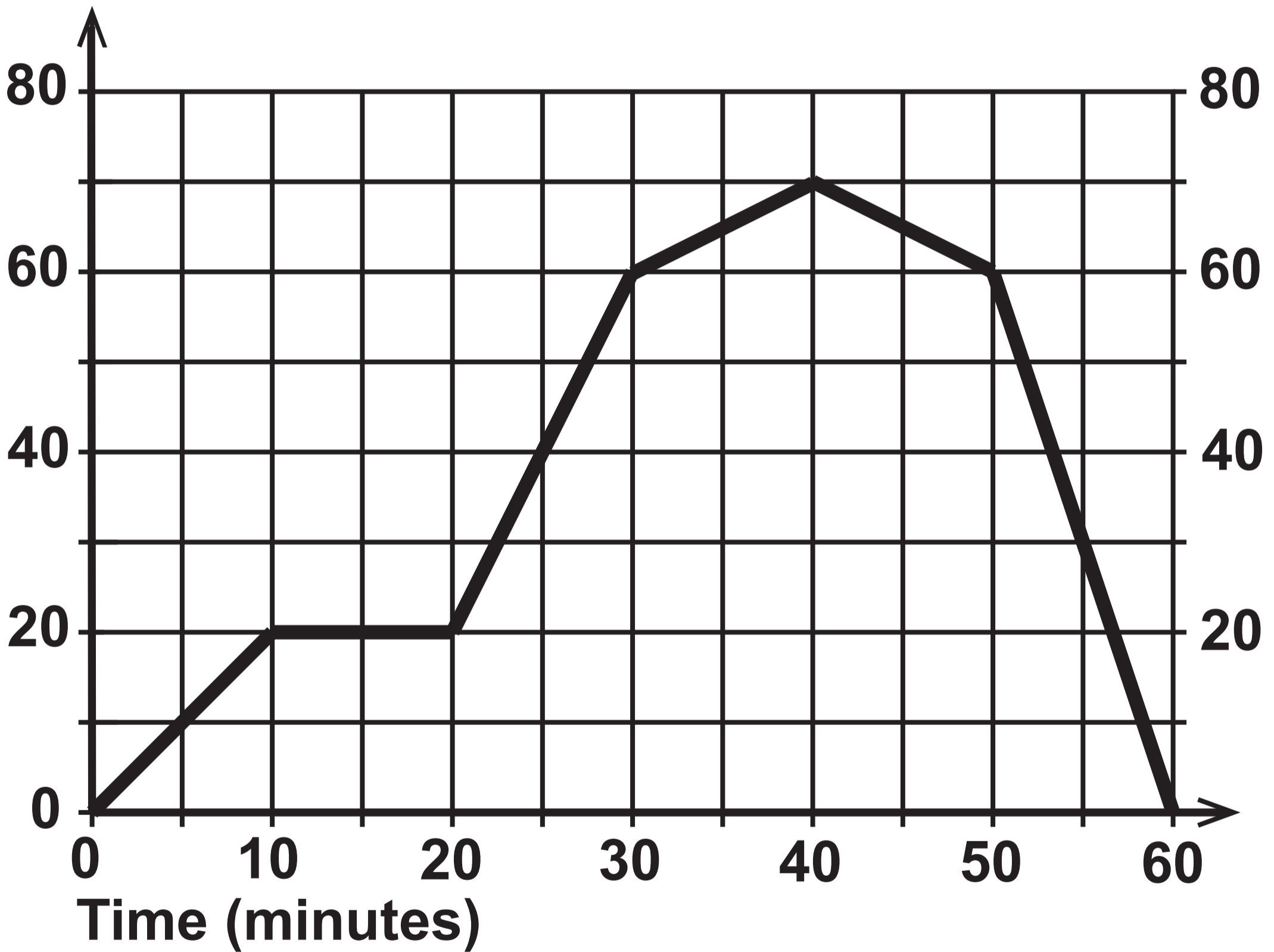
**Frequency**



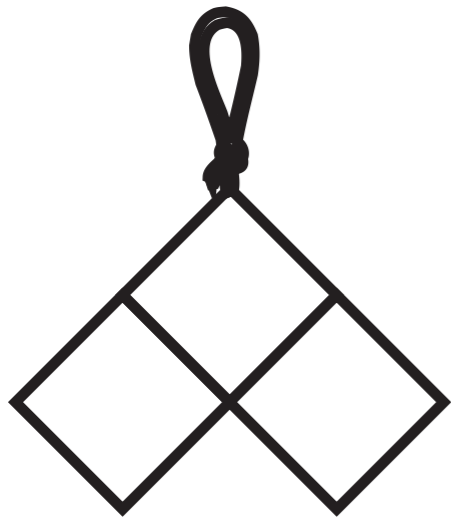
**Question 2**  
**Diagram (ii)**

**18 – year – old students**

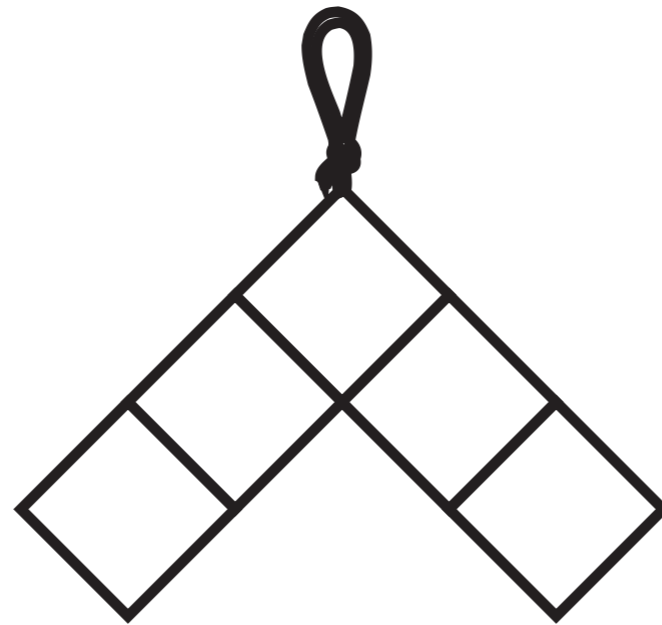
**Frequency**



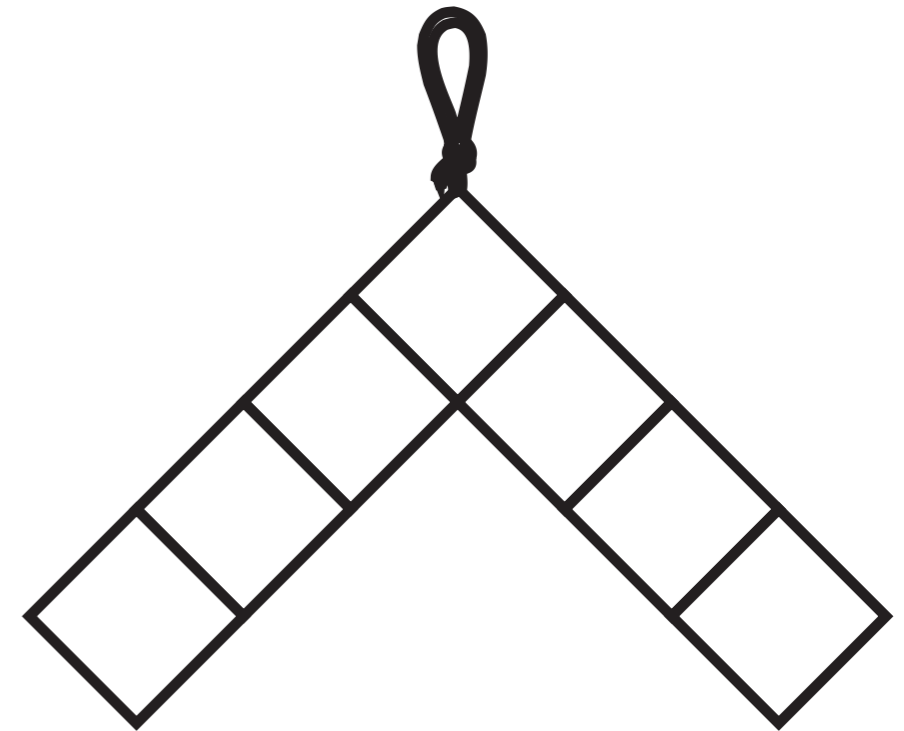
