Simplifying Radicals Primer

Rules: $\sqrt{ab} = \sqrt{a}\cdot\sqrt{b}$ $\quad a \geq 0,\ b \geq 0$

$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$ $\quad a \geq 0,\ b > 0$

* cannot have a RADICAL in the denominator of a fraction

$\sqrt{a}\cdot\sqrt{a} = \left(\sqrt{a}\right)^2 = a$

$M\sqrt{a} \cdot N\sqrt{b} = MN\sqrt{ab}$ $\quad a, b \geq 0$

egs: SIMPLIFY the following:

a) $\sqrt{25} = \boxed{5}$

b) $\sqrt{24} = \sqrt{4\times 6} = \sqrt{4}\cdot\sqrt{6} = \boxed{2\sqrt{6}}$

c) $\sqrt{125} = \sqrt{25\cdot 5} = \sqrt{25}\cdot\sqrt{5}$ $\boxed{= 5\sqrt{5}}$

d) $\frac{\sqrt{48}}{\sqrt{6}} = \sqrt{\frac{48}{6}} = \sqrt{8}$ $\boxed{= 2\sqrt{2}}$

e) $\sqrt{\frac{2}{9}} = \frac{\sqrt{2}}{\sqrt{9}} = \boxed{\frac{\sqrt{2}}{3}}$

f) $\frac{3\sqrt{5}+12}{6} = \frac{3\sqrt{5}}{6} + \frac{12}{6}$

$\boxed{= \frac{\sqrt{5}}{2} + 2}$

g) $\frac{3\sqrt{18}-27}{9} = \frac{9\sqrt{2}-27}{9}$

$= \frac{9\sqrt{2}}{9} - \frac{27}{9}$

$\boxed{= \sqrt{2} - 3}$

h) $\frac{2\sqrt{3}\cdot 5\sqrt{8}}{10\sqrt{6}}$

$= \frac{10\sqrt{24}}{10\sqrt{6}} = \sqrt{4} = 2$

h) $\dfrac{1}{\sqrt{2}} = \dfrac{1}{\sqrt{2}} \cdot \dfrac{\sqrt{2}}{\sqrt{2}} = \boxed{\dfrac{\sqrt{2}}{2}}$

i) $\sqrt{\dfrac{28}{3}} = \dfrac{\sqrt{28}}{\sqrt{3}} = \dfrac{2\sqrt{7}}{\sqrt{3}} \cdot \dfrac{\sqrt{3}}{\sqrt{3}} = \boxed{\dfrac{2\sqrt{21}}{3}}$

Hwk: Worksheet

Ch. 4.1 - Solving Quadratics ($a = 1$) by Factoring

When you multiply two binomials (using FOIL), the result may be generalized as follows:

$$(x + m)(x + n) = x^2 + mx + nx + mn$$

2 3 2 4

$$= \underbrace{x^2 + (m+n)x + mn}_{\text{a QUADRATIC (degree 2) express}^{\underline{n}}}$$

This shows that:

(i) The product of two binomials is a TRINOMIAL.

(ii) The first term, x^2, is a product of x & x.

(iii) The middle term's coefficient is the sum of m & n.

(iv) The last term is a product of m & n.

Generalized trinomial $\Rightarrow$ $ax^2 + bx + c$, but

when $a = 1$, $x^2 + bx + c$

(always arrange in descending order of powers).

FOUR TYPES:

$$\boxed{\begin{array}{llll} (1) & x^2 + bx + c & = & (x + \_\_)(x + \_\_) \\ (2) & x^2 - bx + c & = & (x - \_\_)(x - \_\_) \\ (3) & x^2 + bx - c & = & (x + \_\_)(x - \_\_) \quad \text{bigger number } (+) \\ (4) & x^2 - bx - c & = & (x + \_\_)(x - \_\_) \quad \text{smaller number } (+) \end{array}}$$

eg1: Factor the following:

