

Quadratics Word Problems

Twelve problems in four sets. Sketch it, name one thing x , write the equation, then solve. Show every step in the boxes.

Name	Date	Class / Period
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BEFORE YOU START

1. Draw a quick picture. It does not have to be good.
2. Label one unknown x . Write everything else in terms of x .
3. Solve. Then read the story again and cross out any answer that cannot happen — negative time, negative length, a price below zero.
4. Write a unit on every final answer: seconds, feet, dollars, ft^2 .

Warm-Up · Say It In Algebra

No solving here. Just translate the phrase into symbols.

1 "A number plus its square is 72."

2 "The rectangle is 3 ft longer than it is wide."

3 "When does the ball hit the ground?"

4 "What is the greatest height it reaches?"

5 "Two consecutive positive integers."

How to use this sheet: one set at a time works better than all four in one sitting. Answer key on the last page — attempt all three problems in a set before checking.

Written by Berke Sahbazoglu · 10+ years tutoring Algebra I & II · 6,000+ hours with 200+ students · BS Biochemistry, Washington University in St. Louis · MS Bioinformatics, UMGC. Worksheets are prepared from previous class notes and assigned homework, and every question is checked for accuracy before publishing.

Set A · Things In The Air

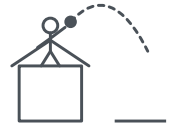
Gravity gives you the $-16t^2$. Ground means $h = 0$. Highest point means vertex.

A1

A ball is thrown straight up from the roof of a 20-foot building at 32 feet per second.

$$h = -16t^2 + 32t + 20$$

(a) How high does it get, and when? (b) When does it hit the ground?



SHOW YOUR WORK

Answer: _____

A2

A firework is launched from the ground and its height in feet is

$$h = -16t^2 + 96t$$

At what two times is it exactly 128 feet in the air?



SHOW YOUR WORK

Answer: _____

A3

A diver jumps upward at 24 ft/s from a 40-foot cliff.

$$h = -16t^2 + 24t + 40$$

(a) What is the highest point of the jump? (b) When does the diver hit the water?



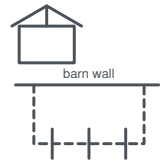
SHOW YOUR WORK

Answer: _____

Set B · Things With Sides

Draw the shape first. Label one side x , then write the other side in terms of x .

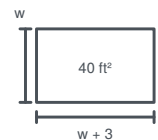
- B1** A farmer has 40 feet of fence and builds a rectangular pen using the barn wall as one side, so only three sides get fenced. What dimensions give the largest pen, and how large is it?



SHOW YOUR WORK

Answer: _____

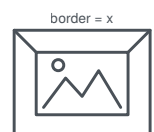
- B2** A rectangular garden is 3 feet longer than it is wide, and its area is 40 square feet. Find the length and the width.



SHOW YOUR WORK

Answer: _____

- B3** A 12-inch by 16-inch photo is put in a frame with a border of the same width all the way around. The whole framed rectangle has an area of 320 square inches. How wide is the border?



SHOW YOUR WORK

Answer: _____

Set C · Things With Prices

Revenue = price $\times$ quantity. Break-even means zero. Best price means vertex.

- C1** A school play sells tickets at p dollars each. At that price they sell $(120 - 4p)$ tickets. Which ticket price brings in the most money, and how much money is that?



SHOW YOUR WORK

Answer: _____

- C2** A small business models profit on x items as
 $P = -x^2 + 60x - 500$
(a) How many items must it sell to break even? (b) How many items give the largest profit, and what is it?



SHOW YOUR WORK

Answer: _____

- C3** A stall's daily revenue at a price of x dollars is
 $R = -2x^2 + 40x$
Which two prices bring in exactly \$150? Which one would you pick, and why?



SHOW YOUR WORK

Answer: _____

Set D · Things With Numbers

These all factor. If yours does not, check the setup before you reach for the formula.

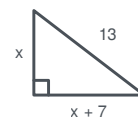
- D1** Two consecutive positive integers multiply to 156. Find both numbers.



SHOW YOUR WORK

Answer: _____

- D2** In a right triangle, one leg is 7 cm longer than the other and the hypotenuse is 13 cm. Find the length of each leg.



