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Date: 1/29/18

CC GEOMETRY

TROICI

LESSON #2: OPERATIONS WITH RADICALS

Do Now:

<p>a) $\sqrt{16x^{16}}$ $\boxed{4x^8}$</p>	<p>b) $-\sqrt{18}$ $-1 \sqrt{9} \sqrt{2}$ $-1 \cdot 3 \cdot \sqrt{2}$ $\boxed{-3\sqrt{2}}$</p>	<p>c) $\sqrt{9x^9}$ $\sqrt{9} \sqrt{x^9}$ $\sqrt{9} \sqrt{x^8} \sqrt{x}$ $\boxed{3x^4\sqrt{x}}$</p>	<p>d) $\underline{x} + \underline{3x} - \underline{y} + \underline{3y}$ $\boxed{4x + 2y}$</p>
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ADDING/SUBTRACTING RADICALS

STEPS	EXAMPLE
<p>1. Simplify radicals 2. Add/subtract coefficients of like radicals</p> <p>*INDEX MUST BE THE SAME!*</p>	<p>$4\sqrt{12} - \sqrt{75}$ $4\sqrt{4} \sqrt{3} - \sqrt{25} \sqrt{3}$ $4 \cdot 2\sqrt{3} - 5\sqrt{3}$ $8\sqrt{3} - 5\sqrt{3} = \boxed{3\sqrt{3}}$</p>

1. $\sqrt{5} + 3\sqrt{7} - 4\sqrt{5} - 5\sqrt{7}$
 $\boxed{-3\sqrt{5} - 2\sqrt{7}}$

2. $3\sqrt{3} + 4\sqrt{3} - \sqrt{2}$
 $\boxed{7\sqrt{3} - \sqrt{2}}$

3. $5(3\sqrt{6} + 2\sqrt{7}) - 4(\sqrt{7} - 2\sqrt{6})$
 $15\sqrt{6} + 10\sqrt{7} - 4\sqrt{7} + 8\sqrt{6}$
 $\boxed{23\sqrt{6} + 6\sqrt{7}}$

4. $\sqrt{20} - 5$
 $\sqrt{4} \sqrt{5} - 5$
 $\boxed{2\sqrt{5} - 5}$ → cannot combine anything else!

5. $\sqrt{20} + \sqrt{40} + \sqrt{60}$
 $\sqrt{4} \sqrt{5} + \sqrt{4} \sqrt{10} + \sqrt{4} \sqrt{15}$
 $\boxed{2\sqrt{5} + 2\sqrt{10} + 2\sqrt{15}}$
 cannot combine!

6. $3\sqrt{72} - 5\sqrt{32}$
 $3\sqrt{36} \sqrt{2} - 5\sqrt{16} \sqrt{2}$
 $3 \cdot 6\sqrt{2} - 5 \cdot 4\sqrt{2}$
 $18\sqrt{2} - 20\sqrt{2} = \boxed{-2\sqrt{2}}$

7. $\sqrt{12w} + \sqrt{27w}$
 $\sqrt{4} \sqrt{3} \sqrt{w} + \sqrt{9} \sqrt{3} \sqrt{w}$
 $2\sqrt{3w} + 3\sqrt{3w}$
 $\boxed{5\sqrt{3w}}$

8. $\sqrt{45x^3} - \sqrt{20x^3}$
 $\sqrt{9} \sqrt{5} \sqrt{x^2} \sqrt{x} - \sqrt{4} \sqrt{5} \sqrt{x^2} \sqrt{x}$
 $3x\sqrt{5x} - 2x\sqrt{5x}$
 $\boxed{x\sqrt{5x}}$