# Question 4



**P1**



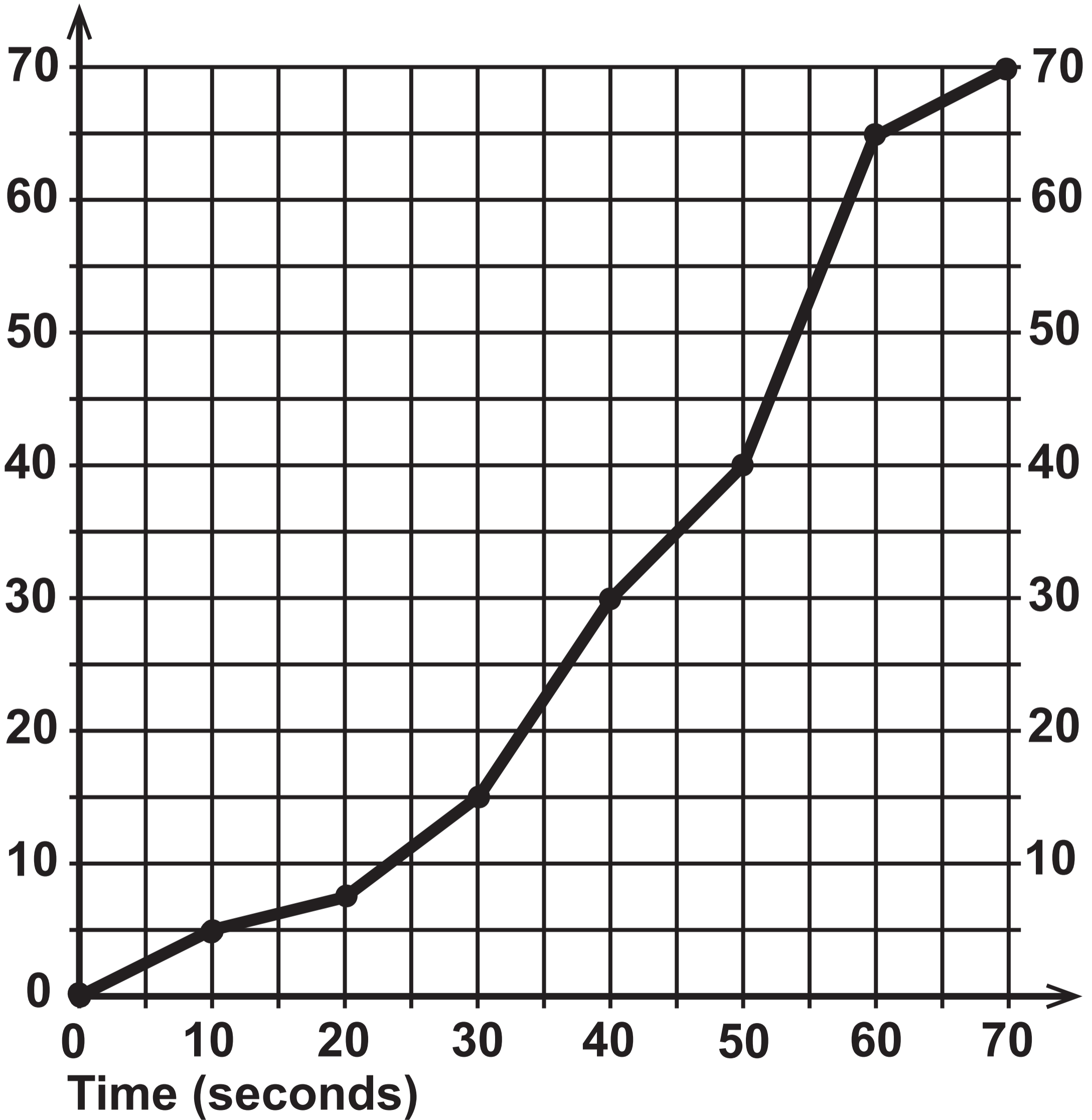
**P2**



**P3**

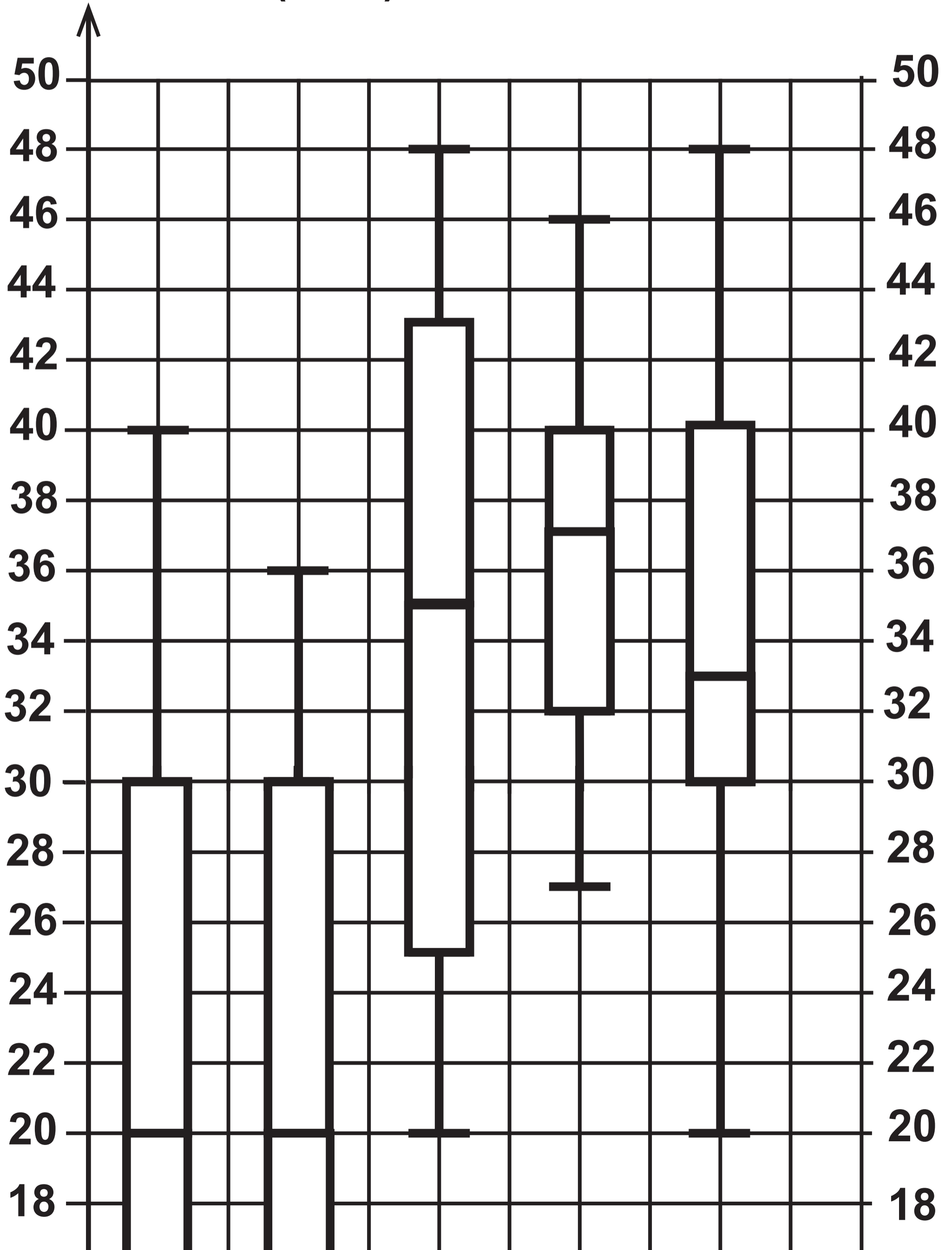
# Question 5

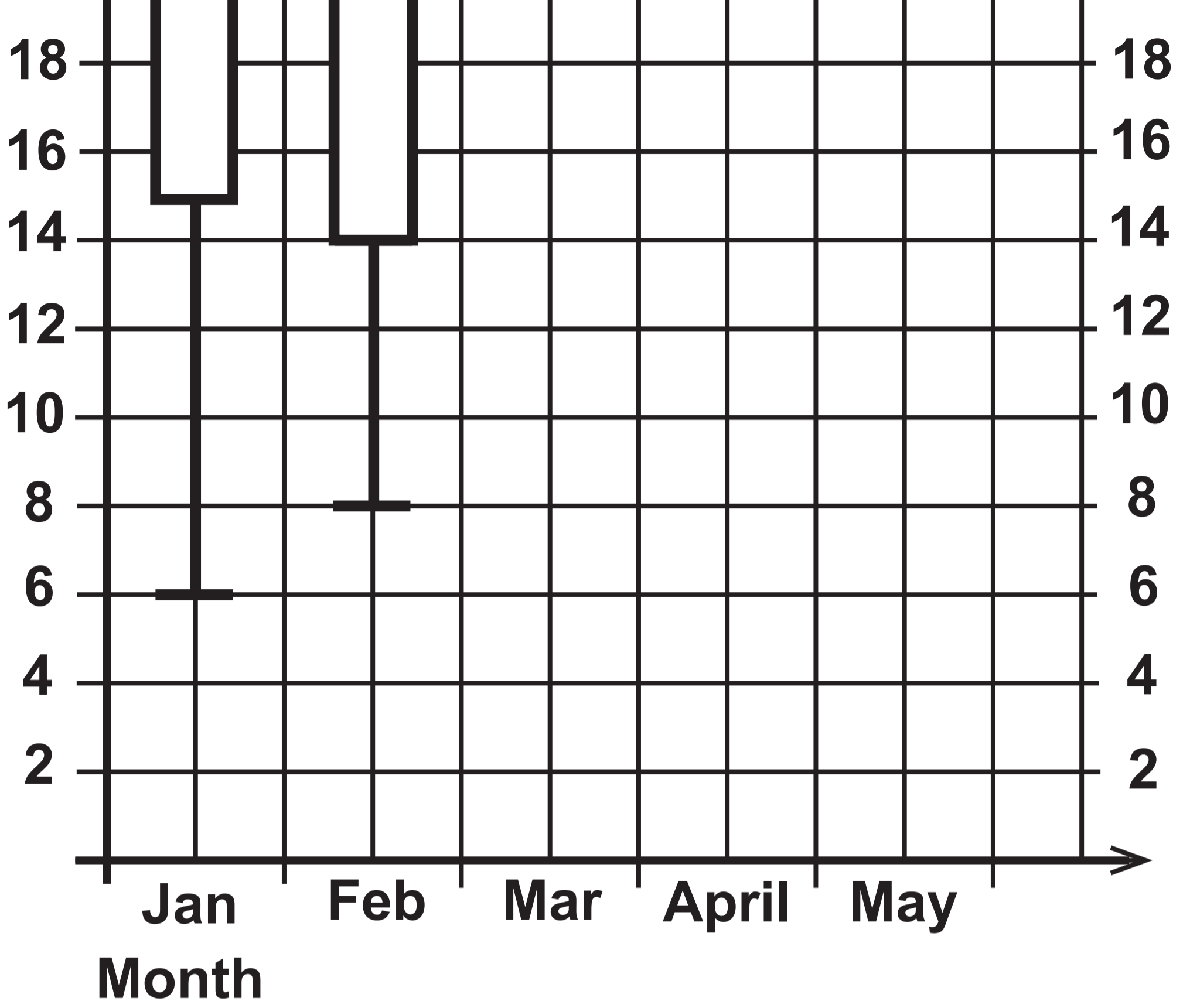
Cumulative frequency



# Question 6

Flow of water ( $\text{m}^3/\text{s}$ )





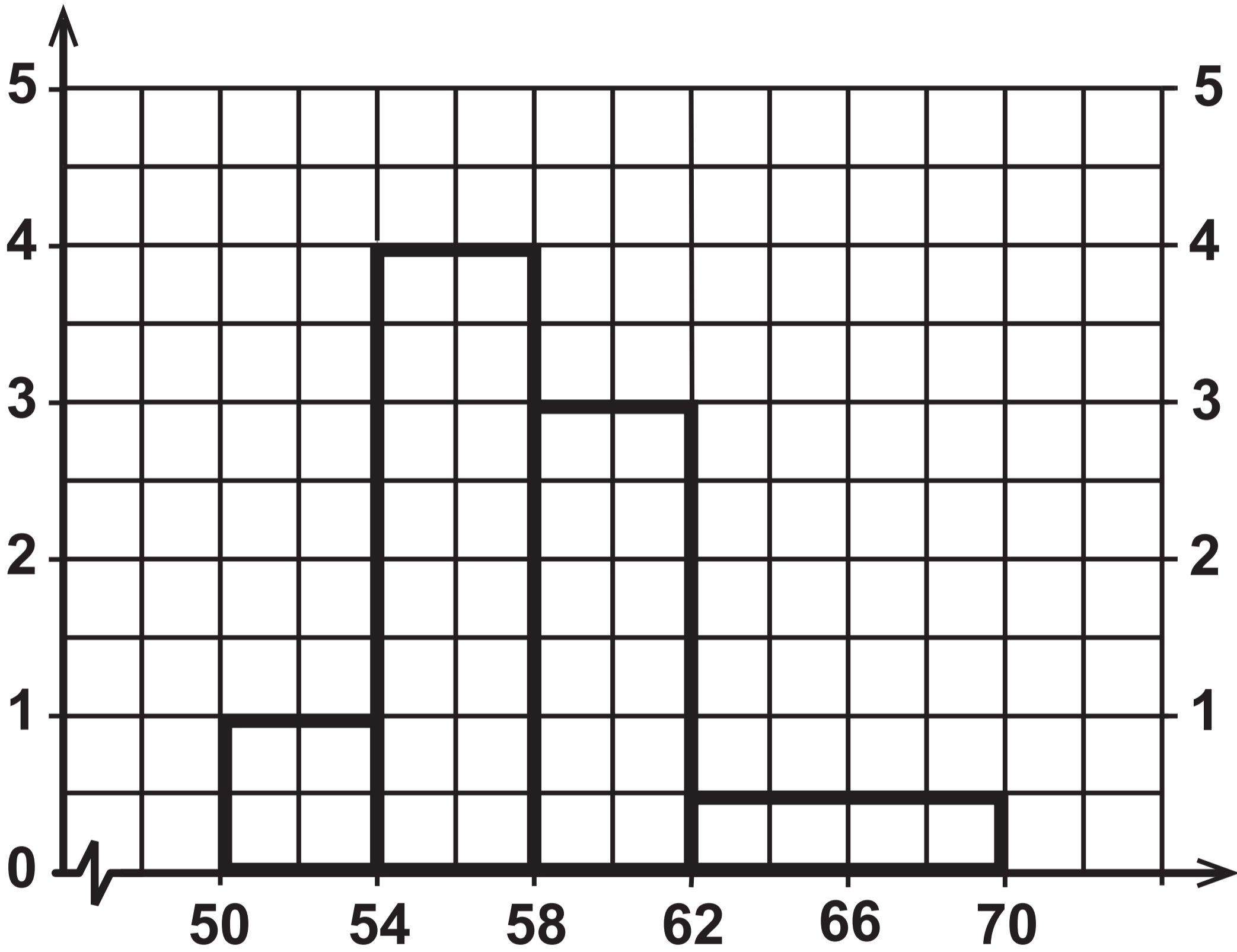
## Question 6 (d)

