

Name Key

Date \_\_\_\_\_

8A: Algebra 1

Period \_\_\_\_\_

Adding & Subtracting Radicals

\*\*In order to add or subtract radicals, the radicands must be the same before you can combine them!

I. Steps:

- 1) If the radicands are not the same, simplify to find the common radicand.
- 2) Add/Subtract the Coefficients.
- 3) Place the "like" radicand next to the answer from step 2.

II. Express the following in simplest radical form.

<p>1) <math>2\sqrt{3} + 5\sqrt{3}</math></p> <p><math>7\sqrt{3}</math></p>	<p>2) <math>6x\sqrt{5} - 2x\sqrt{5}</math></p> <p><math>4x\sqrt{5}</math></p>	<p>3) <math>5\sqrt{7} + \sqrt{7}</math></p> <p><math>6\sqrt{7}</math></p>
<p>4) <math>\sqrt{50} + \sqrt{8}</math></p> <p><math>\sqrt{25 \cdot 2} + \sqrt{4 \cdot 2}</math></p> <p><math>5\sqrt{2} + 2\sqrt{2}</math></p> <p><math>7\sqrt{2}</math></p>	<p>5) <math>5\sqrt{7} + 3\sqrt{28}</math></p> <p><math>5\sqrt{7} + 3 \cdot \sqrt{4 \cdot 7}</math></p> <p><math>5\sqrt{7} + 3 \cdot 2\sqrt{7}</math></p> <p><math>5\sqrt{7} + 6\sqrt{7}</math></p> <p><math>11\sqrt{7}</math></p>	<p>6) <math>\sqrt{48} - \sqrt{3}</math></p> <p><math>\sqrt{16 \cdot 3} - \sqrt{3}</math></p> <p><math>4\sqrt{3} - 1\sqrt{3}</math></p> <p><math>3\sqrt{3}</math></p>
<p>7) <math>2x\sqrt{50} - x\sqrt{2}</math></p> <p><math>2x \cdot \sqrt{25 \cdot 2} - x\sqrt{2}</math></p> <p><math>2x \cdot 5\sqrt{2} - x\sqrt{2}</math></p> <p><math>10x\sqrt{2} - x\sqrt{2}</math></p> <p><math>9x\sqrt{2}</math></p>	<p>8) <math>6\sqrt{24} + \sqrt{54}</math></p> <p><math>6 \cdot \sqrt{4 \cdot 6} + \sqrt{9 \cdot 6}</math></p> <p><math>6 \cdot 2\sqrt{6} + 3\sqrt{6}</math></p> <p><math>12\sqrt{6} + 3\sqrt{6}</math></p> <p><math>15\sqrt{6}</math></p>	<p>9) <math>3\sqrt{18} - 5\sqrt{8}</math></p> <p><math>3 \cdot \sqrt{9 \cdot 2} - 5 \cdot \sqrt{4 \cdot 2}</math></p> <p><math>3 \cdot 3\sqrt{2} - 5 \cdot 2\sqrt{2}</math></p> <p><math>9\sqrt{2} - 10\sqrt{2}</math></p> <p><math>-1\sqrt{2}</math></p>

