



Aberdare Community School  
Mathematics Department

WJEC GCSE

**Higher – Calculator**

Algebra

# **Quadratic, cubic, reciprocal and exponential graphs**

Name: .....

Set: .....

Date: .....

Teacher: .....

8. The table shows some of the values of  $y = 2x^2 - 5$  for values of  $x$  from  $-2$  to  $2$ .

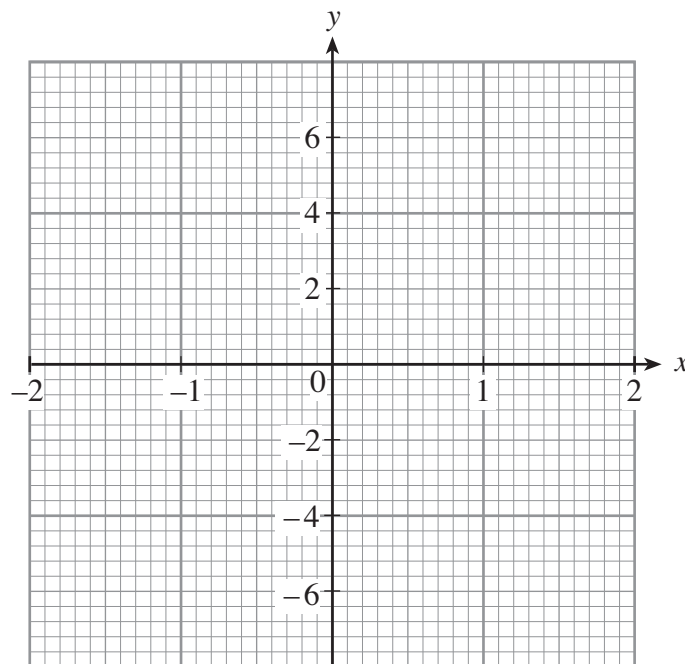
(a) Complete the table by finding the value of  $y$  for  $x = -2$  and  $x = 1$ .

$x$	$-2$	$-1$	$0$	$1$	$2$
$y = 2x^2 - 5$		$-3$	$-5$		$3$

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 ..... [2]

(b) On the graph paper below, draw the graph of  $y = 2x^2 - 5$  for values of  $x$  between  $-2$  and  $2$ .

[2]



(c) Write down the  $x$ -coordinates of the points of intersection of  $y = 2x^2 - 5$  with the  $x$ -axis.

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(d) Write down the minimum value of  $y$ .

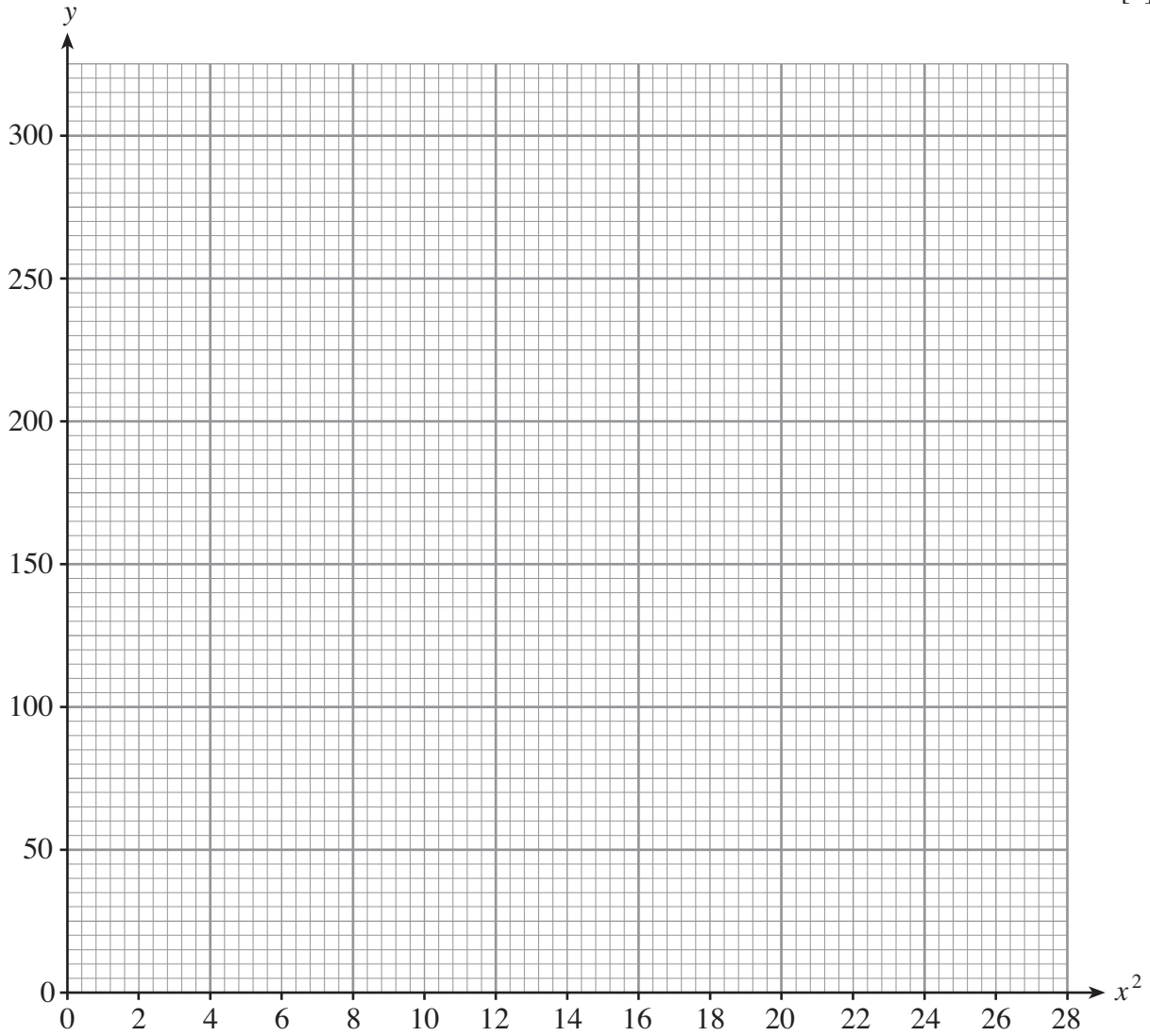
..... [1]

18. The data in the table was recorded during an experiment. Results were recorded for the two variables  $x$  and  $y$ .