### Table

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

# Question 9 (a)

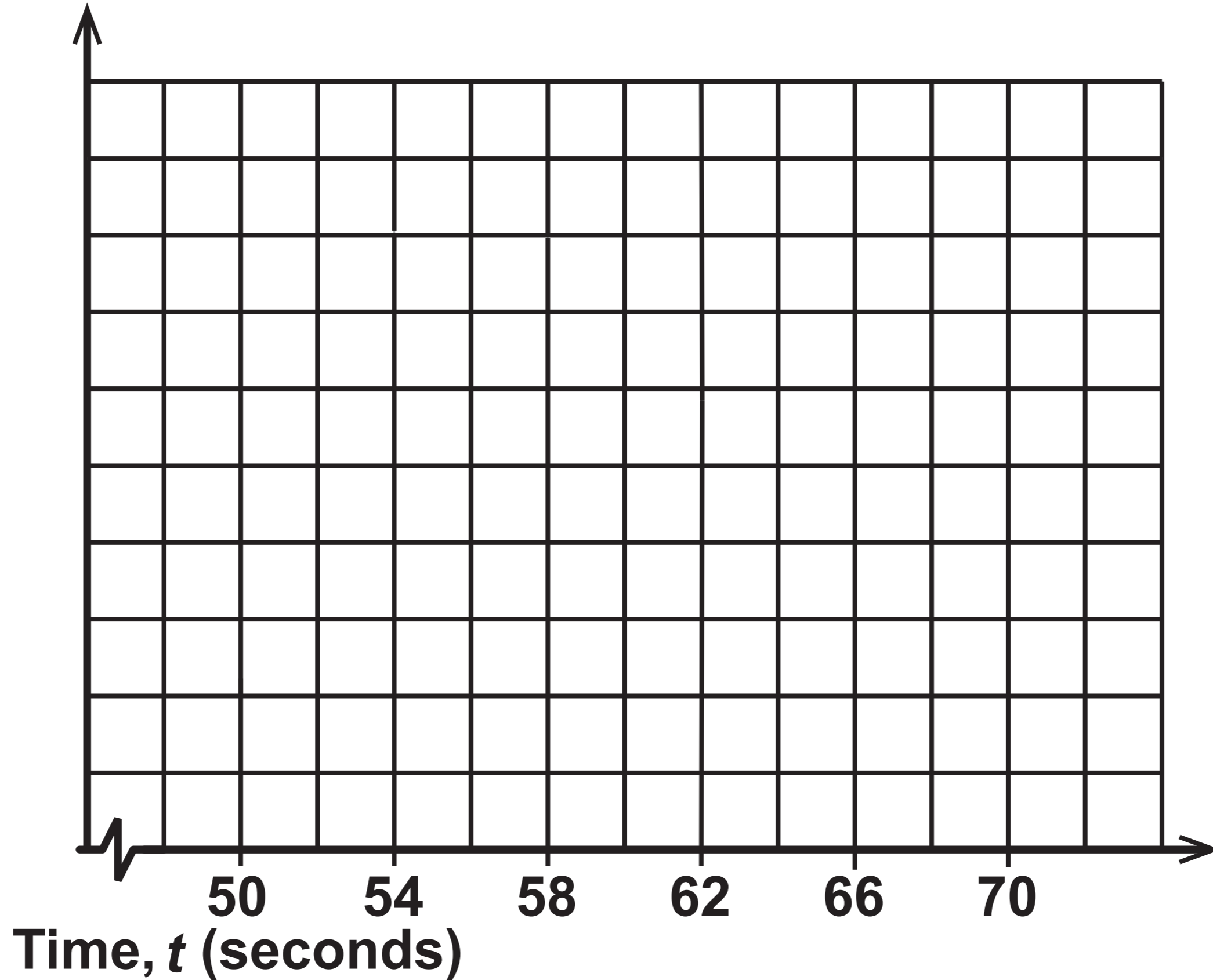
Frequency density



Time (seconds)

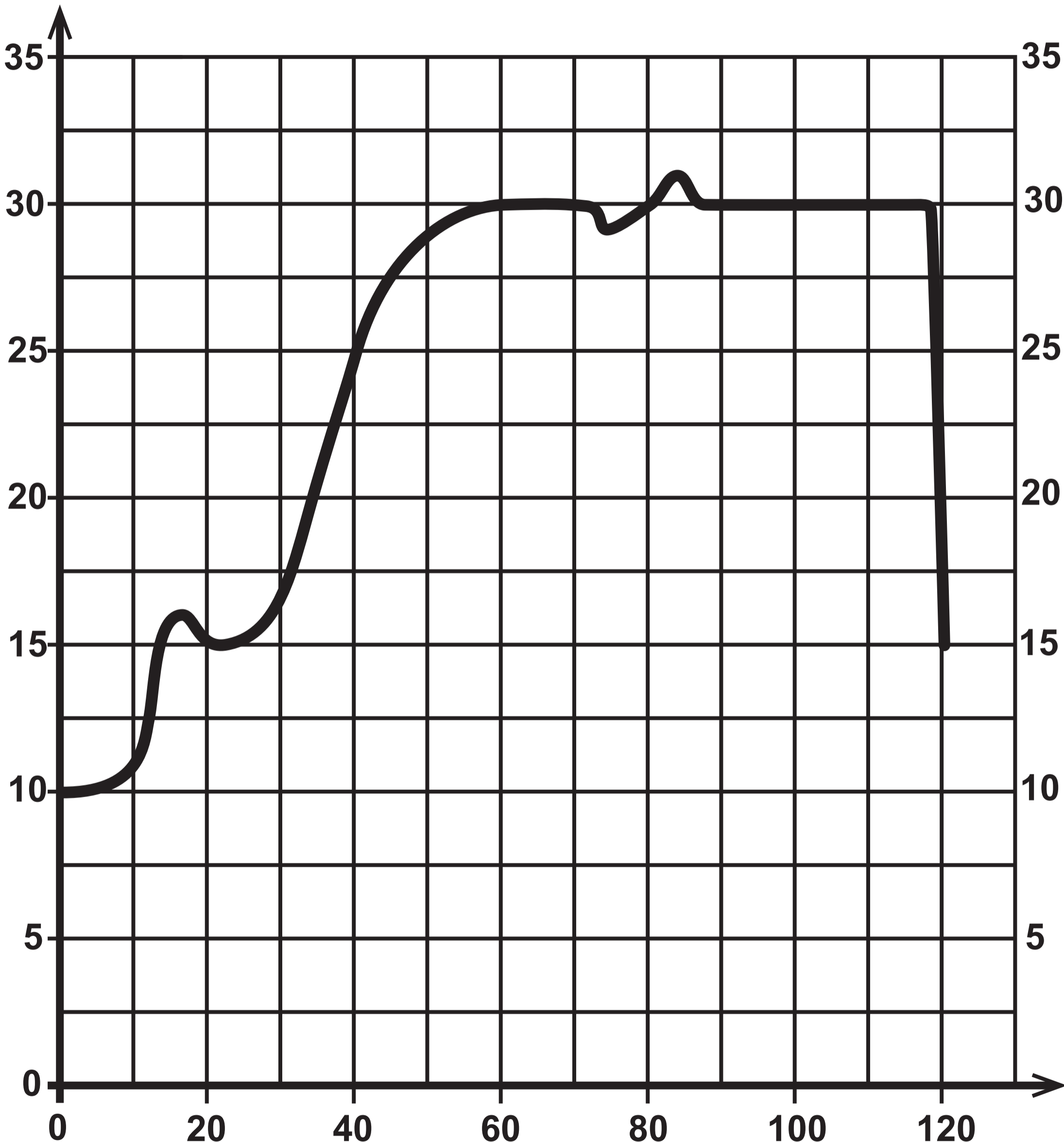
# Question 9 (b)

Frequency density



# Question 10

Speed (metres per second)

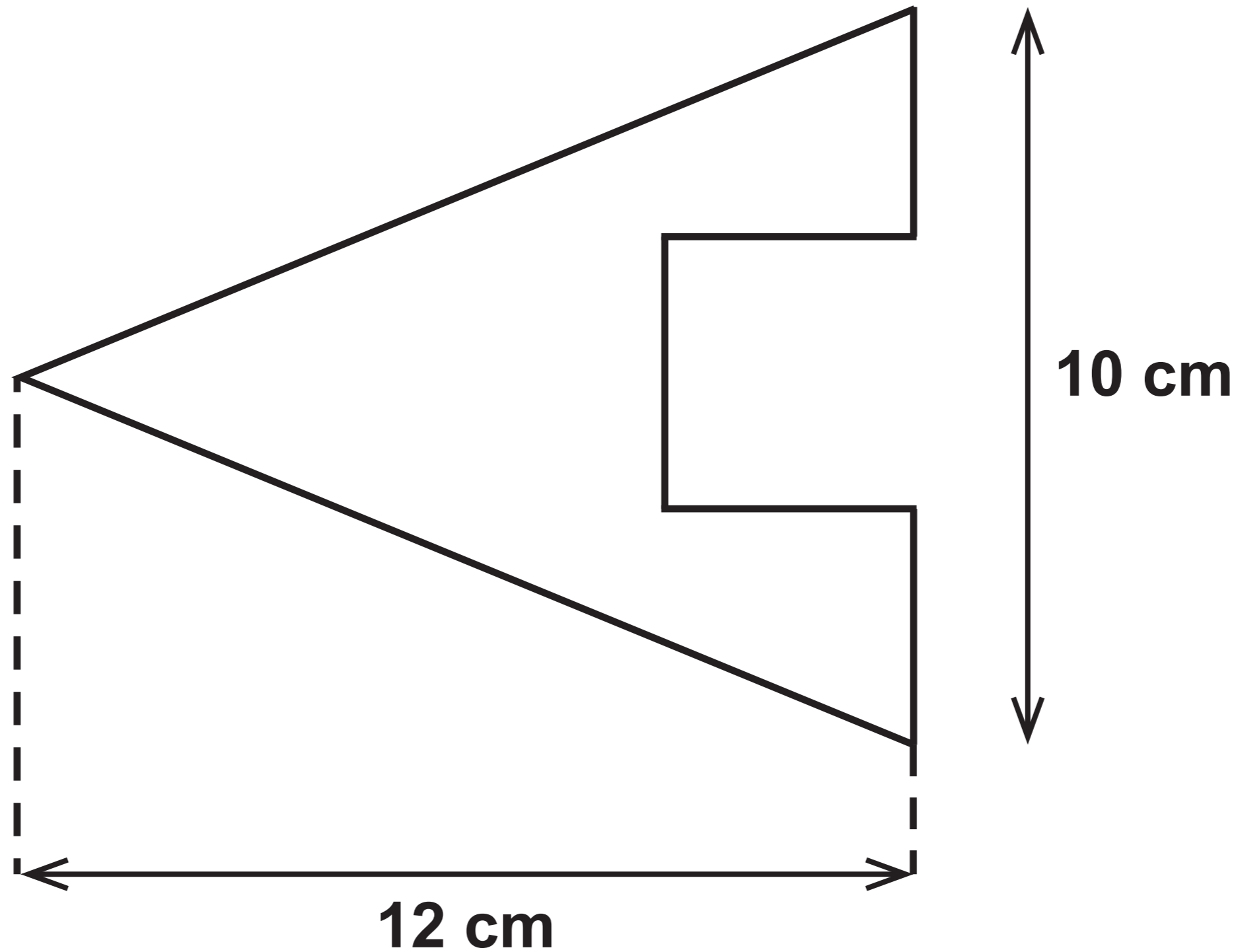


Time,  $t$  (seconds)

