

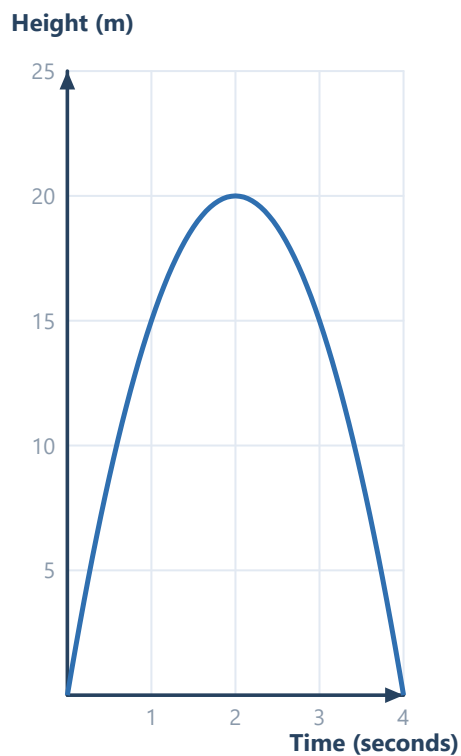
GCSE Maths: Real-life curved graphs (Higher): answers

GCSE Maths - Quadratic and Other Graphs - Higher - Lesson 13.6

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch13-quadratic-other-graphs/higher/real-life-curved-graphs/

Exercise 13F Real-life graphs Non-calculator

- 1 The graph shows the height of a ball thrown upwards, $h = 20t - 5t^2$. Use it to find



- (a) the height of the ball after 1 second

Answer: 15 m

- (b) the height of the ball after 3 seconds

Answer: 15 m

- (c) the greatest height reached by the ball

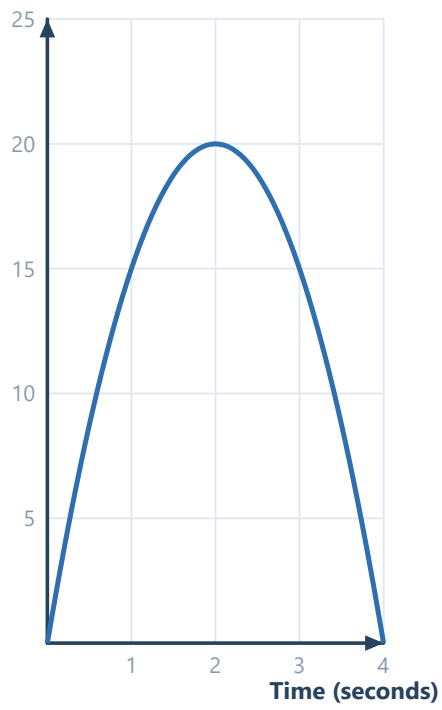
Answer: 20 m (at 2 s)

- (d) how long the ball is in the air

Answer: 4 s

- 2 Use the ball graph to find the time(s) when the height is (a) 15 m, (b) 20 m, (c) 10 m. Give (c) to 1 decimal place.

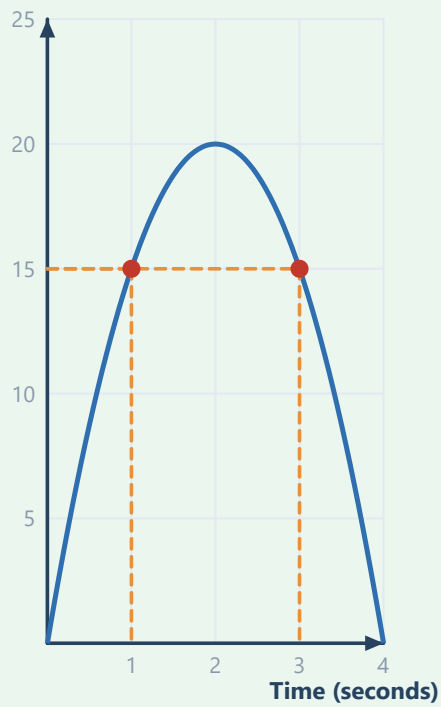
Height (m)