$x$	1	2	3	4	5
$y$	80	100	140	200	270

- (a) On the graph paper plot the values of  $y$  against the values of  $x^2$ .

[2]



- (b) It is known that  $y$  is approximately equal to  $ax^2 + b$ . Use your graph to estimate the values of  $a$  and  $b$ .

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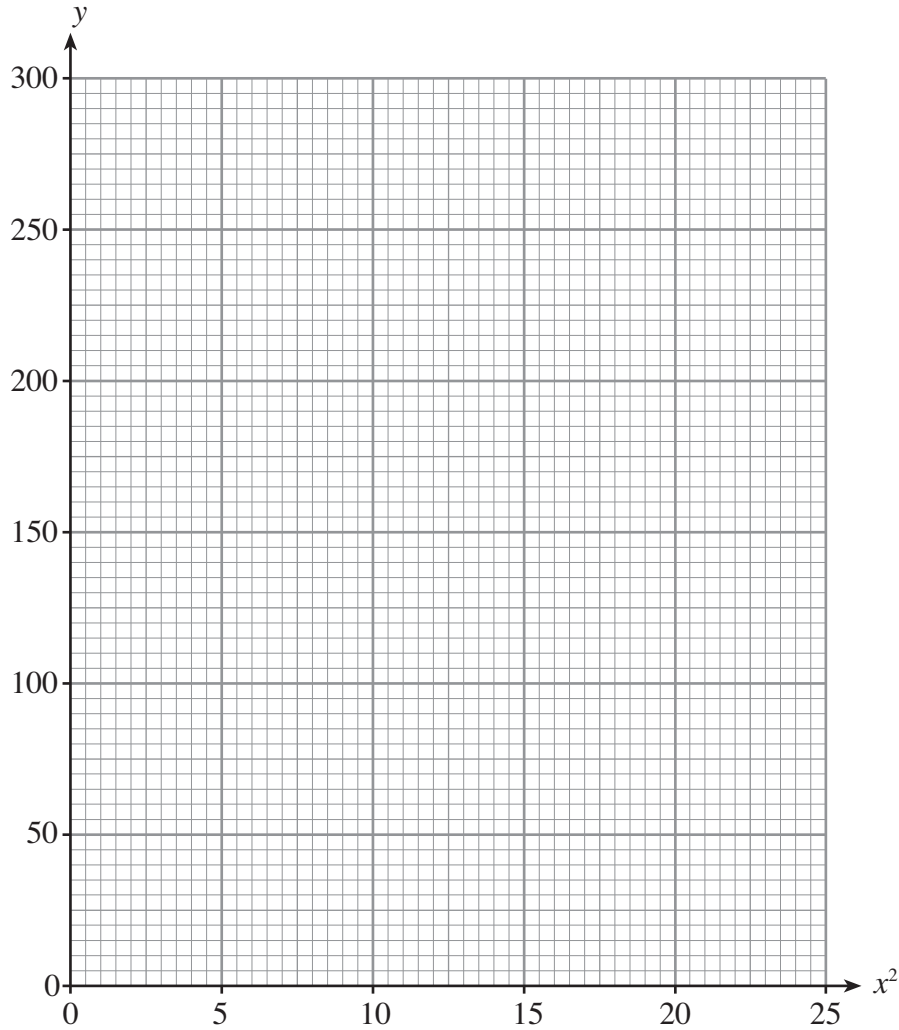
[3]

17. During an experiment the value of a variable  $y$  was found for different values of  $x$ . The results are recorded in the following table.

$x$	1	2	3	4	5
$y$	190	170	130	70	0

- (a) On the graph paper below, plot the values of  $y$  against the values of  $x^2$ .

[2]



- (b) It is known that  $y$  is approximately equal to  $ax^2 + b$ . Use your graph to estimate the values of  $a$  and  $b$ .

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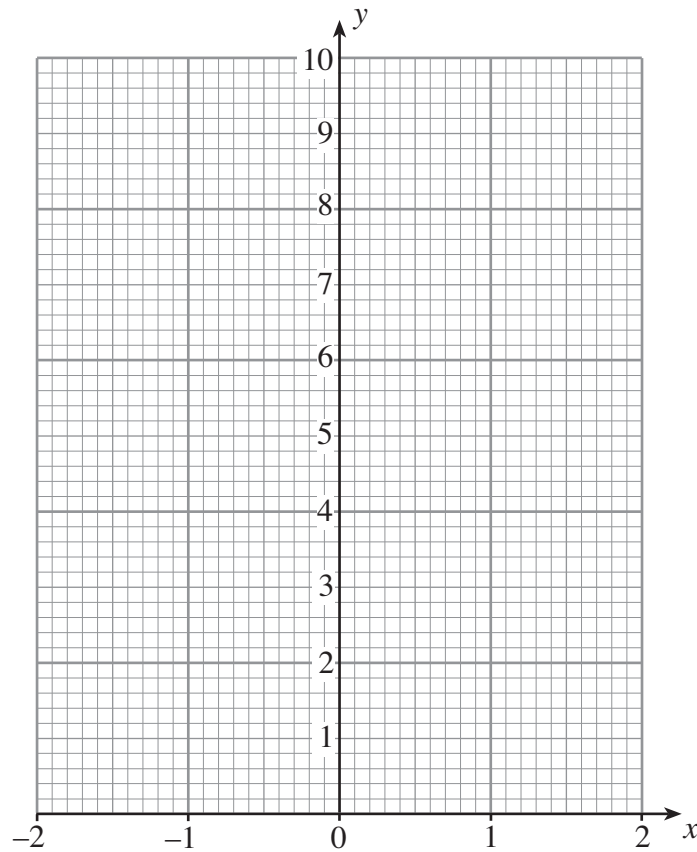
[3]

5. (a) Complete the table below.

