# Lesson 1.7B: Quadratic Applications

Ex. 1 For what value(s) of k does $f(x) = x^2 + kx + 9$ have 2 distinct real solutions?

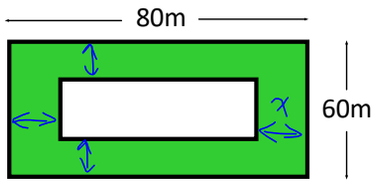
$D = b^2 - 4ac$
$= k^2 - 4(1)(9)$
$= k^2 - 36$

$D > 0$ means 2 solutions

$k^2 - 36 > 0$
$k^2 > 36$

$k > 6$ or $k < -6$

Ex. 2 A factory is built on a lot that measures 80 m by 60 m. A lawn of uniform width, equal to the area of the factory, surrounds it. How wide is the strip of lawn, and what are the dimensions of the factory?




Let x represent the width of the lawn.

Total Area
$A = 80(60)$
$= 4800$

$A_{FACTORY} = 2400$

$A_{FACTORY}$
$2400 = (80-2x)(60-2x)$
$2400 = 4800 - 160x - 120x + 4x^2$
$0 = 4x^2 - 280x + 2400$
$= 4(x^2 - 70x + 600)$
$= 4(x-60)(x-10)$

M 600
A -70
N -60 -10

$x = 60$ → $80-2x$ dimension would be invalid

$x = 10$

Factory Dimensions w/ $x = 10$

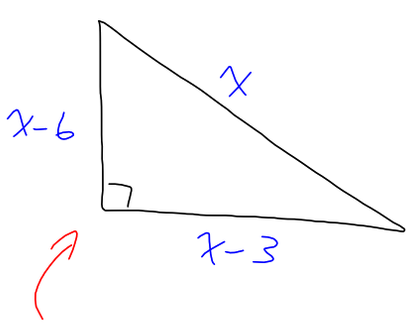
$80-2x$
$= 80 - 2(10)$
$= 60$

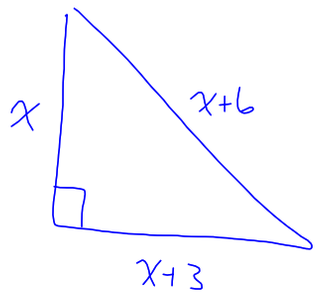
$60-2x$
$= 60 - 2(10)$
$= 40$

∴ The factory is 60m x 40m

The strip of lawn is 10m wide

Ex. 3 The difference between the length of the hypotenuse and the length of the next longest side of a right triangle is 3 cm. The difference between the lengths of the two perpendicular sides is 3 cm. Find the three side lengths.




Let $x$ rep. the length of the hypotenuse

$$x^2 = (x-6)^2 + (x-3)^2$$

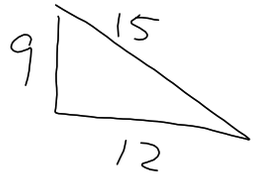
$$x^2 = x^2 - 12x + 36 + x^2 - 6x + 9$$

$$0 = x^2 - 18x + 45$$

$$= (x-15)(x-3)$$

$x = 15$ $\quad$ $x = 3$ ← Inadmissable it would result in negative side lengths

$\therefore x = 15$

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# Homework

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