

## Adding and Subtracting Radical Expressions

Date \_\_\_\_\_ Period \_\_\_\_\_

**Simplify.**

1)  $3\sqrt{6} - 4\sqrt{6}$

2)  $-3\sqrt{7} + 4\sqrt{7}$

3)  $-11\sqrt{21} - 11\sqrt{21}$

4)  $-9\sqrt{15} + 10\sqrt{15}$

5)  $-10\sqrt{7} + 12\sqrt{7}$

6)  $-3\sqrt{17} - 4\sqrt{17}$

7)  $-10\sqrt{11} - 11\sqrt{11}$

8)  $-2\sqrt{3} + 3\sqrt{27}$

9)  $2\sqrt{6} - 2\sqrt{24}$

10)  $2\sqrt{6} + 3\sqrt{54}$

11)  $-\sqrt{12} + 3\sqrt{3}$

12)  $3\sqrt{3} - \sqrt{27}$

$$13) 3\sqrt{8} + 3\sqrt{2}$$

$$14) -3\sqrt{6} + 3\sqrt{6}$$

$$15) -3\sqrt{20} - \sqrt{5}$$

$$16) 2\sqrt{45} - 2\sqrt{5}$$

$$17) 3\sqrt{18} - 2\sqrt{2}$$

$$18) -3\sqrt{18} + 3\sqrt{8} - \sqrt{24}$$

$$19) 3\sqrt{18} + 3\sqrt{12} + 2\sqrt{27}$$

$$20) -3\sqrt{5} - \sqrt{6} - \sqrt{5}$$

$$21) -3\sqrt{2} + 3\sqrt{20} - 3\sqrt{8}$$

$$22) -3\sqrt{3} - \sqrt{8} - 3\sqrt{3}$$

$$23) -2\sqrt{20} + 2\sqrt{18} - 2\sqrt{5}$$

$$24) 2\sqrt{18} - 2\sqrt{12} + 2\sqrt{18}$$

$$25) -\sqrt{45} + 2\sqrt{5} - \sqrt{20} - 2\sqrt{6}$$

$$26) 2\sqrt{20} - \sqrt{20} + 3\sqrt{20} - 2\sqrt{45}$$

$$27) -3\sqrt{45} + 2\sqrt{12} + 3\sqrt{6} - 3\sqrt{20}$$

$$28) -\sqrt{27} - 3\sqrt{45} - \sqrt{20} + 2\sqrt{45}$$

## Adding and Subtracting Radical Expressions

Date \_\_\_\_\_ Period \_\_\_\_\_

**Simplify.**

1)  $3\sqrt{6} - 4\sqrt{6}$   
 $-\sqrt{6}$

2)  $-3\sqrt{7} + 4\sqrt{7}$   
 $\sqrt{7}$

3)  $-11\sqrt{21} - 11\sqrt{21}$   
 $-22\sqrt{21}$

4)  $-9\sqrt{15} + 10\sqrt{15}$   
 $\sqrt{15}$

5)  $-10\sqrt{7} + 12\sqrt{7}$   