$x$	-2	-1	0	1	2
$y = x^2 + 4$					

[2]

(b) Draw a graph of  $y = x^2 + 4$  on the grid below.



[2]

(c) Write down the coordinates of the point where  $y = x^2 + 4$  meets the line  $x = 0$ .

(..... , .....)

[1]

10. The table shows values of  $y = 2x^2 - 5x - 7$  for values of  $x$  from  $-2$  to  $4$ .

$x$	$-2$	$-1$	$0$	$1$	$2$	$3$	$4$
$y = 2x^2 - 5x - 7$	$11$	$0$	$-7$	$-10$	$-9$		$5$

- (a) Complete the table above.

[1]

- (b) On the graph paper below draw the graph of  $y = 2x^2 - 5x - 7$  for the values of  $x$  from  $-2$  to  $4$ .

[2]

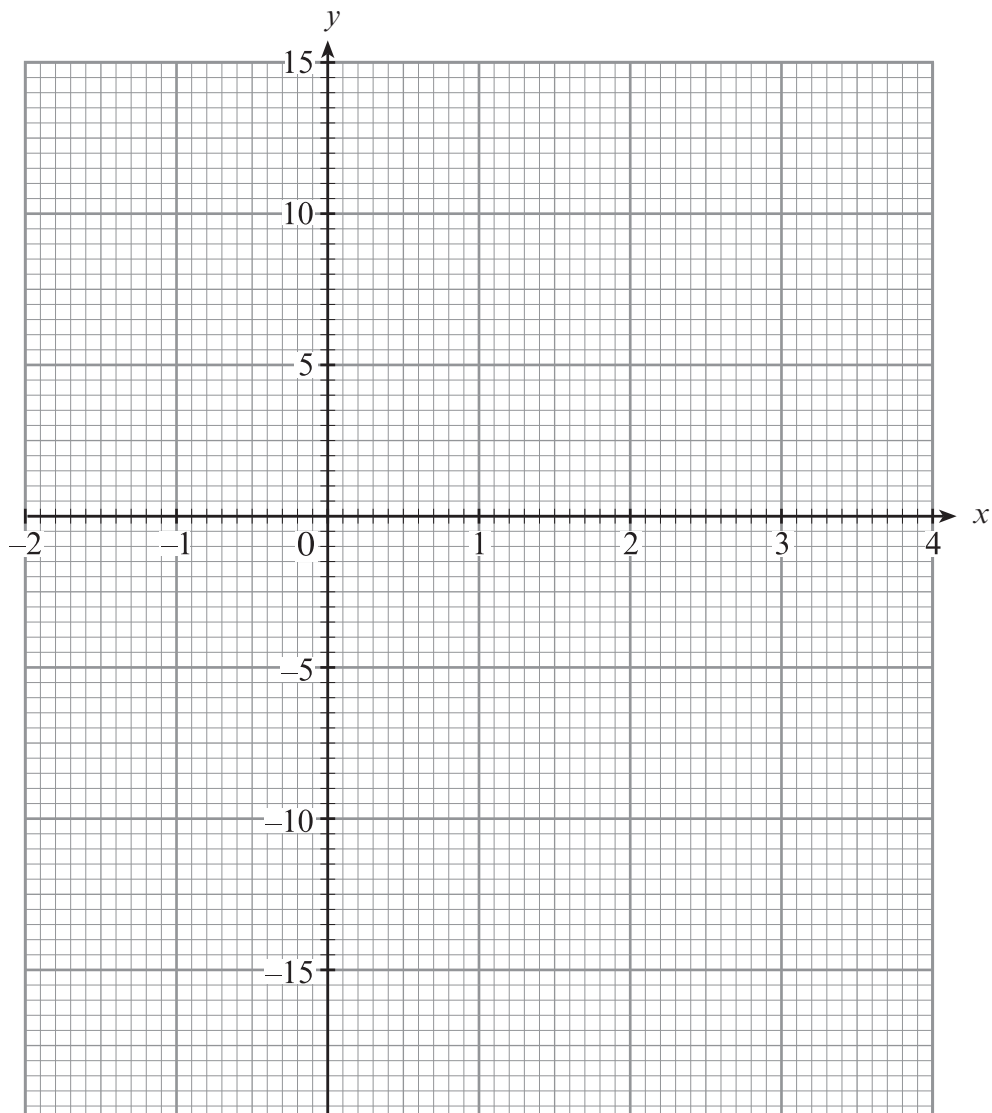
- (c) Write down the  $x$ -coordinates of the points where the curve  $y = 2x^2 - 5x - 7$  intersects the  $x$ -axis.

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[1]



9. Lucy is a scientist. During an investigation she needs to find the points of intersection of two equations to solve a problem.  
The equations are  $y = x^2 - 6x + 8$  and  $x + y = 4$ .  
Draw graphs to solve Lucy's problem.

