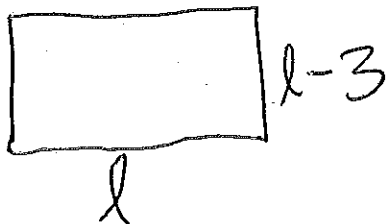## Example 10: Solve.

The shorter side of a rectangle is 3 less than the longer side. The area is $\underline{54}$. Find the length and width.

$l \cdot (l-3) = 54$

$l^2 - 3l = 54$

$ -54 \quad -54$

$l^2 - 3l - 54 = 0$

$b^2 - 4ac$

$(-3)^2 - 4(1)(-54)$

$9 + 216 = 225$

Perfect Square

Add Mult

$(l-9)(l+6)$

$\boxed{l=9} \quad \cancel{l=6}$

$\boxed{W = 9 - 3 = 6}$

$-54 = 1 \cdot 54$

$\boxed{9 \cdot 6}$

$2 \cdot 27$

Practice: Solve.

1) The length of a rectangle is four feet longer than the width. The area is 21. Find the dimensions.
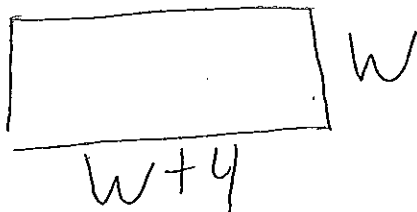
$W \cdot (W+4) = 21$

$W^2 + 4W = 21$

$ -21 \quad -21$

$W^2 + 4W - 21 = 0$

$b^2 - 4ac$

$(4)^2 - 4(1)(-21)$

$16 + 84 = 100$

Perfect Square

Add Mult.

$21 = 1 \cdot 21$

$\boxed{3 \cdot 7}$

$(W+7)(W-3) = 0$

$\cancel{W=-7} \quad \boxed{W=3}$

$\boxed{W = 3, \quad l = 3+4 = 7}$

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Challenge Problem:

One leg of a right triangle is 1 cm longer than the other leg. The hypotenuse measures 5 cm. Find the measure of each leg of the triangle.
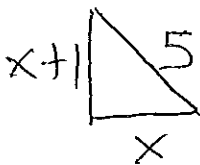
$$a^2 + b^2 = c^2$$
$$x^2 + (x+1)^2 = 5^2$$
$$x^2 + (x+1)(x+1) = 25$$
FOIL
$$x^2 + x^2 + x + x + 1 = 25$$
$$2x^2 + 2x + 1 = 25$$

$$2x^2 + 2x + 1 = 25$$
$$ -25 \quad -25$$
$$2x^2 + 2x - 24 = 0$$
$$b^2 - 4ac$$
$$2^2 - 4(2)(-24)$$
$$4 + 192 = 196$$
$$2x^2 + 2x - 24 = 0 \quad \text{Perfect Square}$$
$$x^2 + x - 12 = 0$$
$$(x - 3)(x + 4)$$
$$\boxed{x = 3} \quad x = -4$$

Summary

The square of a number exceeds 5 times the number by 24. Find the number(s).

Translate the problem into a mathematical equation.　　　$x^2 = 5x + 24$

Get all terms on the same side.　　　$x^2 - 5x - 24 = 0$

Factor the difference of squares.　　　$(x - 8)(x + 3) = 0$

Set each factor equal to 0 and solve for x.　　　$x - 8 = 0 \quad | \quad x + 3 = 0$
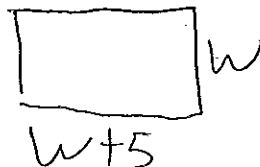　　　　　　　　　　　　　　　　　　　　$x = 8 \quad | \quad x = -3$

List all values of x.　　　$x = \{8, -3\}$

Exit Ticket

1. The length of a rectangle is 5 meters longer than its width and the area of the rectangle is 84 meters². Which equation represents this problem if w is the width of the rectangle?

　(1) $w(w + 5) = 84$
　(2) $(w + 5)(w - 5) = 84$
　(3) $w(w + 5) + 84 = 0$
　(4) $w^2 - 84 = 0$

2. When 36 is subtracted from the square of a number, the result is five times the number. What is the positive solution?

1) 9
2) 6
3) 3
4) 4

$$x^2 - 36 = 5x$$
$$x^2 - 5x - 36 = 0$$
$$(x - 9)(x + 4) = 0$$
$$\boxed{x = 9} \quad x = -4$$

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