# Question 11

## Simplified 2D diagram

Diagram NOT drawn to scale



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**MATHEMATICS – NUMERACY**

**UNIT 1: NON – CALCULATOR**

**HIGHER TIER**

**THURSDAY, 25 MAY 2017 – MORNING**

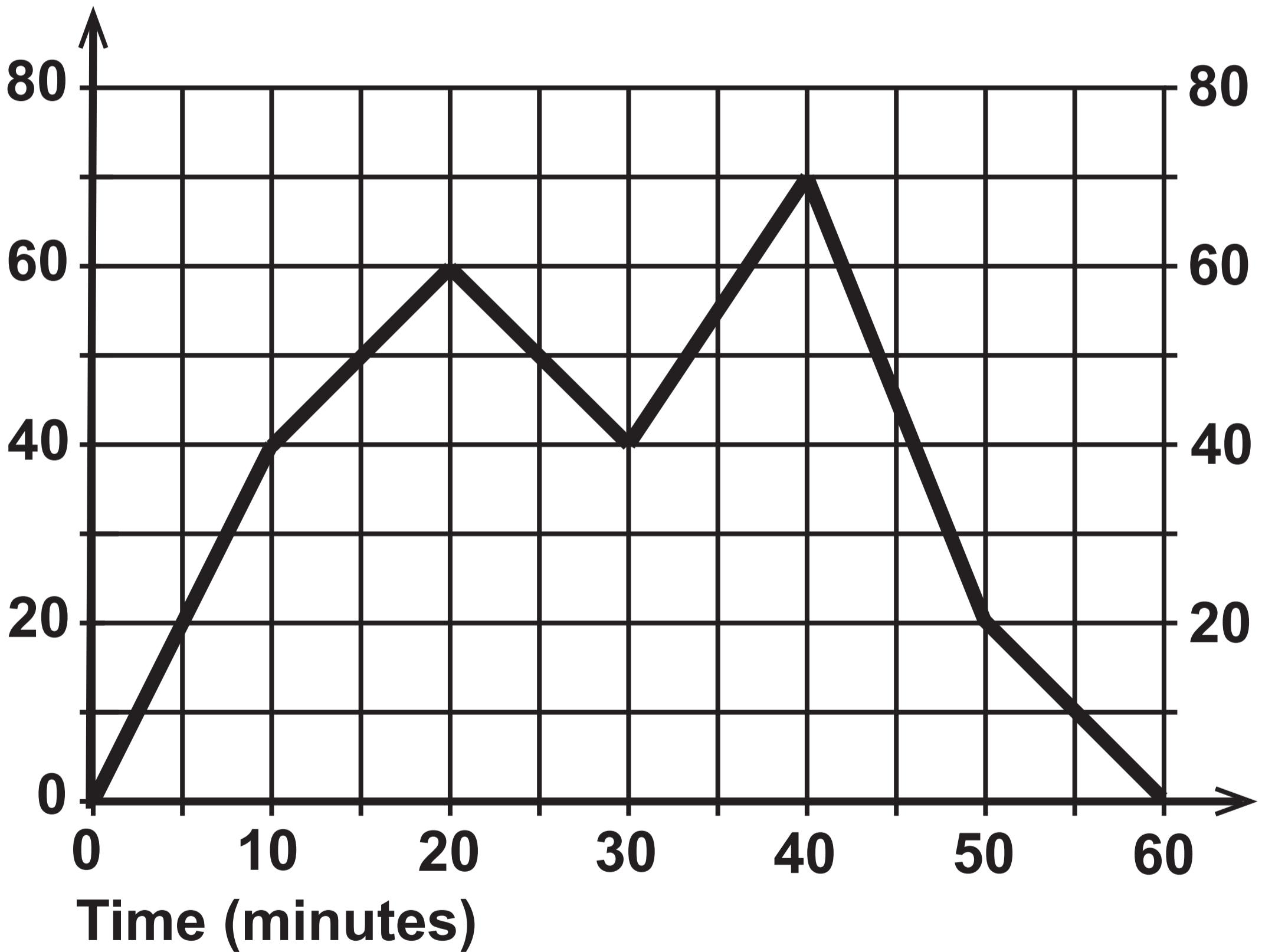
# **Spare Diagram Booklet**

<b>Surname:</b>	
<b>Other Names:</b>	
<b>Centre Number:</b>	
<b>Candidate Number:</b>	<b>0</b>

