Solving Quadratics by Factoring

Steps to solving by factoring:

1. **Always set the equation equal to zero**
2. **Place all variables with exponents in descending order (leave x^2 term positive)**
3. **Factor completely**
4. **Set each factored part with a variable equal to zero and solve the equation**
5. **Hint- There are as many solutions as the highest exponent**

A. $x^2 - 5x - 66 = 0$

$(x-11)(x+6)$

$x-11=0$ $x+6=0$

$x=11$ $x=-6$

B. $x^2 + 32 = 12x$

$x^2-12x+32=0$

$(x-8)(x-4)=0$

$x-8=0$ $x-4=0$

$x=8$ $x=4$

C. $2x^2 = 8x + 90$

$2x^2-8x-90=0$

$2(x^2-4x-45)=0$

$2(x-9)(x+5)=0$

$x-9=0$ $x+5=0$

$x=9$ $x=-5$

D. $10y^2 - 26y + 12 = 0$

$2(5y^2-13y+6)=0$

$2(5y^2-10y-3y+6)=0$

$2(5y^2-10y)(-3y+6)=0$

$5y(y-2)-3(y-2)=0$

$2(5y-3)(y-2)=0$

$y=3/5$ $y=2$

E. $3y^2 + 22y - 16 = 0$ p: -48 s: 22

$3y^2+24y-2y-16$

$3y(y+8)-2(y+8)=0$

$(3y-2)(y+8)=0$

$y=2/3$ $y=-8$

F. $5x = 12x^2$

$-12x^2+5x=0$

$12x^2-5x=0$

$x(12x-5)=0$

$x=0$ $12x-5=0$

$x=5/12$

G. $4x^2 = 18x$

$4x^2-18x=0$

$2x(2x-9)=0$

$2x=0$ $2x-9=0$

$x=0$ $2x=9$

$x=9/2$

H. $9x^2 = 16$

$9x^2-16=0$

$(3x+4)(3x-4)=0$

$3x=-4$ $3x=4$

$x=-4/3$ $x=4/3$

I. $4x^3 - 2x^2 - 12x = 0$

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

$2x(2x^2-4x+3x-6)=0$

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

$2x=0$ $2x+3=0$ $x-2=0$

$x=0$ $x=-3/2$ $x=2$

Solving Quadratics by Factoring

J) $25x^2 = 36$

$25x^2 - 36 = 0$

$(5x+6)(5x-6) = 0$

$x = \pm 6/5$

K) $x^3 - 4x = 0$

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

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

$x = 0$

$x = \pm 2$

L) $12m^3 - 15m = 8m^2$

$12m^3 - 8m^2 - 15m = 0$

$m(12m^2 - 8m - 15) = 0$

$m(6m^2 - 18m + 10m - 15) = 0$

$(12m^2 - 18m)(10m + 15)$

$6m(2m-3) + 5(2m-3)$

$m = 0$ $\quad 6m+5=0$ $\quad 2m-3=0$

$m = -5/6$ $\quad m = 3/2$

Sum and Product of Roots:

The solutions to $ax^2 + bx + c = 0$ can be represented by s_1 and s_2.

The sum of the solutions $s_1 + s_2 = -\frac{b}{a}$ and the product of the solutions s_1 and $s_2 = \frac{c}{a}$.

Write the quadratic equation that has the following solution.

A) 3 and -4

$3 + -4 = -1 = -b/a$

$3 \times -4 = -12 = c/a$

$a = 1$, $b = 1$, $c = -12$

$x^2 + x - 12$

B) 8 and 2

$8 + 2 = 10 = -b/a$

$8 \times 2 = 16 = c/a$

$a = 1$, $b = -10$, $c = 16$

$x^2 - 10x + 16$

C) $-\frac{5}{3}$ and $\frac{2}{3}$

$-\frac{5}{3} + \frac{2}{3} = \frac{-3}{3} = -\frac{b}{a}$

need common denominator

$a = 9$

$\frac{-3}{3} = \frac{-9}{9}$

$-\frac{5}{3} \times \frac{2}{3} = \frac{-10}{9} = \frac{c}{a}$

$a = 9$ $\quad b = 9$ $\quad c = -10$

$9x^2 + 9x - 10$