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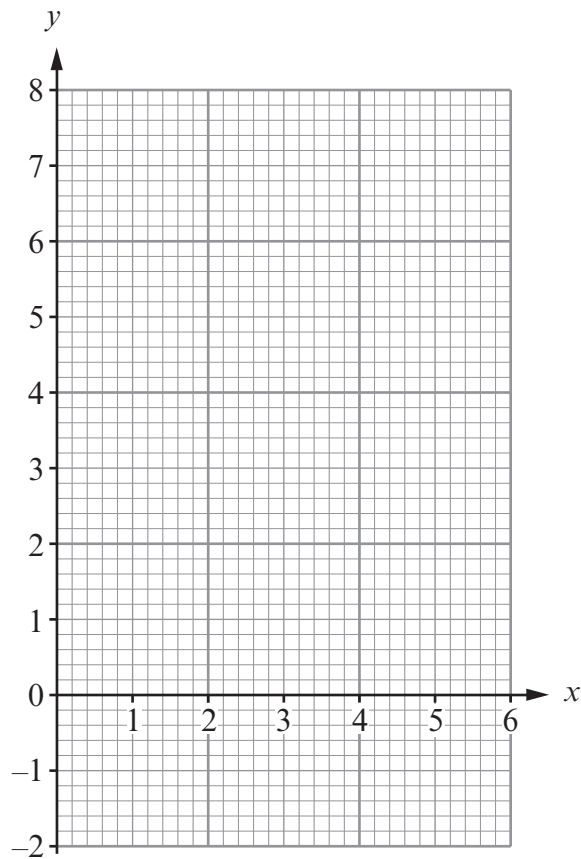
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[5]

Points of intersection .....

[2]

11. (a) A particle loses half of its mass every second.  
Its initial mass is 100 grams.

(i) Use the graph paper opposite to show the decreasing mass during the first 8 seconds.

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[3]

(ii) After how many seconds will the mass be 5 grams?

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[1]

(b) A particle has an initial mass  $m$  grams.  
Its mass halves every second.

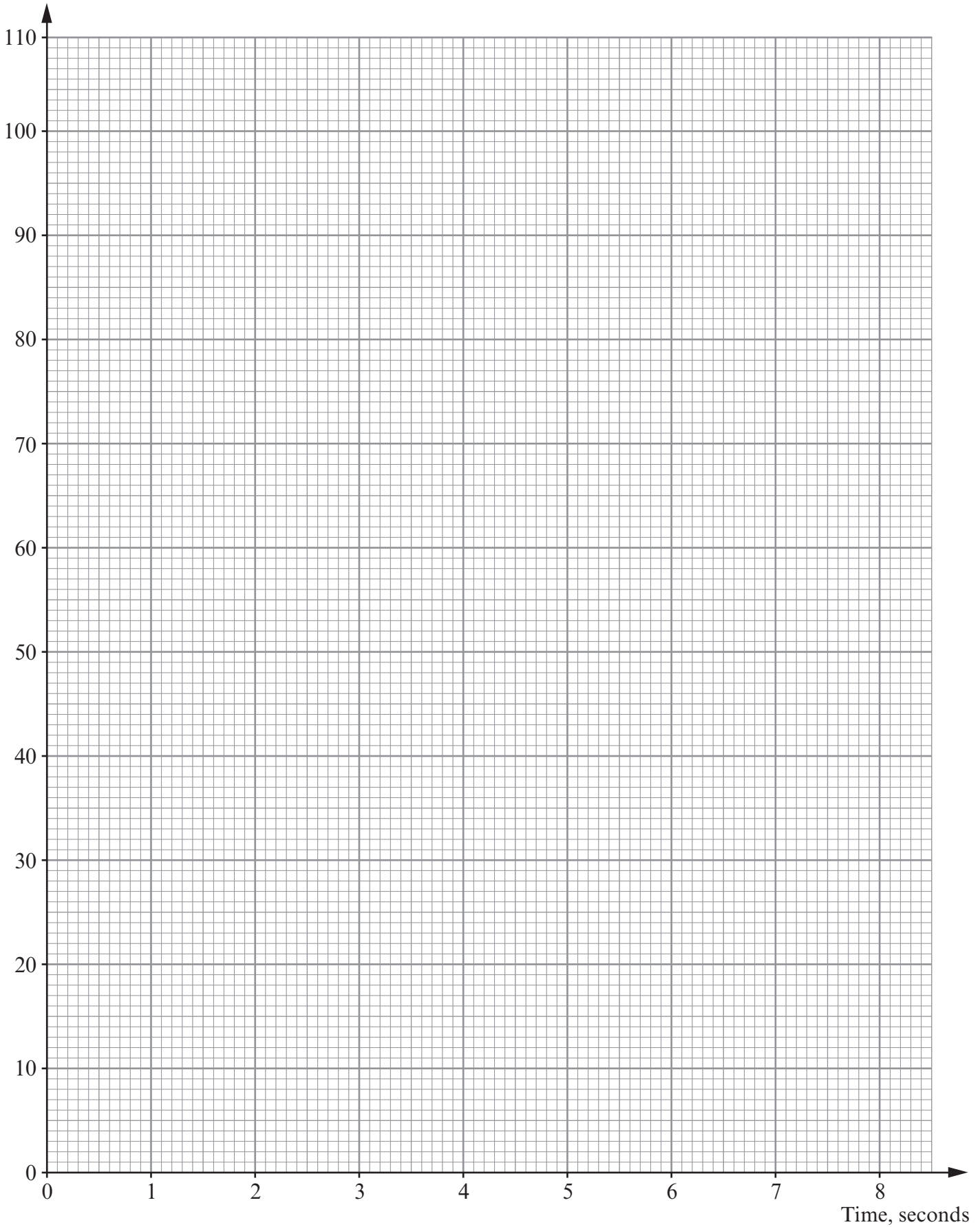
Write down a formula for finding the final mass,  $f$  grams, of the particle after  $t$  seconds.