a) $x^2 + 7x + 12$

$\frac{\times}{12}\ \frac{+}{7}$ $\boxed{= (x+4)(x+3)}$

4, 3

b) $x^2 - 7x + 6$

$\frac{\times}{6}\ \frac{+}{-7}$ $\boxed{= (x-6)(x-1)}$

−6, −1

c) $x^2 + 3x - 10$

$\frac{\times}{-10}\ \frac{+}{3}$ $= \boxed{(x-2)(x+5)}$

−2, 5

d) $x^2 - 2x - 8$

$\frac{\times}{-8}\ \frac{+}{-2}$ $\boxed{= (x-4)(x+2)}$

−4, 2

e) $x^2 + 8 - 6x$

$\frac{\times}{8}\ \frac{+}{-6}$ $= x^2 - 6x + 8$

−4, −2 $\boxed{= (x-4)(x-2)}$

f) $x^2 - 2x + 4$

$\frac{\times}{4}\ \frac{+}{-2}$ UNFACTORABLE

g) $x^2 + 4xy - 21y^2$

$\frac{\times}{-21}\ \frac{+}{4}$ $\boxed{= (x+7y)(x-3y)}$

7, −3

h) $5x^2 + 35x + 60$

$= 5(x^2 + 7x + 12)$

$\frac{\times}{12}\ \frac{+}{7}$ $\boxed{= 5(x+4)(x+3)}$

4, 3

i) $-x^2 + 5x + 6$

$= -1(x^2 - 5x - 6)$

$\frac{\times}{-6}\ \frac{+}{-5}$ $\boxed{= -1(x-6)(x+1)}$

−6, 1

j) $-3x^4 - 18x^3 - 27x^2$

$= -3x^2(x^2 + 6x + 9)$

$\frac{\times}{9}\ \frac{+}{6}$ $= -3x^2(x+3)(x+3)$

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

Factoring Difference of Squares $(a^2x^2 - b^2y^2)$; $a \neq 0$, $b \neq 0$

Rule: $a^2 - b^2 = (a+b)(a-b)$

eg2: Factor the following

a) $x^2 - 16$

$\boxed{= (x+4)(x-4)}$

b) $x^4 - 4y^2$

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

c) $x^4 - 16$

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

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

d) $16x^2 - 4$

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

e) $(x^2 - 6x + 9)^{\text{TYPO}} - y^2$

$= (x-3)(x-3) - y^2$

$= (x-3)^2 - y^2$

$= ((x-3)+y)((x-3)-y)$

f) $(16x^2 + 24xy + 9y^2) - (4a^2 - 4ab + b^2)$

$= (4x+3y)(4x+3y) - (2a+b)(2a+b)$

$= (4x+3y)^2 - (2a+b)^2$

$= ((4x+3y)+(2a+b))((4x+3y)-(2a+b))$

p.163 - 168 # 1-14

(omit (9 ~~...~~) 13ef, 14 c-f)

Ch. 4.2 - Factoring trinomials where $a \neq 1$
$(ax^2 + bx + c)$

... and ... where 'a' cannot be factored out!

* if you'd like, read the book's methods on p. 169 and p. 171 $\Rightarrow$ perfectly acceptable methods.

Best method? Factoring by DECOMPOSITION.
↳ not in book.

Steps:

1. Find two numbers that multiply to give (ac) and add to give b.
2. Rewrite "middle term" (bx) as a sum of the two numbers (ie. make the trinomial a 'tetranomial').
3. Factor in groups of two.
4. Factor out the common binomial.

eg1: Factor $2x^2 + 7x - 4$

×	+
−8	7

8, −1

$$= (2x^2 + 8x)(-1x - 4)$$

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

$$\boxed{= (x+4)(2x-1)}$$

eg2: Factor $12x^2 - 5x - 2$

$\times$	$+$
-24	-5

$-8, 3$

$= 12x^2 - 8x + 3x - 2$

$= 4x(3x-2) + 1(3x-2)$

$\boxed{= (3x-2)(4x+1)}$

---

eg3: Factor $-10x^3 + 2x^2 + 12x$

* 1^{st}: factor to create QUADRATIC expression

$= -2x\underbrace{(5x^2 - 1x - 6)}_{\text{FACTOR this by decomposition}}$

$\times$	$+$
-30	-1

$-6, 5$

$= -2x\ (5x^2 + 5x - 6x - 6)$

$= (-2x)\left(5x(x+1) - 6(x+1)\right)$

$\boxed{= -2x(x+1)(5x-6)}$

Def'n: A trinomial that is a square of a binomial is called a PERFECT SQUARE TRINOMIAL.