**Question 2**  
**Diagram (i)**

**16 – year – old students**

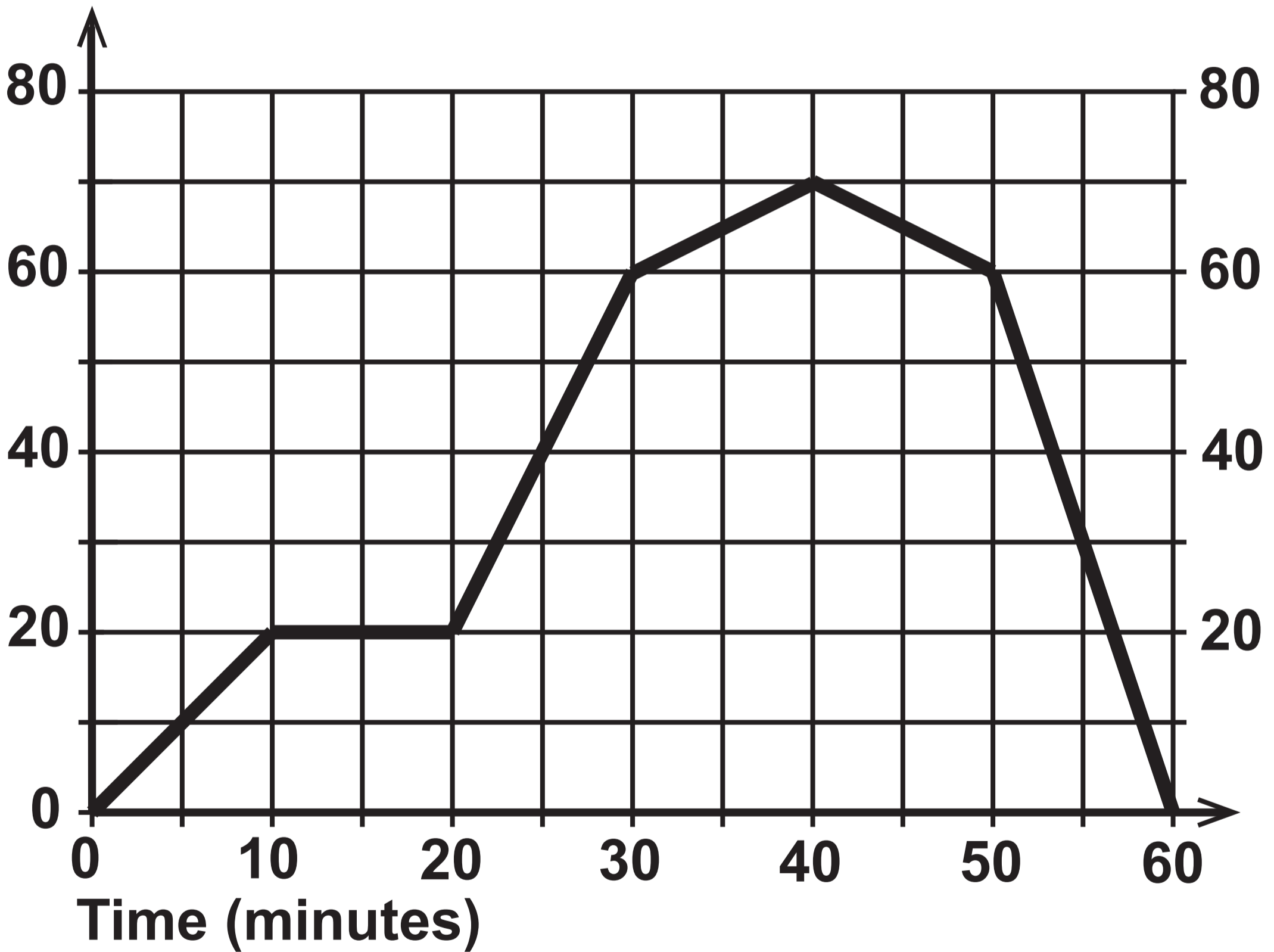
**Frequency**



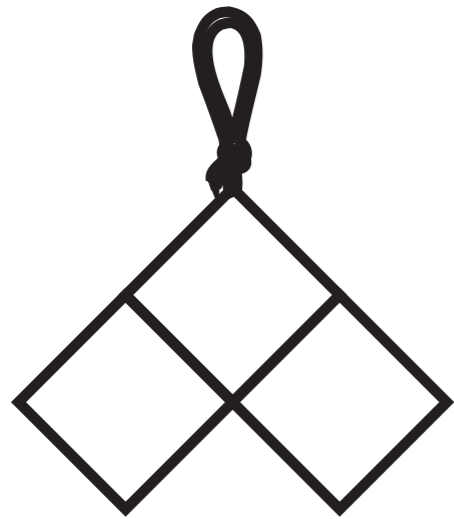
**Question 2**  
**Diagram (ii)**

**18 – year – old students**

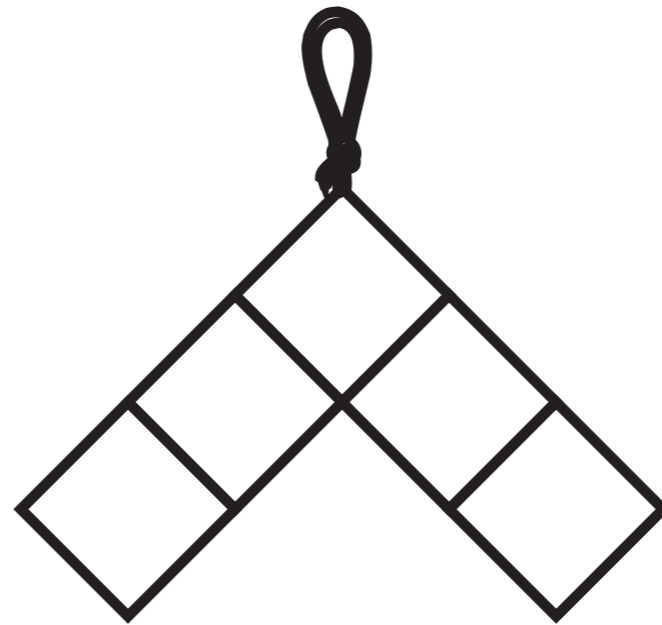
**Frequency**



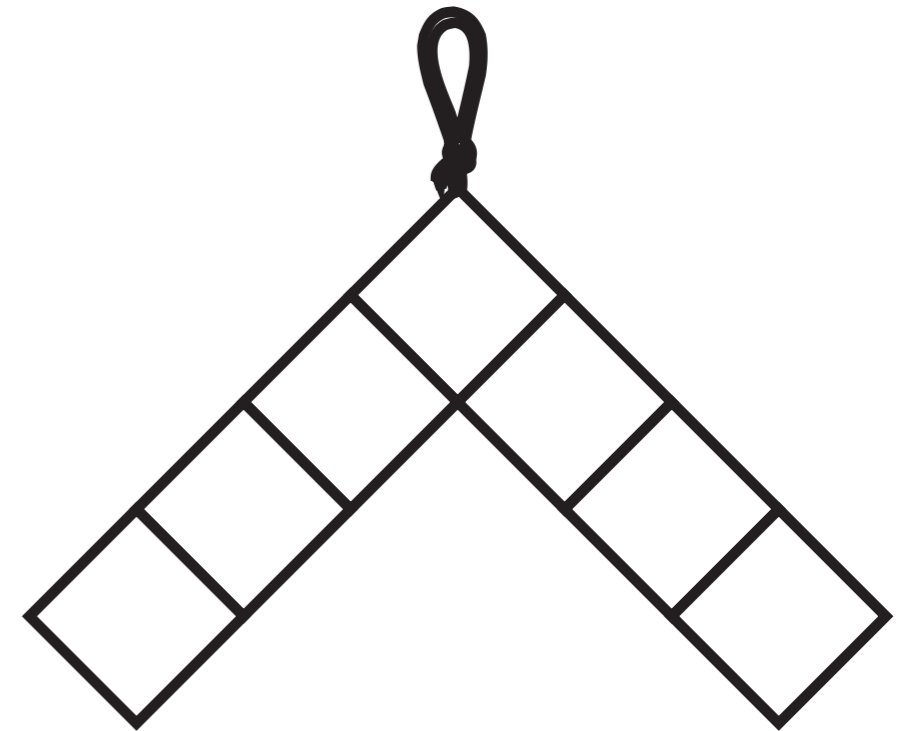
# Question 4



**P1**



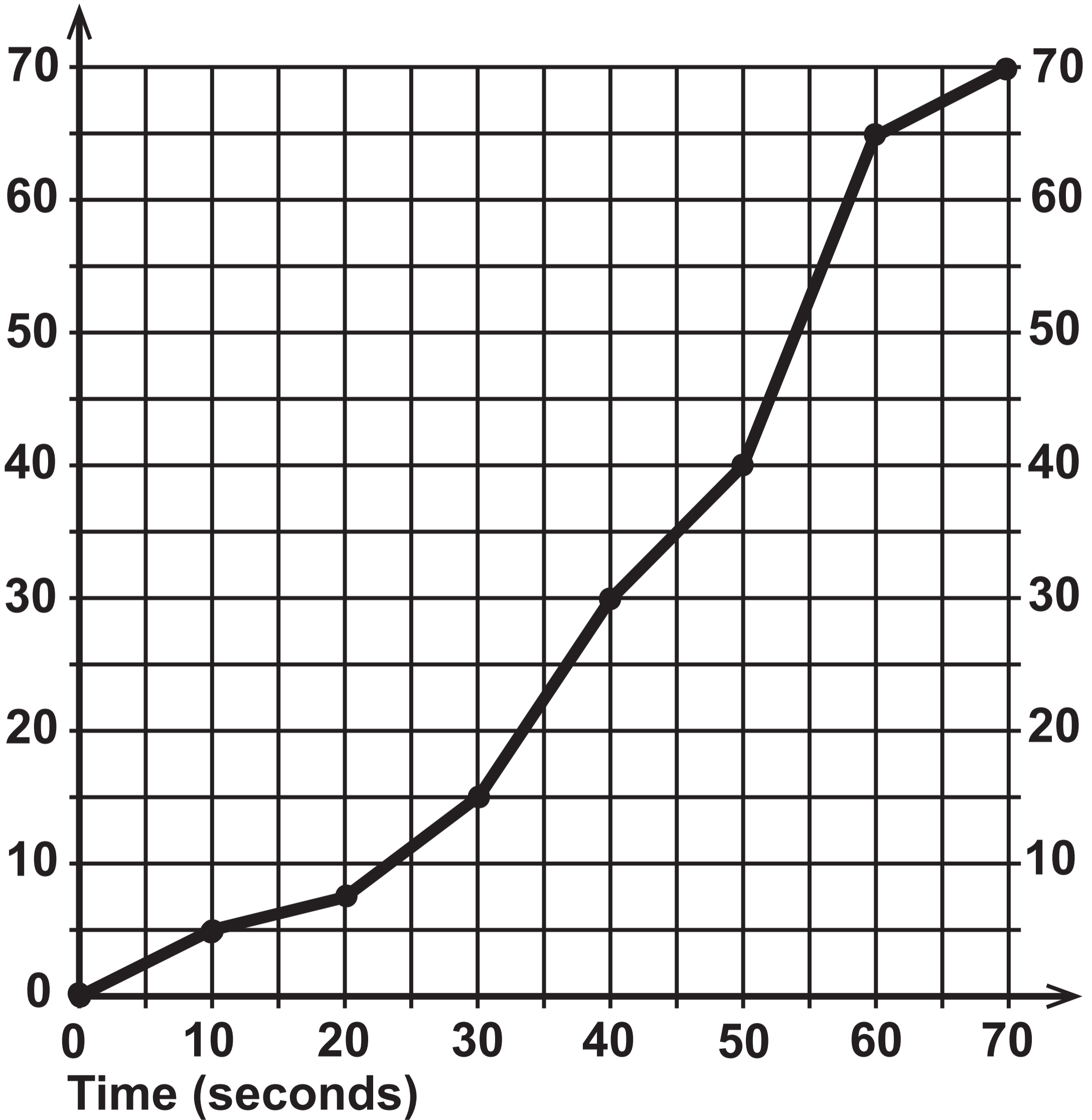