(a) height 15 m

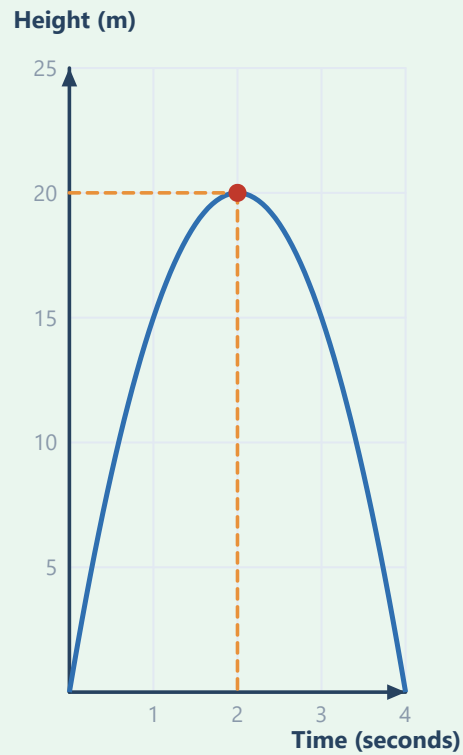
Answer: 1 and 3 s

Height (m)



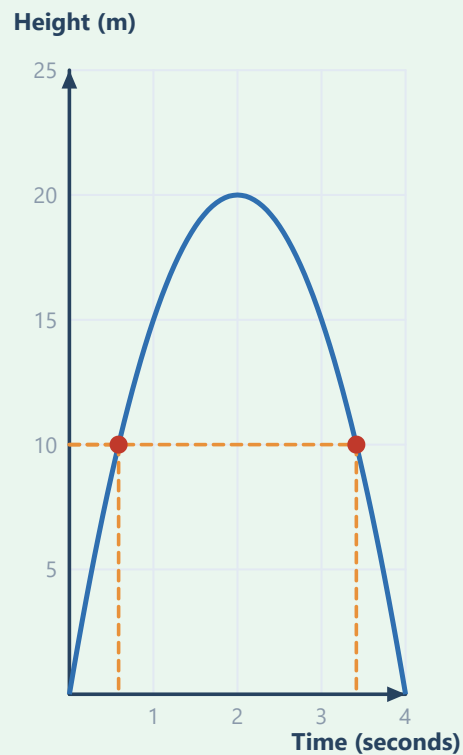
(b) height 20 m

Answer: 2 s

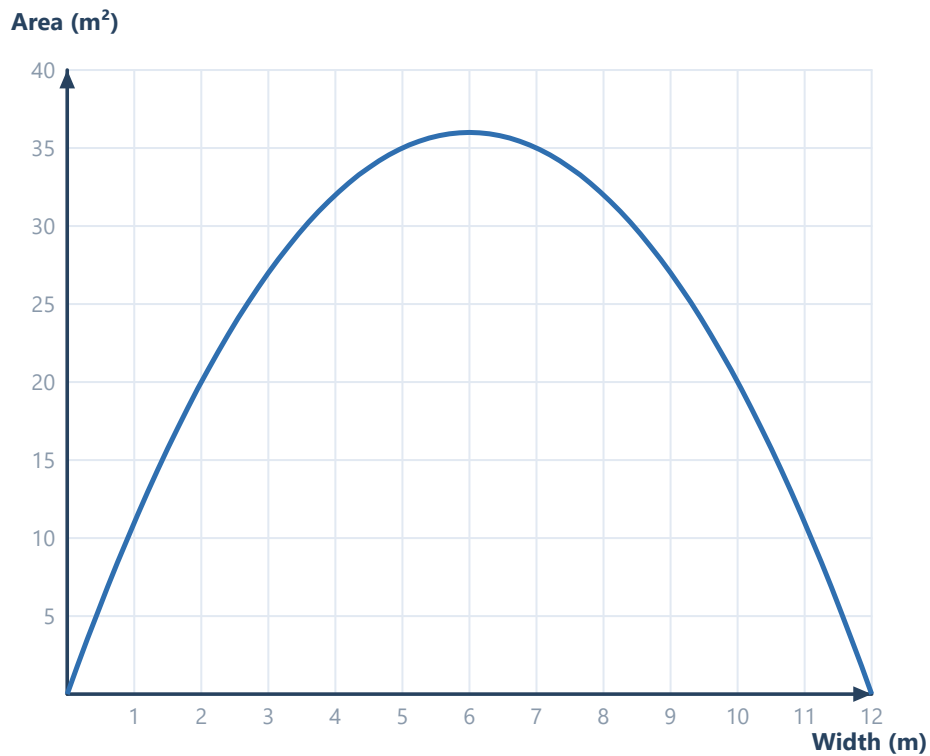


(c) height 10 m

Answer: 0.6 and 3.4 s (accept answers within 0.1)



- 3 A farmer has 24 m of fencing for a rectangular pen against a wall. The width is x m and the area is A m² where $A = 12x - x^2$. Use the graph to find (a) the area when $x = 3$, (b) the largest area