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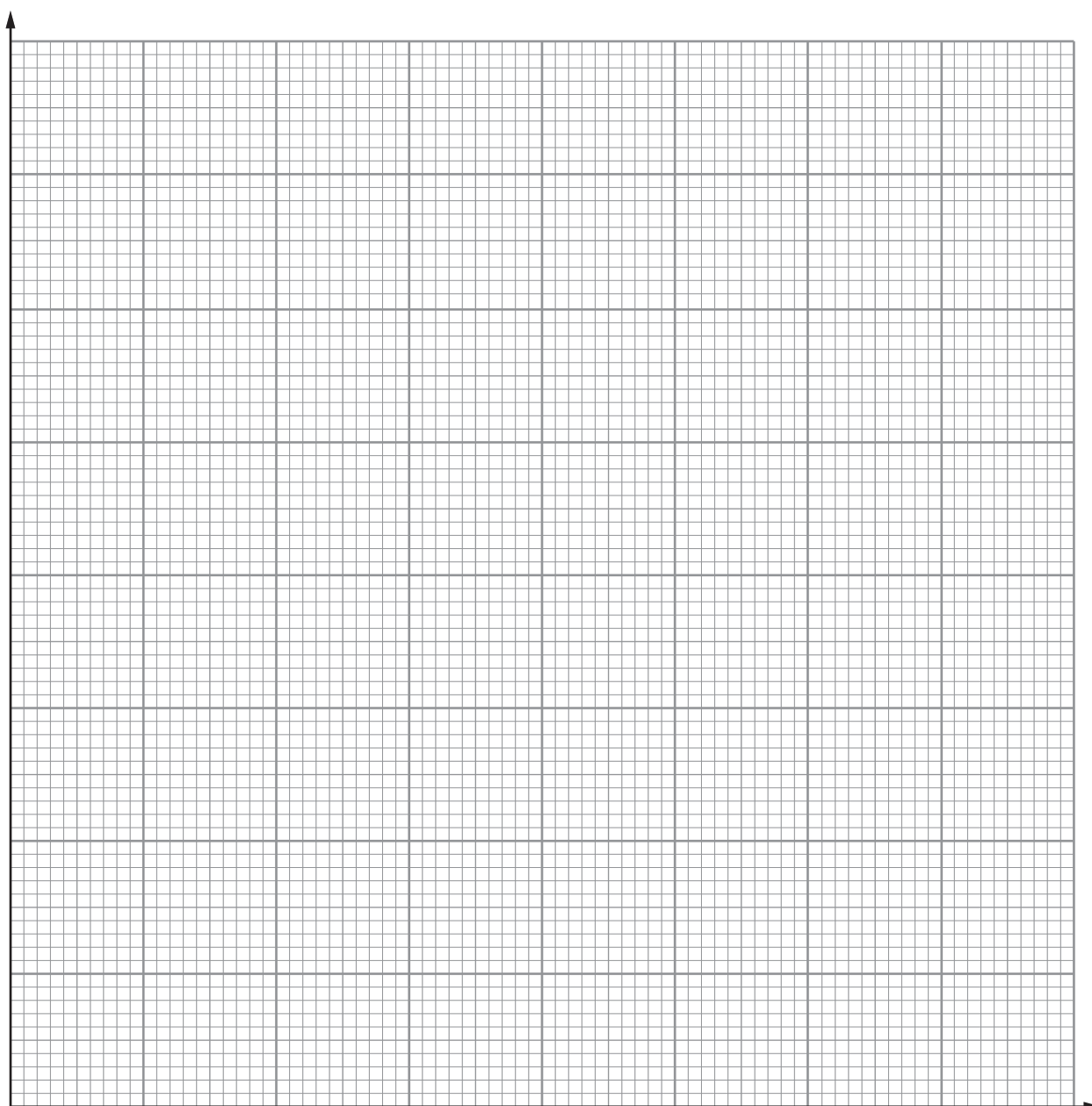


Mass, grams



12. The formula  $v = 8t - t^2$  is used to calculate the velocity  $v$  m/s of a particle at a time  $t$  seconds after the start of an experiment.

(a) Draw the graph of  $v = 8t - t^2$  for values of  $t$  from 0 to 8.



[5]

(b) Find the time at which the acceleration of the particle is zero.

..... [1]

(c) Find an approximation for the acceleration when  $t = 7$ .  
State the units of your answer.

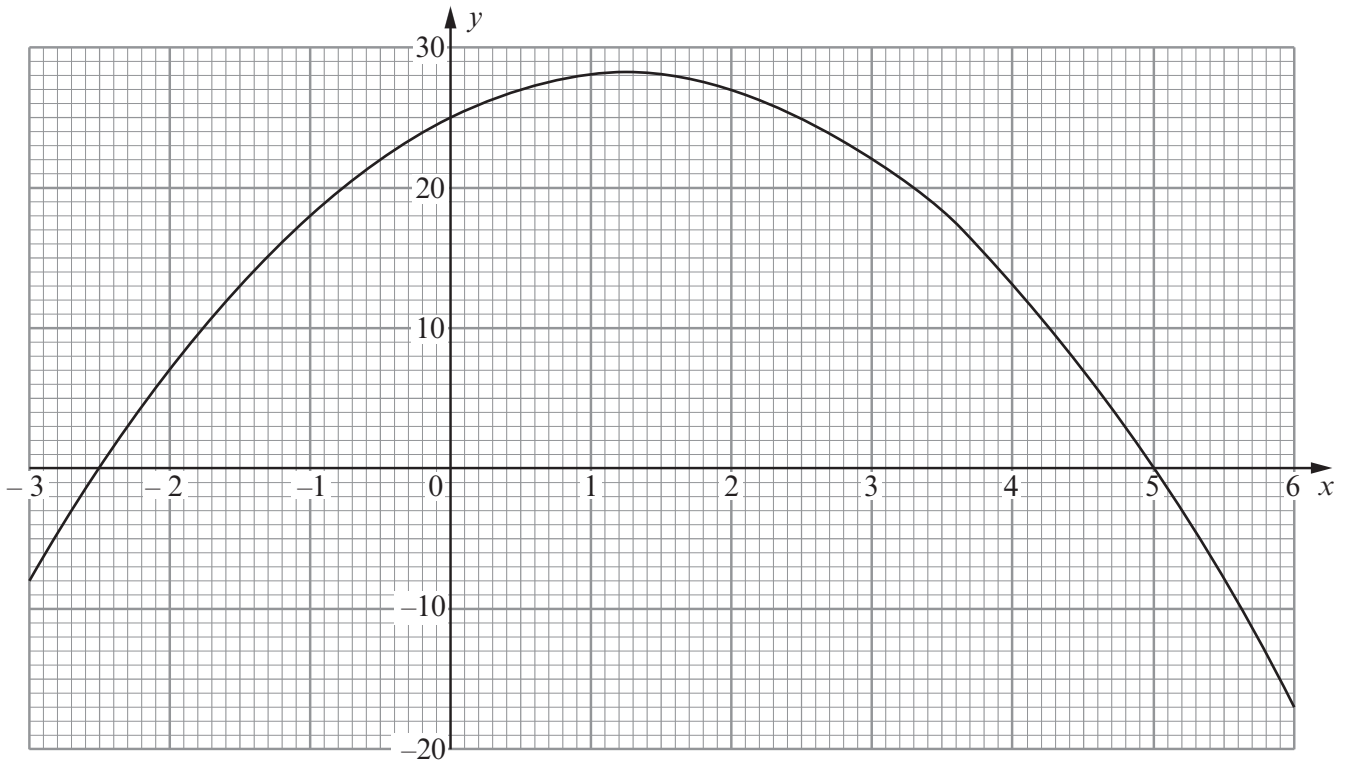
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(d) Find an approximation for the distance travelled by the particle by the time  $t = 8$ .

