7.4 Solving Problems with Quad. Equations

Ex: Determine two numbers whose sum is 17 and whose product is 72.

Solution: Let x be one number
other number is $17-x$

Product = 72

$x(17-x)=72$

$17x-x^2=72$

$0=x^2-17x+72$

$0=(x-8)(x-9)$

$x-8=0 \quad x-9=0$

$x=8 \quad x=9$

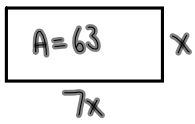
If x is 8
other # is $17-8=9$

If x is 9
other # is $17-9=8$

So, the two #'s are 8 and 9

Ex ②: A rectangle is 7 times as long as it is wide and its area is 63. What are the dimensions?

Solution:



$7x \cdot x = 63$

$7x^2 = 63$

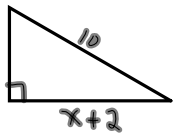
$x^2 = 9$

$x = \pm 3$

Since x represents width $x = 3$ is solution and dimensions are 3 by 21

Ex ③: One leg of a right Δ is 2cm longer than the other. If the hypotenuse is 10cm, how long are the legs?

Solution:



By Pythagorean Th'm

$leg^2 + leg^2 = hyp^2$

$x^2 + (x+2)^2 = 10^2$

$x^2 + (x+2)^2 = 10^2$

$x^2 + (x+2)(x+2) = 100$

$x^2 + x^2 + 2x + 2x + 4 = 100$

$2x^2 + 4x + 4 - 100 = 0$

$\frac{2x^2 + 4x - 96 = 0}{2}$

$x^2 + 2x - 48 = 0$

$(x+8)(x-6) = 0$

$x + 8 = 0 \quad x - 6 = 0$

$x = -8 \quad x = 6$

side can't be neg.

legs are 6 cm and 8 cm

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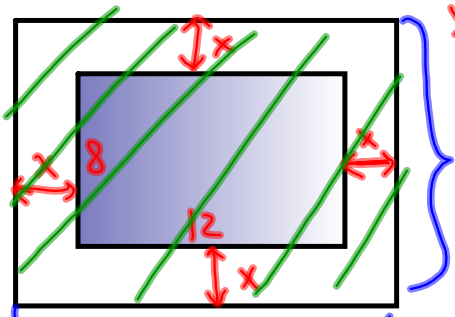
2 consecutive integers : x and x+1

Ex: A rectangular pool is 8m by 12m. A walkway of uniform width surrounds the pool. If the total area of the walkway and the pool is $320m^2$, how wide is the walkway?

Solution:



x = width of walk

$8+2x$

$12+2x$

Big Rectangle: $A = l \times w$

$320 = (12+2x)(8+2x)$

$320 = 96 + 24x + 16x + 4x^2$

$0 = 4x^2 + 40x + 96 - 320$

$\frac{4x^2 + 40x - 224 = 0}{4}$

$x^2 + 10x - 56 = 0$

$(x-4)(x+14) = 0$

$x - 4 = 0$ $\quad x + 14 = 0$

$x = 4$ $\quad x = -14$

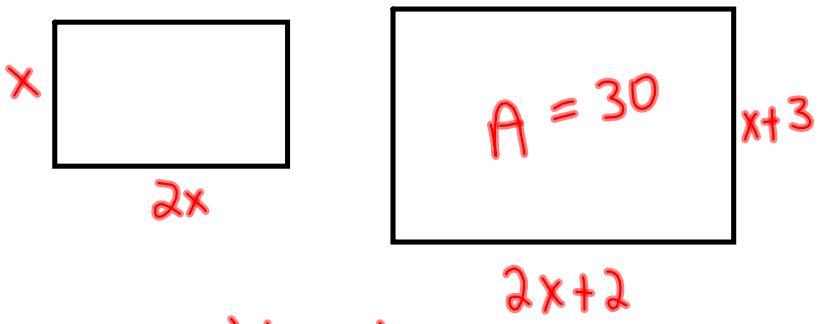
walkway is 4 m wide

walkway can't have neg. width

-56

$-4 \mid 14$

Ex: The length of a ~~rectangle~~ is twice its width. If the length is increased by 2cm and the width by 3 cm, the area is 30 cm^2 what are the original dimensions?



$30 = (2x+2)(x+3)$

$30 = 2x^2 + 6x + 2x + 6$

$0 = 2x^2 + 8x + 6 - 30$

$0 = 2x^2 + 8x - 24$

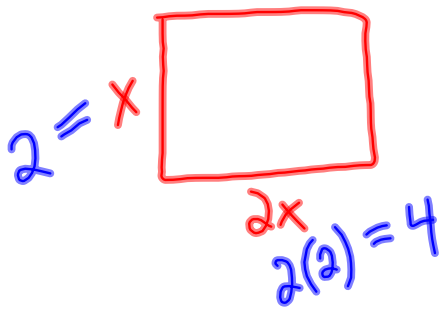
$0 = x^2 + 4x - 12$

$0 = (x+6)(x-2)$

$x+6=0 \quad x-2=0$

~~$x=-6$~~ $\quad x=2$

original rectangle



original dimensions are 2 by 4

$h(t) = -4.9t^2 + 14t + 2$

$h = -4.9t^2 + 14t + 2$

hits the ground $\Rightarrow h = 0$

Solve: $0 = -4.9t^2 + 14t + 2$

$4.9t^2 - 14t - 2 = 0$

$a = 4.9$
$b = -14$
$c = -2$

$$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$t = \frac{-(-14) \pm \sqrt{(-14)^2 - 4(4.9)(-2)}}{2(4.9)}$$

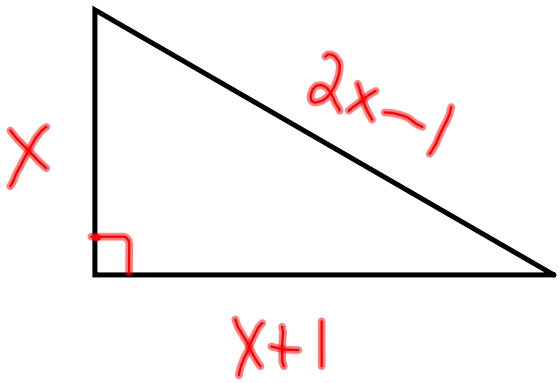
$$t = \frac{14 \pm \sqrt{196 + 39.2}}{9.8}$$

$$t = \frac{14 \pm \sqrt{235.2}}{9.8}$$

$$t = \frac{14 \pm 15.3}{9.8}$$

$$t = \frac{14 + 15.3}{9.8} = 2.99 = 3.0$$

$$t = \frac{14 - 15.3}{9.8} = -$$ ☹


2x−1
X
X+1