and the width that gives it, (c) the widths that give an area of 20 m².



- (a) the area when $x = 3$

Answer: 27 m²

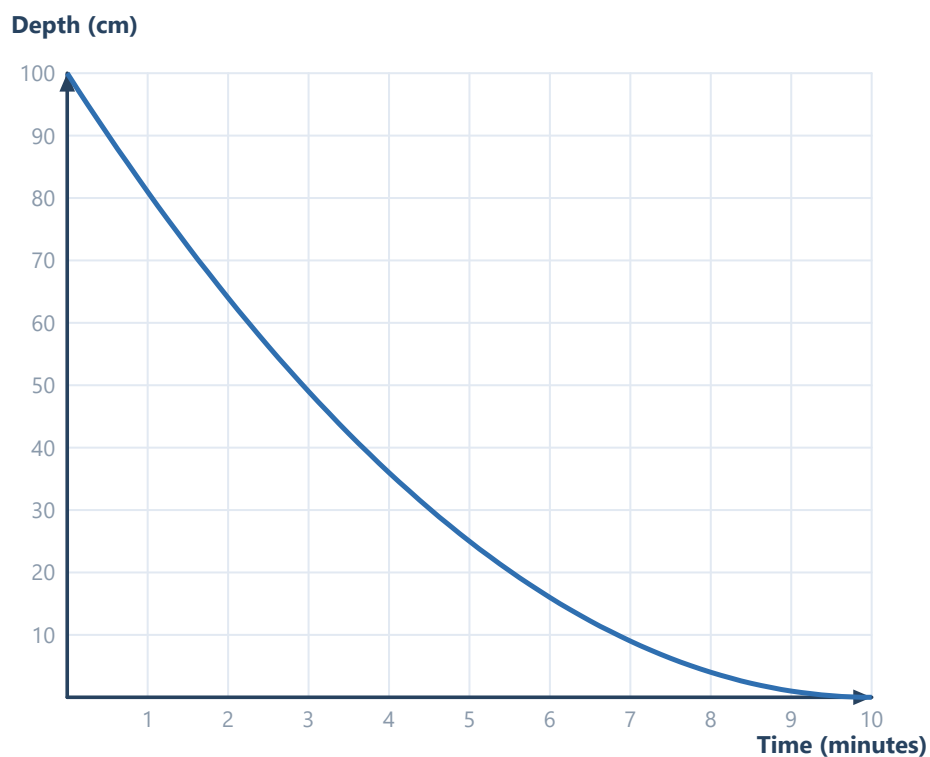
- (b) the largest area

Answer: 36 m² (at 6 m)

- (c) widths giving area 20 m²

Answer: 2 and 10 m

- 4 Water drains from a tank. The depth d cm after t minutes is shown on the graph. Use it to find (a) the depth after 4 minutes, (b) the depth after 2 minutes, (c) when the depth is 25 cm, (d) when the tank is empty.



