



The quadratic formula

About 50 minutes Calculator allowed 48 marks

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

- A1** Needed today [2 marks] **A2** Last lesson [2 marks]
 Work out $\frac{(-4) \times (-4) - 4}{-2}$. Solve $2x^2 + 15x + 25 = 0$.

Answer

Answer

- A3** From chapter 2 [2 marks] **A4** From chapter 7 [2 marks]
 40% of the students in a school are boys. 60% of the boys and 85% of the girls walk to school. What percentage of all the students walk to school? Points A and B are 40 cm apart. Point P is 29 cm from A and 29 cm from B . How far is P from the line AB ?

Answer

Answer

B Example, then your turn

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

Solve $x^2 + x - 11 = 0$. Give your answers correct to 2 decimal places.

Hint $a = 1$, $b = 1$, $c = -11$. Put brackets round every value in $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

- B1** Solve $x^2 - 9x + 7 = 0$. Give your answers correct to 2 decimal places. [3 marks]

Answer $x = \dots\dots$ or $x = \dots\dots$

EXAMPLE 2

Solve $2x^2 + 7x + 2 = 0$. Give your answers correct to 2 decimal places.

Hint Work out $b^2 - 4ac$ first, then divide by $2a = 4$.

- B2** Solve $4x^2 - 5x - 3 = 0$. Give your answers correct to 2 decimal places. [3 marks]

Answer $x = \dots\dots$ or $x = \dots\dots$

C Practice

- C1** Work out the discriminant of $3x^2 - 2x + 5 = 0$. How many real solutions are there? [2 marks]
- C2** Solve $x^2 + 14x + 46 = 0$. Give your answers in the form $a \pm \sqrt{b}$. [2 marks]

Answer solutions

Answer $x = \dots \pm \sqrt{\dots}$

- C3** Show that $25x^2 - 20x + 4 = 0$ has exactly one solution, and find it. [2 marks]
- C4** Solve $2x^2 = 3x + 7$. Give your answers correct to 3 significant figures. [3 marks]

Answer $x = \dots$

Answer $x = \dots$ or $x = \dots$

- C5** Solve $x(x + 5) = 3(x + 4)$. Give your answers correct to 2 decimal places. [3 marks]
- C6** Solve $2x^2 - 6x + 1 = 0$. Give your answers in the form $\frac{a \pm \sqrt{b}}{c}$, where a , b and c are whole numbers, as simply as possible. [3 marks]

Answer $x = \dots$ or $x = \dots$

Answer $x = \dots$

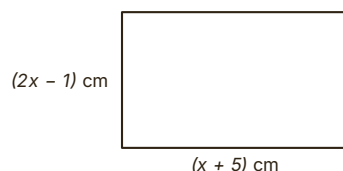
D Exam-style questions

- D1** Ben solves $x^2 - 8x - 5 = 0$. He writes $x = \frac{-8 \pm \sqrt{64 + 20}}{2}$. [3 marks]

Explain Ben's mistake, and solve the equation. Give your answers correct to 2 decimal places.

Answer $x = \dots$ or $x = \dots$

- D2** A rectangular photo is $(x + 5)$ cm long and $(2x - 1)$ cm wide. Its area is 60 cm^2 . The diagram is not drawn accurately.



- (a)** Show that $2x^2 + 9x - 65 = 0$. [2 marks]

(b) Find the value of x . Give your answer correct to 3 significant figures.

[3 marks]

Answer

(c) Work out the perimeter of the photo. Give your answer correct to 3 significant figures. [2 marks]

Answer

Total for D2: 7 marks

D3 A ball is thrown upwards. After t seconds its height is $h = 24t - 5t^2$ metres.

(a) Work out the two times at which the ball is 15 m high. Give your answers correct to 3 significant figures. [3 marks]

Answer $t = \dots\dots$ s and $t = \dots\dots$ s

(b) Explain why there are two answers to part (a). [1 mark]

(c) For how long is the ball higher than 15 m? Give your answer correct to 3 significant figures. [1 mark]

Answer

Total for D3: 5 marks

E Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

E1 The equation $kx^2 + 6x + k = 0$ has exactly one solution. Find the two possible values of k , and the solution of the equation for each one. [4 marks]

Answer $k = \dots\dots$, $x = \dots\dots$ or $k = \dots\dots$, $x = \dots\dots$

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Exactly one solution means the discriminant is 0.
Hint 2 $b^2 - 4ac = 36 - 4k^2 = 0$, so $k^2 = 9$.
Hint 3 $k = 3$ gives $3x^2 + 6x + 3 = 3(x + 1)^2 = 0$, so $x = -1$.
 $k = -3$ gives $-3(x - 1)^2 = 0$, so $x = 1$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

- I can solve a quadratic equation with the quadratic formula. ☐ ☐ ☐
- I can use the discriminant to say how many solutions there are. ☐ ☐ ☐
- I can give exact answers in surd form, simplified. ☐ ☐ ☐