

Name:

Section:

Quadratic Equations Worksheet

1 Amira drives 40 km to work.

(a) Amira takes x minutes to drive the first 30 km of the journey.

Show that her average speed in km/h for the first 30 km of the journey is $\frac{1800}{x}$.

[1]

(b) Amira's average speed in km/h for the final 10 km of the journey is $\frac{600}{x-25}$.

Her average speed for the first 30 km of the journey is 8 km/h slower than her average speed for the final 10 km.

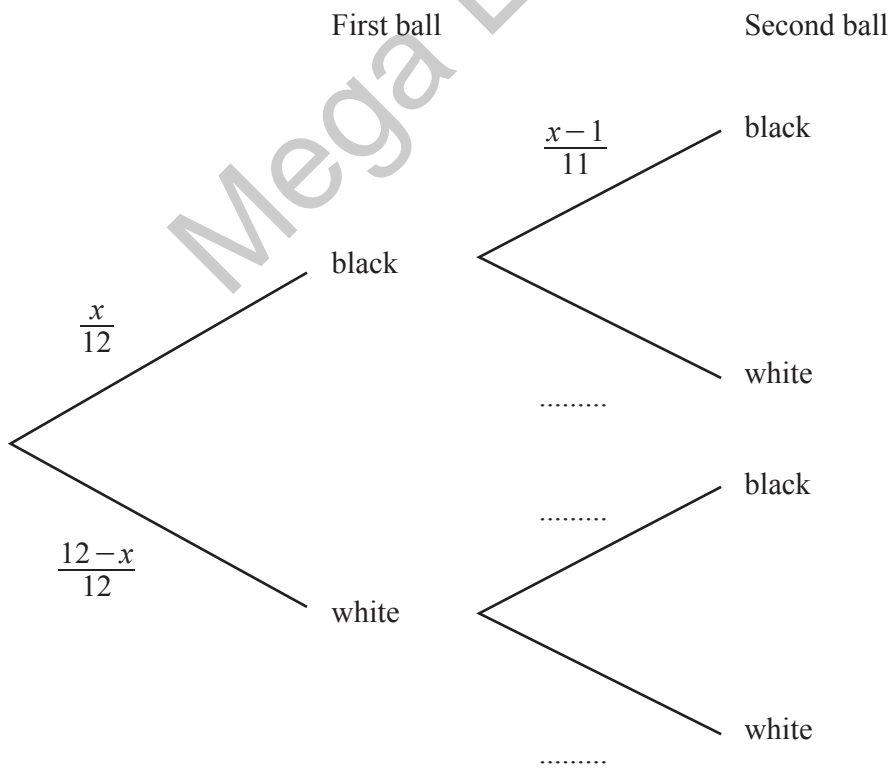
Form an equation in x and show that it simplifies to $x^2 + 125x - 5625 = 0$.

[3]

- (c) Solve the equation $x^2 + 125x - 5625 = 0$.
 Show your working and give each answer correct to 1 decimal place.

- 2 A bag contains 12 balls.
 There are x black balls in the bag and the other balls are white.
 Two balls are taken at random from the bag without replacement.

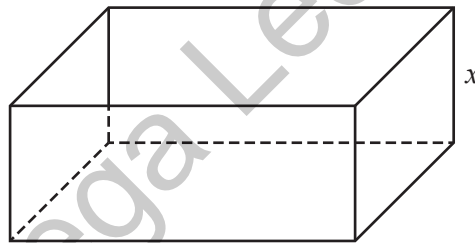
$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]



- (a) The probability that both balls are black is $\frac{14}{33}$.

Form an equation in x and solve it to find the number of black balls in the bag.
Show your working.

3



..... [4]

The diagram shows an open box in the shape of a cuboid.

The height of the box is x cm.

The width of the box is 5 cm more than its height.

The length of the box is two times its width.

- (a) Write down expressions, in terms of x , for the width and the length of the box.

