

Algebra 1 · Solving Quadratic Equations · Worksheet Answer Key

Common Core A-REI.B.4a, A-REI.B.4b, A-APR.B.3, A-CED.A.1 · mathovore.fr

Each solution shows the method, the key computation and the final answer in bold. For word problems, check every solution against the situation and reject any that cannot happen, such as a negative length.

Algebra 1 Common Core: A-REI.B.4a · A-REI.B.4b · A-APR.B.3 · A-CED.A.1

Problem 1: Standard form

- a. Subtract $5x$ and add 2: $3x^2 - 5x + 2 = 0$, so $a = 3$, $b = -5$, $c = 2$.
b. Distribute: $x^2 + 4x = 21$. Subtract 21: $x^2 + 4x - 21 = 0$, so $a = 1$, $b = 4$, $c = -21$.

Problem 2: Perfect-square roots

- a. $x = \pm\sqrt{81}$. $x = 9$ **or** $x = -9$.
b. Add 11: $x^2 = 36$. $x = 6$ **or** $x = -6$. Check: $36 - 11 = 25$.

Problem 3: Square roots, not perfect

- a. $x = \pm\sqrt{20} = \pm 2\sqrt{5} \approx \pm 4.47$. $x = \pm 2\sqrt{5}$.
b. Divide by 3: $x^2 = 25$. $x = \pm 5$.

Problem 4: Square both sides back

Take square roots: $x - 3 = \pm 4$. Then $x = 3 + 4 = 7$ or $x = 3 - 4 = -1$. $x = 7$ **or** $x = -1$.

Check: $(7 - 3)^2 = 16$ and $(-1 - 3)^2 = 16$. Both points are 4 units from 3.

Problem 5: Square roots with a shift

$$x + 2 = \pm\sqrt{10}, \text{ so } x = -2 \pm \sqrt{10}.$$

With $\sqrt{10} \approx 3.162$: $x \approx 1.16$ **or** $x \approx -5.16$.

Problem 6: Zero-product property

Set each factor to 0: $x - 4 = 0$ or $x + 7 = 0$. $x = 4$ **or** $x = -7$.

Problem 7: Factor a trinomial

Find two numbers with product 20 and sum 9: 4 and 5. So $(x+4)(x+5)=0$.

$x = -4$ **or** $x = -5$. Check: $16 - 36 + 20 = 0$.

Problem 8: Negative constant

Two numbers with product -28 and sum -3 : -7 and 4 . So $(x-7)(x+4)=0$.

$x = 7$ **or** $x = -4$. Check: $49 - 21 - 28 = 0$.

Problem 9: Common factor

a. Factor out x : $x(x-6)=0$. $x=0$ **or** $x=6$.

b. $x(x+8)=0$. $x=0$ **or** $x=-8$.

Do not divide by x : that would lose the solution $x=0$.

Problem 10: Rearrange first

Move every term to the left: $x^2 - 2x - 15 = 0$. Factor: $(x-5)(x+3)=0$.

$x = 5$ **or** $x = -3$. Check $x = -3$: $9 = -6 + 15$.

Problem 11: Leading coefficient 2

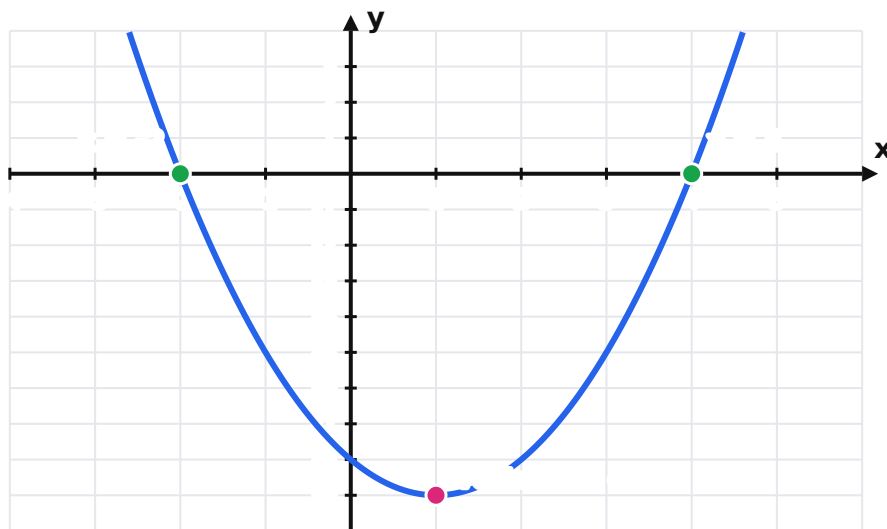
Split the middle term: $2x^2 + 6x + x + 3 = 2x(x+3) + 1(x+3) = (2x+1)(x+3)$.