For $ax^2 + bx + c$ to be a perfect sq. trinomial:

i) c must be positive, and a perfect square

ii) a must be a perfect square

iii) b is the sq. rt. of ax^2 multiplied by the sq. rt. of c, then doubled. (Could be ⊕ or ⊖).

eg4: Factor:

a) $x^2 + 8x + 16$

$= (x+4)(x+4)$

$\boxed{= (x+4)^2}$

b) $4x^2 - 12x + 9$

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

$= (2x-3)^2$

or just use DECOMP.

c) $(x-2y)^2 - 2(x-2y) + 1$

$= ((x-2y)-1)((x-2y)-1)$

$\boxed{= ((x-2y)-1)^2}$

eg5 Find all integers k such that each trinomial is a perfect square:

a) $x^2 + 6x + k$

$3 + 3 = 6$

$3 \times 3 = \boxed{k = 9}$

b) $9x^2 - kx + 4$

$\left.\begin{array}{l}\sqrt{9} = 3 \\ \sqrt{4} = 2\end{array}\right\}$ $3 \times 2 = 6$ OR -6

$K = 6 + 6$

$\boxed{= 12}$

$k = -6 + -6$

$\boxed{= -12}$

c) $kx^2 + 12x + 9$

$\sqrt{9} = 3$

$\frac{12}{2} = 6$

$3 \times ? = 6$

$? = 2$

$\sqrt{k} = 2$

$\boxed{k = 4}$

$\boxed{\begin{array}{l}\text{p. } 173-176 \\ \#1-8\end{array}}$

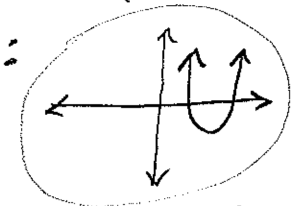
+ QUIZ

omit 8 3j 6d

2l typo!

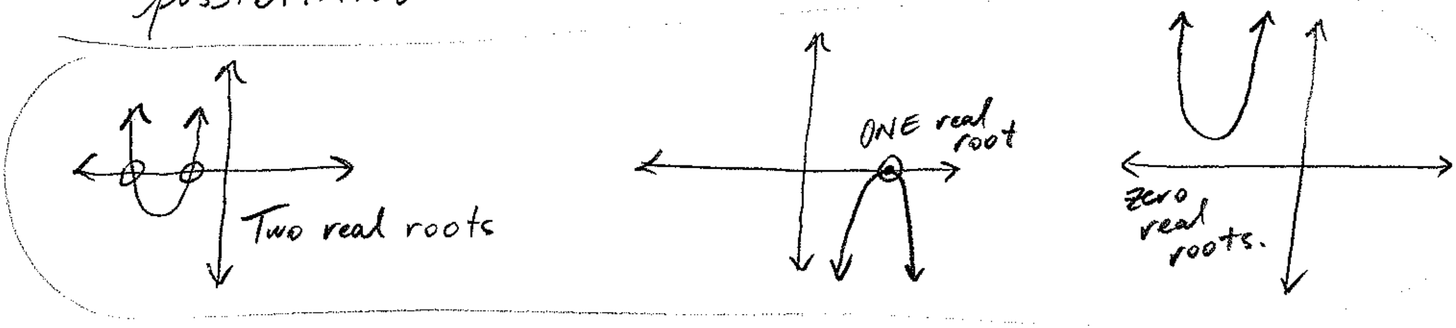
Ch. 6.1 - Solving Quadratic Equations by Factoring

When graphed, a quadratic function ($y = \underline{ax^2+bx+c}$) results in a PARABOLA:



$f(x) =$

When $y=0$, solving for x gives the x-intercepts (real zeros) (roots) of the function and there are three general possibilities:



A quadratic equation is written in the form

$$\boxed{\underbrace{ax^2+bx+c}_{\text{GENERAL FORM}} = 0 \quad \text{where } a,b,c \in \mathbb{R},\ a \neq 0.}$$