 $2\sqrt{7}$

6)  $-3\sqrt{17} - 4\sqrt{17}$   
 $-7\sqrt{17}$

7)  $-10\sqrt{11} - 11\sqrt{11}$   
 $-21\sqrt{11}$

8)  $-2\sqrt{3} + 3\sqrt{27}$   
 $7\sqrt{3}$

9)  $2\sqrt{6} - 2\sqrt{24}$   
 $-2\sqrt{6}$

10)  $2\sqrt{6} + 3\sqrt{54}$   
 $11\sqrt{6}$

11)  $-\sqrt{12} + 3\sqrt{3}$   
 $\sqrt{3}$

12)  $3\sqrt{3} - \sqrt{27}$   
 $0$

$$13) \frac{3\sqrt{8} + 3\sqrt{2}}{9\sqrt{2}}$$

$$14) \frac{-3\sqrt{6} + 3\sqrt{6}}{0}$$

$$15) \frac{-3\sqrt{20} - \sqrt{5}}{-7\sqrt{5}}$$

$$16) \frac{2\sqrt{45} - 2\sqrt{5}}{4\sqrt{5}}$$

$$17) \frac{3\sqrt{18} - 2\sqrt{2}}{7\sqrt{2}}$$

$$18) \frac{-3\sqrt{18} + 3\sqrt{8} - \sqrt{24}}{-3\sqrt{2} - 2\sqrt{6}}$$

$$19) \frac{3\sqrt{18} + 3\sqrt{12} + 2\sqrt{27}}{9\sqrt{2} + 12\sqrt{3}}$$

$$20) \frac{-3\sqrt{5} - \sqrt{6} - \sqrt{5}}{-4\sqrt{5} - \sqrt{6}}$$

$$21) \frac{-3\sqrt{2} + 3\sqrt{20} - 3\sqrt{8}}{-9\sqrt{2} + 6\sqrt{5}}$$

$$22) \frac{-3\sqrt{3} - \sqrt{8} - 3\sqrt{3}}{-6\sqrt{3} - 2\sqrt{2}}$$

$$23) \frac{-2\sqrt{20} + 2\sqrt{18} - 2\sqrt{5}}{-6\sqrt{5} + 6\sqrt{2}}$$

$$24) \frac{2\sqrt{18} - 2\sqrt{12} + 2\sqrt{18}}{12\sqrt{2} - 4\sqrt{3}}$$

$$25) \frac{-\sqrt{45} + 2\sqrt{5} - \sqrt{20} - 2\sqrt{6}}{-3\sqrt{5} - 2\sqrt{6}}$$

$$26) \frac{2\sqrt{20} - \sqrt{20} + 3\sqrt{20} - 2\sqrt{45}}{2\sqrt{5}}$$

$$27) \frac{-3\sqrt{45} + 2\sqrt{12} + 3\sqrt{6} - 3\sqrt{20}}{-15\sqrt{5} + 4\sqrt{3} + 3\sqrt{6}}$$

$$28) \frac{-\sqrt{27} - 3\sqrt{45} - \sqrt{20} + 2\sqrt{45}}{-3\sqrt{3} - 5\sqrt{5}}$$