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**END OF PAPER**

13. The graph of  $y = -2x^2 + 5x + 25$  for values of  $x$  from  $-3$  to  $6$  is shown below.



(a) Use the graph to solve each of the following equations.

(i)  $-2x^2 + 5x + 25 = 0$

..... [1]

(ii)  $-2x^2 + 5x + 20 = 0$

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 ..... [2]



- (b) Find the coordinates of the points of intersection of the graph of  $y = -2x^2 + 5x + 25$  and the graph of  $y = x^2 - 2x - 3$ .

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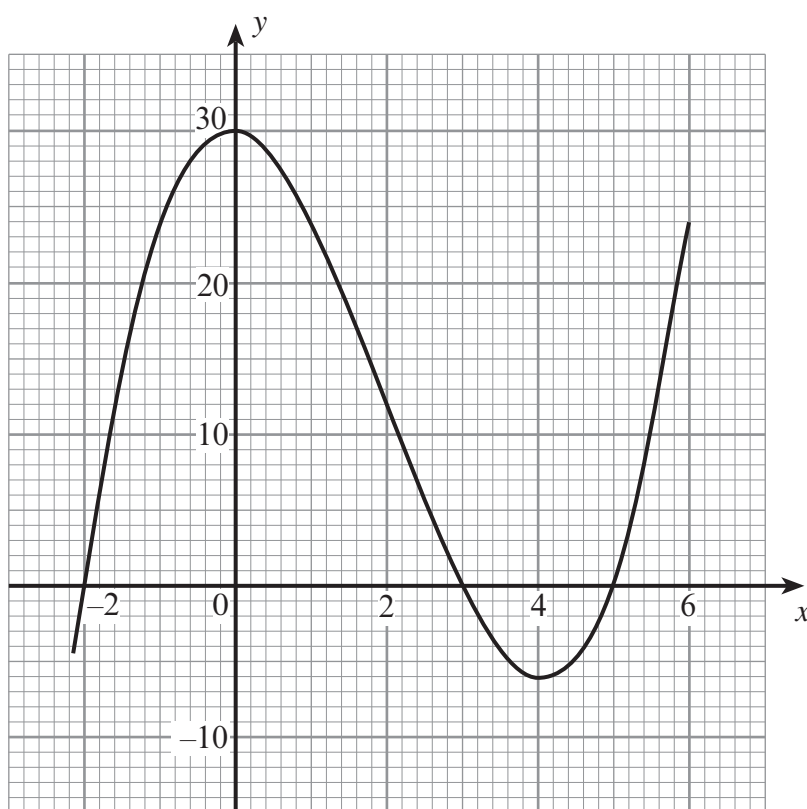
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[5]



17. The graph of the equation  $y = x^3 - 6x^2 - x + 30$  is shown on the graph paper below.



Use the graph above to answer the following questions.

(a) Solve  $x^3 - 6x^2 - x + 30 = 0$ .

..... [2]

(b) By drawing a suitable straight line, solve the equation  $x^3 - 6x^2 - x + 30 = -5x + 10$ .

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13. (a) Use the graph paper below to draw a graph of the equation  $y = 6 + x - x^2$  for values of  $x$  from  $-2$  to  $3$ .

