

Notes 6.5: Quadratic Equations

1) Multiply: $(x+5)(x+6)$

$$= x^2 + 6x + 5x + 30$$

$$= \boxed{x^2 + 11x + 30}$$

2) Multiply: $(7x+5)(4x-3)$

$$= 28x^2 - 21x + 20x - 15$$

$$= \boxed{28x^2 - x - 15}$$

3) Factor: $x^2 + 5x + 6$

$$\begin{array}{l|l} ac=6 & \text{sum} = 5 \\ \hline 3 \cdot 2 & 3+2 \end{array}$$

$$= \boxed{(x+3)(x+2)}$$

4) Factor: $x^2 + 3x - 10$

$$\begin{array}{l|l} ac = -10 & \text{sum} = 3 \\ \hline 5(-2) & 5-2=3 \end{array}$$

$$= \boxed{(x+5)(x-2)}$$

5) Factor: $5x^2 - 14x + 8$

$$\begin{array}{l|l} ac=40 & \text{sum} = -14 \\ \hline -10(-4) & -10-4=-14 \end{array}$$

$$\frac{5x^2}{5x} \quad \frac{-10x}{5x} \left| \frac{4x}{-4} \quad \frac{+8}{-4} \right.$$

$$= 5x(x-2) - 4(x-2)$$

$$= \boxed{(5x-4)(x-2)}$$

6) Factor: $6x^2 + 19x - 7$

$$\begin{array}{l|l} ac = -42 & \text{sum} = 19 \\ \hline 21(-2) & 21-2=19 \end{array}$$

$$\frac{6x^2}{3x} + \frac{21x}{3x} \left| \frac{-2x}{-1} \quad \frac{-7}{-1} \right.$$

$$3x(2x+7) - 1(2x+7)$$

$$= \boxed{(3x-1)(2x+7)}$$

Quadratic Equation $ax^2 + bx + c = 0$,
where a, b, c are real numbers, with $a \neq 0$

Zero-Product Principle
If $AB = 0$, then $A = 0$ or $B = 0$

7) Solve: $(x+6)(x-3) = 0$

$$\begin{array}{r} x+6=0 \\ -6 \quad -6 \\ \hline \boxed{x=-6} \end{array}$$

$$\begin{array}{r} x-3=0 \\ +3 \quad +3 \\ \hline \boxed{x=3} \end{array}$$

8) Solve $x^2 - 6x = 16$

$$\begin{array}{r} - 6x 16 \\ -16 \quad -16 \\ \hline x^2 - 6x - 16 = 0 \end{array}$$

$$\begin{array}{l|l} -16 & -6 \\ \hline -8(2) & \end{array}$$

$$(x-8)(x+2) = 0$$

$$\begin{array}{r} x-8=0 \\ +8 \quad +8 \\ \hline \boxed{x=8} \end{array}$$

$$\begin{array}{r} x+2=0 \\ -2 \quad -2 \\ \hline \boxed{x=-2} \end{array}$$

9) Solve: $2x^2 + 7x - 4 = 0$

$$\begin{array}{l|l} ac = -8 & -7 \\ \hline 8(-1) & \end{array}$$

$$\frac{2x^2}{2x} + \frac{8x}{2x} \left| \frac{-1x}{-1} \quad \frac{-4}{-1} \right. = 0$$

$$2x(x+4) - 1(x+4) = 0$$

$$(2x-1)(x+4) = 0$$

$$\begin{array}{r} 2x-1=0 \\ +1 \quad +1 \\ \hline \boxed{x = \frac{1}{2}} \end{array}$$

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

$$a=8 \quad b=2 \quad c=-1$$

10) Solve using the quadratic formula $8x^2 + 2x - 1 = 0$

$$\begin{aligned} x &= \frac{-2 \pm \sqrt{2^2 - 4(8)(-1)}}{2(8)} \\ &= \frac{-2 \pm \sqrt{4 + 32}}{16} \\ &= \frac{-2 \pm \sqrt{36}}{16} \\ &= \frac{-2 \pm 6}{16} \end{aligned}$$

$$\begin{aligned} x &= \frac{-2+6}{16} \\ &= \frac{4}{16} \\ x &= \frac{1}{4} \end{aligned}$$

$$\begin{aligned} x &= \frac{-2-6}{16} \\ &= \frac{-8}{16} \\ x &= -\frac{1}{2} \end{aligned}$$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

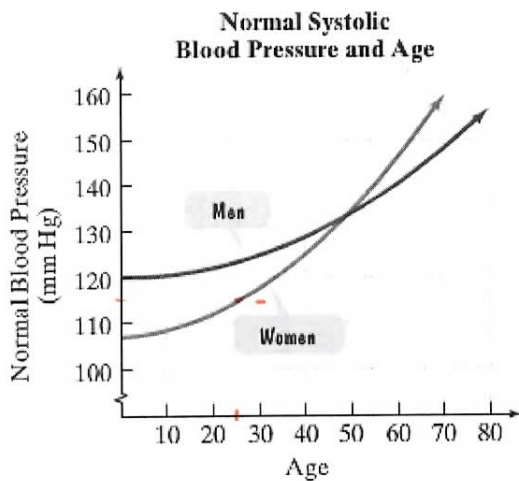
11) Solve using the quadratic formula $2x^2 = 6x - 1$ (Round answers to the hundredths)

$$\begin{aligned} 2x^2 - 6x + 1 &= 0 \\ x &= \frac{6 \pm \sqrt{(-6)^2 - 4(2)(1)}}{2(2)} \\ &= \frac{6 \pm \sqrt{36 - 8}}{4} \\ &= \frac{6 \pm \sqrt{28}}{4} \end{aligned}$$

$$\begin{aligned} &\frac{-6x+1 \quad -6x+1}{\sqrt{28}} \\ &\quad \uparrow \\ &7 \cdot 4 \\ &\quad \uparrow \\ &2.2 \\ &2\sqrt{7} \end{aligned}$$

$$\begin{aligned} x &= \frac{6 \pm 2\sqrt{7}}{4} \\ &= \frac{6}{4} \pm \frac{2\sqrt{7}}{4} \\ x &= \frac{3}{2} \pm \frac{\sqrt{7}}{2} \end{aligned}$$

12) The formula $P = 0.01A^2 + 0.05A + 107$ models a woman's normal systolic blood pressure, P , at age A . Use the formula to find the age, to the nearest year, of a woman whose normal systolic blood pressure is 115 mm Hg. Use the graph for women to verify your solution.



$$\begin{aligned} P &= .01A^2 + .05A + 107 \\ 115 &= .01A^2 + .05A + 107 \\ -115 &\quad \quad \quad -115 \\ \hline 0 &= .01A^2 + .05A - 8 \\ x &= \frac{-.05 \pm \sqrt{.05^2 - 4(.01)(-8)}}{2(.01)} \\ &= \frac{-.05 \pm \sqrt{.0025 + .32}}{.02} \end{aligned}$$

$$\begin{aligned} &= \frac{-.05 \pm .56789}{.02} = 25.894 \approx 26 \text{ years old} \\ &= -30.89 \end{aligned}$$