## Adding + Subtracting Rational Expressions

**Simplify each expression.**

1)  $\frac{u + 5v}{8v^2u^2} - \frac{u - 6v}{8v^2u^2}$

2)  $\frac{5n}{30m} + \frac{2m + 4n}{30m}$

3)  $\frac{a + 2b}{6a^3} - \frac{5a + 4b}{6a^3}$

4)  $\frac{x + y}{18xy} - \frac{6x + y}{18xy}$

5)  $\frac{4a - 5}{6a^2 + 30a} + \frac{a - 1}{6a^2 + 30a}$

6)  $\frac{5x - 4}{9x^3 + 27x^2} - \frac{x + 6}{9x^3 + 27x^2}$

7)  $\frac{b - 3}{12b + 18} + \frac{4b}{12b + 18}$

8)  $\frac{n - 4}{n^2 - n - 20} + \frac{n + 1}{n^2 - n - 20}$

9)  $\frac{7x}{2x} - \frac{x - 2}{20x + 16}$

10)  $\frac{8}{7v - 6} + \frac{4}{3v^2}$

11)  $\frac{7v}{8} - \frac{8v-4}{5v-2}$

12)  $\frac{4}{n+7} - \frac{7}{n-2}$

13)  $\frac{7}{3n^2+24n} - \frac{7}{2n}$

14)  $\frac{6}{v-2} - \frac{7}{2v+7}$

15)  $\frac{6x}{3} + \frac{7}{15x+3}$

16)  $\frac{5v}{v-3} + \frac{5}{v+6}$

17)  $\frac{4x}{x^2+4x-5} - \frac{5}{4}$

18)  $\frac{2}{x+3} - \frac{6x}{2x+1}$

19)  $\frac{4x}{x+3} - \frac{4x}{x+6}$

20)  $\frac{2x}{3x+3} - \frac{2}{x+5}$

21)  $\frac{6}{x-2} + \frac{6}{x+1}$

22)  $\frac{v-2}{3v^4-15v^3-18v^2} + 3v$

## Adding + Subtracting Rational Expressions

**Simplify each expression.**

$$1) \frac{u + 5v}{8v^2u^2} - \frac{u - 6v}{8v^2u^2}$$

$$\frac{11}{8vu^2}$$

$$2) \frac{5n}{30m} + \frac{2m + 4n}{30m}$$

$$\frac{9n + 2m}{30m}$$

$$3) \frac{a + 2b}{6a^3} - \frac{5a + 4b}{6a^3}$$

$$\frac{-2a - b}{3a^3}$$

$$4) \frac{x + y}{18xy} - \frac{6x + y}{18xy}$$

$$-\frac{5}{18y}$$

$$5) \frac{4a - 5}{6a^2 + 30a} + \frac{a - 1}{6a^2 + 30a}$$

$$\frac{5a - 6}{6a^2 + 30a}$$

$$6) \frac{5x - 4}{9x^3 + 27x^2} - \frac{x + 6}{9x^3 + 27x^2}$$

$$\frac{4x - 10}{9x^3 + 27x^2}$$

$$7) \frac{b - 3}{12b + 18} + \frac{4b}{12b + 18}$$

$$\frac{5b - 3}{12b + 18}$$

$$8) \frac{n - 4}{n^2 - n - 20} + \frac{n + 1}{n^2 - n - 20}$$

$$\frac{2n - 3}{n^2 - n - 20}$$

$$9) \frac{7x}{2x} - \frac{x - 2}{20x + 16}$$

$$\frac{69x + 58}{4(5x + 4)}$$

$$10) \frac{8}{7v - 6} + \frac{4}{3v^2}$$

$$\frac{24v^2 + 28v - 24}{3v^2(7v - 6)}$$

$$11) \frac{7v}{8} - \frac{8v-4}{5v-2}$$

$$\frac{35v^2 - 78v + 32}{8(5v-2)}$$

$$12) \frac{4}{n+7} - \frac{7}{n-2}$$