- (a) the depth after 4 minutes

Answer: 36 cm

- (b) the depth after 2 minutes

Answer: 64 cm

- (c) when the depth is 25 cm

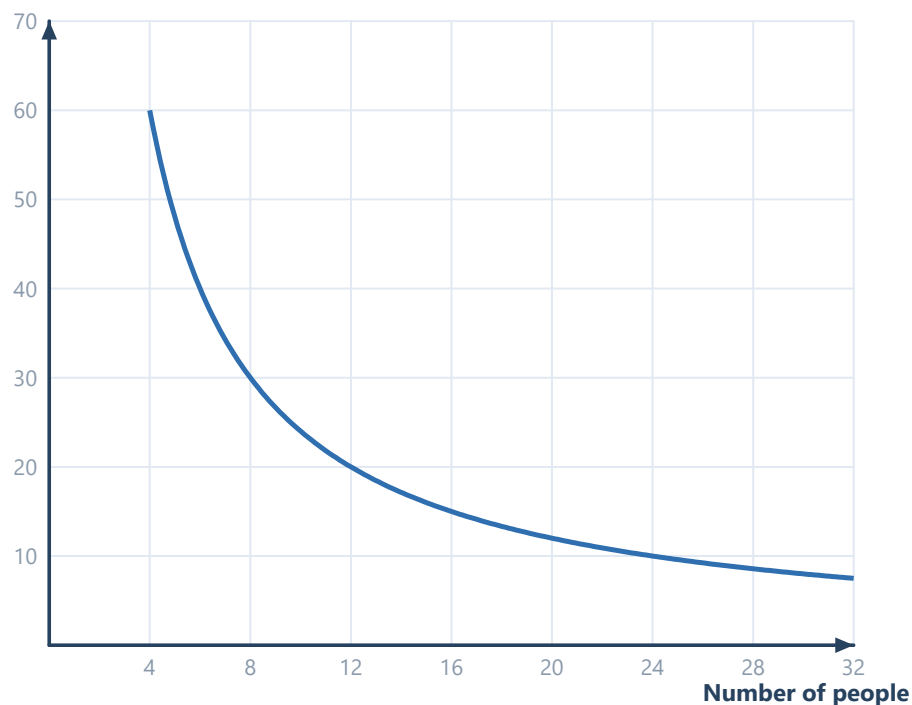
Answer: 5 minutes

- (d) when the tank is empty

Answer: 10 minutes

- 5 A coach costing £240 is shared equally between n people, so each pays $C = 240 \div n$ pounds. Use the graph to find (a) the cost per person when 8 people go, (b) the cost per person when 15 people go, (c) the number of people if each pays £12, (d) the number if each pays £10.

Cost per person (£)