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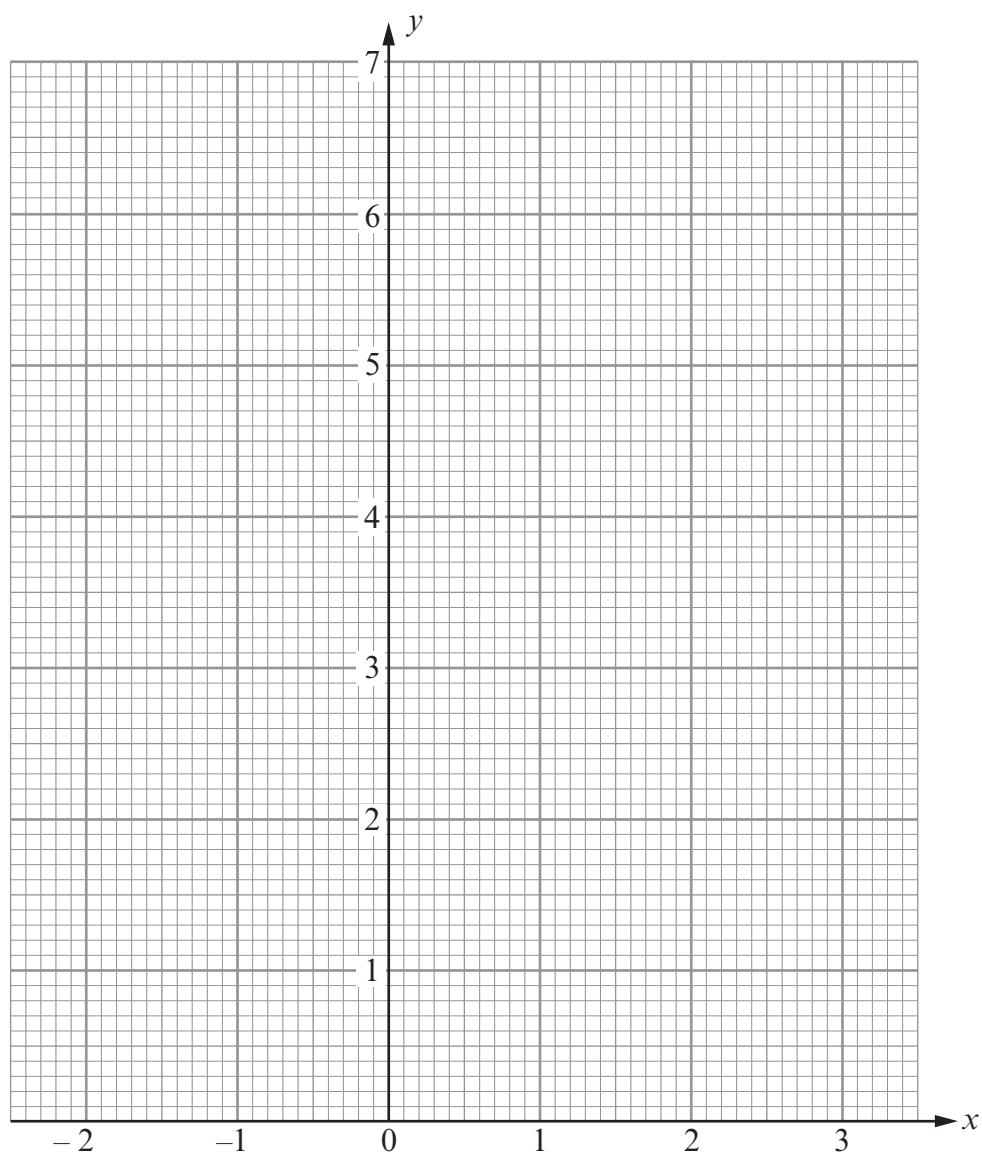
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[3]



(b) Use your graph to solve the following equations.

(i)  $6 + x - x^2 = 0$

..... [1]

(ii)  $4 + x - x^2 = 0$

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..... [2]

(c) Use the trapezium rule, with the ordinates  $x = 0$ ,  $x = 1$ ,  $x = 2$  and  $x = 3$ , to estimate the area of the region enclosed by the curve, the positive  $x$ -axis and the positive  $y$ -axis.

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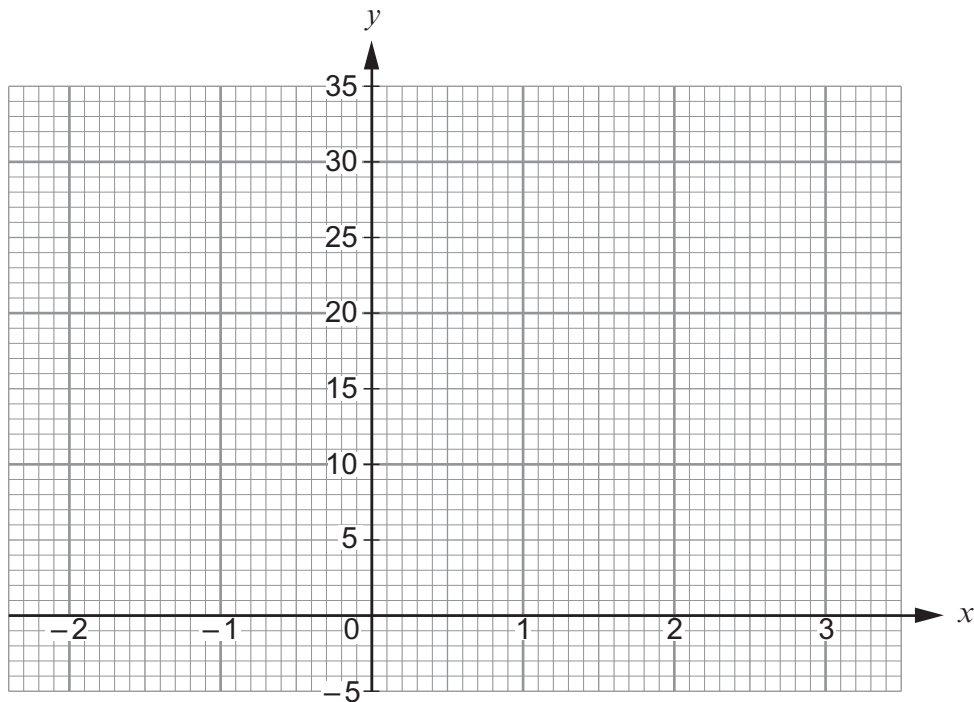


4. The table shows some of the values of  $y = x^3 + 6$  for values of  $x$  from  $-2$  to  $3$ .

(a) Complete the table by finding the value of  $y$  for  $x = -1$  and  $x = 2$ . [2]

$x$	$-2$	$-1$	$0$	$1$	$2$	$3$
$y = x^3 + 6$	$-2$		$6$	$7$		$33$

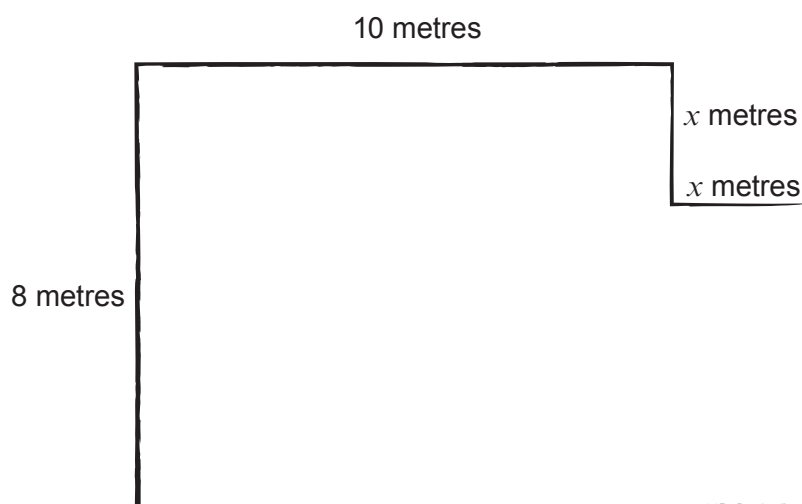
(b) On the graph paper below, draw the graph of  $y = x^3 + 6$  for values of  $x$  from  $-2$  to  $3$ . [2]