$$\frac{-3n-57}{(n+7)(n-2)}$$

$$13) \frac{7}{3n^2+24n} - \frac{7}{2n}$$

$$\frac{-154-21n}{6n(n+8)}$$

$$14) \frac{6}{v-2} - \frac{7}{2v+7}$$

$$\frac{5v+56}{(2v+7)(v-2)}$$

$$15) \frac{6x}{3} + \frac{7}{15x+3}$$

$$\frac{30x^2+6x+7}{3(5x+1)}$$

$$16) \frac{5v}{v-3} + \frac{5}{v+6}$$

$$\frac{5v^2+35v-15}{(v+6)(v-3)}$$

$$17) \frac{4x}{x^2+4x-5} - \frac{5}{4}$$

$$\frac{-4x-5x^2+25}{4(x+5)(x-1)}$$

$$18) \frac{2}{x+3} - \frac{6x}{2x+1}$$

$$\frac{-14x+2-6x^2}{(2x+1)(x+3)}$$

$$19) \frac{4x}{x+3} - \frac{4x}{x+6}$$

$$\frac{12x}{(x+3)(x+6)}$$

$$20) \frac{2x}{3x+3} - \frac{2}{x+5}$$

$$\frac{2x^2+4x-6}{3(x+1)(x+5)}$$

$$21) \frac{6}{x-2} + \frac{6}{x+1}$$

$$\frac{12x-6}{(x+1)(x-2)}$$

$$22) \frac{v-2}{3v^4-15v^3-18v^2} + 3v$$

$$\frac{9v^5-45v^4-54v^3+v-2}{3v^2(v+1)(v-6)}$$



## Dividing Radical Expressions

**Simplify.**

1)  $\frac{\sqrt{15}}{5\sqrt{20}}$

2)  $\frac{\sqrt{8}}{\sqrt{100}}$

3)  $\frac{\sqrt{6}}{\sqrt{27}}$

4)  $\frac{3\sqrt{20}}{2\sqrt{4}}$

5)  $\frac{4}{\sqrt{5}}$

6)  $\frac{\sqrt{4}}{5\sqrt{3}}$

7)  $\frac{\sqrt{5}}{\sqrt{3}}$

8)  $\frac{\sqrt{2}}{2\sqrt{3}}$

9)  $\frac{\sqrt{3x^2y^3}}{4\sqrt{5xy^3}}$

10)  $\frac{\sqrt{15xy}}{3\sqrt{10xy^3}}$

11)  $\frac{3 - 3\sqrt{3a}}{4\sqrt{8a}}$

12)  $\frac{3n^2 + \sqrt{2n^2}}{\sqrt{10n}}$

$$13) \frac{4x^3 - 3\sqrt{3x}}{3\sqrt{3x^2}}$$

$$14) \frac{\sqrt{5k^4} + 3\sqrt{2k}}{\sqrt{3k^3}}$$

$$15) \frac{3}{4 + 4\sqrt{5}}$$

$$16) \frac{5}{-5 - 3\sqrt{3}}$$

$$17) \frac{5}{-3 - 3\sqrt{3}}$$

$$18) \frac{4}{\sqrt{2} - 5\sqrt{3}}$$

$$19) \frac{2 + 5\sqrt{3}}{-4 + 4\sqrt{2}}$$

$$20) \frac{\sqrt{5} + 2\sqrt{2}}{4 - \sqrt{5}}$$

$$21) \frac{\sqrt{5} + 3}{4 - \sqrt{5}}$$

$$22) \frac{3 - 4\sqrt{3}}{4\sqrt{5} + 3\sqrt{2}}$$

## Dividing Radical Expressions

**Simplify.**

$$1) \frac{\sqrt{15}}{5\sqrt{20}}$$

$$\frac{\sqrt{3}}{10}$$

$$2) \frac{\sqrt{8}}{\sqrt{100}}$$

$$\frac{\sqrt{2}}{5}$$

$$3) \frac{\sqrt{6}}{\sqrt{27}}$$

$$\frac{\sqrt{2}}{3}$$

$$4) \frac{3\sqrt{20}}{2\sqrt{4}}$$

$$\frac{3\sqrt{5}}{2}$$

$$5) \frac{4}{\sqrt{5}}$$

$$\frac{4\sqrt{5}}{5}$$

$$6) \frac{\sqrt{4}}{5\sqrt{3}}$$

$$\frac{2\sqrt{3}}{15}$$

