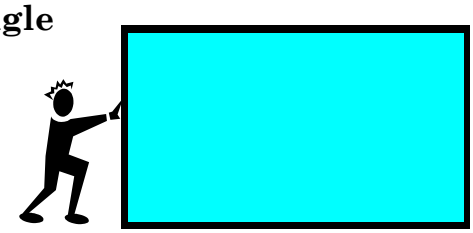
AREA OF A RECTANGLE

EXAMPLE: **The length of a rectangle is 6 less than 4 times its width. If the <u>area</u> is 18, find the dimensions of the rectangle.**



Solution: Letting w represent the width of the rectangle, the length l must be $l = 4w - 6$. We'll start our solution with the formula for the area of a rectangle, $\boldsymbol{A = lw}$, substitute the given area of 18 for A, and substitute the expression $4w - 6$ for l.

	$A = lw$	(Area = length × width)
$\Rightarrow$	$18 = (4w - 6)w$	(substitute 18 for A and $4w - 6$ for l)
$\Rightarrow$	$18 = w(4w - 6)$	(turn the factors around)
$\Rightarrow$	$18 = 4w^2 - 6w$	(distribute . . . look, it's quadratic!)
$\Rightarrow$	$0 = 4w^2 - 6w - 18$	(bring all terms to same side)
$\Rightarrow$	$4w^2 - 6w - 18 = 0$	(turn it around for standard form)
$\Rightarrow$	$\frac{4w^2 - 6w - 18}{2} = \frac{0}{2}$	(divide each side by 2)
$\Rightarrow$	$2w^2 - 3w - 9 = 0$	
$\Rightarrow$	$(2w + 3)(w - 3) = 0$	
$\Rightarrow$	$2w + 3 = 0$ OR $w - 3 = 0$	
$\Rightarrow$	$w = -\frac{3}{2}$ OR $w = 3$	

We must discard the first solution (because a width cannot be negative) and thus take the width to be **3**. The length is found as follows:

$$l = 4w - 6 = 4(\mathbf{3}) - 6 = 12 - 6 = \mathbf{6}$$

The dimensions of the rectangle are therefore

$$\boxed{6 \times 3}$$

Let's make sure these are the correct dimensions. First, is the length equal to 6 less than 4 times the width? $4w - 6 = 4(\mathbf{3}) - 6 = 6$, which is the length. Second, is the area of the rectangle 18? Of course: $6 \times 3 = 18$.

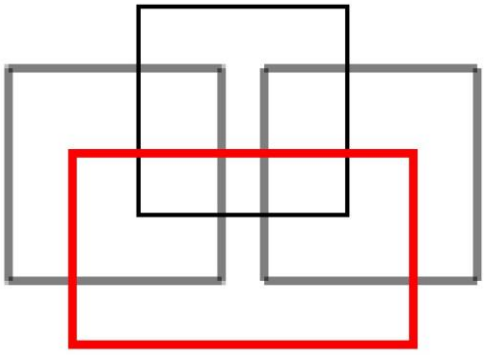
Homework

1. The length of a rectangle is 3 more than twice its width. If the area is 65, find the dimensions of the rectangle.

2. The length of a rectangle is 2 less than 10 times its width. If the area is 36, find the dimensions of the rectangle.

3. The length of a rectangle is 1 more than its width. If the area is 156, find the dimensions of the rectangle.

4. The length of a rectangle is 11 less than 3 times its width. If the area is 190, find the dimensions of the rectangle.



5. The length of a rectangle is 12 less than twice its width. If the area is 144, find the dimensions of the rectangle.

6. The length of a rectangle is 9 more than 10 times its width. If the area is 19, find the dimensions of the rectangle.

Solutions

1. 13×5

2. 18×2

3. 13×12

4. 19×10

5. 12×12

6. 19×1

"Knowledge is the eye of desire and can become the pilot of the soul."

Will Durant