- (a) 8 people

Answer: £30

- (b) 15 people

Answer: £16

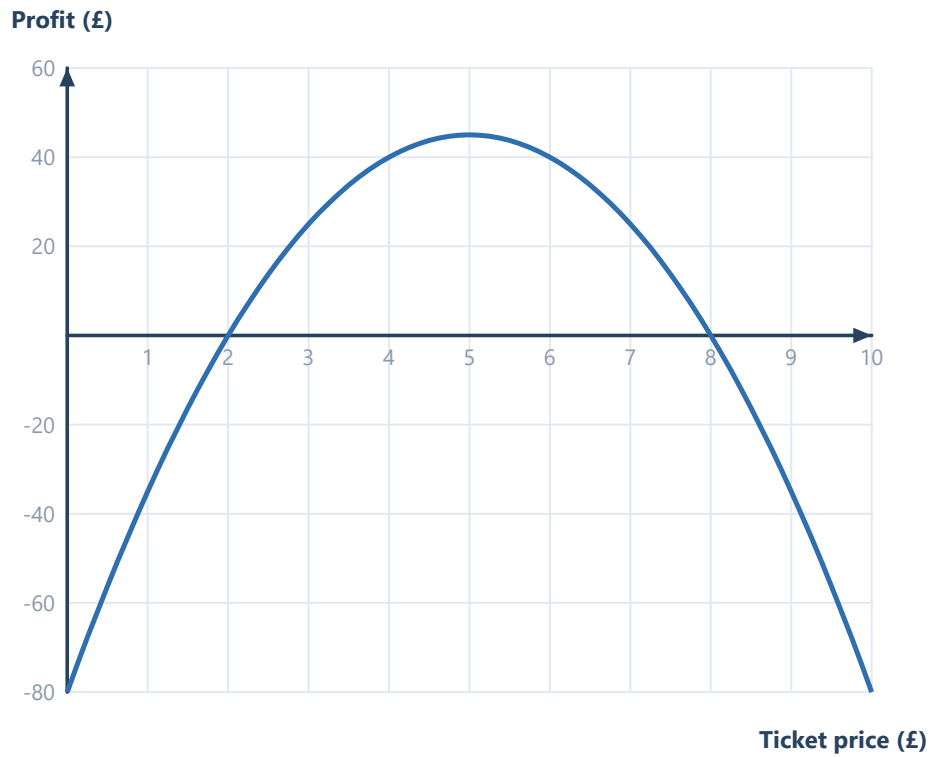
- (c) each pays £12

Answer: 20 people

- (d) each pays £10

Answer: 24 people

- 6 A school disco sells tickets at x pounds. The profit is P pounds where $P = -5x^2 + 50x - 80$. Use the graph to find (a) the profit when the ticket price is £3, (b) the ticket price that gives the greatest profit and the profit it gives, (c) the two ticket prices at which the school makes no profit (breaks even).



- (a) the profit at £3

Answer: £25

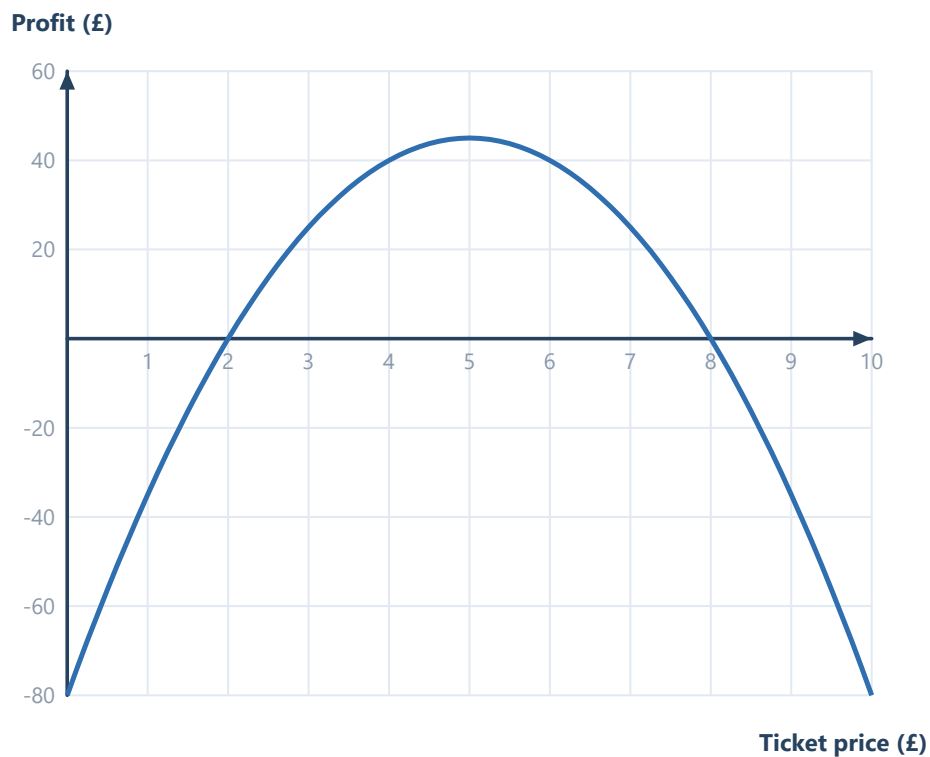
- (b) the best ticket price

Answer: £45 (at £5)