MULTIPLYING RADICALS

STEPS	EXAMPLE
<ol style="list-style-type: none"> 1. Multiply or divide coefficients 2. Multiply or divide radicands 3. Simplify radical <p style="text-align: center;">*INDEX MUST BE THE SAME!*</p>	<p>a) $(3\sqrt{5})(4\sqrt{10})$</p> $(3 \times 4)(\sqrt{5} \times \sqrt{10})$ $12\sqrt{50}$ $12\sqrt{25 \cdot 2}$ $12 \cdot 5\sqrt{2}$ $\boxed{60\sqrt{2}}$ <p>b) $\frac{32\sqrt{54}}{2\sqrt{3}}$</p> $\left(\frac{32}{2}\right)\left(\frac{\sqrt{54}}{\sqrt{3}}\right)$ $16\sqrt{18}$ $16\sqrt{9 \cdot 2}$ $16 \cdot 3\sqrt{2}$ $\boxed{48\sqrt{2}}$

a) $(\sqrt{2})(\sqrt{5})$

$$\boxed{\sqrt{10}}$$

b) $(3\sqrt{2})(\sqrt{6})$

$$3\sqrt{12}$$

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

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

$$\boxed{6\sqrt{3}}$$

c) $(\sqrt{8})(\sqrt{6})$

$$\sqrt{48}$$

$$\sqrt{16 \cdot 3}$$

$$\boxed{4\sqrt{3}}$$

d) $\frac{\sqrt{72}}{\sqrt{6}} = \sqrt{12}$

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

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

e) $\frac{\sqrt{50}}{\sqrt{5}} = \sqrt{10}$

$$\frac{5\sqrt{2}}{5\sqrt{1}} = \frac{5\sqrt{2} \cdot \sqrt{5}}{\sqrt{5} \cdot \sqrt{5}} = \frac{5\sqrt{10}}{5}$$

f) $\frac{27\sqrt{490}}{9\sqrt{5}}$

$$3\sqrt{98}$$

$$3\sqrt{49 \cdot 2}$$

$$3 \cdot 7\sqrt{2}$$

$$\boxed{21\sqrt{2}}$$

g) $(\sqrt{8})\left(\sqrt{\frac{1}{2}}\right) = \sqrt{4} = \boxed{2}$

h) $(2\sqrt{15})(3\sqrt{30})$

$$6\sqrt{450}$$

$$6\sqrt{225 \cdot 2}$$

$$6 \cdot 15\sqrt{2}$$

$$\boxed{90\sqrt{2}}$$

i) $(6\sqrt{2})(6\sqrt{18})$

$$36\sqrt{36}$$

$$36 \cdot 6 = \boxed{216}$$

j) $\left(\sqrt{\frac{2}{5}}\right)\left(\sqrt{\frac{9}{2}}\right)\left(\sqrt{\frac{10}{3}}\right)$

$$\boxed{\sqrt{6}}$$

k) $\frac{\sqrt{7}}{\sqrt{63}} = \frac{\sqrt{1}}{\sqrt{9}} = \boxed{\frac{1}{3}}$

l) $\frac{24\sqrt{56}}{6\sqrt{7}} = 4\sqrt{8}$

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

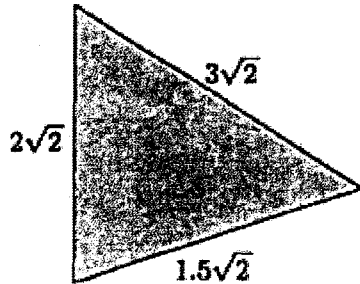
$$4 \cdot 2\sqrt{2}$$

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

GEOMETRIC APPLICATIONS

AREA	PERIMETER
$A_{\text{Rectangle}} = L \cdot W$ $A_{\text{Triangle}} = \frac{1}{2} \cdot B \cdot H$	Add all sides!

