

<b>PROPERTY OF:</b>

UNIT 6

# QUADRATIC WORD PROBLEMS

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Day 3: Tue Feb 22 Day 4: Wed Feb 23	2-3		Quadratic Word Problems	Handout
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Day 3: Mon Feb 8 Day 4: Tue Mar 1	6-7	4.7	Quadratic Word Problems	Page 404-407 #12, 14, 16, 17, 18
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Day 3: Fri Mar 4 Day 4: Mon Mar 7	10-11		Review	Handout
Day 1: Tue Mar 8 Day 2: Wed Mar 9			Test	
Day 3: Thu Mar 10 Day 4: Fri Mar 11			Quadratic Word Problem Assignment	
MARCH BREAK				
Day 1: Mon Mar 21 Day 2: Tue Mar 22	12		Quadratic Word Problem Assignment	

<b>LEARNING GOAL:</b>	In this unit, we will focus on <b>PROBLEM SOLVING</b> related to applications of quadratic equations.
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# What Kind of Music Do Barbers and Tailors Play Together?



Solve each problem and find your answer at the bottom of the page. Cross out the letter above each correct answer. When you finish, you will have the answer to the noteworthy question above.

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|--|---|
| <p>1 Eight more than the square of a number is the same as 6 times the number. Find the number.</p> <p>2 Fifteen less than the square of a number is the same as twice the number. Find the number.</p> <p>3 If a number is added to twice its square, the result is 6. Find the number.</p> <p>4 Seven less than 4 times the square of a number is 18. Find the number.</p> <p>5 Find two consecutive integers whose product is 56.</p> | <p>6 Find two consecutive positive odd integers whose product is 35.</p> <p>7 The sum of the squares of two consecutive integers is 41. Find the integers.</p> <p>8 Find two consecutive odd integers such that the square of the first, added to 3 times the second, is 24.</p> <p>9 Find two consecutive even integers such that the square of the second, decreased by twice the first, is 52.</p> <p>10 Find three consecutive positive integers such that the square of the first, increased by the last, is 22.</p> |
|--|---|

S	C	U	H	A	L	T	I	O	P	S	O	I	E	N	W	G		
3, 5	4, 6 or -2, -4	5 or -3	4, 5, 6	5, 7	6, 7 or -7, -6	$\frac{3}{2}$ or -2	4	$\frac{3}{2}$ or -5	$\frac{5}{2}$ or -5	$\frac{2}{2}$ or -5	5, 6 or -6, -5	6 or -1	2 or 4	6, 8 or -8, -6	-9, -7	4, 5 or -5, -4	6, 7, 8	7, 8 or -8, -7

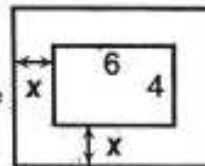
# Did You Hear About...

A	B	C	D
E	F	G	H ?

Solve each problem below. Find your answer in the answer column and notice the word next to it. Write this word in the box containing the letter of that exercise. Keep working and you will hear about something hot.

- (A) The length of a rectangle is 3 cm more than the width. The area is  $70 \text{ cm}^2$ . Find the dimensions of the rectangle.
- (B) The length of a rectangle is 4 cm more than the width. The area is  $96 \text{ cm}^2$ . Find the dimensions of the rectangle.
- (C) The length of a photograph is 1 cm less than twice the width. The area is  $45 \text{ cm}^2$ . Find the dimensions of the photograph.
- (D) If the sides of a square are increased by 3 m, the area becomes  $64 \text{ m}^2$ . Find the length of a side of the original square.
- (E) A square field had 5 m added to its length and 2 m added to its width. The field then had an area of  $130 \text{ m}^2$ . Find the length of a side of the original field.
- (F) The dimensions of a rectangular garden were 4 m by 5 m. Each dimension was increased by the same amount. The garden then had an area of  $56 \text{ m}^2$ . Find the dimensions of the new garden. (Hint: Let  $x$  be the amount of increase.)
- (G) The dimensions of a rectangular garden were 3 m by 10 m. When both dimensions were increased by equal amounts, the area of the garden doubled. Find the dimensions of the new garden.

- (H) A 4 m by 6 m rug covers half of the floor area of a room and leaves a uniform strip of bare floor around the edges. What are the dimensions of the room?



6 m	THAT
5 m by 12 m	HOT
7 cm by 10 cm	THE
8 cm by 11 cm	CHAIRS
8 m	WHO
4 cm by 7 cm	GUY
5 m	DEALER
7 m by 9 m	PILLOWS
8 cm by 12 cm	CROOKED
7 m by 8 m	BUYS
5 m by 6 m	STUFF
6 m by 8 m	WATERBEDS
8 m by 9 m	SELLS
7 m by 14 m	TABLES
5 cm by 9 cm	FURNITURE

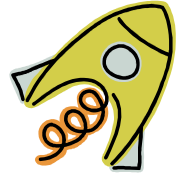
## QUADRATIC WORD PROBLEMS

### *Determining Maximum and Minimum Values*

#### Example 1

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A model rocket is launched from the roof of a building. Its flight path is modeled by  $h = -5t^2 + 30t + 10$  where  $h$  is the height of the rocket above the ground in metres and  $t$  is the time after the launch in seconds.



What is the rocket's maximum height?

#### Example 2

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A rectangular field will be fenced on all four sides. There will also be a line of fence across the field, parallel to the shorter side.

If 900 m of fencing are available, what dimensions of the field will produce the maximum area? What is the maximum area?