- (c) break-even prices

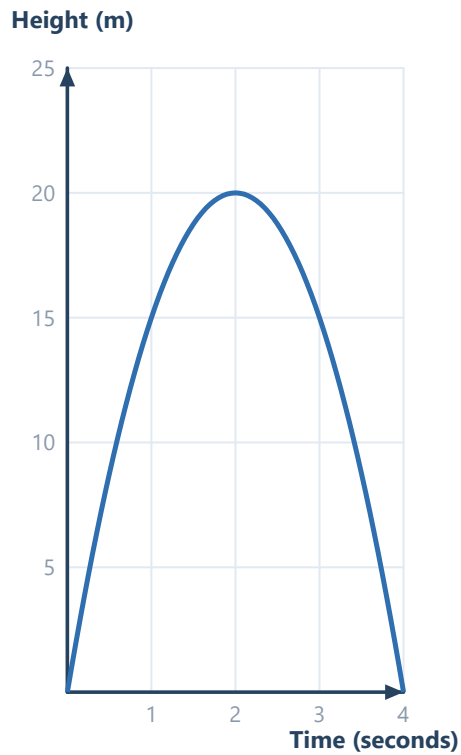
Answer: £2 and £8

- 7** Use the profit graph (above) to find the ticket prices for which the profit is at least £40. (Find where the profit is £40 first.)



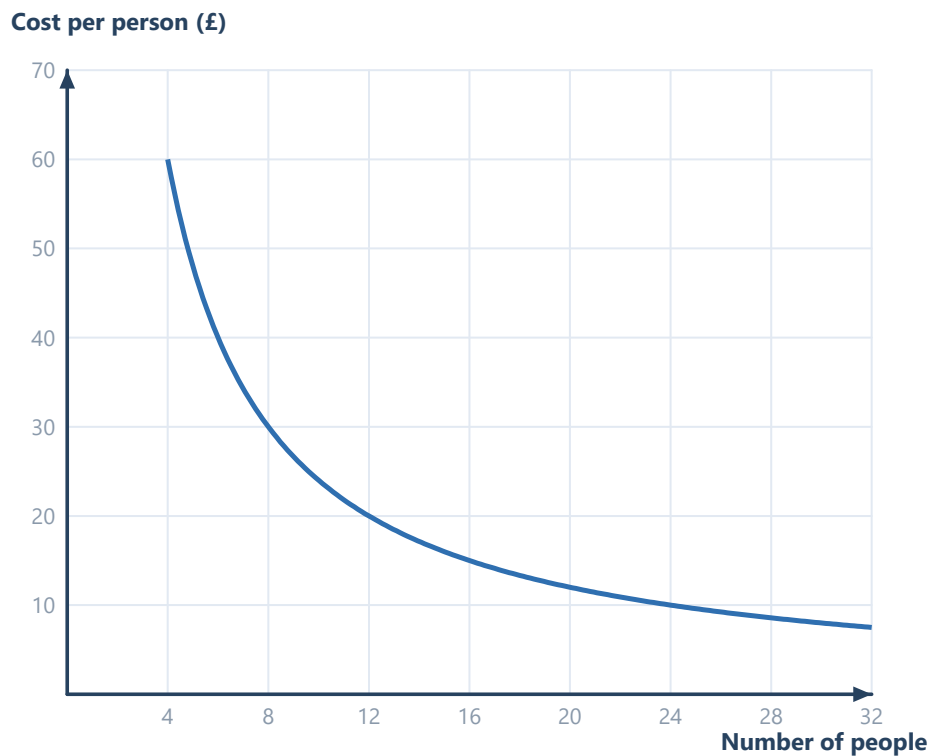
Answer: From £4 to £6

- 8 Dan says that the ball is more than 18 m above the ground for more than 1 second. Use the ball graph to decide whether he is right. Give a reason.



