Geometry B: Skills Practice – Proportions and Simplifying Square Root Expressions

Name:		

A proportion is an equation stating two fractions are equal.

Example:
$$\frac{8}{x} = \frac{4}{7}$$

To solve proportions, we cross-multiply and solve the resulting equation normally.

Example: Solve the proportion written above.

Examples: Solve each proportion.

A.
$$\frac{x}{5} = \frac{200}{x}$$

B.
$$\frac{x-3}{4} = \frac{9}{2}$$

c.
$$\frac{x-3}{9} = \frac{4}{x-3}$$

Simplifying Square Roots: Removing the Perfect Square Factor

Square roots have been simplified when all perfect square factors have been removed from the root. To do this, a list of perfect squares is helpful (shown below).

Example: Simplify the following roots:

$$\sqrt{3179}$$

$$\sqrt{112}$$

The First 20 Perfect Squares

$$1^{2} = 1$$
 $6^{2} = 36$ $11^{2} = 121$ $16^{2} = 256$
 $2^{2} = 4$ $7^{2} = 49$ $12^{2} = 144$ $17^{2} = 289$
 $3^{2} = 9$ $8^{2} = 64$ $13^{2} = 169$ $18^{2} = 324$
 $4^{2} = 16$ $9^{2} = 81$ $14^{2} = 196$ $19^{2} = 361$

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$$5^2 = 25$$
 $10^2 = 100$ $15^2 = 225$ $20^2 = 400$

Square Root Arithmetic: Adding, Subracting, Multiplying, Dividing

To add or subtract roots, only roots with the same radicand (the number inside the root) can be simplified. All final answers should be simplified as well.

Example: Simplify $4\sqrt{3} - 10\sqrt{3} + 2\sqrt{6}$

Multiplying or dividing square roots is done regardless of the radicand.

Example: Simplify the following expressions.

$$\sqrt{6}\sqrt{10} = \sqrt{\frac{24}{3}} =$$

A. Solve each proportion.

$$#1 \frac{-2}{11} = \frac{x}{22}$$

$$#2 \ \frac{3}{7} = \frac{x+2}{15}$$

#3
$$\frac{27}{x} = \frac{x}{3}$$

#4
$$\frac{x-6}{14} = \frac{4}{x-6}$$

$$#5 \frac{x-1}{40} = \frac{1}{6}$$

$$\#6 \ \frac{8}{22} = \frac{1}{x-4}$$

B. Simplify each square root expression.

#10
$$\sqrt{1183}$$

#11
$$\sqrt{252}$$

#12
$$\sqrt{675}$$

C. Simplify each square root expression

#13
$$2\sqrt{2} - 5\sqrt{2}$$

#14
$$10\sqrt{3} + 5\sqrt{2} - \sqrt{3}$$

#15
$$8\sqrt{6} - 5\sqrt{3} + 4\sqrt{6}$$

#16
$$\sqrt{\frac{56}{7}}$$

$$#17\sqrt{\frac{44}{11}}$$

#18
$$\sqrt{\frac{26}{2}}$$

#19
$$\sqrt{22}\sqrt{10}$$

#20
$$5\sqrt{3}\sqrt{7}$$

#21
$$\sqrt{20}\sqrt{5}$$

Simplifying Square Roots: Rationalizing the Denominator

• In most cases, it is preferable to remove square roots from the denominator of a fraction. This process is known as **rationalizing the denominator**. A walkthrough of how to do this is shown below:

Example: Simplify $\frac{3}{\sqrt{6}}$

First multiply the numerator and denominator by the root in the denominator:

 $\frac{3}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}}$ Now simplify $\rightarrow \frac{3\sqrt{6}}{\sqrt{36}} \rightarrow$ the denominator is now a perfect square so take the square root:

 $\frac{3\sqrt{6}}{6}$ \rightarrow Simplify any non-root terms: $\frac{\sqrt{6}}{2}$ and that's it!

D. Simplify

#22
$$\frac{5}{\sqrt{10}}$$

#23
$$\frac{3}{\sqrt{15}}$$

#24
$$\frac{7}{\sqrt{13}}$$

Name: Key

A proportion is an equation stating two fractions are equal.

Example: $\frac{8}{x} = \frac{4}{7}$

To solve proportions, we cross-multiply and solve the resulting equation normally.

$$4x = 7(8)$$

Example: Solve the proportion written above.

$$\frac{4x = 56}{4}$$

$$x = |4|$$

Examples: Solve each proportion.

A.
$$\frac{x}{5} = \frac{200}{x}$$
 $x^{2} = 200(5)$
 $x^{2} = 1000$
 $x = \pm 1000$
 $x = 1000$
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 $x = 10000$
 $x = 1000$

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Example: Simplify $4\sqrt{3} - 10\sqrt{3} + 2\sqrt{6}$

Multiplying or dividing square roots is done regardless of the radicand.

Example: Simplify the following expressions.

$$\sqrt{6}\sqrt{10} = \sqrt{4} \cdot \sqrt{15}$$

$$\sqrt{\frac{24}{3}} = \sqrt{\frac{24}{3}} = \sqrt{\frac{24}{3}}$$

A. Solve each proportion.

#1
$$\frac{-2}{11} = \frac{x}{22}$$

$$11x = 22(-2)$$

$$11x = -44$$

#2
$$\frac{3}{7} = \frac{x+2}{15}$$

$$7(X+2) = 3(15)$$

$$7x + 14 = 45$$

$$7x = 31$$

$$X = \frac{31}{7}$$

$$\#3 \frac{27}{x} = \frac{x}{3}$$

$$\chi^2 = 3(27)$$

$$x^2 = 81$$

$$\sqrt{x^2} = \sqrt{81}$$

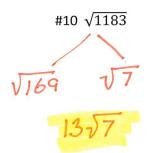
X = ±9 + Two solutions

$$\#6 \ \frac{8}{22} = \frac{1}{x-4}$$

$$\underbrace{g(X-4)}_{Q} = \underbrace{32}_{Q}$$

$$X = \frac{27}{4}$$

B. Simplify each square root expression.



#7 √392

Combine like terms Combine like radicals

C. Simplify each square root expression

#13
$$2\sqrt{2} - 5\sqrt{2}$$
 #14 $10\sqrt{3} + 5\sqrt{2} - \sqrt{3}$ #15 $8\sqrt{6} - 5\sqrt{3} + 4\sqrt{6}$
 $-3\sqrt{3}$ #16 $\sqrt{\frac{56}{7}}$ #17 $\sqrt{\frac{44}{11}}$ #18 $\sqrt{\frac{26}{2}}$

#19 $\sqrt{22}\sqrt{10}$ #20 $5\sqrt{3}\sqrt{7}$ #21 $\sqrt{20}\sqrt{5}$

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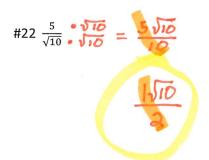
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D. Simplify



#23
$$\frac{3}{\sqrt{15}}$$
 $\sqrt{15}$ = $\frac{3\sqrt{15}}{15}$

$$#24 \frac{7}{\sqrt{13}} \cdot \sqrt{13} = \frac{7\sqrt{13}}{13}$$

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