Again, solving for x finds the $\boxed{\begin{array}{c} x\text{-intercepts} \\ \text{(real roots)} \\ \text{(real zeros)} \end{array}}$ of $y = ax^2+bx+c$

Zero Factor Property

The equation $\underline{mn = 0}$ is true if either $\underline{m=0}$ or $\underline{n=0}$.

eg1: Solve by factoring:

x	+
-6	-1
-3, 2	

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

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

HINT: when x's coefficient is 1, read constant of binomial as OPPOSITE

so... for this to be true, either $(x-3)=0$ and/or $(x+2)=0$

$\boxed{x = 3}$ $\quad$ $\boxed{x = -2}$

eg2: Solve by factoring:

$$2x^2 - 9x + 10 = 0 \qquad \frac{\times}{20} \quad \frac{+}{-9}$$

$$2x^2 - 4x - 5x + 10 = 0 \qquad -5, -4$$

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

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

hint: When $ax - b = 0$, $x = \frac{b}{a}$

$$x - 2 = 0 \qquad 2x - 5 = 0$$

$$\boxed{x = 2} \qquad 2x = 5$$

Check $\boxed{x = \frac{5}{2}}$

eg3: Solve by factoring $3x^2 + 15x = 0$ (ie: When $c = 0$)

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

$$3x = 0 \qquad \boxed{x = -5}$$

$$\boxed{x = 0}$$

so... when $c = 0$, one solution will be $\boxed{x = 0}$

eg4: Solve by factoring

$$3x^2 - 7x = 20$$

$$3x^2 - 7x - 20 = 0 \qquad \frac{\times}{-60} \quad \frac{+}{-7}$$

$$3x^2 - 12x + 5x - 20 = 0 \qquad -12, 5$$

$$3x(x-4) + 5(x-4) = 0$$

$$(x-4)(3x+5) = 0$$

$$\boxed{x = 4, -\frac{5}{3}}$$

eg5: Solve by factoring:

$$\frac{x}{x-5} - \frac{3}{x+1} = \frac{30}{x^2-4x-5}$$

* find common denominator!

$(x-5)(x+1) = x^2-4x-5$

$$\frac{x(x-5)(x+1)}{(x-5)} - \frac{(3)(x-5)(x+1)}{(x+1)} = \frac{30(x-5)(x+1)}{(x-5)(x+1)}$$

$$x(x+1) - 3(x-5) = 30$$

$$x^2 + x - 3x + 15 = 30$$

$$x^2 - 2x - 15 = 0$$

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

$$\boxed{x = \cancel{5}, -3}$$

eg6: For each of the following, write a quadratic equation given the real roots:

a) $2, -5$

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

$\boxed{x^2 + 3x - 10 = 0}$

b) $0, 6$

$x(x-6) = 0$

$\boxed{x^2 - 6x = 0}$

c) $\frac{2}{3}, -\frac{1}{2}$

$(3x-2)(2x+1) = 0$

$\boxed{6x^2 - x - 2 = 0}$

p 265-270: #1-9 omit 3bdf omit 8e

(word probs. (10-15) now, if you want, or later...)

Ch. 6.2 - The Square Root Principle and Completing the Square

Square Root Principle - may be used when $\underline{b=0}$ in $ax^2+bx+c=0$. (becomes $\underline{ax^2+c=0}$)

Possibilities: i) If $\frac{-c}{a} \boxed{>} 0$, there will be two solutions.

ii) If $\frac{-c}{a} = 0$, there will be one solution ($\underline{x=0}$).

iii) If $\frac{-c}{a} < 0$, there will be no real roots.

eg1: Solve the following using the sq. root principle:

a) $x^2-4=0$

$\sqrt{x^2}=\sqrt{4}$

$x=\pm\sqrt{4}$

$x=\pm 2$

b) $x^2+9=0$

$\sqrt{x^2}=\sqrt{-9}$

no solution!

c) $\sqrt{(x-2)^2}=\sqrt{16}$

$x-2=\pm\sqrt{16}$

$x-2=\pm 4$

$\boxed{x=6,-2}$

eg2: Solve using the sq. root principle:

a) $3x^2-8=0$

$3x^2=8$

$\sqrt{x^2}=\sqrt{\frac{8}{3}}$

$\boxed{x=\pm\sqrt{\frac{8}{3}}}$ *haven't learned radicals yet!