### Example 3

Tickets to a school dance cost \$4 and the projected attendance is 300 people. For every \$0.10 increase in ticket price, the dance committee projects that attendance will decrease by 5.



a) Determine the dance committee's greatest possible revenue.

b) What ticket price will produce the greatest revenue?

### Homework

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## QUADRATIC WORD PROBLEMS

### *Solving Quadratic Equations*

#### Example 1

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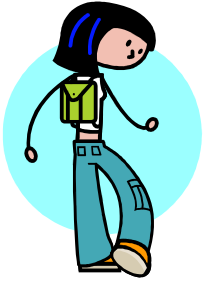
A water balloon is catapulted into the air so that its height  $h$ , in metres, after  $t$  seconds is  $h = -4.9t^2 + 27t + 2.4$

- a) How high is the balloon after 1 second?
- b) For how long is the balloon more than 30 m high?
- c) What is the maximum height of the balloon?
- d) When will the balloon burst as it hits the ground?



## Example 2

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Nancy walks 15 m diagonally across a rectangular field. She then returns to her starting position along the outside of the field. The total distance she walks is 36 m. What are the dimensions of the field?

## Homework

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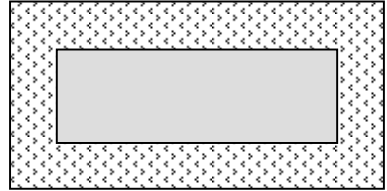
## QUADRATIC WORD PROBLEMS

### *Solving Quadratic Equations*

#### Example 1

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A rectangular lawn measuring 8 m by 4 m is surrounded by a flower bed of uniform width. The combined area of the lawn and the flower bed is  $165 \text{ m}^2$ . What is the width of the flower bed?





Example 2

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A mural is to be painted on a wall that is 15 m long and 12 m high. A border of uniform width is to surround the mural. If the mural is to cover 75% of the area of the wall, how wide must the border be, to the nearest tenth of a metre?

Homework

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## UNIT 6 REVIEW QUADRATIC WORD PROBLEMS

### General Strategies

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- Read the problem entirely. Don't be afraid to re-read it until you understand.
- Determine what you are asked to find.
  - If it requires finding a maximum or minimum, then complete the square.
  - If it requires solving a quadratic equation, the factor or use the quadratic formula.
- Draw and label a diagram when applicable.
- Define all variables you introduce.
- Look at your answer and ask yourself: “**Is this answer possible?**” You may find that your answer is not possible because it does not fit with the facts presented in the problem.
- Finish your solution with a concluding statement.

### Determining Maximum and Minimum Values

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1. A rectangular field is to be enclosed by 400 m of fence. What is the maximum area? What dimensions will give the maximum area?  
(Answer: 10000 m<sup>2</sup>, 100 m by 100 m)
2. Last year, talent show tickets were sold for \$11 each and 400 people attended. It has been determined that an increase of \$1 in ticket price would cause a decrease in attendance of 20 people. What ticket price would maximize revenue?  
(Answer: \$15.50)

### Solving Quadratic Equations

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3. The sum of the squares of two consecutive even integers is 452. Find the integers.  
(Answer: 14, 16 or -14, 16)
4. The width of a rectangle is 2 m less than the length. The area is 48 m<sup>2</sup>. Find the dimensions.  
(Answer: 6 m by 8 m)
5. One side of a right triangle is 2 cm shorter than the hypotenuse and 7 cm longer than the third side. Find the lengths of the sides of the triangle.  
(Answer: 8 cm, 15 cm, 17 cm)

6. A uniform border on a framed photograph has the same area as the photograph. What are the outside dimensions of the border if the dimensions of the photograph are 25 cm by 20 cm?  
(Answer: 34.2 cm by 29.2 cm)
7. A sheet of cardboard 10 inches by 12 inches will be made into a box by cutting equal-sized squares from each corner and folding up the four edges. If the area of the base is to be 80 square inches, then what size square should be cut from each corner?  
(Answer: 1 inch by 1 inch)

### Multi-Part Questions

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8. A football is punted into the air. Its height  $h$ , in metres, after  $t$  seconds is given by the equation  $h = -4.9t^2 + 24.5t + 1$ .
- a) How high is the ball after 1 second?  
(Answer: 20.6 m)
- b) Find the maximum height of the ball to one decimal place.  
(Answer: 31.6 m)
- c) When does the ball reach its maximum height?  
(Answer: 2.5 s)
- d) When does the ball hit the ground?  
(5.04 seconds)

## QUADRATIC WORD PROBLEM ASSIGNMENT

**Due Date:** \_\_\_\_\_

- Your Task:**
- Create a unique word problem that needs to be solved using a quadratic equation.
  - Solve the word problem with a complete solution and explanation.
  - Illustrate your problem on a poster (half-sheet of bristol board preferred).

**Please Note:** You may choose to work with a partner or individually. If you choose to work with a partner, both students will receive the same mark.

**Assessment:**      **Word Problem**

There is no way this problem would ever be in a textbook!	This might be in a textbook.	This problem was assigned for homework.	Not Done
6	4	2	0

**Illustration/Poster**

Wow! Call a publisher!	Good work.	More effort required.	Not Done
6	4	2	0

**Solution**

Most efficient method used with complete explanation.	Most efficient method used but no or partial explanation or not the most efficient method used with good explanation.	Wrong solution or not the most efficient method with no explanation.	Not Done
6	4	2	0

**On Time**

Handed in on time.	Handed in on the correct day, but after class.	Handed in one class late.	Handed in 2 or more classes late
4	3	2	0

**Total:** \_\_\_\_\_/22