

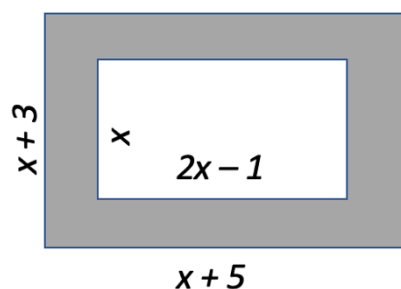
Situations Modeled with Quadratics

Show all work in your notebook to justify your answers. Indicate which Key Feature you needed to solve for in order to answer the question.

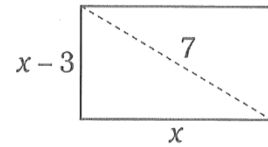
1. The ages of three children in a family can be expressed as consecutive integers. The square of the age of the youngest child is 4 more than 8 times the age of the oldest child. Find the ages of the three children.
2. Justin is skeet shooting during the Olympic trials. The height of the skeet is modeled by the equation: $h = -5t^2 + 32t + 2$, where h is the height in meters t seconds after the skeet is released. The path of Justin's bullet is modeled by the equation: $h = 31.5t + 1$ with the same units. How long will it take for the bullet to hit the skeet? How high off the ground will the skeet be when it's been hit?
3. The equation for the cost of manufacturing lawn mowers is $C = 0.008x^2 - 0.04x + 75$ where x represents the number of lawn mowers (in thousands). What number of lawnmowers should be produced to minimize costs?
4. In an effort to catch a criminal; a superhero is going to leap over a building and take a short cut down the ally. The function $f(x) = -16x^2 + 150x$ gives the superhero's height in feet as a function of time. The building is 425 feet high. Will the superhero make it over the building?

Show work to prove or disprove each statement.

- a. Yes, the superhero always makes it!
 - b. No, the superhero can only jump half the height of the building
 - c. No, the superhero will crash into the building at 351 feet
 - d. No, the superhero can only jump 150 feet into the air
5. If the shaded area is 23 cm^2 , then what is the *smallest* possible value of the inner area?



6. A rectangular flag is designed so that the width is 3 feet less than the length. The diagonal measure of the flag is 7 feet. Find the length and the width.



7. A small independent motion picture company determines the profit P for producing n DVD copies of a recent release is $P = -0.02n^2 + 3.40n - 16$. P is the profit in thousands of dollars and n is the number of DVDs in thousands.
- How many DVDs should the company produce to maximize the profit?
 - What will the maximum profit be?
8. A pelican flying in the air over water drops a crab from a height of 30 feet. The distance the crab is from the water as it falls can be represented by the function $h(t) = -16t^2 + 30$, where t is time, in seconds.
- To catch the crab as it falls, a gull flies along a path represented by the function $g(t) = -8t + 15$.
- Can the gull catch the crab before the crab hits the water? (If yes, how long after the crab is dropped, and how high above the water?)
9. A garden measuring 12 meters by 16 meters. A pedestrian pathway will be installed all around it, increasing the total area (walkway + garden) to 285 square meters. What will be the width of the pathway? (Hint: Draw a picture to help.)