1. The length of a rectangular courtyard is given by the expression $3x - 2$. If the area is given by, $3x^2 + 4x - 4$, find the width of the room.

$a=3 \quad b=4 \quad c=-4$

$ac = -12$

$6 \cdot -2$

$3x^2+4x-4$

$(3x^2+6x)(-2x-4)$

$3x(x+2)-2(x+2)$

$(3x-2)(x+2)$

2. ~~Your family goes to a restaurant for dinner.~~ There are six people in your family. Some order the chicken dinner for $14 and some order the steak dinner for $17. If the total bill was $99, how many people ordered each dinner?

x = People for chicken 1

y = People for steak 5

$-14(x + y = 6)$

$14x + 17y = 99$

$-14x - 14y = -84$

$+ \quad 14x + 17y = 99$

$\frac{3y}{3} = \frac{15}{3} \quad y = 5$

Example 1:

An object is launched at 19.6 meters per second (m/s) from a 58.8-meter tall platform. The equation for the object's height *s* at time *t* seconds after launch is $s(t) = -4.9t^2 + 19.6t + 58.8$, where *s* is in meters. When does the object strike the ground?

Root → FACTOR

$-4.9t^2+19.6t+58.8$

$-4.9(t^2-4t-12)=0$ $ac=\frac{-12}{-6\,|\,2}$

$(t^2-6t)(+2t-12)=0$

$t(t-6)2(t-6)=0$

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

$t+2=0$ $t-6=0$

$t=-2$ $t=6$

6 sec

Example 2:

Jason jumped off of a cliff into the ocean in Acapulco while vacationing with some friends. His height as a function of time could be modeled by the function $h(t) = -16t^2 + 16t + 480$, where t is the time in seconds and h is the height in feet.

a. How long did it take for Jason to reach his maximum height?

A.O.S $x = -\frac{b}{2a}$ (t = x) (h = vertex)

$\frac{-b}{2a} = \frac{-16}{-32} = \frac{1}{2}$ sec

b. What was the highest point that Jason reached?

vertex y (HEIGHT)

$-16\left(\frac{1}{2}\right)^2 + 16\left(\frac{1}{2}\right) + 480$

$-4 + 8 + 480$

$= 484$ ft

c. Jason hit the water after how many seconds?

ROOT ↓ factor

$-16t^2 + 16t + 480$

$-16(t^2 - t - 30) = 0$

$ac = -30$

$-6 \mid 5$

$(t^2 - 6t)(+5t - 30) = 0$

$t(t-6)\,5(t-6) = 0$

$(t+5)(t-6)$

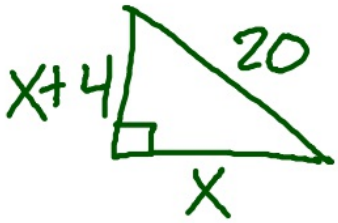
$t + 5 = 0$ $\quad t - 6 = 0$

$t = -5$ $\quad t = 6$

6 sec

Example 3:

One leg of a right triangle exceeds the other leg by four inches. The hypotenuse is 20 inches. Find the length of the shorter leg of the right triangle.



$a^2+b^2=c^2$

$(x)^2+(x+4)^2=20^2$

$x^2+x^2+8x+16=400$

$-400 \quad -400$

$2x^2+8x-384=0$

$2(x^2+4x-192)=0$

$(x^2+16x-12x-192)=0$ $\quad ac=-192$, $16 \mid -12$

$x(x+16)-12(x+16)=0$

$(x-12)(x+16)=0$

$x-12=0$ $\quad x+16=0$

$x=12$ $\quad x=-16$

Example 4:

Jocelyn and Kelly built rockets from assembly kits and are going to launch them at the same time to see whose rocket flies higher. If Jocelyn's rocket's height, in feet, can be described by the equation $J(x) = -16x^2 + 256x$ while Kelly's is represented by $K(x) = 16x^2 + 288x$

- Who wins the rocket race? (What is the max height for both rockets?) J

$-16(8)^2+256(8)$

1024 ft

KELLY

$-16(9)^2+288(9)$

1296 ft

- After how many seconds does each rocket land? Ground → Root → Factor

J $-16t^2+256t$ $t=16$ sec

$-16t(t-16)$

$-16t=0$ $t-16=0$

K $-16t^2+288t$

$-16t(t-18)$ $t-18=0$

$-16t=0$ $t=18$ sec

- What was the difference in time for the two different rockets to reach their respective max heights?

$x=\frac{-b}{2a}$

J

$x=\frac{-256}{-32}=8$ sec

K

$x=\frac{-288}{-32}=9$ sec.

1 sec