$$7) \frac{\sqrt{5}}{\sqrt{3}}$$

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

$$8) \frac{\sqrt{2}}{2\sqrt{3}}$$

$$\frac{\sqrt{6}}{6}$$

$$9) \frac{\sqrt{3x^2y^3}}{4\sqrt{5xy^3}}$$

$$\frac{\sqrt{15x}}{20}$$

$$10) \frac{\sqrt{15xy}}{3\sqrt{10xy^3}}$$

$$\frac{\sqrt{6}}{6y}$$

$$11) \frac{3 - 3\sqrt{3a}}{4\sqrt{8a}}$$

$$\frac{3\sqrt{2a} - 3a\sqrt{6}}{16a}$$

$$12) \frac{3n^2 + \sqrt{2n^2}}{\sqrt{10n}}$$

$$\frac{3n\sqrt{10n} + 2\sqrt{5n}}{10}$$

$$13) \frac{4x^3 - 3\sqrt{3x}}{3\sqrt{3x^2}}$$

$$\frac{4x^3\sqrt{3} - 9\sqrt{x}}{9x}$$

$$14) \frac{\sqrt{5k^4} + 3\sqrt{2k}}{\sqrt{3k^3}}$$

$$\frac{k\sqrt{15k} + 3\sqrt{6}}{3k}$$

$$15) \frac{3}{4 + 4\sqrt{5}}$$

$$\frac{-3 + 3\sqrt{5}}{16}$$

$$16) \frac{5}{-5 - 3\sqrt{3}}$$

$$\frac{25 - 15\sqrt{3}}{2}$$

$$17) \frac{5}{-3 - 3\sqrt{3}}$$

$$\frac{5 - 5\sqrt{3}}{6}$$

$$18) \frac{4}{\sqrt{2} - 5\sqrt{3}}$$

$$\frac{-4\sqrt{2} - 20\sqrt{3}}{73}$$

$$19) \frac{2 + 5\sqrt{3}}{-4 + 4\sqrt{2}}$$

$$\frac{2 + 2\sqrt{2} + 5\sqrt{3} + 5\sqrt{6}}{4}$$

$$20) \frac{\sqrt{5} + 2\sqrt{2}}{4 - \sqrt{5}}$$

$$\frac{4\sqrt{5} + 5 + 8\sqrt{2} + 2\sqrt{10}}{11}$$

$$21) \frac{\sqrt{5} + 3}{4 - \sqrt{5}}$$

$$\frac{7\sqrt{5} + 17}{11}$$

$$22) \frac{3 - 4\sqrt{3}}{4\sqrt{5} + 3\sqrt{2}}$$

$$\frac{12\sqrt{5} - 9\sqrt{2} - 16\sqrt{15} + 12\sqrt{6}}{62}$$

## Factoring By Grouping

**Factor each completely.**

1)  $8r^3 - 64r^2 + r - 8$

2)  $12p^3 - 21p^2 + 28p - 49$

3)  $12x^3 + 2x^2 - 30x - 5$

4)  $6v^3 - 16v^2 + 21v - 56$

5)  $63n^3 + 54n^2 - 105n - 90$

6)  $21k^3 - 84k^2 + 15k - 60$

7)  $25v^3 + 5v^2 + 30v + 6$

8)  $105n^3 + 175n^2 - 75n - 125$

9)  $96n^3 - 84n^2 + 112n - 98$

10)  $28v^3 + 16v^2 - 21v - 12$

11)  $4v^3 - 12v^2 - 5v + 15$

12)  $49x^3 - 35x^2 + 56x - 40$

13)  $24p^3 + 15p^2 - 56p - 35$

14)  $24r^3 - 64r^2 - 21r + 56$

$$15) 56xw + 49xk^2 - 24yw - 21yk^2$$

$$16) 42mc + 36md - 7n^2c - 6n^2d$$

$$17) 12x^2u + 3x^2v + 28yu + 7yv$$

$$18) 40ac^2 + 25ak^2 + 32bc^2 + 20bk^2$$

$$19) 12bc - 4bd - 15xc + 5xd$$

$$20) 16mn - 4m^2 + 28n - 7m$$

$$21) 56xy - 35x + 16ry - 10r$$

$$22) 21xy + 15x + 35ry + 25r$$