$\boxed{x=\pm\frac{2\sqrt{6}}{3}}$

b) $(x-1)^2=12$

$\sqrt{(x-1)^2}=\sqrt{12}$

$x-1=\pm\sqrt{12}$

$\boxed{x=\pm\sqrt{12}+1}$

$\boxed{x=\pm 2\sqrt{3}+1}$

$\boxed{\text{Qs: 1,2 p.273}}$

Instructions for Completing the Square in order to solve Quadratic Equations

Typical Quadratic Equation: $ax^2 + bx + c = 0$; $a \neq 0$

Type I – When $a = 1$

1. Write equation in $x^2 + bx + c = 0$ form (in order of descending powers);
2. Move 'c' to the 'other' side (if 'c' is zero, don't do anything);
3. Calculate half of 'b' and write the number in a box;
4. Square the number in the box and write it in a circle beside the box;
5. Add the number in the circle to BOTH sides of the equation;
6. Complete the square! (ie. Turn the trinomial into a square of a binomial) – HINT: the binomial will *always* be x and the number in the box, all squared!
7. Use the square root principle to solve the equation.

Type II – When $a \neq 1$

1. Write equation in $a\,x^2 + bx + c = 0$ form (in order of descending powers);
2. Move 'c' to the 'other' side (if 'c' is zero, don't do anything);
3. Factor 'a' out of $a\,x^2$ and bx (could create fractions – that's OK!) – this will create a "new" 'b' value;
4. Calculate half of the "new" 'b' value and write the number in a box;
5. Square the number in the box and write it in a circle beside the box;
6. A. Add the number in the circle in brackets on the variable side of the equation;

   B. Multiply the number you added in brackets by the 'a' value that you factored out and add the product to the 'other' (non-variable) side.
7. Complete the square! (ie. Turn the trinomial in to a square of a binomial) – HINT: the binomial will *always* be x and the number in the box, all squared!
8. Use the square root principle to solve the equation.

Completing the Square

- can be utilized if quadratic cannot be factored.
- see Instruction sheet.

eg1: Solve by Completing the Square

$$x^2 - 6x - 27 = 0 \qquad \boxed{-3} \; 9$$

$$x^2 - 6x = 27$$

$$x^2 - 6x + 9 = 27 + 9$$

$$\sqrt{(x-3)^2} = \sqrt{36}$$

$$x - 3 = \pm 6$$

$$\boxed{x = 9, -3}$$

eg2: $x^2 + 8x + 11 = 0$

$$x^2 + 8x = -11 \qquad \boxed{+4} \; 16$$

$$x^2 + 8x + 16 = -11 + 16$$

$$\sqrt{(x+4)^2} = \sqrt{5}$$

$$x + 4 = \pm\sqrt{5}$$

$$\boxed{x = \pm\sqrt{5} - 4}$$

eg3: Solve $-x^2+8x-17=0$

$$x^2-8x+17=0$$

$$x^2-8x=-17 \qquad \boxed{-4}\ 16$$

$$x^2-8x+16=-17+16$$

$$(x-4)^2=-1$$

no solution!

