#5

Multiply and Divide Radical Expressions

$2 \cdot 5 =$ 10 $\quad 2 \cdot \sqrt{5} =$ $2\sqrt{5}$ $\quad \sqrt{2} \cdot 5 =$ $5\sqrt{2}$ $\quad \sqrt{2} \cdot \sqrt{5} =$ $\sqrt{10}$

$2\sqrt{3} \cdot 5 =$ $10\sqrt{3}$ $\quad 2\sqrt{3} \cdot \sqrt{5} =$ $2\sqrt{15}$ $\quad 2\sqrt{3} \cdot 4\sqrt{5} =$ $8\sqrt{15}$

Perform the indicated operations and simplify.

1. $\sqrt{5}\sqrt{7}$

$= \sqrt{35}$

2. $\sqrt{3}\sqrt{21}$

$= \sqrt{63}$

3. $\sqrt{10}\sqrt{30}$

$= \sqrt{300}$

$= \sqrt{3 \cdot 100} \quad = 10\sqrt{3}$

4. $4(\sqrt{2} - \sqrt{7})$

$4\sqrt{2} - 4\sqrt{7}$

5. $\sqrt{5}(6 - \sqrt{5})$

$6\sqrt{5} - \sqrt{25}$

$6\sqrt{5} - 5$

6. $2\sqrt{3}(2\sqrt{3} - 4\sqrt{5})$

$4\sqrt{9} - 8\sqrt{15}$

$12 - 8\sqrt{15}$

7. $\sqrt{7}(4\sqrt{7} - 2\sqrt{3})$

$4\sqrt{49} - 2\sqrt{21}$

$28 - 2\sqrt{21}$

8. $\sqrt{3x}(\sqrt{6x} - \sqrt{12})$

$\sqrt{18x^2} - \sqrt{36x}$

$x\sqrt{2 \cdot 9} - 6\sqrt{x}$

$3x\sqrt{2} - 6\sqrt{x}$

9. $3\sqrt{2}(\sqrt{2} - 4) + \sqrt{2}(5 - \sqrt{2})$

$3\sqrt{4} - 12\sqrt{2} + 5\sqrt{2} - \sqrt{4}$

$6 - 12\sqrt{2} + 5\sqrt{2} - 2$

$4 - 7\sqrt{2}$

10. $(\sqrt{6} - 3)(\sqrt{6} + 4)$

$\sqrt{36} + 4\sqrt{6} - 3\sqrt{6} - 12$

$6 + \sqrt{6} - 12$

$\sqrt{6} - 6$

11. $(\sqrt{m} - \sqrt{5})^2$

$(\sqrt{m} - \sqrt{5})(\sqrt{m} - \sqrt{5})$

$\sqrt{m^2} - \sqrt{5m} - \sqrt{5m} + \sqrt{25}$

$m - 2\sqrt{5m} + 5$

12. $(5\sqrt{x} + 2)(2\sqrt{x} - 1)$

$10\sqrt{x^2} - 5\sqrt{x} + 4\sqrt{x} - 2$

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

13. $(\sqrt{5} - x)(\sqrt{5} + x)$

$\sqrt{25} + x\sqrt{5} - x\sqrt{5} - x^2$

$5 - x^2$

14. $(5\sqrt{2} + 3)(\sqrt{2} - 3)$

$5\sqrt{4} - 15\sqrt{2} + 3\sqrt{2} - 9$

$10 - 12\sqrt{2} - 9$

$1 - 12\sqrt{2}$

15. $(3 + 2\sqrt{5})^2$

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

$9 + 6\sqrt{5} + 6\sqrt{5} + 4\sqrt{25}$

$9 + 11\sqrt{5} + 20$

$29 + 11\sqrt{5}$

#6

$\frac{6}{3} = \underline{2}$ $\quad \frac{\sqrt{6}}{\sqrt{2}} = \underline{\sqrt{3}}$ $\quad \frac{\sqrt{6}}{2} = \underline{\frac{\sqrt{6}}{2}}$ $\quad \frac{12\sqrt{6}}{2} = \underline{6\sqrt{6}}$ $\quad \frac{12\sqrt{6}}{\sqrt{2}} = \underline{12\sqrt{3}}$

Simplest form for fractions with $\sqrt{\ }$

1. No perfect square factor under $\sqrt{\ }$ ex. $\sqrt{75} = \sqrt{25}\sqrt{3} = 5\sqrt{3}$

2. No fractions under a $\sqrt{\ }$ ex. $\sqrt{\frac{3}{4}} = \frac{\sqrt{3}}{\sqrt{4}} = \frac{\sqrt{3}}{2}$

3. No $\sqrt{\ }$ in a denominator ex. $\frac{2}{\sqrt{3}} \bullet \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{\sqrt{9}} = \frac{2\sqrt{3}}{3}$

