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 $x^2 + 125x - 5625 = 0$.

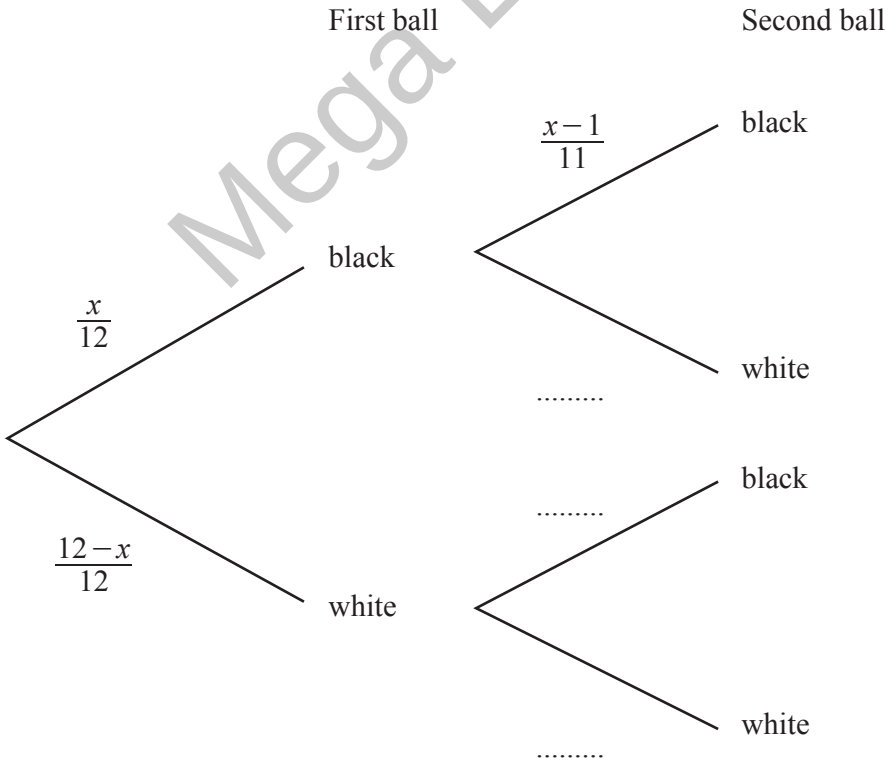
[3]

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

$x =$ ..... or $x =$ ..... [3]

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.

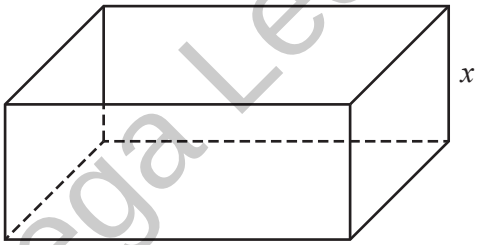


(a) The probability that both balls are black is $\frac{14}{33}$.

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

..... [4]

3



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 $210\,\text{cm}^2$.

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.

$x =$ ..... or $x =$ ..... [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 $22x^2 - 273x + 216 = 0$.

[4]

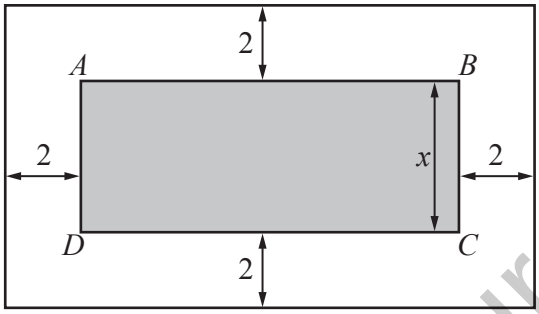
(iv) Solve the equation $22x^2 - 273x + 216 = 0$.
Show your working and give each answer correct to 2 decimal places.

Answer $x =$ ..... or $x =$ ..... [3]

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

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 $3x^2 + 16x - 460 = 0$.

[4]

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

Answer $x =$ ..... or ..... [3]

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

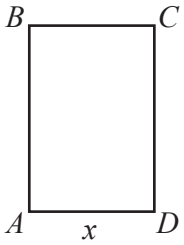
Answer Height = ... cm

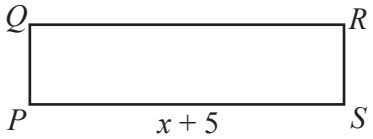
Length = ... cm [2]

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

Answer x = ... or ..... [3]

8





ABCD and *PQRS* are rectangles.
$AD = x$ cm and $PS = (x + 5)$ cm.
Each rectangle has an area of 17 cm^2.

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

Answer $PQ =$ ..... cm [1]

(ii) *AB* is 3 cm longer than *PQ*.

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

[3]

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

Answer $x =$ ..... or ..... [3]

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

Answer $x =$ ..... or ..... [3]

(iv) Find the perimeter of the rectangle *PQRS*.

Answer ..... 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 $x =$ ..... or ..... [3]

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

Answer ..... cm [1]

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

Give both answers correct to 2 decimal places.

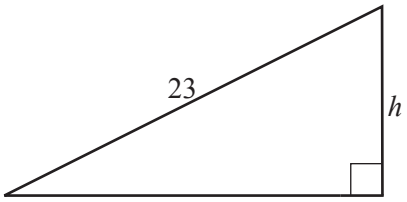
Answer x = ... or ..... [2]

(ii) The solutions of $\left(x+\frac{7}{2}\right)=\pm\frac{\sqrt{5}}{2}$ 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 ..... cm^2 [1]

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

Answer ..... cm^2 [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]

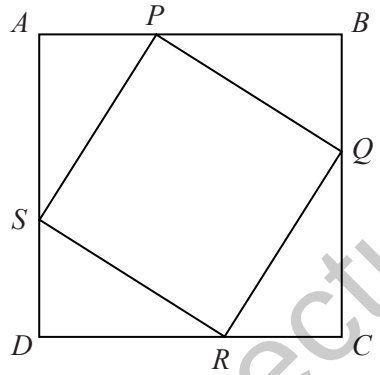
(iii) Solve the equation $2x^2 + 5x - 20 = 0$, giving your answers correct to 2 decimal places.

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 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 $x =$ ..... or ..... [3]