SHOW YOUR WORK

Answer: _____

- D3** A number added to its own square gives 72. Find every number that works — and say whether the story lets you keep both.



SHOW YOUR WORK

Answer: _____

Answer Key

Attempt all three in a set before you look. Checking after every problem is grading, not practicing.

WARM-UP · SAY IT IN ALGEBRA		
1	$x^2 + x = 72$	"Its square" is x^2 , "plus" is +.
2	length = $w + 3$	Area becomes $w(w + 3)$.
3	set $h = 0$	Ground level is height zero.
4	find the vertex	$x = -b/2a$, then plug back in for the height.
5	n and $n + 1$	Consecutive means one step apart.

SET A · THINGS IN THE AIR		
A1	36 ft at $t = 1$ s; lands at $t = 2.5$ s	Vertex: $t = -32/(2 \cdot -16) = 1$, $h = 36$. Ground: $-16t^2 + 32t + 20 = 0 \rightarrow 4t^2 - 8t - 5 = 0 \rightarrow (2t - 5)(2t + 1) = 0$. Reject $t = -0.5$.
A2	$t = 2$ s and $t = 4$ s	$-16t^2 + 96t = 128 \rightarrow t^2 - 6t + 8 = 0 \rightarrow (t - 2)(t - 4) = 0$. Up at 2 s, back down through it at 4 s.
A3	49 ft at $t = 0.75$ s; water at $t = 2.5$ s	Vertex: $t = -24/(2 \cdot -16) = 0.75$, $h = 49$. Ground: $2t^2 - 3t - 5 = 0 \rightarrow (2t - 5)(t + 1) = 0$. Reject $t = -1$.

SET B · THINGS WITH SIDES		
B1	10 ft $\times$ 20 ft, area 200 ft ²	Two sides x , third side $40 - 2x$. $A = x(40 - 2x) = -2x^2 + 40x$, vertex at $x = 10$.
B2	5 ft wide, 8 ft long	$w(w + 3) = 40 \rightarrow w^2 + 3w - 40 = 0 \rightarrow (w + 8)(w - 5) = 0$. Reject $w = -8$.
B3	Border 2 in wide	$(12 + 2x)(16 + 2x) = 320 \rightarrow 4x^2 + 56x - 128 = 0 \rightarrow x^2 + 14x - 32 = 0 \rightarrow (x + 16)(x - 2) = 0$. Framed size 16 in $\times$ 20 in.

Answer Key, continued

Sets C and D.

SET C · THINGS WITH PRICES		
C1	\$15 a ticket → \$900	$R = p(120 - 4p) = -4p^2 + 120p$, vertex at $p = 15$, selling 60 tickets.
C2	Break even at 10 and 50; best profit \$400 at 30 items	$-x^2 + 60x - 500 = 0 \rightarrow x^2 - 60x + 500 = 0 \rightarrow (x - 10)(x - 50) = 0$. Vertex at $x = 30$.
C3	\$5 or \$15	$-2x^2 + 40x = 150 \rightarrow x^2 - 20x + 75 = 0 \rightarrow (x - 5)(x - 15) = 0$. Same revenue either way, so the choice depends on how many you want to sell.

SET D · THINGS WITH NUMBERS		
D1	12 and 13	$n(n + 1) = 156 \rightarrow n^2 + n - 156 = 0 \rightarrow (n + 13)(n - 12) = 0$. Reject $n = -13$, "positive."
D2	Legs 5 cm and 12 cm	$x^2 + (x + 7)^2 = 169 \rightarrow 2x^2 + 14x - 120 = 0 \rightarrow x^2 + 7x - 60 = 0 \rightarrow (x + 12)(x - 5) = 0$. Reject $x = -12$.
D3	$x = 8$ or $x = -9$	$x^2 + x - 72 = 0 \rightarrow (x + 9)(x - 8) = 0$. Keep both: nothing in the story says the number has to be positive.

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Written by Berke Sahbazoglu — 10+ years teaching Algebra I & II, 6,000+ tutoring hours with 200+ students. Worksheets are prepared from previous class notes and assigned homework, and every question is checked for accuracy before publishing. Spotted an error? Email or text and it gets fixed the same week.

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