$$10) 2\sqrt{3} - \sqrt{27}$$

$$2\sqrt{3} - \sqrt{9 \cdot 3}$$

$$2\sqrt{3} - 3\sqrt{3}$$

$$\boxed{-1\sqrt{3}}$$

$$11) 6\sqrt{2} + \sqrt{32}$$

$$6\sqrt{2} + \sqrt{16 \cdot 2}$$

$$6\sqrt{2} + 4\sqrt{2}$$

$$\boxed{10\sqrt{2}}$$

$$12) 3\sqrt{2} - 5\sqrt{8}$$

$$3\sqrt{2} - 5 \cdot \sqrt{4 \cdot 2}$$

$$3\sqrt{2} - 5 \cdot 2\sqrt{2}$$

$$3\sqrt{2} - 10\sqrt{2}$$

$$\boxed{-7\sqrt{2}}$$

$$13) 3\sqrt{3} + \sqrt{12}$$

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

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

$$\boxed{5\sqrt{3}}$$

$$14) 12\sqrt{27} + 4\sqrt{6}$$

$$12 \cdot \sqrt{9 \cdot 3} + 4\sqrt{6}$$

$$12 \cdot 3\sqrt{3} + 4\sqrt{6}$$

$$\boxed{36\sqrt{3} + 4\sqrt{6}}$$

↑

not like terms, can't combine

$$15) 8x\sqrt{300} - 4x\sqrt{12}$$

$$8x \cdot \sqrt{100 \cdot 3} - 4x \cdot \sqrt{4 \cdot 3}$$

$$8x \cdot 10\sqrt{3} - 4x \cdot 2\sqrt{3}$$

$$80x\sqrt{3} - 8x\sqrt{3}$$

$$\boxed{72x\sqrt{3}}$$

$$16) 7x\sqrt{40} + 3x\sqrt{90}$$

$$7x \cdot \sqrt{4 \cdot 10} + 3x \cdot \sqrt{9 \cdot 10}$$

$$7x \cdot 2\sqrt{10} + 3x \cdot 3\sqrt{10}$$

$$14x\sqrt{10} + 9x\sqrt{10}$$

$$\boxed{23x\sqrt{10}}$$

$$17) 7x^2\sqrt{6} + x^2\sqrt{6}$$

$$\boxed{8x^2\sqrt{6}}$$

$$18) 3\sqrt{44} - 7\sqrt{11} + \sqrt{99}$$

$$3 \cdot \sqrt{4 \cdot 11} - 7\sqrt{11} + \sqrt{9 \cdot 11}$$

$$3 \cdot 2\sqrt{11} - 7\sqrt{11} + 3\sqrt{11}$$

$$6\sqrt{11} - 7\sqrt{11} + 3\sqrt{11}$$

$$\boxed{2\sqrt{11}}$$

$$19) 6\sqrt{6x} + \sqrt{54x}$$

$$6\sqrt{6x} + \sqrt{9 \cdot 6x}$$

$$6\sqrt{6x} + \sqrt{9 \cdot 6x}$$

$$6\sqrt{6x} + 3\sqrt{6x}$$

$$\boxed{9\sqrt{6x}}$$

$$20) \sqrt{20} + 9\sqrt{5} - \sqrt{45}$$

$$\sqrt{4 \cdot 5} + 9\sqrt{5} - \sqrt{9 \cdot 5}$$

$$2\sqrt{5} + 9\sqrt{5} - 3\sqrt{5}$$

$$\boxed{8\sqrt{5}}$$

$$21) 10\sqrt{2} + 4\sqrt{200} - 6\sqrt{8}$$

$$10\sqrt{2} + 4 \cdot \sqrt{100 \cdot 2} - 6 \cdot \sqrt{4 \cdot 2}$$

$$10\sqrt{2} + 4 \cdot 10\sqrt{2} - 6 \cdot 2\sqrt{2}$$

$$10\sqrt{2} + 40\sqrt{2} - 12\sqrt{2}$$

$$\boxed{38\sqrt{2}}$$

$$22) \sqrt{3a^2} + \sqrt{48a^2}$$

$$\sqrt{3} \sqrt{a^2} + \sqrt{4 \cdot 3} \sqrt{a^2}$$

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

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

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

$$\boxed{5a\sqrt{3}}$$

$$23) \frac{16\sqrt{21}}{2\sqrt{7}} - 5\sqrt{12}$$

$$8\sqrt{3} - 5\sqrt{12}$$

$$8\sqrt{3} - 5\sqrt{4 \cdot 3}$$

$$8\sqrt{3} - 5 \cdot 2\sqrt{3}$$

$$8\sqrt{3} - 10\sqrt{3}$$