$2x+1=0$ gives $x = -\frac{1}{2}$, and $x+3=0$ gives $x = -3$. $x = -\frac{1}{2}$ **or** $x = -3$.

Problem 12: Solve from a graph

The solutions are the x-intercepts: $x = -2$ **and** $x = 4$.

Factoring: $(x-4)(x+2)=0$, so $x=4$ or $x=-2$. The graph and the algebra agree. The lowest point is $(1, -9)$, halfway between the zeros.



The graph of $y = x^2 - 2x - 8$.

Problem 13: Complete the square

Subtract 5: $x^2 + 6x = -5$. Add $3^2 = 9$: $x^2 + 6x + 9 = 4$, so $(x+3)^2 = 4$.

$x+3 = \pm 2$. $x = -1$ **or** $x = -5$.

Problem 14: Irrational solutions

$x^2 - 8x = -3$. Add $(-4)^2 = 16$: $(x-4)^2 = 13$.

$x = 4 \pm \sqrt{13}$, so $x \approx 7.61$ **or** $x \approx 0.39$.

Problem 15: Odd middle coefficient

$x^2 + 5x = 2$. Half of 5 is $\frac{5}{2}$, and its square is $\frac{25}{4}$. So $x^2 + 5x + \frac{25}{4} = 2 + \frac{25}{4} = \frac{33}{4}$.

$\left(x + \frac{5}{2}\right)^2 = \frac{33}{4}$, so $x = \frac{-5 \pm \sqrt{33}}{2}$. $x \approx 0.37$ **or** $x \approx -5.37$.

Problem 16: Divide first

Divide by 2: $x^2 - 6x + 5 = 0$, so $x^2 - 6x = -5$. Add 9: $(x-3)^2 = 4$.

$x-3 = \pm 2$. $x = 5$ **or** $x = 1$. Check: $50 - 60 + 10 = 0$.

Problem 17: Use the formula

$a = 2$, $b = -5$, $c = -3$. $b^2 - 4ac = 25 + 24 = 49$.

$x = \frac{5 \pm 7}{4}$. $x = 3$ **or** $x = -\frac{1}{2}$.

Problem 18: Formula with a radical

$$b^2 - 4ac = 16 + 12 = 28, \text{ and } \sqrt{28} = 2\sqrt{7}.$$

$$x = \frac{4 \pm 2\sqrt{7}}{2} = 2 \pm \sqrt{7}. \quad x \approx 4.65 \text{ or } x \approx -0.65.$$

Problem 19: Formula, a not 1

$$a = 3, b = -4, c = -2. \quad b^2 - 4ac = 16 + 24 = 40.$$

$$x = \frac{4 \pm \sqrt{40}}{6} = \frac{2 \pm \sqrt{10}}{3}. \quad x \approx 1.72 \text{ or } x \approx -0.39.$$

Problem 20: Discriminant and graph

The parabola never touches the x-axis, so there are **no real solutions**.

Discriminant: $b^2 - 4ac = (-2)^2 - 4(1)(3) = 4 - 12 = -8 < 0$. A negative discriminant means no real solutions.

Problem 21: Find k

One solution means $b^2 - 4ac = 0$: $36 - 4k = 0$, so $k = 9$.

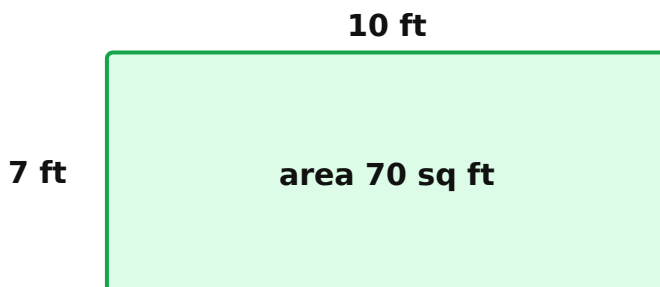
Then $x^2 + 6x + 9 = (x + 3)^2 = 0$ gives $x = -3$.

