

Alg. 1 - BE Tuesday 2-23-10

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

$$\textcircled{2} \quad 4x^2 + 20x + 25 = 0$$

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

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

$$\textcircled{4} \quad 4x^2 + 20x + 24 = 0$$

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

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

$$\downarrow \quad \downarrow$$

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

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

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

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

$$x = -\frac{4}{2} = -2$$

$$\left\{ \begin{array}{l} x = -\frac{5}{2} - \frac{1}{2} \\ x = -\frac{6}{2} = -3 \end{array} \right.$$

$$x = -\frac{6}{2} = -3$$

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

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

Solving

STANDARD FORM FIRST

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

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

$$d < 0 \overset{+}{\Rightarrow} 2 \text{ real solutions (roots)}$$

$$d = 0 \Rightarrow 1 \text{ real solution}$$

$$d < 0 \overset{-}{\Rightarrow} 0 \text{ real solution}$$

$$d = \text{discriminant} = b^2 - 4ac$$

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

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}} \quad (\text{EX}) \quad \sqrt{\frac{1}{4}} = \frac{\sqrt{1}}{\sqrt{4}} = \frac{1}{2}$$

$$\stackrel{\text{CK}}{=} \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4} \checkmark$$

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

$$\begin{aligned} (\text{EX}) \quad \sqrt{64} &= \sqrt{4} \cdot \sqrt{16} \\ &= 2 \cdot 4 = 8 \end{aligned}$$

$$\stackrel{\text{CK}}{=} \sqrt{64} = 8 \checkmark$$

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 $\Rightarrow$ perfect square factors

$$\textcircled{\text{Ex}} \quad \sqrt{8} = \sqrt{4} \sqrt{2} \\ = \boxed{2\sqrt{2}} \text{ Simplified}$$

if $x = 3 \pm \sqrt{8}$, must write EXACT

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

$$\textcircled{\text{Ex}} \quad \sqrt{12} = ?$$

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

$$\textcircled{\text{Ex}} \quad \sqrt{20} = ?$$

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

$$\textcircled{\text{Ex}} \quad \sqrt{32} = ?$$

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

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

Rule 2 $\Rightarrow$ NO $\sqrt{\quad}$ in denominator

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

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

ⓔx $\sqrt{3} \cdot \sqrt{3} = ?$ 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 "Conheads" you may
also call it

"Narfing the garthok"

How to RTD or NTG:

① Ex Simplify $\frac{1}{\sqrt{2}}$

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

② Ex Simplify $\frac{\sqrt{3}}{\sqrt{5}}$

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

③ Ex Simplify $\frac{\sqrt{2}}{\sqrt{6}}$

$$\begin{aligned} \frac{\sqrt{2}}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} &= \frac{\sqrt{12}}{6} = \frac{\sqrt{4}\sqrt{3}}{6} \\ &= \frac{2\sqrt{3}}{6} = \boxed{\frac{\sqrt{3}}{3}} \end{aligned}$$

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 $\sqrt{\frac{a}{b}}$ is simplified!
 (RADICAL)

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

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

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

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

$$\textcircled{\text{EX}} \sqrt{\frac{5}{16}} = ? \quad \frac{\sqrt{5}}{\sqrt{16}} = \boxed{\frac{\sqrt{5}}{4}}$$

$$\textcircled{\text{EX}} \sqrt{\frac{16}{5}} = ? \quad \frac{\sqrt{16}}{\sqrt{5}} = \frac{4}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \boxed{\frac{4\sqrt{5}}{5}}$$

Terms under the $\sqrt{\quad}$?, if they are the same... you have like terms.

$$\textcircled{\text{EX}} 2\sqrt{2} + 3\sqrt{2} = \boxed{5\sqrt{2}}$$

Don't confuse with:

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

why?

$$\textcircled{\text{EX}} 5\sqrt{3} + 8\sqrt{2} - 2\sqrt{3} = ?$$

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

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

$$\textcircled{\text{EX}} \quad \sqrt{2} \cdot \sqrt{10}$$

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

$$\textcircled{\text{EX}} \quad 2\sqrt{3} \cdot 5\sqrt{15}$$

$$\begin{aligned} 10\sqrt{45} &= 10\sqrt{9} \sqrt{5} \\ &= 10 \cdot 3 \sqrt{5} = \boxed{30\sqrt{5}} \end{aligned}$$

Homework: Pg. 589-590

4-6, 9, 10, 15-21

Pg 595 # 4-9