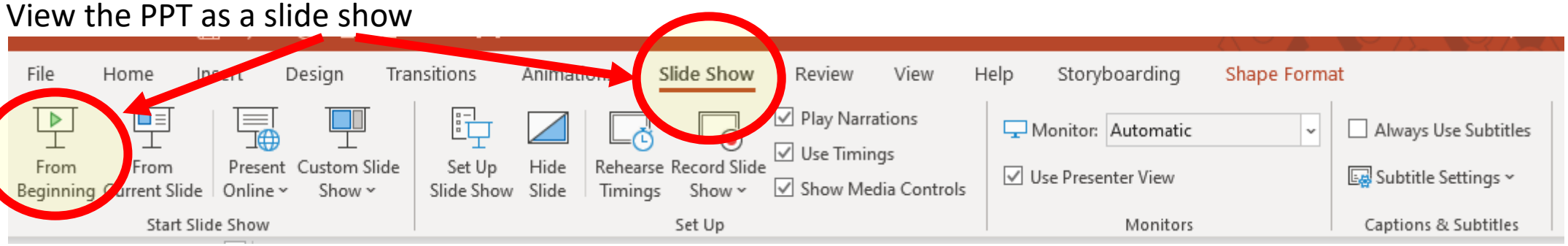
How to best use these slides…

- View the PPT as a slide show



- Then click through every step
  - Mouse clicks will advance the slide show
  - Left/right arrow keys move forward/backward
  - Mouse wheel scrolling moves forward/backward
- When a question is posed, stop and think it through, try to answer it yourself before clicking
- If you have questions, use PS discussion boards, email me, and/or visit us in a Teams class session!

LESSON 7. 5a

Solving Rational Equations

by Cross Multiplying

Today you will:

- Solve rational equations by cross multiplying
- Practice using English to describe math processes and equations

Core Vocabulary:

- Cross multiplying, p. 392

How would you solve the following?

$\frac{3}{x} = \frac{5}{4}$ $\rightarrow 3 \cdot 4 = 5 \cdot x$

$\frac{x}{1} \cdot \frac{3}{x} = \frac{x}{1} \cdot \frac{5}{4}$ Multiply both sides by x

$3 = \frac{5x}{4}$ Simplify

$4 \cdot 3 = \frac{4}{1} \cdot \frac{5x}{4}$ Multiply both sides by 4

$12 = 5x$ Simplify

$x = \frac{12}{5}$ Solve for x, divide both sides by 5

Check

$\frac{3}{12/5} = \frac{5}{4}$

$\frac{3}{1} \cdot \frac{5}{12} = \frac{5}{4}$

$\frac{15}{12} = \frac{5}{4}$ ✓

Notice what we did:

- We multiplied both sides by the left denominator…
- and we multiplied both sides by the right denominator.

We ***CROSS MULTIPLIED***

Cross Multiplication

- IMPORTANT: only works when you have one fraction equal to another fraction.
  - Can only be a single fraction on the left…
  - …and a single fraction on the right.
- Multiple each side by the denominator from the other side.

$$\frac{3}{x} = \frac{5}{4} \rightarrow 3 \cdot 4 = 5 \cdot x \rightarrow 12 = 5x$$

- **IMPORTANT**:
  - ***ALWAYS*** check your answer
  - In a few days we will see why!!!

Solve $\frac{3}{x+1} = \frac{9}{4x+5}$.

SOLUTION

$\frac{3}{x+1} = \frac{9}{4x+5}$	Write original equation.
$3(4x+5) = 9(x+1)$	Cross multiply.
$12x + 15 = 9x + 9$	Distributive Property.
$3x + 15 = 9$	Subtract $9x$ from each side.
$3x = -6$	Subtract 15 from each side.
$x = -2$	Divide each side by 3.

Check

$$\frac{3}{-2+1} \stackrel{?}{=} \frac{9}{4(-2)+5}$$

$$\frac{3}{-1} \stackrel{?}{=} \frac{9}{-3}$$

$$-3 = -3 \checkmark$$

▶ The solution is $x = -2$.

An *alloy* is formed by mixing two or more metals. Sterling silver is an alloy composed of 92.5% silver and 7.5% copper by weight. You have 15 ounces of 800 grade silver, which is 80% silver and 20% copper by weight. How much pure silver should you mix with the 800 grade silver to make sterling silver?

SOLUTION

$$\text{percent of copper in mixture} = \frac{\text{weight of copper in mixture}}{\text{total weight of mixture}}$$

$$\frac{7.5}{100} = \frac{(0.2)(15)}{15 + x}$$ x is the amount of silver added.

$$7.5(15 + x) = 100(0.2)(15)$$ Cross multiply.

$$112.5 + 7.5x = 300$$ Simplify.

$$7.5x = 187.5$$ Subtract 112.5 from each side.

$$x = 25$$ Divide each side by 7.5.

You should mix 25 ounces of pure silver with the 15 ounces of 800 grade silver.

Review/Recap

- Cross Multiplication
  - IMPORTANT:
    - Can only be a single fraction on the left…
    - …and a single fraction on the right.
  - Multiple each side by the denominator from the other side.
- ***ALWAYS*** check your answer
  - In a few days we will see why!!!

Homework

Pg 396, #3-14