eg4: Solve $3x^2+18x-24=0$

$$x^2+6x-8=0$$

$$x^2+6x=8 \qquad \boxed{+3}\ 9$$

$$x^2+6x+9=8+9$$

$$\sqrt{(x+3)^2}=\sqrt{17}$$

$$x+3=\pm\sqrt{17}$$

$$\boxed{x=\pm\sqrt{17}-3}$$

eg5: Solve $5x^2+10x-4=0$

$$5x^2+10x=4 \qquad \boxed{+1}\ 1$$

$$5(x^2+2x)=4$$

$$5(x^2+2x+1)=4+5$$

$$5(x+1)^2=9$$

$$\sqrt{(x+1)^2}=\sqrt{\frac{9}{5}}$$

$$x+1=\pm\frac{3}{\sqrt{5}}\cdot\frac{\sqrt{5}}{\sqrt{5}}$$

$$x=\pm\frac{3\sqrt{5}}{5}-1 \qquad \boxed{=\frac{\pm3\sqrt{5}-5}{5}}$$

To halve a fraction:
* double the denom.
& reduce

eg6: Solve $2x^2 - 5x - 1 = 0$

$$2x^2 - 5x = 1$$

$\boxed{\frac{-5}{4}}$ $\frac{25}{16}$

$$2\left(x^2 - \frac{5}{2}x\right) = 1$$

$$2\left(x^2 - \frac{5}{2}x + \frac{25}{16}\right) = 1 + \frac{50}{16}$$

$$2\left(x - \frac{5}{4}\right)^2 = \frac{66}{16}$$

$$\left(x - \frac{5}{4}\right)^2 = \frac{66}{32}$$

$$\sqrt{\left(x - \frac{5}{4}\right)^2} = \sqrt{\frac{33}{16}}$$

$$x - \frac{5}{4} = \frac{\pm\sqrt{33}}{4}$$

$$\boxed{x = \frac{\pm\sqrt{33} + 5}{4}}$$

Qs 3 - 7 p. 274-276

Ch. 6.3 - The Quadratic Formula

- the QUADRATIC FORMULA can be used to find the real roots of quadratic equations.

If $ax^2 + bx + c = 0$, then $\boxed{x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$
$(a \neq 0)$

derived by COMPLETING THE SQUARE of $ax^2 + bx + c = 0$

Three possible scenarios:

-all three rely on the value of the DISCRIMINANT $(b^2 - 4ac)$ (RADICAND):

(i) If $b^2 - 4ac > 0$, then two real roots.

(ii) If $b^2 - 4ac = 0$, then one real root.

(iii) If $b^2 - 4ac < 0$, then no real roots.

eg1: Solve $3x^2 + 5x - 2 = 0$ using the Q.F.

$a = 3 \quad b = 5 \quad c = -2$

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

$$x = \frac{-5 \pm \sqrt{(5)^2 - 4(3)(-2)}}{2(3)}$$

$$x = \frac{-5 \pm \sqrt{49}}{6}$$

$$x = \frac{-5 \pm 7}{6}$$

$$\boxed{x = \frac{1}{3}, -2}$$

Check!

eg2: Solve $3x^2 + 2x - 4 = 0$ using the Q.F.

$a = 3 \quad b = 2 \quad c = -4$

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

$$x = \frac{-2 \pm \sqrt{(2)^2 - 4(3)(-4)}}{2(3)}$$

$$x = \frac{-2 \pm \sqrt{52}}{6}$$

$$x = \frac{-2 \pm 2\sqrt{13}}{6} = \frac{-2}{6} \pm \frac{2\sqrt{13}}{6} = \boxed{-\frac{1}{3} \pm \frac{\sqrt{13}}{3}}$$

Check w/ decimals

eg3: Solve $9x^2 - 12x + 4 = 0$ using the Q.F.

$a = 9 \quad b = -12 \quad c = 4$

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

$$x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(9)(4)}}{2(9)}$$

$$x = \frac{12 \pm \sqrt{0}}{18} = \frac{12}{18} = \boxed{\frac{2}{3}}$$

eg4: Solve $2x^2 - 3x + 4 = 0$ using the Q.F.

$a = 2, \quad b = -3, \quad c = 4$

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

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(4)}}{2(2)}$$

$$x = \frac{3 \pm \sqrt{-23}}{4}$$

$\boxed{\text{no solution!}}$

eg5: Solve using the Q.F.

$$\frac{2}{x-3} + \frac{3}{x+2} = 1$$

FIND common denominator.
$(x-3)(x+2)$

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

$$2x+4 + 3x-9 = x^2 - x - 6$$

$$0 = x^2 - 6x - 1$$

$a = 1 \quad b = -6 \quad c = -1$

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

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(-1)}}{2(1)}$$

$$x = \frac{6 \pm \sqrt{40}}{2} = \frac{6 \pm 2\sqrt{10}}{2} = \boxed{3 \pm \sqrt{10}}$$

~~eg6: Solve~~

* derive Q.F.?