**P2**



**P3**

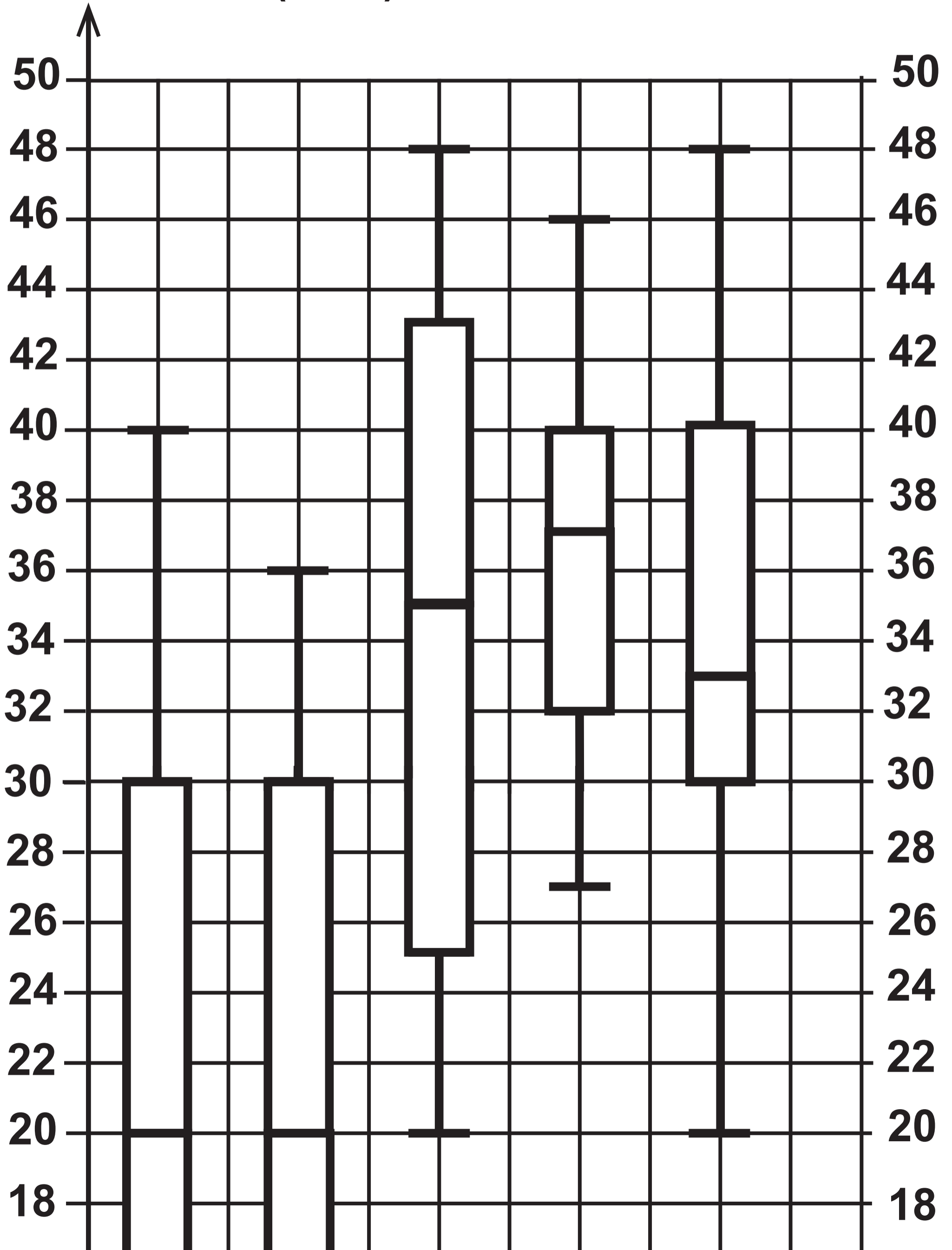
# Question 5

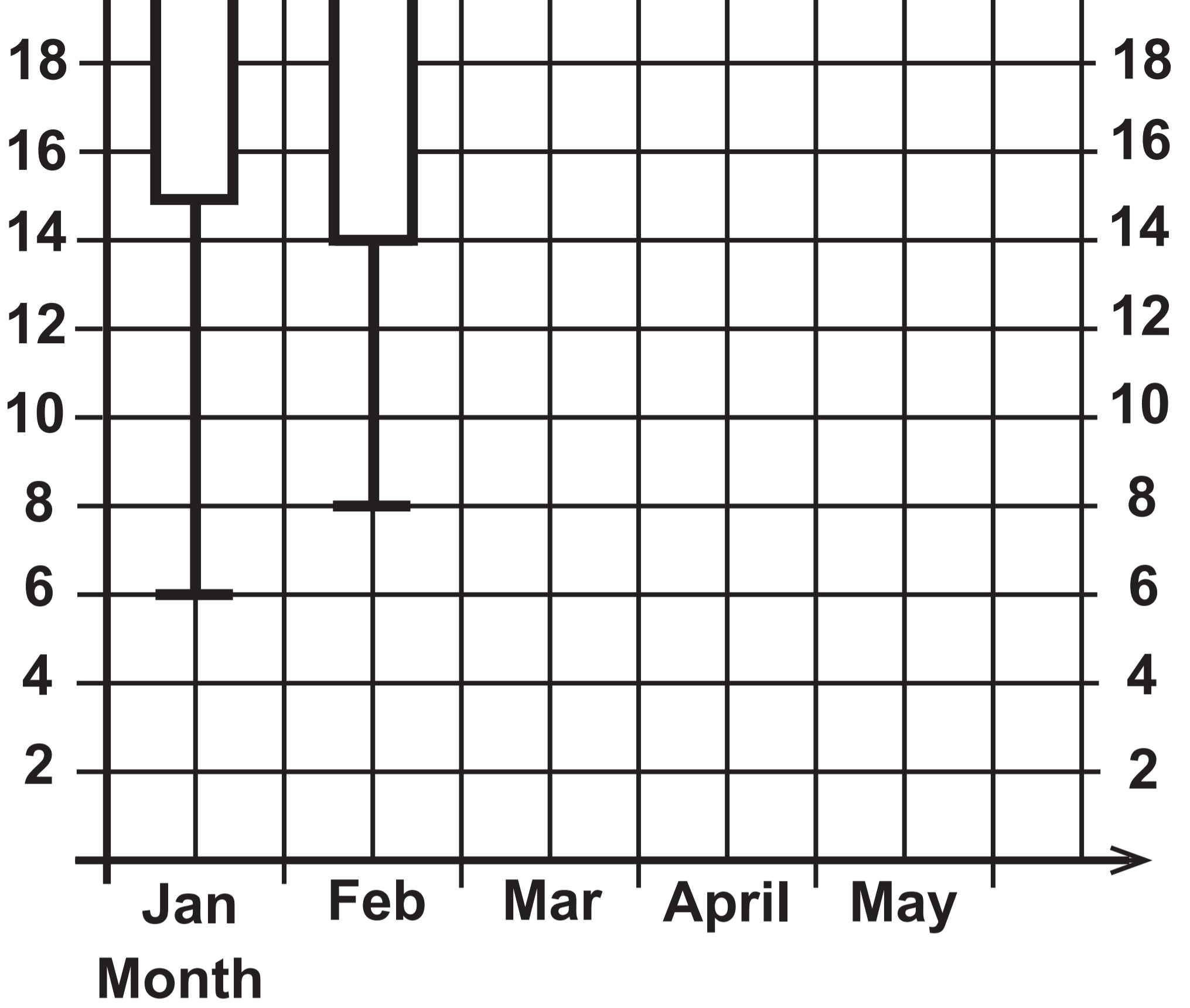
Cumulative frequency



# Question 6

Flow of water ( $\text{m}^3/\text{s}$ )





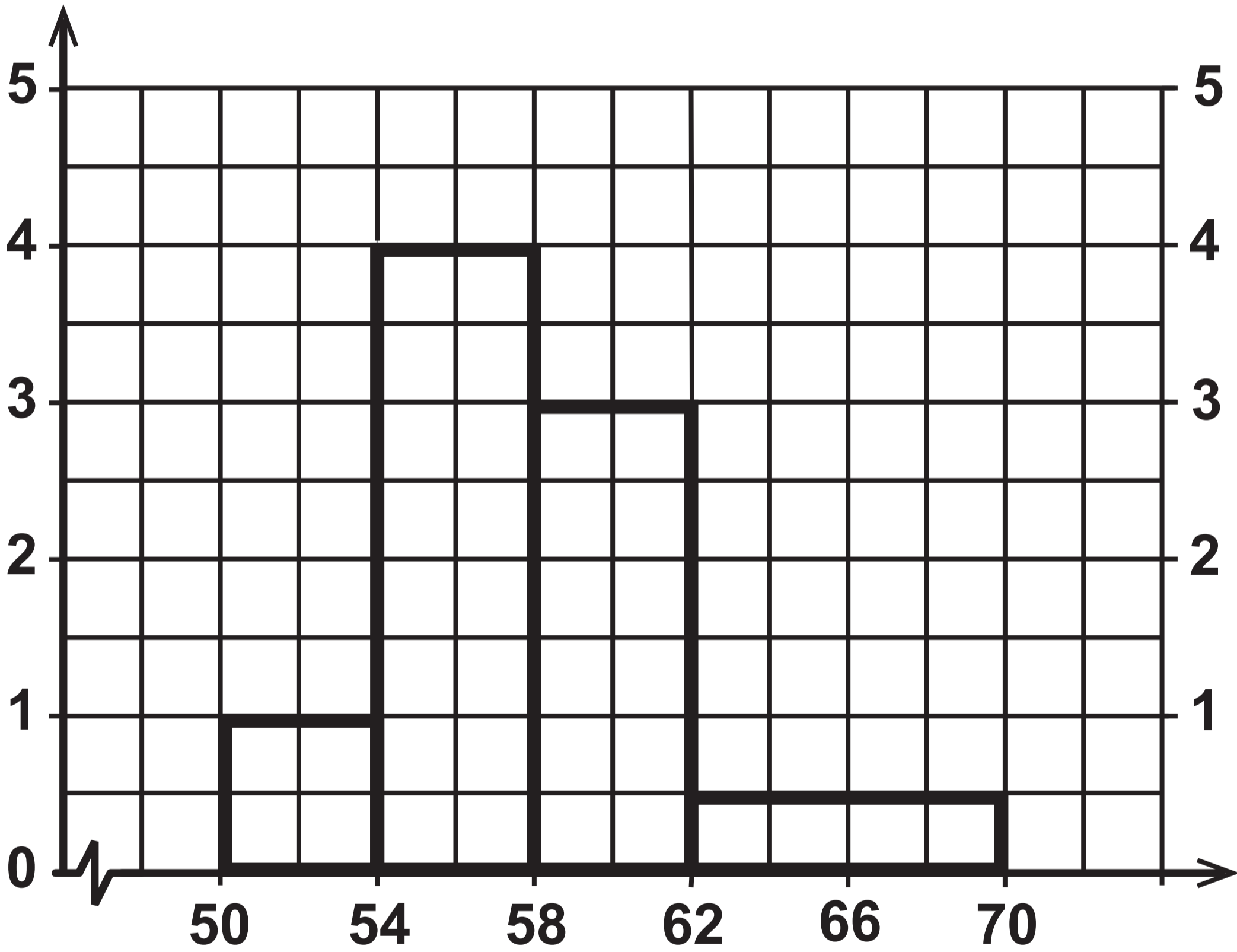
## Question 6 (d)

### Table

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

# Question 9 (a)

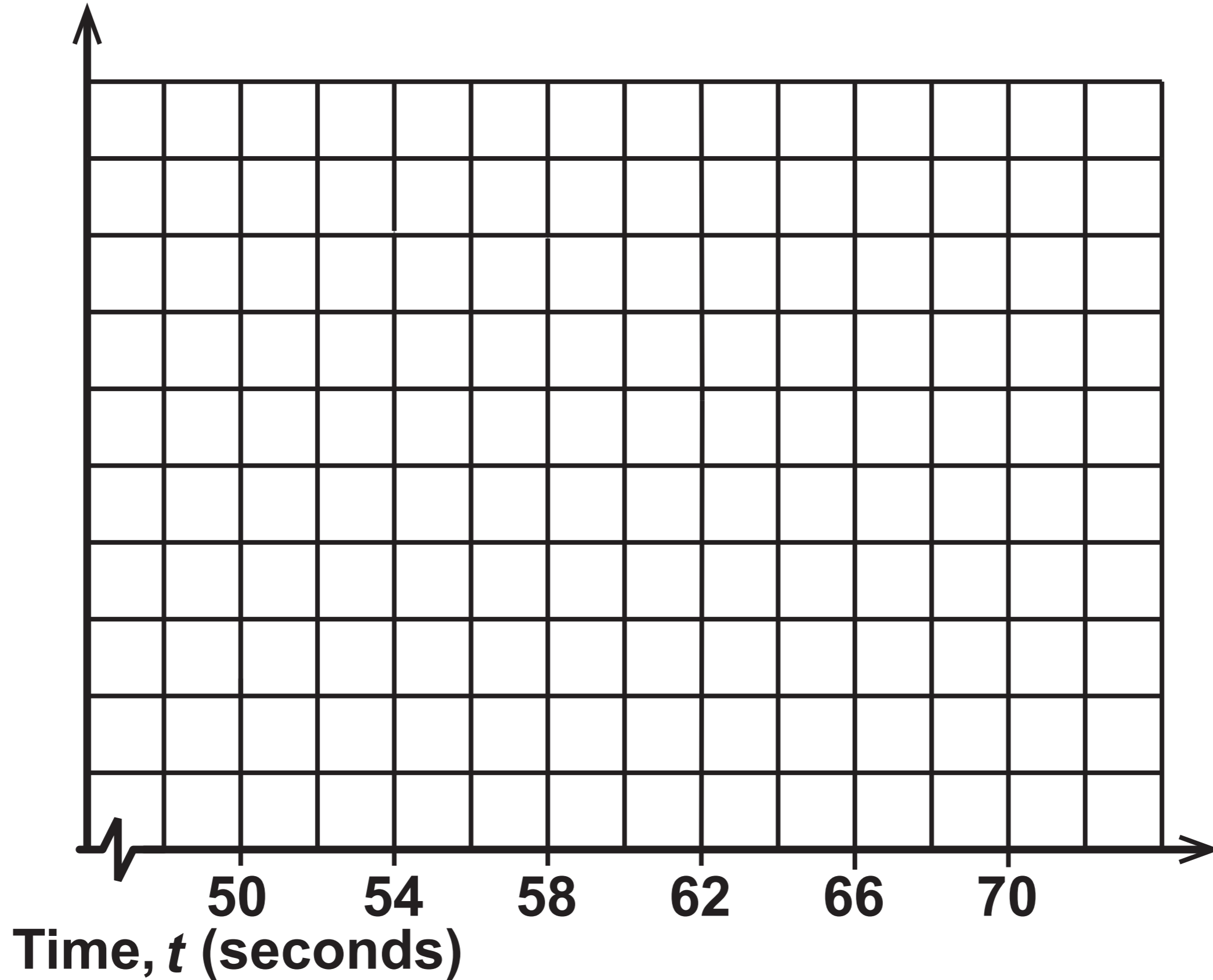
Frequency density



Time (seconds)