= cm

= cm [2]

(b) The external surface area of the open box is 210 cm^2 .

Form an equation in x and show that it simplifies to $4x^2 + 25x - 80 = 0$.

[4]

(c) Solve the equation $4x^2 + 25x - 80 = 0$.
Show your working and give your answers correct to 2 decimal places.

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$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]

4 (a) On Monday, Ravi goes on a 20 km run.

(i) His average speed for the first 12 km is x km/h.

Write down an expression, in terms of x , for the time taken for the first 12 km.
Give your answer in minutes.

Answer minutes [1]

(ii) His average speed for the final 8 km of the run is 1.5 km/h slower than for the first 12 km.

Write an expression, in terms of x , for the time taken for the final 8 km of the run.
Give your answer in minutes.

Answer minutes [1]

(iii) Ravi takes 110 minutes to complete the full 20 km.

Form an equation in x and show that it simplifies to $22x^2 - 273x + 216 = 0$.

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[4]

(iv) Solve the equation $22x^2 - 273x + 216 = 0$.

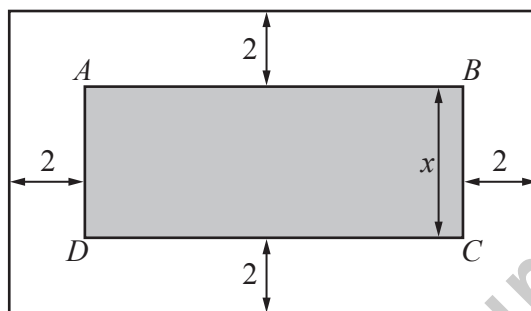
Show your working and give each answer correct to 2 decimal places.

Answer $x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]

5 Simplify $\frac{v^2 - 8v}{2v^2 - 13v - 24}$.

Answer [3]

6 A rectangular picture, $ABCD$, is placed inside a rectangular frame.



The length, AB , of the picture is three times its height, x cm.
The width of the frame is 2 cm.

(a) The total area of the picture and the frame is 476 cm^2 .

Form an equation in x and show that it simplifies to $3x^2 + 16x - 460 = 0$.

MegaLecture

[4]

(b) Solve the equation $3x^2 + 16x - 460 = 0$.

Answer $x = \dots\dots\dots$ or $\dots\dots\dots$ [3]

(c) Find the height and length of the **frame**.

Answer Height = cm

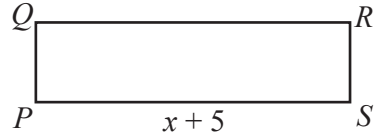
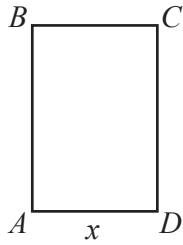
Length = cm [2]

7 Solve $2x(x + 1) = 3(4 - x)$.

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Answer $x = \dots\dots\dots$ or $\dots\dots\dots$ [3]

8



$ABCD$ and $PQRS$ are rectangles.
 $AD = x$ cm and $PS = (x + 5)$ cm.
Each rectangle has an area of 17 cm².

(i) Write down an expression for PQ in terms of x .

(ii) AB is 3 cm longer than PQ .

Answer $PQ = \dots\dots\dots$ cm [1]

Form an equation in x and show that it simplifies to $3x^2 + 15x - 85 = 0$.

(iii) Solve the equation $3x^2 + 15x - 85 = 0$.
Give your solutions correct to 3 significant figures.

[3]

Answer $x = \dots\dots\dots$ or $\dots\dots\dots$ [3]

- (iii) Solve the equation $3x^2 + 15x - 85 = 0$.
Give your solutions correct to 3 significant figures.

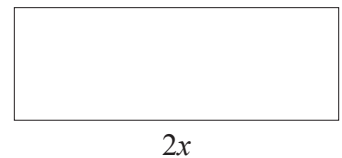
Answer $x = \dots\dots\dots$ or $\dots\dots\dots$ [3]

- (iv) Find the perimeter of the rectangle $PQRS$.