Hwk: p. 280 - 284 # 1-5, 8.
(try #7 see eg5 p. 279)

Chapter 6.5 Word Problem Examples

Eg1: The sum of a number and twice its reciprocal is 9/2. Find the number.

Let x = the number
then $\frac{1}{x}$ = its reciprocal

$$x + 2\left(\frac{1}{x}\right) = \frac{9}{2}$$

$$x\left(x + \frac{2}{x}\right) = \left(\frac{9}{2}\right)x$$

$$2\left(x^2 + 2\right) = \left(\frac{9}{2}x\right)2$$

$$2x^2 - 9x + 4 = 0$$

$$\left(2x^2 - 8x\right)\left(-1x + 4\right) = 0$$

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

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

$$\boxed{x = 4, \frac{1}{2}}$$

Eg2: A patrol boat took 2.5 hours for a round trip 12 km up-river and 12 km back down-river. The speed of the current was 2 km/h. What was the speed of the boat in still water?

Let x = speed of boat in still water

$$d = st \Rightarrow t = \frac{d}{s}$$

$$2.5 = \overbrace{\frac{12}{x+2}}^{\text{downriver}} + \overbrace{\frac{12}{x-2}}^{\text{upriver}}$$

$$2.5(x+2)(x-2) = 12(x-2) + 12(x+2)$$

$$2.5x^2 - 10 = 24x$$

$$5x^2 - 48x - 20 = 0$$

$$5x^2 - 50x + 2x - 20 = 0$$

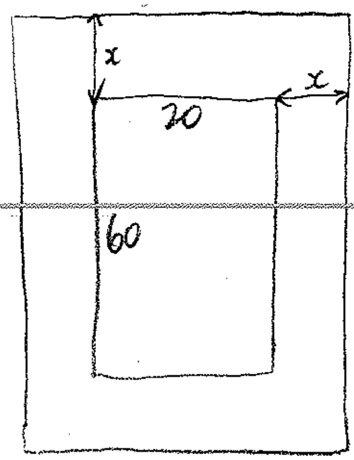
$$5x(x-10) + 2(x-10) = 0$$

$$(x-10)(5x+2) = 0$$

$$\boxed{x = 10}, \cancel{-\frac{2}{5}}$$

$$\boxed{10 \text{ km/h.}}$$

Eg3: A 20 cm by 60 cm painting has a frame surrounding it. If the frame is the same width all around, and the total area of the frame is 516 cm^2, then how wide is the frame?



Let x = width of frame

Area(frame) = A(big rect.) − A(painting)

$516 = (60+2x)(20+2x) - (20)(60)$

$516 = 1200 + 160x + 4x^2 - 1200$

$0 = 4x^2 + 160x - 516$

$0 = x^2 + 40x - 129$

$0 = (x+43)(x-3)$

$x = \cancel{-43}, \boxed{3}$

Eg4: Sally biked from Mount Douglas to Stelly's, a distance of 25 km, on two consecutive days. On day 1, she rode 3 km/h faster so her ride took 20 minutes less. Calculate her speed on both days and round to the nearest tenth.

Let x = speed on day 2 (slower speed)
then $x+3$ = speed on day 1 (faster speed)

20 mins = $\frac{1}{3}$ hr.

$t = \frac{d}{s}$

$\frac{1}{3}$ = longer time (day 2) − shorter time (day 1)

$\frac{1}{3} = \frac{25}{x} - \frac{25}{x+3}$

$\frac{1}{3}(x)(x+3) = 25(x+3) - 25x$

$\frac{1}{3}x^2 + x = 75$

$x^2 + 3x - 225 = 0$

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

$x = \frac{-3 \pm \sqrt{3^2-4(1)(-225)}}{2}$

$x = \frac{-3 \pm 30.15}{2} = \boxed{13.6 \text{ km/h}}$

$x+3 = \boxed{16.6 \text{ km/h}}$

Homework:

p.294-296 #1-18
Also don't 7, 13
p.270 # 10-15

Chapter Review

Ch. 4.1 – 4.2

p. 213 – 214

1–4 omit 2ed/4b

Ch. 6.1 – 6.3, 6.5

p. 297 – 299

1–6, 8, 10 – 11 (omit 11 though)

only # of roots, not type