$$23) 5a^2z - 4a^2c + 15xz - 12xc$$

$$24) 4xy + 6 - x - 24y$$

$$25) 21xy - 12b^2 + 14xb - 18by$$

$$26) 9mz - 4nc + 3mc - 12nz$$

$$27) 28xy + 25 + 35x + 20y$$

$$28) 30uv + 30u + 36u^2 + 25v$$

## Factoring By Grouping

**Factor each completely.**

1)  $8r^3 - 64r^2 + r - 8$   
 $(8r^2 + 1)(r - 8)$

2)  $12p^3 - 21p^2 + 28p - 49$   
 $(3p^2 + 7)(4p - 7)$

3)  $12x^3 + 2x^2 - 30x - 5$   
 $(2x^2 - 5)(6x + 1)$

4)  $6v^3 - 16v^2 + 21v - 56$   
 $(2v^2 + 7)(3v - 8)$

5)  $63n^3 + 54n^2 - 105n - 90$   
 $3(3n^2 - 5)(7n + 6)$

6)  $21k^3 - 84k^2 + 15k - 60$   
 $3(7k^2 + 5)(k - 4)$

7)  $25v^3 + 5v^2 + 30v + 6$   
 $(5v^2 + 6)(5v + 1)$

8)  $105n^3 + 175n^2 - 75n - 125$   
 $5(7n^2 - 5)(3n + 5)$

9)  $96n^3 - 84n^2 + 112n - 98$   
 $2(6n^2 + 7)(8n - 7)$

10)  $28v^3 + 16v^2 - 21v - 12$   
 $(4v^2 - 3)(7v + 4)$

11)  $4v^3 - 12v^2 - 5v + 15$   
 $(4v^2 - 5)(v - 3)$

12)  $49x^3 - 35x^2 + 56x - 40$   
 $(7x^2 + 8)(7x - 5)$

13)  $24p^3 + 15p^2 - 56p - 35$   
 $(3p^2 - 7)(8p + 5)$

14)  $24r^3 - 64r^2 - 21r + 56$   
 $(8r^2 - 7)(3r - 8)$

$$15) 56xw + 49xk^2 - 24yw - 21yk^2 \\ (7x - 3y)(8w + 7k^2)$$

$$16) 42mc + 36md - 7n^2c - 6n^2d \\ (6m - n^2)(7c + 6d)$$

$$17) 12x^2u + 3x^2v + 28yu + 7yv \\ (3x^2 + 7y)(4u + v)$$

$$18) 40ac^2 + 25ak^2 + 32bc^2 + 20bk^2 \\ (5a + 4b)(8c^2 + 5k^2)$$

$$19) 12bc - 4bd - 15xc + 5xd \\ (4b - 5x)(3c - d)$$

$$20) 16mn - 4m^2 + 28n - 7m \\ (4m + 7)(4n - m)$$

$$21) 56xy - 35x + 16ry - 10r \\ (7x + 2r)(8y - 5)$$

$$22) 21xy + 15x + 35ry + 25r \\ (3x + 5r)(7y + 5)$$

$$23) 5a^2z - 4a^2c + 15xz - 12xc \\ (a^2 + 3x)(5z - 4c)$$

$$24) 4xy + 6 - x - 24y \\ (x - 6)(4y - 1)$$

$$25) 21xy - 12b^2 + 14xb - 18by \\ (7x - 6b)(3y + 2b)$$

$$26) 9mz - 4nc + 3mc - 12nz \\ (3m - 4n)(3z + c)$$

$$27) 28xy + 25 + 35x + 20y \\ (7x + 5)(4y + 5)$$

$$28) 30uv + 30u + 36u^2 + 25v \\ (6u + 5)(5v + 6u)$$



## Factoring Trinomials (a = 1)

**Factor each completely.**

1)  $b^2 + 8b + 7$

2)  $n^2 - 11n + 10$

3)  $m^2 + m - 90$

4)  $n^2 + 4n - 12$

5)  $n^2 - 10n + 9$

6)  $b^2 + 16b + 64$

7)  $m^2 + 2m - 24$

8)  $x^2 - 4x + 24$

9)  $k^2 - 13k + 40$

10)  $a^2 + 11a + 18$

11)  $n^2 - n - 56$