Problem 22: Rectangle area

$w(w + 3) = 70$, so $w^2 + 3w - 70 = 0$. Factor: $(w + 10)(w - 7) = 0$.

$w = -10$ is rejected because a width cannot be negative. So $w = 7$ and the length is $7 + 3 = 10$.

7 ft by 10 ft. Check: $7 \times 10 = 70$.



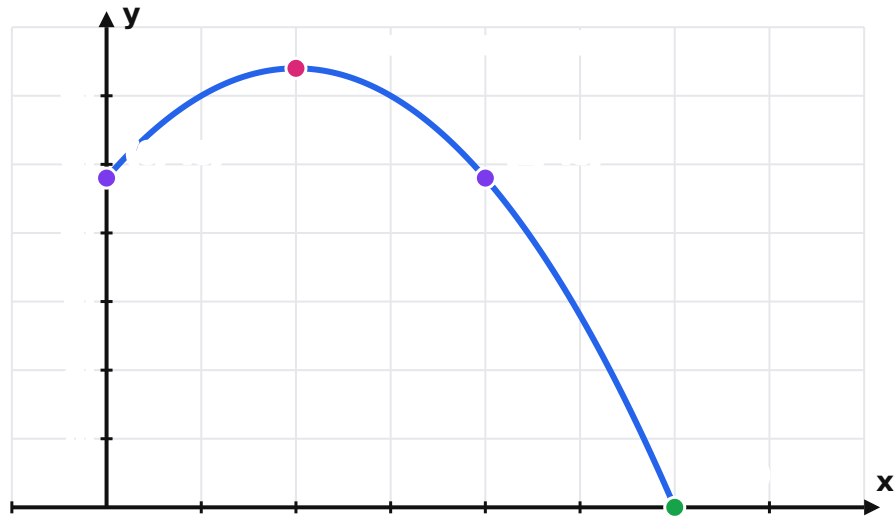
Rectangle model for the problem.

Problem 23: Stone from a cliff

a. Set $h = 0$: $-16(t^2 - 2t - 3) = 0$, so $-16(t - 3)(t + 1) = 0$. $t = -1$ is rejected because time cannot

be negative. $t = 3$ **seconds**.

- b. Set $h = 48$: $-16t^2 + 32t = 0$, so $-16t(t-2) = 0$. $t = 0$ **and** $t = 2$ **seconds**: the launch and the return to ledge height.



Height of a stone (feet) against time (seconds).

Problem 24: Consecutive integers

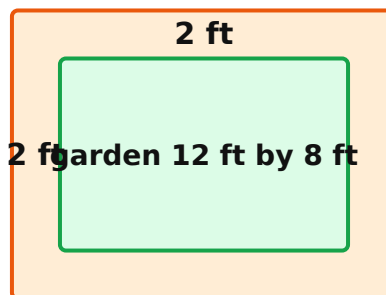
Let the integers be n and $n+1$. $n(n+1) = 156$, so $n^2 + n - 156 = 0$. Factor: $(n+13)(n-12) = 0$.

$n = 12$ gives **12 and 13**. $n = -13$ gives -13 and -12 , whose product is also 156, so **-13 and -12** is the other pair, but it is not positive.

Problem 25: Garden border

The outer rectangle is $(12+2x)$ by $(8+2x)$. $(12+2x)(8+2x) = 192$, so $4x^2 + 40x + 96 = 192$ and $4x^2 + 40x - 96 = 0$. Divide by 4: $x^2 + 10x - 24 = 0$, so $(x+12)(x-2) = 0$.

$x = -12$ is rejected. $x = 2$ **feet**. Check: $16 \times 12 = 192$.



Garden with a uniform border.

Problem 26: School play tickets

- a. $200x - 10x^2 = 1000$, so $x^2 - 20x + 100 = 0$, or $(x - 10)^2 = 0$. $x = 10$: a price of \$10, with 100 tickets sold. This is the only price, because it is the maximum.
- b. $200x - 10x^2 = 1200$ gives $x^2 - 20x + 120 = 0$. $D = 400 - 480 = -80 < 0$. **No**: \$1,200 is never reached.

Problem 27: Find the error

The zero-product property only applies when the product is 0. Here the product is 14, so the factors do not have to equal 14.

Correct work: $x^2 - 5x - 14 = 0$, so $(x - 7)(x + 2) = 0$. $x = 7$ **or** $x = -2$. Check $x = 7$: $49 - 35 = 14$.