4. Must be reduced ex. $\frac{8\sqrt{5}}{2} = 4\sqrt{5}$

1. $\sqrt{\frac{8}{9}} = \frac{\sqrt{8}}{\sqrt{9}} = \frac{\sqrt{2\cdot4}}{3} = \frac{2\sqrt{2}}{3}$

2. $\sqrt{\frac{18}{x^2}} = \frac{\sqrt{18}}{\sqrt{x^2}} = \frac{\sqrt{2\cdot9}}{x} = \frac{3\sqrt{2}}{x}$

3. $\sqrt{\frac{15}{36}} = \frac{\sqrt{15}}{\sqrt{36}} = \frac{\sqrt{15}}{6}$

4. $\sqrt{\frac{2}{3}} = \frac{\sqrt{2}\cdot\sqrt{3}}{\sqrt{3}\cdot\sqrt{3}} = \frac{\sqrt{6}}{\sqrt{9}} = \frac{\sqrt{6}}{3}$

5. $\sqrt{\frac{5}{7}} = \frac{\sqrt{5}\cdot\sqrt{7}}{\sqrt{7}\cdot\sqrt{7}} = \frac{\sqrt{35}}{\sqrt{49}} = \frac{\sqrt{35}}{7}$

6. $\frac{5}{\sqrt{2}}\cdot\frac{\sqrt{2}}{\sqrt{2}} = \frac{5\sqrt{2}}{\sqrt{4}} = \frac{5\sqrt{2}}{2}$

7. $\frac{2}{\sqrt{7}}\cdot\frac{\sqrt{7}}{\sqrt{7}} = \frac{2\sqrt{7}}{\sqrt{49}} = \frac{2\sqrt{7}}{7}$

8. $\frac{4}{\sqrt{10}}\cdot\frac{\sqrt{10}}{\sqrt{10}} = \frac{4\sqrt{10}}{\sqrt{100}} = \frac{4\sqrt{10}}{10} = \frac{2\sqrt{10}}{5}$

9. $\frac{2}{\sqrt{6}}\cdot\frac{\sqrt{6}}{\sqrt{6}} = \frac{2\sqrt{6}}{\sqrt{36}} = \frac{2\sqrt{6}}{6} = \frac{1\sqrt{6}}{3}$ OR $\frac{\sqrt{6}}{3}$

#7

Multiply and Divide Radical Homework

Name_____

Class Time_____

Perform the indicated operations. Simplify all answers completely.

1. $\sqrt{5}\sqrt{15} = \sqrt{75} = \sqrt{3\cdot 25} = 5\sqrt{3}$

2. $\sqrt{14}\sqrt{35} = \sqrt{490} = \sqrt{49\cdot 10} = 7\sqrt{10}$

3. $\sqrt{2}(\sqrt{3} - \sqrt{5}) = \sqrt{6} - \sqrt{10}$

4. $\sqrt{3}(\sqrt{27} - \sqrt{3}) = \sqrt{81} - \sqrt{9} = 9 - 3 = 6$

5. $\sqrt{2}(\sqrt{6} + \sqrt{10})$
$\sqrt{12} + \sqrt{20} = \sqrt{3\cdot 4} + \sqrt{4\cdot 5} = 2\sqrt{3} + 2\sqrt{5}$

6. $\sqrt{7}(3 - \sqrt{7})$
$3\sqrt{7} - \sqrt{49}$
$3\sqrt{7} - 7$

7. $\sqrt{5}(3\sqrt{5} - 4\sqrt{3})$
$3\sqrt{25} - 4\sqrt{15}$
$15 - 4\sqrt{15}$

8. $\sqrt{y}(\sqrt{y} - \sqrt{5})$
$\sqrt{y^2} - \sqrt{5y} = y - \sqrt{5y}$

9. $\sqrt{2x}(\sqrt{8x} - \sqrt{32})$
$\sqrt{16x^2} - \sqrt{64x}$
$4x - 8\sqrt{x}$

10. $\sqrt{5}(3 + \sqrt{15})$
$3\sqrt{5} + \sqrt{75} = 3\sqrt{5}$

11. $4\sqrt{x}(2\sqrt{x} + 3\sqrt{7})$
$8\sqrt{x^2} + 12\sqrt{7x}$
$8x + 12\sqrt{7x}$

12. $5\sqrt{3}(\sqrt{3} - 2) + \sqrt{3}(7 - \sqrt{3})$
$5\sqrt{9} - 10\sqrt{3} + 7\sqrt{3} - \sqrt{9}$
$15 - 3\sqrt{3} - 3 = 12 - 3\sqrt{3}$

13. $(\sqrt{10} - 5)(\sqrt{10} + 2)$
$\sqrt{100} + 2\sqrt{10} - 5\sqrt{10} - 10$
$10 - 3\sqrt{10} - 10$
$= -3\sqrt{10}$