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

$$24) \frac{3\sqrt{75} + \sqrt{27}}{3}$$

$$\frac{3\sqrt{25 \cdot 3} + \sqrt{9 \cdot 3}}{3}$$

$$\frac{3 \cdot 5\sqrt{3} + 3\sqrt{3}}{3}$$

$$\frac{15\sqrt{3} + 3\sqrt{3}}{3}$$

$$\frac{18\sqrt{3}}{3}$$

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

$$25) (\sqrt{3} + \sqrt{2})(\sqrt{3} + \sqrt{2})$$

$$\sqrt{9} + \sqrt{6} + \sqrt{6} + \sqrt{4}$$

$$3 + \sqrt{6} + \sqrt{6} + 2$$

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

↑  
NOT like terms, can't combine

$$26) (5 + \sqrt{3})^2$$

$$(5 + \sqrt{3})(5 + \sqrt{3})$$

$$25 + 5\sqrt{3} + 5\sqrt{3} + \sqrt{9}$$

$$25 + 5\sqrt{3} + 5\sqrt{3} + 3$$

$$\boxed{28 + 10\sqrt{3}}$$

↑  
NOT like terms, can't combine

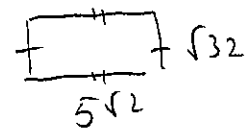
$$27) (4 + \sqrt{5})(4 - \sqrt{5})$$

$$16 - 4\sqrt{5} + 4\sqrt{5} - \sqrt{25}$$

$$16 - 4\sqrt{5} + 4\sqrt{5} - 5$$

$$\boxed{11}$$

28) What is the perimeter of a rectangle with length  $5\sqrt{2}$  and width  $\sqrt{32}$ .



$$P = 2L + 2w$$

$$P = 2(5\sqrt{2}) + 2(\sqrt{32})$$

$$P = 10\sqrt{2} + 2\sqrt{32}$$

$$P = 10\sqrt{2} + 2 \cdot \sqrt{16 \cdot 2}$$

$$P = 10\sqrt{2} + 2 \cdot 4\sqrt{2}$$

$$P = 10\sqrt{2} + 8\sqrt{2}$$

$$\boxed{P = 18\sqrt{2}}$$

~ or ~

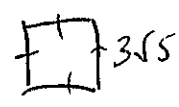
$$5\sqrt{2} + 5\sqrt{2} + \sqrt{32} + \sqrt{32}$$

$$5\sqrt{2} + 5\sqrt{2} + \sqrt{16 \cdot 2} + \sqrt{16 \cdot 2}$$

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

$$\boxed{18\sqrt{2}}$$

29) What is the perimeter of a square whose length of one side measures  $3\sqrt{5}$ ?



$$P = 4s$$

$$P = 4(3\sqrt{5})$$

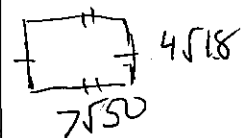
$$\boxed{P = 12\sqrt{5}}$$

~ or ~

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

$$\boxed{12\sqrt{5}}$$

30) Find the perimeter of a rectangle with length  $7\sqrt{50}$  and width  $4\sqrt{18}$ .



$$P = 2L + 2w$$

$$P = 2(7\sqrt{50}) + 2(4\sqrt{18})$$

$$P = 14\sqrt{50} + 8\sqrt{18}$$

$$P = 14 \cdot \sqrt{25 \cdot 2} + 8 \cdot \sqrt{9 \cdot 2}$$

$$P = 14 \cdot 5\sqrt{2} + 8 \cdot 3\sqrt{2}$$

$$70\sqrt{2} + 24\sqrt{2}$$

$$\boxed{P = 94\sqrt{2}}$$

~ or ~

$$7\sqrt{50} + 7\sqrt{50} + 4\sqrt{18} + 4\sqrt{18}$$

$$\left( \sqrt{25 \cdot 2} \right) \left( \sqrt{25 \cdot 2} \right) \left( \sqrt{9 \cdot 2} \right) \left( \sqrt{9 \cdot 2} \right)$$

$$7 \cdot 5\sqrt{2} \quad 7 \cdot 5\sqrt{2} \quad 4 \cdot 3\sqrt{2} \quad 4 \cdot 3\sqrt{2}$$

$$35\sqrt{2} + 35\sqrt{2} + 12\sqrt{2} + 12\sqrt{2}$$

$$\boxed{94\sqrt{2}}$$