1. Find the perimeter of the triangle below:



$$2\sqrt{2} + 3\sqrt{2} + 1.5\sqrt{2}$$

$$\boxed{6.5\sqrt{2}}$$

1. If the sides of a triangle are $\sqrt{12}$, $4\sqrt{3}$, and $\sqrt{75}$, find the perimeter.

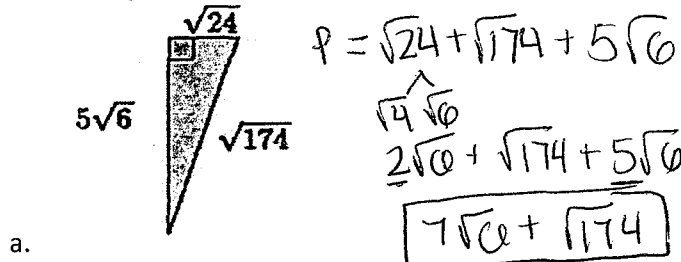
$$\sqrt{12} + 4\sqrt{3} + \sqrt{75}$$

$$\sqrt{4} \sqrt{3} + 4\sqrt{3} + \sqrt{25} \sqrt{3}$$

$$2\sqrt{3} + 4\sqrt{3} + 5\sqrt{3}$$

$$\rightarrow \boxed{11\sqrt{3}}$$

2. Determine the area and perimeter of the triangles below:



$$P = \sqrt{24} + \sqrt{174} + 5\sqrt{6}$$

$$\sqrt{4} \sqrt{6} + \sqrt{14} \sqrt{6} + 5\sqrt{6}$$

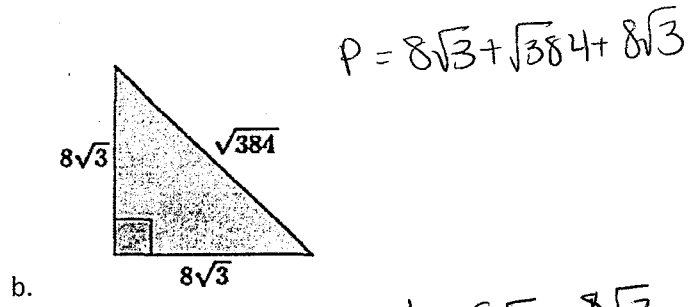
$$2\sqrt{6} + \sqrt{174} + 5\sqrt{6}$$

$$\boxed{7\sqrt{6} + \sqrt{174}}$$

$$A = \frac{1}{2} \sqrt{24} \cdot 5\sqrt{6}$$

$$A = 2.5 \sqrt{144}$$

$$A = 2.5 \cdot 12 = \boxed{30}$$



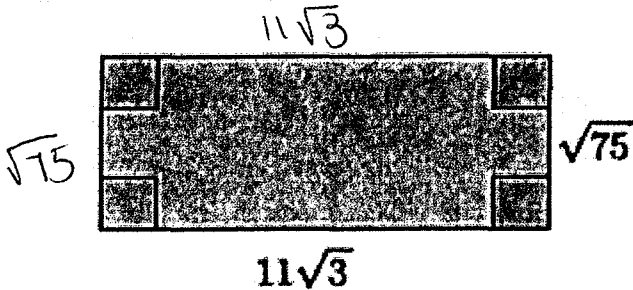
$$P = 8\sqrt{3} + \sqrt{384} + 8\sqrt{3}$$

$$A = \frac{1}{2} \cdot 8\sqrt{3} \cdot 8\sqrt{3}$$

$$A = 32\sqrt{9}$$

$$A = 32 \cdot 3 = \boxed{96}$$

3. Determine the area and perimeter of the rectangle below:



$$P = \sqrt{75} + \sqrt{75} + 11\sqrt{3} + 11\sqrt{3}$$

$$\sqrt{25} \sqrt{3} + \sqrt{25} \sqrt{3}$$

$$5\sqrt{3} + 5\sqrt{3} + 11\sqrt{3} + 11\sqrt{3}$$

$$\boxed{32\sqrt{3}}$$

$$A = 11\sqrt{3} \cdot \sqrt{75}$$

$$A = 11\sqrt{225}$$

$$A = 11 \cdot 15 = \boxed{165}$$