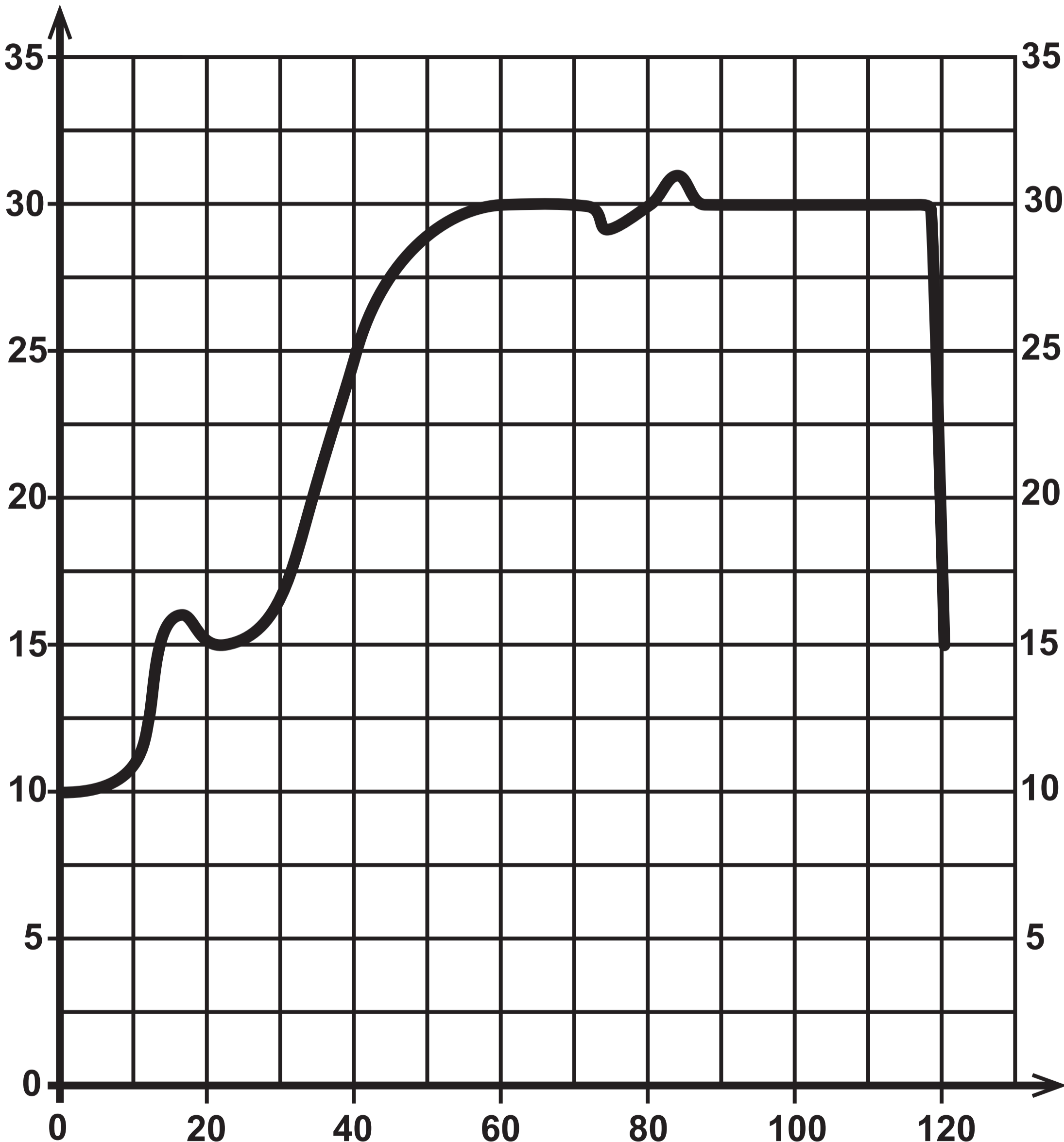
# Question 9 (b)

Frequency density



# Question 10

Speed (metres per second)

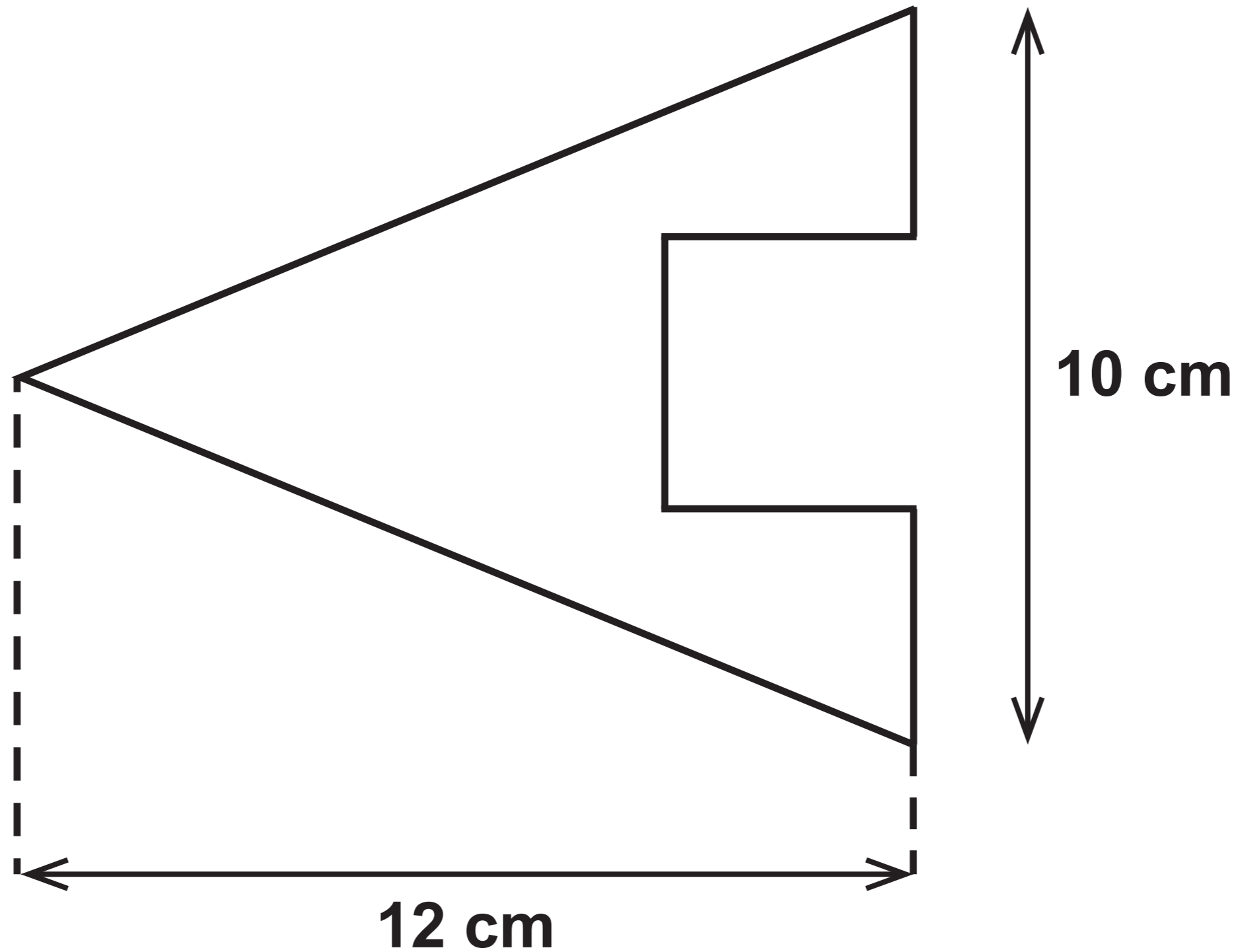


Time,  $t$  (seconds)