(c) Faye wants to solve the equation  $x^3 + 6 = 10$  by first drawing a line on the graph above. Show how Faye would do this on the graph above. You do not need to find the solution of the equation. [1]



11. Gerry has sketched the floor plan of a room.  
All the corners of the room are either  $90^\circ$  or  $270^\circ$ .  
Gerry has forgotten some of the measurements but she knows two of the measurements are the same, so she has labelled them  $x$  metres.



*Diagram not drawn to scale*

- (a) Show that the area of the floor, in square metres, is  $80 + 8x - x^2$ . [2]

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- (b) Use the graph paper opposite to draw the graph representing the area, in square metres, of the floor plan.  
Use values of  $x$  from  $x = 0$  to  $x = 5$ . [3]

The area is  $80 + 8x - x^2$  square metres.

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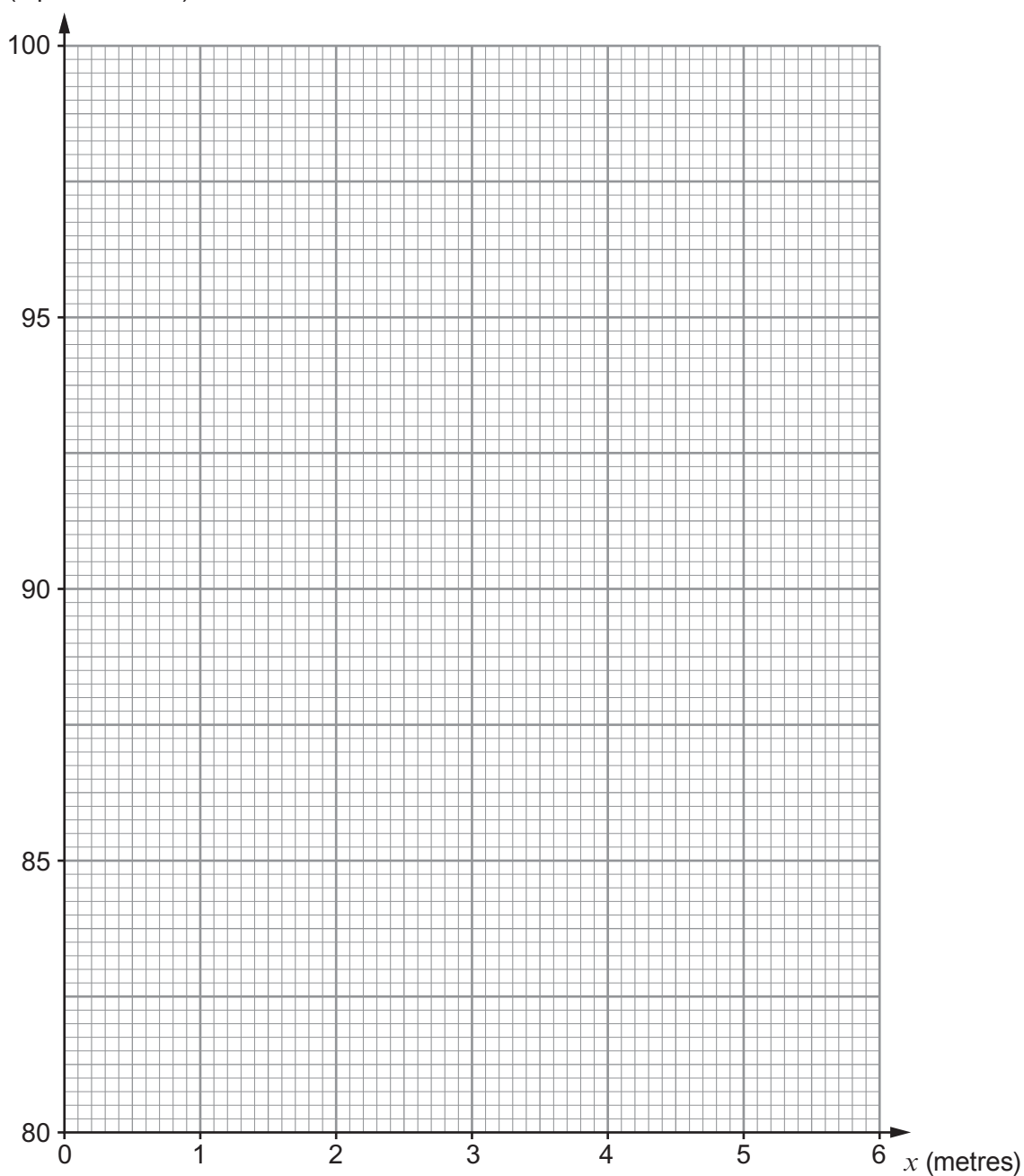
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Area (square metres)



- (c) Gerry calculated the area of the floor in the room before she lost some of measurements.  
The area is 83.75 square metres. Find the value of  $x$ .

[2]

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14. (a) Use the graph paper on the opposite page to draw the graph of  $y = x^2 - 2x$  for values of  $x$  from  $-2$  to  $4$ . [3]

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- (b) Solve the equation  $x^2 - 2x = 0$ . [1]

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- (c) **Use your graph** to solve the equation  $x^2 - 3x - 1 = 0$ . [3]

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Examiner  
only

