Alg. 1-BE Monday 2-28-11

① Is this a perfect square trinomial?

$4x^2+20x+25$

② If so, solve the related QE by factoring. $\Rightarrow 4x^2+20x+25=0$

③ Is $4x^2+20x+24$ a Perfect Square Trinomial?

④ If not, solve $4x^2+20x+24=0$ by Completing The Square.

BE Answers

② $4x^2+20x+25=0$

$\downarrow (2x+5)^2 = 0$

$\boxed{x=\left\{-\frac{5}{2}\right\}}$

④ $4x^2+20x+24=0$

$4x^2+20x = -24$

$x^2+5x+\frac{25}{4} = -6+\frac{25}{4} = -\frac{24}{4}+\frac{25}{4}$

$\downarrow \qquad \swarrow$

$(x+\frac{5}{2})^2 = \frac{1}{4}$

$x = -\frac{5}{2} \pm \sqrt{\frac{1}{4}}$

$x = -\frac{5}{2} \pm \frac{1}{2}$

$x = -\frac{5}{2}+\frac{1}{2}$ $\quad\begin{cases} x = -\frac{5}{2}-\frac{1}{2} \end{cases}$

$x = -\frac{4}{2} = -2$ $\quad\begin{cases} x = -\frac{6}{2} = -3 \end{cases}$

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

NOTE: $4x^2+20x+24 = 4(x^2+5x+6)$

Solving $ax^2+bx+c=0$

STANDARD FORM FIRST

1. GCF ?
2. Perfect Square Trinomial ?
3. Magic Number Method ?
4. Complete the Square

$\oplus$

$d>0 \Rightarrow$ 2 real SOLUTIONS (roots)

positive

$d=0 \Rightarrow$ 1 real SOLUTION

$\ominus$

$d<0 \Rightarrow$ 0 real SOLUTION

negative

d = discriminant = b^2-4ac

A few important facts about using and simplifying radicals. ($\sqrt{\ }$)

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

(Ex) $\sqrt{\frac{1}{4}} = \frac{\sqrt{1}}{\sqrt{4}} = \frac{1}{2}$

CK $\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$ ✓

$$\sqrt{a \cdot b} = \sqrt{a} \cdot \sqrt{b}$$

(Ex) $\sqrt{64} = \sqrt{4} \cdot \sqrt{16}$

$= 2 \cdot 4 = 8$

CK $\sqrt{64} = 8$ ✓

Simplifying Radicals – 2 big rules

1. Never leave a perfect square factor under a radical.
2. Never leave a radical in the denominator.

Rule 1 ⇒ perfect square factors

(Ex) $\sqrt{8} = \sqrt{4}\sqrt{2}$

$= \boxed{2\sqrt{2}}$ Simplified

IF $x = 3 \pm \sqrt{8}$, MUST WRITE EXACT

ANSWER: $x = 3 \pm 2\sqrt{2}$

(Ex) $\sqrt{12} = ?$

$\sqrt{4} \cdot \sqrt{3} = 2\sqrt{3}$

(Ex) $\sqrt{20} = ?$

$\sqrt{4}\sqrt{5} = 2\sqrt{5}$

(Ex) $\sqrt{32} = ?$

$\sqrt{16}\sqrt{2} = 4\sqrt{2}$

or $\sqrt{32} = \sqrt{4}\sqrt{8} = 2\sqrt{8} = 2\sqrt{4} \cdot \sqrt{2}$

$= 2 \cdot 2\sqrt{2}$

$= 4\sqrt{2}$ ✓

Rule 2 ⇒ no $\sqrt{\ }$ in denominator

It is very useful to know the following: $\sqrt{x}\sqrt{x} = ?$

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

(Ex) $\sqrt{3} \cdot \sqrt{3} = ?$ $\boxed{3}$

This is how you will eliminate irrational numbers from the denominator of a fraction. This process is called

"rationalizing the denominator"

or, if you like the movie "Coneheads" you may also call it

"narfling the garthok"

How to RTD or NTG:

(Ex) Simplify $\frac{1}{\sqrt{2}}$

$$\frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{1\sqrt{2}}{2} = \boxed{\frac{\sqrt{2}}{2}}$$

(Ex) Simplify $\frac{\sqrt{3}}{\sqrt{5}}$

$$\frac{\sqrt{3}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \boxed{\frac{\sqrt{15}}{5}}$$

(Ex) Simplify $\frac{\sqrt{2}}{\sqrt{6}}$

$$\frac{\sqrt{2}}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{\sqrt{12}}{6} = \frac{\sqrt{4}\sqrt{3}}{6}$$

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

Be alert: since $\sqrt{\frac{2}{3}}$ is also $\frac{\sqrt{2}}{\sqrt{3}}$, $\sqrt{\frac{2}{3}}$ is NOT considered simplified, $\sqrt{\frac{2}{3}} = \frac{\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{\sqrt{6}}{3}}$

↑ Simplified

No fraction under a $\sqrt{\frac{a}{b}}$ (radical) is simplified!

(Ex) Simplify $\sqrt{\frac{2}{7}}$

$$\frac{\sqrt{2}}{\sqrt{7}} = \frac{\sqrt{7}}{\sqrt{7}} = \boxed{\frac{\sqrt{14}}{7}}$$

(Ex) Simplify $\sqrt{\frac{5}{8}}$

$$\frac{\sqrt{5}}{\sqrt{8}} \cdot \frac{\sqrt{8}}{\sqrt{8}} = \frac{\sqrt{40}}{8} = \frac{\sqrt{4}\sqrt{10}}{8} = \frac{2\sqrt{10}}{8} = \boxed{\frac{\sqrt{10}}{4}}$$

(Ex) $\sqrt{\frac{5}{16}} = ?$ $\quad \frac{\sqrt{5}}{\sqrt{16}} = \boxed{\frac{\sqrt{5}}{4}}$

(Ex) $\sqrt{\frac{16}{5}} = ?$ $\quad \frac{\sqrt{16}}{\sqrt{5}} = \frac{4}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \boxed{\frac{4\sqrt{5}}{5}}$

Terms under the $\sqrt{\ }$?, if they are the same... you have <u>like</u> terms.

(Ex) $2\sqrt{2} + 3\sqrt{2} = \boxed{5\sqrt{2}}$

Don't confuse with:

$2\sqrt{2} \cdot 3\sqrt{2} = 6 \cdot \sqrt{2} \cdot \sqrt{2} = \boxed{12}$

why?

(Ex) $5\sqrt{3} + 8\sqrt{2} - 2\sqrt{3} = ?$

$\boxed{3\sqrt{3} + 8\sqrt{2}}$

Often, the product of two simplified radicals is not simplified, so you must simplify it.

(Ex) $\sqrt{2} \cdot \sqrt{10}$

$\sqrt{20} = \sqrt{4}\sqrt{5} = \boxed{2\sqrt{5}}$

(Ex) $2\sqrt{3} \cdot 5\sqrt{15}$

$10\sqrt{45} = 10\sqrt{9}\sqrt{5}$

$= 10 \cdot 3\sqrt{5} = \boxed{30\sqrt{5}}$

Homework: Pg. 589-590

4-6, 9, 10, 15-21

Pg 595 # 4-9