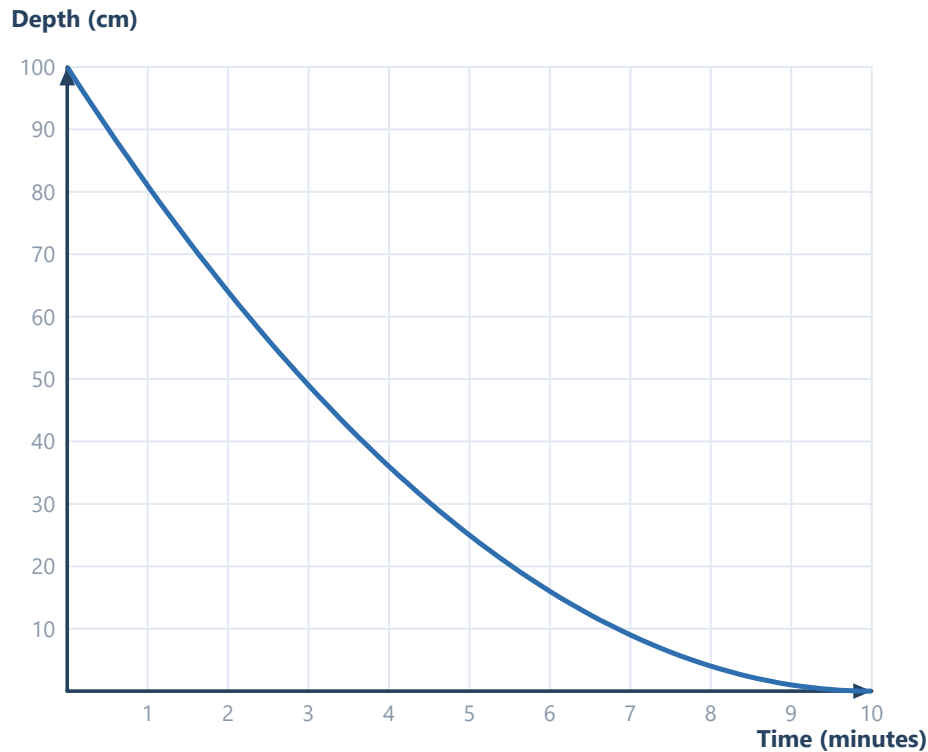
Answer: Yes: about 1.4 s to 2.6 s is 1.2 s

- 9 Each person on the coach trip can pay at most £20. Use the graph of $C = 240 \div n$ to find the smallest number of people needed.



Answer: 12 people

- 10** Read from the tank graph the depth after 0 minutes and after 5 minutes. Work out the average rate at which the depth falls in the first 5 minutes, in cm per minute.



Answer: 15 cm per minute

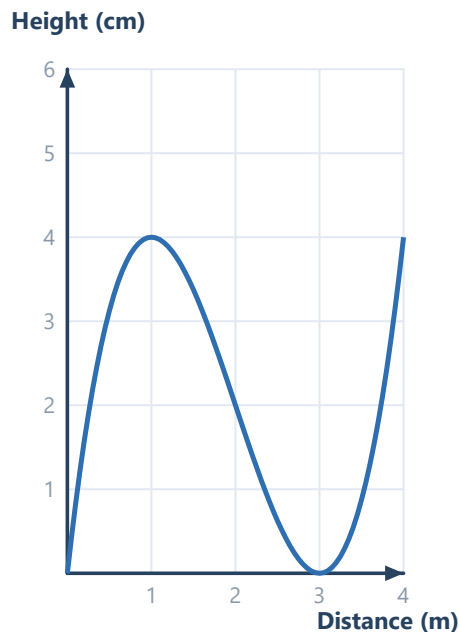
- 11** Sasha says: "The ball takes 2 seconds to reach its highest point, so the whole flight takes 4 seconds." Use the symmetry of the graph to explain why she is right.

Answer: The curve is symmetrical about $t = 2$

- 12** A student looks at the tank graph and says the water drains at a constant rate. Use values from the graph to show that this is wrong.

Answer: The depth falls by 36 cm in the first 2 minutes but only by 4 cm in the last 2 minutes

- 13** The bumpy road profile has height h cm at distance x m, with $h = x^3 - 6x^2 + 9x$. Use the graph to find (a) the height at $x = 2$, (b) the height at $x = 4$, (c) the distances at which the height is 2 cm, to 1 decimal place.



