Quadratic Problems

Date:

Example 1: Height Problem

A ball is dropped from the top of a cliff. The height of the ball after 't' seconds is shown in the table below. Calculate the first and second differences and sketch a graph of the function.

time	height	first difference	second difference
0	180		
1	175		
2	160		
3	135		
4	100		
5	55		
6	0		

a) Determine the height of the cliff. What value of 't' corresponds to the height of the cliff?

b) What is the initial height of the ball? How does this correspond to the height of the cliff?

c) How long does it take for the ball to reach the ground? What is the value of 'h' when the ball hits the ground?

d) Determine the quadratic relation to represent the situation.

Example 2: Area Problem

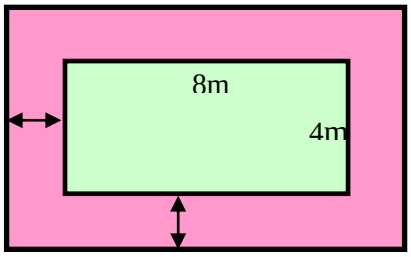
A rectangle is 4 cm longer than it is wide. If the area is 192 cm^2, determine its dimensions.

Example 3: Number Problem

The sum of the squares of two consecutive numbers is 113. Determine the numbers.

Example 4: Border Problem

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



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Exercise

1. The length of a rectangle is 5 metres more than the width. If the area is 36 m^2, what are the dimensions of the rectangle?

2. Two numbers differ by 6. If the numbers are squared and then added, the result is 146. What are the numbers?

3. The hypotenuse of a right triangle is 17 cm long. The next longest side is 7 cm longer than the third side. Determine the unknown lengths.

4. An area rug has a central patterned section that is 3 m by 5 m. There is a plain border of uniform width surrounding this patterned section. The total area of the rug is 24 m^2. Determine the width of the border.

5. A picture that measures 10 cm by 5 cm is to be surrounded by a matte before being framed. The width of the matte is to be the same on all sides of the picture. The area of the matte is to be twice the area of the picture. What is the width of the matte?

6. Helen owns a campground that has a rectangular swimming pool measuring 10 m by 20 m. She wants to put a wooden deck of uniform width around the pool. She knows that the cost of the deck will be $30 per square metre and has $1920 in her budget to pay for the deck. What is the widest that the deck can be?

7. A boy throws a ball vertically upward from the top of a cliff. The height of the ball above the base of the cliff is approximated by the equation $h = 75 + 10t - 5t^2$.

   a) How high is the cliff?

   b) How long does it take for the ball to reach a height of 35 m above the base of the cliff?

   c) What is the maximum height of the ball?

Answers

1) 4 by 9 m 2) -5 and -11 or 5 and 11 3) 8cm, 15 cm 4) 0.5 m 5) 2.5 cm 6) 1m

7a) 75m b) 4s c) 80m