Answer $\dots\dots\dots$ cm [2]

- 9 A rectangle has length $2x$ cm, perimeter 18 cm and area 10 cm^2 .

- (i) Show that $2x^2 - 9x + 5 = 0$.



[2]

- (ii) Solve $2x^2 - 9x + 5 = 0$, giving your answers correct to 2 decimal places.

Answer $x = \dots\dots\dots$ or $\dots\dots\dots$ [3]

(iii) Find the difference between the length and the width of the rectangle.

Answer cm [1]

10 (a) (i) Solve the equation $(x + \frac{7}{2}) = \pm \frac{\sqrt{5}}{2}$.

Give both answers correct to 2 decimal places.

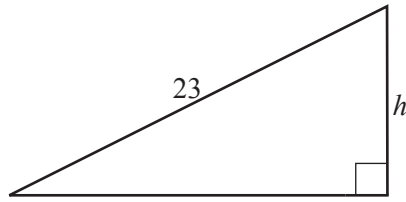
Answer $x =$ or [2]

(ii) The solutions of $(x + \frac{7}{2}) = \pm \frac{\sqrt{5}}{2}$ are also the solutions of $x^2 + Bx + C = 0$, where B and C are integers.

Find B and C .

Answer $B =$ $C =$ [3]

11



A right-angled triangle has a base that is 7 cm longer than its height, h cm. The hypotenuse of the triangle is 23 cm.

(i) Show that h satisfies the equation $h^2 + 7h - 240 = 0$.

[2]

(ii) Write down an expression, in terms of h , for the area of the triangle.

Answer cm² [1]

(iii) Hence state the exact area of the triangle.

Answer cm² [1]

(iv) Solve $h^2 + 7h - 240 = 0$, giving your answers correct to 1 decimal place.

Answer $h =$ or [3]

(v) Calculate the perimeter of the triangle.

Answer cm [1]

12 (a) The distance between London and York is 320 km .
A train takes x hours to travel between London and York.

(i) Write down an expression, in terms of x , for the average speed of the train.

Answer km/h [1]

(ii) A car takes $2\frac{1}{2}$ hours longer than a train to travel between London and York.
The average speed of the train is 80 km/h greater than the average speed of the car.

Form an equation in x and show that it simplifies to $2x^2 + 5x - 20 = 0$.

[3]

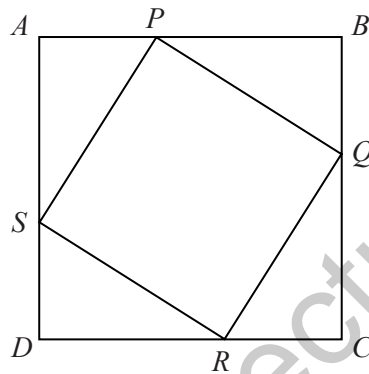
(iii) Solve the equation $2x^2 + 5x - 20 = 0$, giving your answers correct to 2 decimal places.

Answer $x =$ or [3]

(iv) Hence find the average speed of the car correct to the nearest km/h.

Answer km/h [2]

13



$ABCD$ is a square.
 $AP = BQ = CR = DS$.

(a) The length of a side of the square $ABCD$ is 40 cm and $AP = x$ cm.

(i) Write down an expression for PB in terms of x .

..... cm [1]

(ii) Show that the area, $y \text{ cm}^2$, of $PQRS$ is given by $y = 1600 - 80x + 2x^2$.

[2]

(b) (i) When $y = 1100$, show that $x^2 - 40x + 250 = 0$.

[1]

(ii) Solve the equation $x^2 - 40x + 250 = 0$.
Give each answer correct to 1 decimal place.

Answer $x = \dots\dots\dots$ or $\dots\dots\dots$ [3]

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