

MAC1105 College Algebra  
1.5 Practice Problems

1. The square of a number plus the number is 110. Find the number(s).

$$x^2 + x = 110$$

The numbers are  
10, -11

$$x^2 + x - 110 = 0$$

$$(x - 10)(x + 11) = 0$$

$$\begin{array}{r} x - 10 = 0 \\ +10 \quad +10 \\ \hline x = 10 \end{array} \quad \begin{array}{r} x + 11 = 0 \\ -11 \quad -11 \\ \hline x = -11 \end{array}$$

2. The sum of the square of a positive number and the square of 3 more than the number is 65. What is the number?

$$x^2 + (x+3)^2 = 65$$

$$2(x+7)(x-4) = 0$$

$$x^2 + x^2 + 6x + 9 = 65$$

$$\begin{array}{r} x+7=0 \\ -7 \quad -7 \\ \hline x=-7 \end{array} \quad \begin{array}{r} x-4=0 \\ +4 \quad +4 \\ \hline x=4 \end{array}$$

$$2x^2 + 6x + 9 - 65 = 0$$

$$2x^2 + 6x - 56 = 0$$

$$2(x^2 + 3x - 28) = 0$$

the number is 4 since  
it is positive

3. Justin threw a rock straight up from a cliff that was 140 ft above the water. If the height of the rock  $h$ , in feet, after  $t$  seconds is given by the equation  $h = -16t^2 + 92t + 140$ , how long will it take for the rock to hit the water?

The height is zero when the rock hits the water.

$$0 = -16t^2 + 92t + 140$$

$$0 = -4(4t^2 - 23t - 35)$$

$$0 = -4(4t+5)(t-7)$$

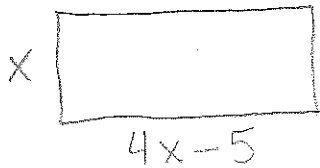
It takes the rock

$$\begin{array}{r} 4t+5=0 \\ -5 \quad -5 \\ \hline 4t = -5 \\ \frac{4t}{4} = \frac{-5}{4} \\ t = -\frac{5}{4} \end{array} \quad \begin{array}{r} t-7=0 \\ +7 \quad +7 \\ \hline t=7 \end{array}$$

7 seconds to  
hit the water

$$\begin{array}{r} 4t = -5 \\ \frac{4t}{4} = \frac{-5}{4} \\ t = -\frac{5}{4} \end{array}$$

4. The length of a rectangle is 5 inches less than four times its width. Its area is 21 square inches. Find the dimensions of the rectangle.



$$\begin{aligned}
 x(4x-5) &= 21 \\
 4x^2 - 5x &= 21 \\
 4x^2 - 5x - 21 &= 0 \\
 (4x+7)(x-3) &= 0 \\
 4x+7=0 & \quad x-3=0 \\
 -7 \quad -7 & \quad +3 \quad +3 \\
 4x &= -7 & \quad x &= 3 \\
 x &= -\frac{7}{4} & \quad x &= 3
 \end{aligned}$$

$$x = 3$$

the width is 3 inches  
the length is  $4(3)-5$   
 $12-5$   
 $= 7$  inches

5. A boat traveled downstream a distance of 30 mi and then came right back. If the speed of the current was 5 mph and the total trip took 4 hours and 30 minutes, find the average speed of the boat relative to the water.

	Distance	Rate	Time
downstream	30	$x+5$	$\frac{30}{x+5}$
upstream	30	$x-5$	$\frac{30}{x-5}$

$$\frac{30}{x+5} + \frac{30}{x-5} = \frac{9}{2}$$

$$\begin{aligned}
 60(x-5) + 60(x+5) &= 9(x+5)(x-5) \\
 60x - 300 + 60x + 300 &= 9(x^2 - 25)
 \end{aligned}$$

$$120x = 9x^2 - 225$$

$$0 = \frac{9x^2 - 120x - 225}{3}$$

$$0 = 3x^2 - 40x - 75$$

$$0 = (3x+5)(x-15)$$

$$3x+5=0$$

$$3x = -5$$

$$x = -\frac{5}{3}$$

$$x-15=0$$

$$+15 \quad +15$$

$$x = 15$$

6. Brothers, Tommy and Jay, can mow their mother's lawn together in 67 minutes. Tommy could mow the lawn by himself in 20 minutes less time than it would take Jay. How long would it take Jay to mow the lawn by himself?

Tommy	$x-20$	$\frac{1}{x-20}$
Jay	$x$	$\frac{1}{x}$
together	67	$\frac{1}{67}$

$$\frac{1}{x-20} + \frac{1}{x} = \frac{1}{67}$$

$$67x + 67(x-20) = x(x-20)$$

$$67x + 67x - 1340 = x^2 - 20x$$

$$134x - 1340 = x^2 - 20x$$

$$0 = x^2 - 154x + 1340$$

$$a=1 \quad b=-154 \quad c=1340$$

$$x = \frac{-(-154) \pm \sqrt{(-154)^2 - 4(1)(1340)}}{2(1)}$$

$$= \frac{154 \pm \sqrt{23716 - 5360}}{2} = \frac{154 \pm \sqrt{18356}}{2} = \frac{154 \pm 135.462}{2}$$

It takes 144 min for Jay to mow

144.7

~~9.269~~