(a) $x = 2$

Answer: 2 cm

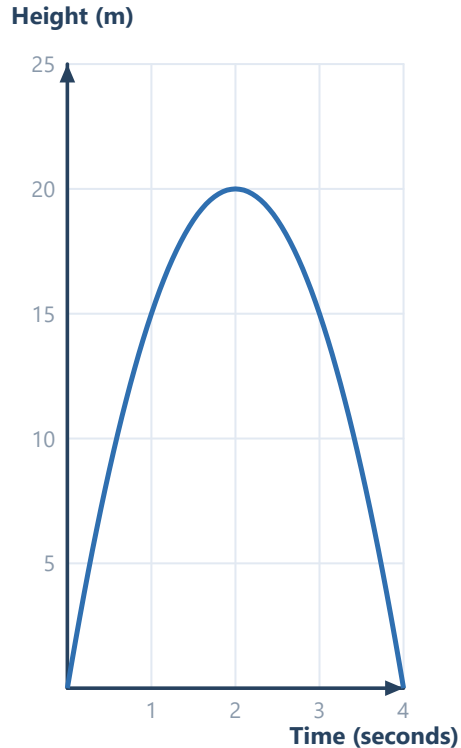
(b) $x = 4$

Answer: 4 cm

(c) height 2 cm

Answer: 0.3, 2.0 and 3.7 m (accept answers within 0.1)

- 14 Use the ball graph to find the height at 0.5 seconds and at 3.5 seconds. Explain why the two heights are the same.



(a) height at $t = 0.5$

Answer: 8.75 m

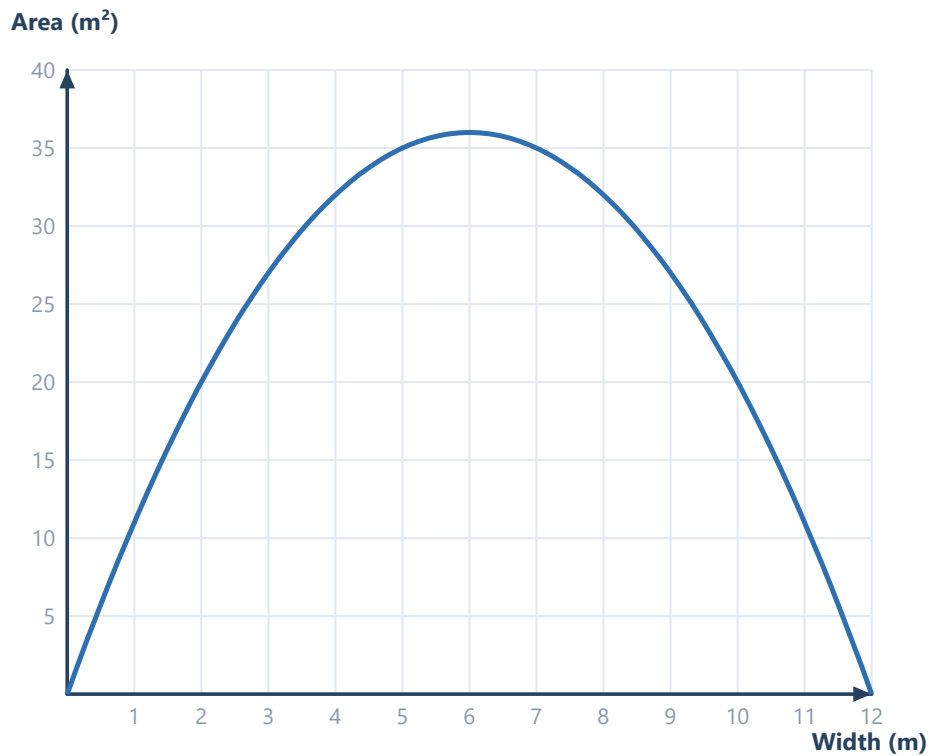
(b) height at $t = 3.5$

Answer: 8.75 m

(c) Explain

Answer: Symmetry about $t = 2$

- 15 Use the area graph to find the widths for which the area of the pen is 30 m^2 . Give your answers to 1 decimal place. Explain why there are two answers.



- (a) widths for 30 m²

Answer: 3.6 and 8.4 m (accept answers within 0.1)

- (b) Explain

Answer: The width x and $12 - x$ give the same area

- 16** Another ball is thrown with height $h = 30t - 5t^2$. Without drawing a graph, find (a) when it lands, (b) the time when it is at its highest, (c) the greatest height.

- (a) when it lands

Answer: $t = 6$ s

- (b) time of greatest height

Answer: $t = 3$ s

- (c) greatest height

Answer: 45 m