14. $(2 + \sqrt{x})(8 + \sqrt{x})$
$16 + 2\sqrt{x} + 8\sqrt{x} + \sqrt{x^2}$
$16 + 10\sqrt{x} + x$

15. $(\sqrt{x} - \sqrt{7})(\sqrt{x} + \sqrt{7})$
$\sqrt{x^2} + \sqrt{7x} - \sqrt{7x} - \sqrt{49}$
$x - 7$

16. $(\sqrt{a} - \sqrt{5})^2 = (\sqrt{a} - \sqrt{5})(\sqrt{a} - \sqrt{5})$
$= \sqrt{a^2} - \sqrt{5a} - \sqrt{5a} + \sqrt{25}$
$= a - 2\sqrt{5a} + 5$

#8

17. $(4 + 5\sqrt{3})^2$

$(4+5\sqrt{3})(4+5\sqrt{3})$

$16 + 20\sqrt{3} + 20\sqrt{3} + 25\sqrt{9}$

$16 + 40\sqrt{3} + 75$

$91 + 40\sqrt{3}$

18. $(\sqrt{x} - y)(\sqrt{x} + y)$

$\sqrt{x^2} + y\sqrt{x} - y\sqrt{x} - y^2$

$x - y^2$

19. $(4\sqrt{x} + 1)(3\sqrt{x} + 2)$

$12\sqrt{x^2} + 8\sqrt{x} + 3\sqrt{x} + 2$

$12x + 11\sqrt{x} + 2$

20. $(\sqrt{2} - 3)(\sqrt{6} + 5)$

$\sqrt{12} + 5\sqrt{2} - 3\sqrt{6} - 15$

$\sqrt{3\cdot4} + 5\sqrt{2} - 3\sqrt{6} - 15$

$2\sqrt{3} + 5\sqrt{2} - 3\sqrt{6} - 15$

21. $\sqrt{\frac{27}{16}} = \frac{\sqrt{27}}{\sqrt{16}} = \frac{\sqrt{3\cdot9}}{4} = \frac{3\sqrt{3}}{4}$

22. $\sqrt{\frac{14}{y^2}} = \frac{\sqrt{14}}{\sqrt{y^2}} = \frac{\sqrt{14}}{y}$

23. $\sqrt{\frac{24}{25}} = \frac{\sqrt{24}}{\sqrt{25}} = \frac{\sqrt{4\cdot6}}{5} = \frac{2\sqrt{6}}{5}$

24. $\sqrt{\frac{7}{5}} = \frac{\sqrt{7}\cdot\sqrt{5}}{\sqrt{5}\cdot\sqrt{5}} = \frac{\sqrt{35}}{\sqrt{25}} = \frac{\sqrt{35}}{5}$

25. $\sqrt{\frac{10}{7}} = \frac{\sqrt{10}\cdot\sqrt{7}}{\sqrt{7}\cdot\sqrt{7}} = \frac{\sqrt{70}}{\sqrt{49}} = \frac{\sqrt{70}}{7}$

26. $\frac{2}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{\sqrt{9}} = \frac{2\sqrt{3}}{3}$

27. $\frac{5}{\sqrt{10}}\cdot\frac{\sqrt{10}}{\sqrt{10}} = \frac{5\sqrt{10}}{\sqrt{100}} = \frac{5\sqrt{10}}{10} = \frac{\sqrt{10}}{2}$

28. $\frac{6}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}} = \frac{6\sqrt{3}}{\sqrt{9}} = \frac{6\sqrt{3}}{3} = 2\sqrt{3}$

29. $\frac{2}{\sqrt{6}}\cdot\frac{\sqrt{6}}{\sqrt{6}} = \frac{2\sqrt{6}}{\sqrt{36}} = \frac{2\sqrt{6}}{6} = \frac{\sqrt{6}}{3}$

Homework: This worksheet <u>PLUS</u> Page 385: 52; Page 395: 15, 21

Answers to odd problems:

1. $5\sqrt{3}$ 3. $\sqrt{6} - \sqrt{10}$ 5. $2\sqrt{3} + 2\sqrt{5}$ 7. $15 - 4\sqrt{15}$ 9. $4x - 8\sqrt{x}$

11. $8x + 12\sqrt{7x}$ 13. $-3\sqrt{10}$ 15. $x - 7$ 17. ~~81~~ 91 $+ 40\sqrt{3}$ 19. $12x + 11\sqrt{x} + 2$

21. $\frac{3\sqrt{3}}{4}$ 23. $\frac{2\sqrt{6}}{5}$ 25. $\frac{\sqrt{70}}{7}$ 27. $\frac{\sqrt{10}}{2}$ 29. $\frac{\sqrt{6}}{3}$