# Question 11

## Simplified 2D diagram

Diagram NOT drawn to scale



**GCSE – NEW  
MATHEMATICS**



**and**

**NUMERACY**

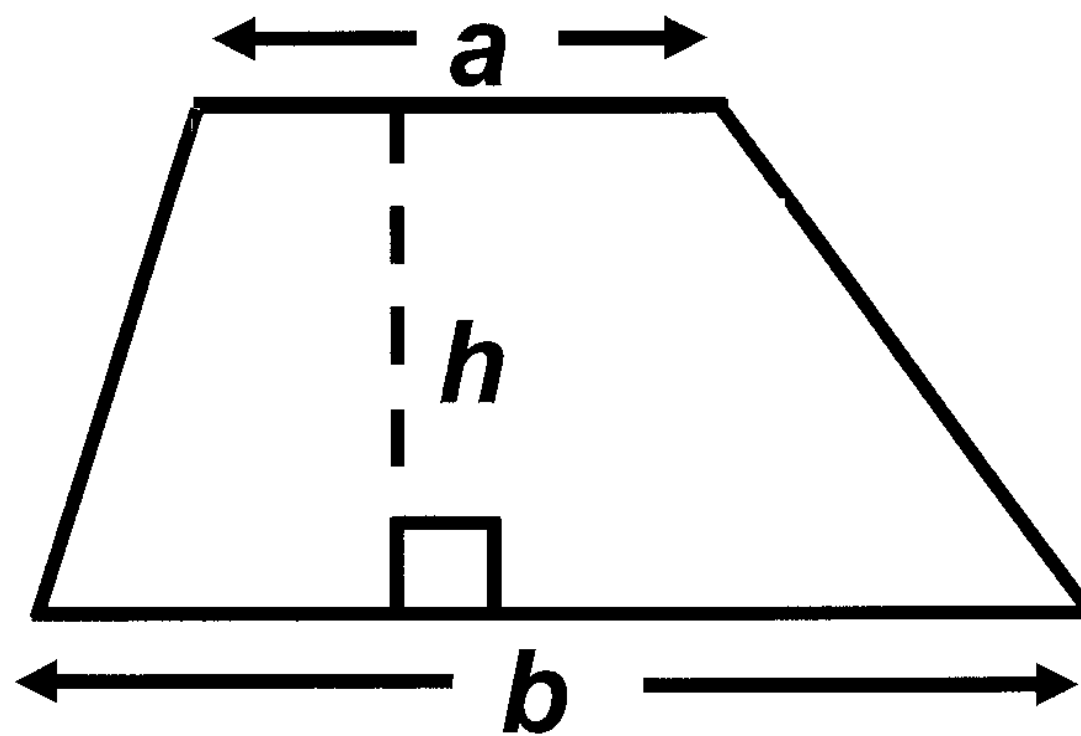
**FORMULA LIST  
HIGHER TIER  
GCSE**

**You must not write on these formula pages.**

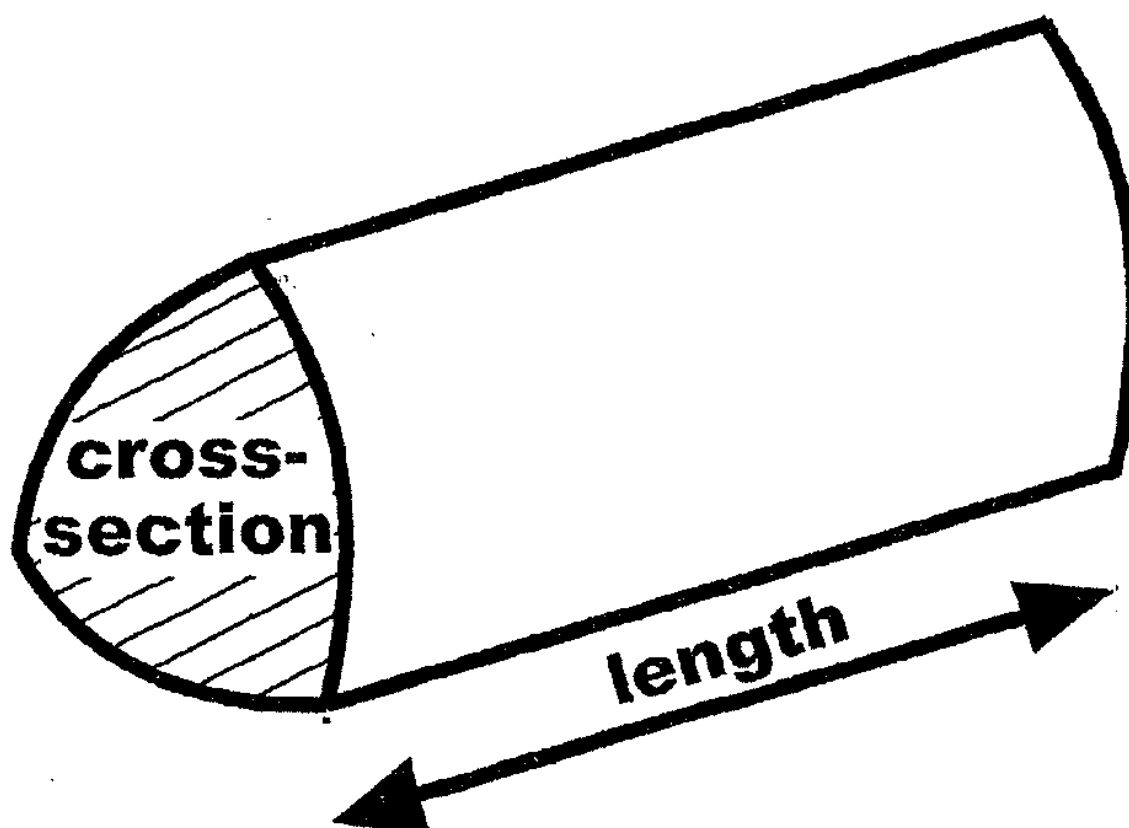
**Anything you write on these formula pages will gain NO credit.**

## Formula List – Higher Tier

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

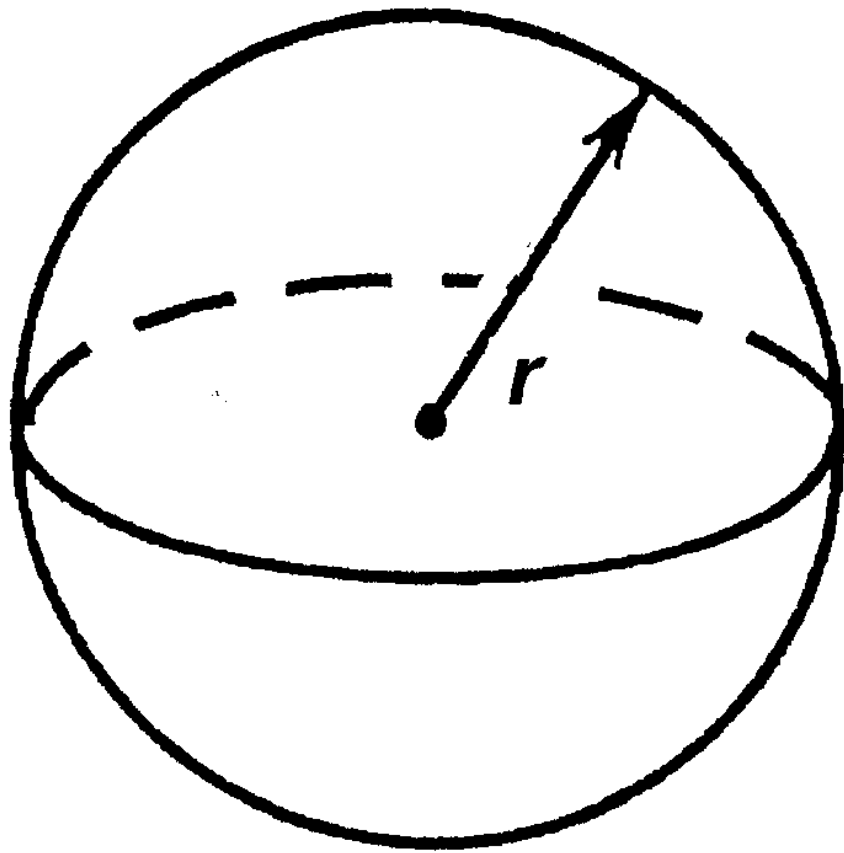


Volume of prism =  
area of cross – section  $\times$  length



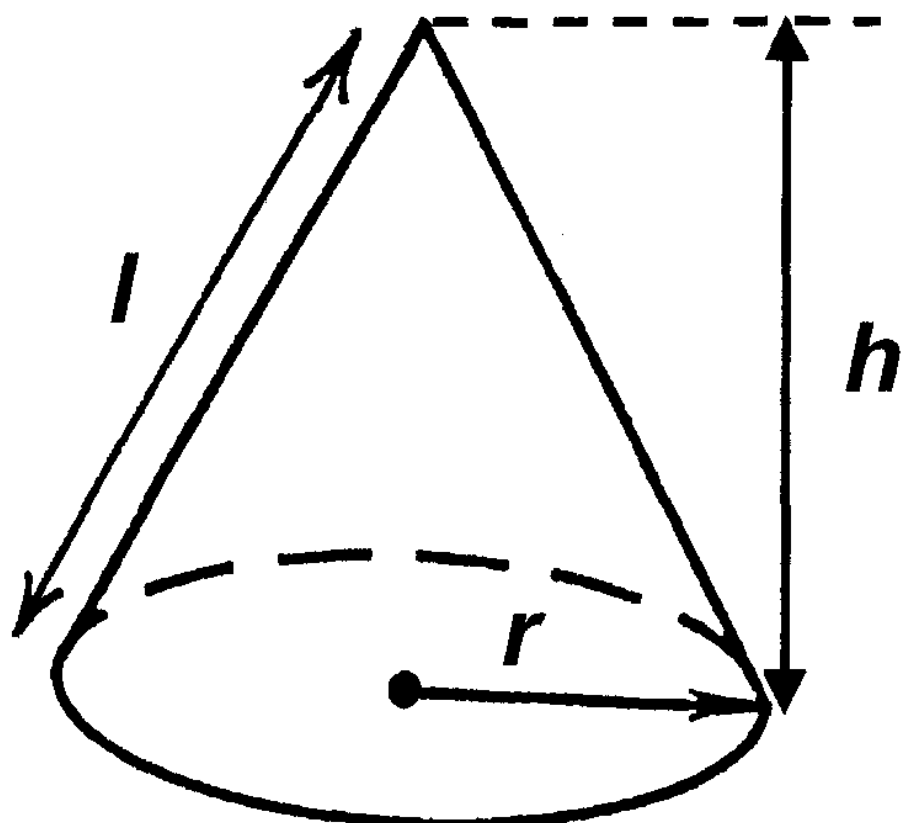
**Volume of sphere =  $\frac{4}{3}\pi r^3$**

**Surface area of sphere =  $4\pi r^2$**

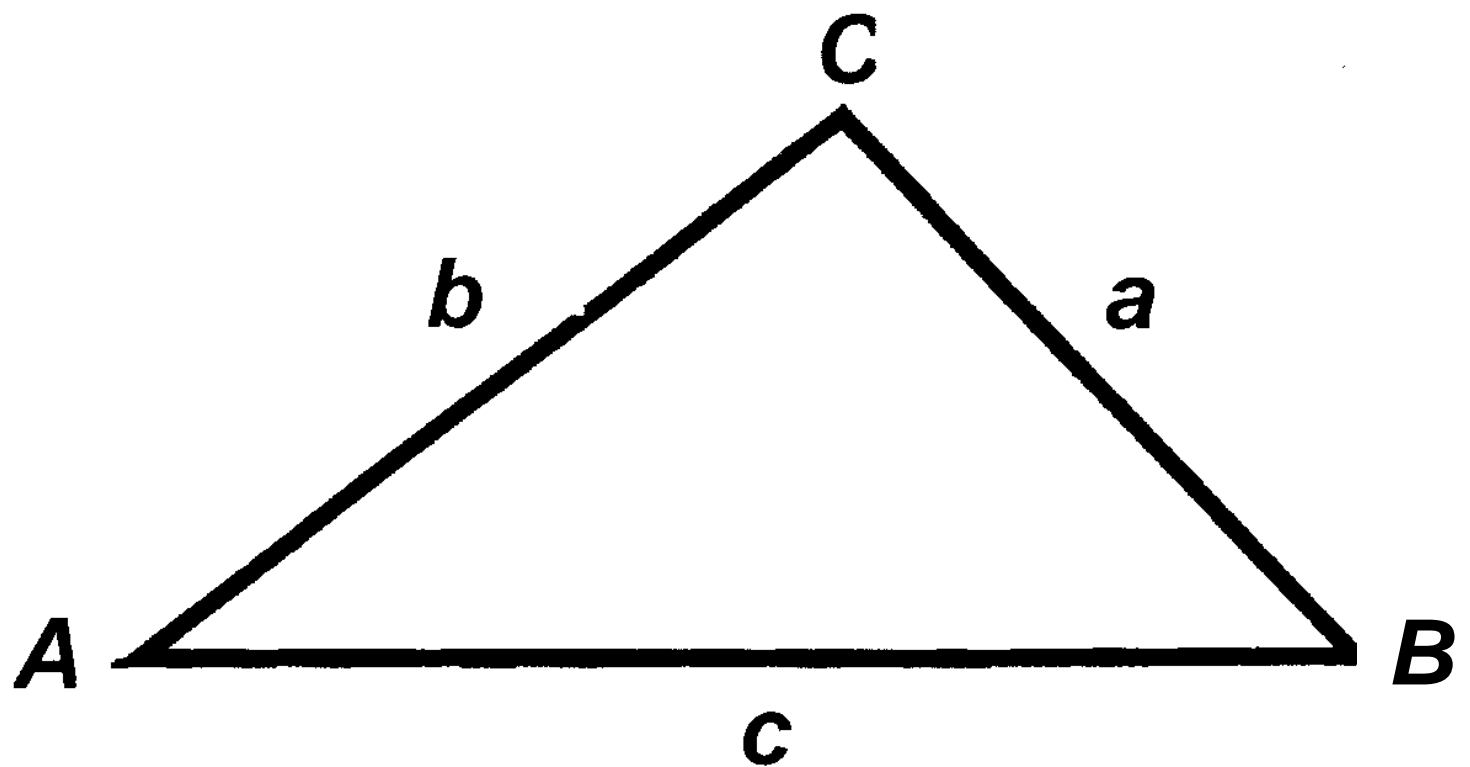


**Volume of cone =  $\frac{1}{3}\pi r^2 h$**

**Curved surface area of cone =  $\pi r l$**



**In any triangle ABC**



**Sine Rule**  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

**Cosine Rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

**Area of triangle**  $= \frac{1}{2} ab \sin C$

## **The Quadratic Equation**

**The solutions of  $ax^2 + bx + c = 0$**

**where  $a \neq 0$ , are given by**

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

## **Annual Equivalent Rate (AER)**

**AER, as a decimal, is calculated using**

**the formula  $\left(1 + \frac{i}{n}\right)^n - 1$ , where  $i$  is the nominal interest rate per annum as a**

**decimal and  $n$  is the number of**

**compounding periods per annum.**