12)  $n^2 - 5n + 6$

13)  $b^2 - 6b + 8$

14)  $n^2 + 6n + 8$

15)  $2n^2 + 6n - 108$

16)  $5n^2 + 10n + 20$

17)  $2k^2 + 22k + 60$

18)  $a^2 - a - 90$

19)  $p^2 + 11p + 10$

20)  $5v^2 - 30v + 40$

21)  $2p^2 + 2p - 4$

22)  $4v^2 - 4v - 8$

23)  $x^2 - 15x + 50$

24)  $v^2 - 7v + 10$

25)  $p^2 + 3p - 18$

26)  $6v^2 + 66v + 60$

## Factoring Trinomials (a = 1)

**Factor each completely.**

1)  $b^2 + 8b + 7$

$(b + 7)(b + 1)$

2)  $n^2 - 11n + 10$

$(n - 10)(n - 1)$

3)  $m^2 + m - 90$

$(m - 9)(m + 10)$

4)  $n^2 + 4n - 12$

$(n - 2)(n + 6)$

5)  $n^2 - 10n + 9$

$(n - 1)(n - 9)$

6)  $b^2 + 16b + 64$

$(b + 8)^2$

7)  $m^2 + 2m - 24$

$(m + 6)(m - 4)$

8)  $x^2 - 4x + 24$

Not factorable

9)  $k^2 - 13k + 40$

$(k - 5)(k - 8)$

10)  $a^2 + 11a + 18$

$(a + 2)(a + 9)$

11)  $n^2 - n - 56$

$(n + 7)(n - 8)$

12)  $n^2 - 5n + 6$

$(n - 2)(n - 3)$

$$13) \quad b^2 - 6b + 8 \\ (b - 4)(b - 2)$$

$$14) \quad n^2 + 6n + 8 \\ (n + 2)(n + 4)$$

$$15) \quad 2n^2 + 6n - 108 \\ 2(n + 9)(n - 6)$$

$$16) \quad 5n^2 + 10n + 20 \\ 5(n^2 + 2n + 4)$$

$$17) \quad 2k^2 + 22k + 60 \\ 2(k + 5)(k + 6)$$

$$18) \quad a^2 - a - 90 \\ (a - 10)(a + 9)$$

$$19) \quad p^2 + 11p + 10 \\ (p + 10)(p + 1)$$

$$20) \quad 5v^2 - 30v + 40 \\ 5(v - 2)(v - 4)$$

$$21) \quad 2p^2 + 2p - 4 \\ 2(p - 1)(p + 2)$$

$$22) \quad 4v^2 - 4v - 8 \\ 4(v + 1)(v - 2)$$

$$23) \quad x^2 - 15x + 50 \\ (x - 10)(x - 5)$$

$$24) \quad v^2 - 7v + 10 \\ (v - 5)(v - 2)$$

$$25) \quad p^2 + 3p - 18 \\ (p - 3)(p + 6)$$

$$26) \quad 6v^2 + 66v + 60 \\ 6(v + 10)(v + 1)$$

## Least Common Multiple

**Find the LCM of each.**

1) 10, 3

2) 14, 6

3) 15, 6

4) 15, 20

5) 27, 18

6) 4, 30

7) 24, 32

8) 20, 30

9) 24, 36

10) 35, 25

11)  $18xy^2$ ,  $15y^3$

12)  $20x^3$ ,  $16x^4$

13)  $18, 6v$

14)  $3x^2, 10$

15)  $20y, 14y^2$

16)  $25x^2, 25y$

17)  $32u^2, 14v^2$

18)  $18m^2, 24nm$

19)  $16x^2y, 32x$

20)  $30ab^3, 20ab^3$

21)  $30, 25, 10$

22)  $28, 14, 21$

23)  $10, 4, 18$

24)  $10ba, 20ba, 28ba$

25)  $8y^2, 16xy, 16y$

26)  $28b^2, 20ab^3, 16b^4$

## Least Common Multiple

**Find the LCM of each.**

1) 10, 3

30

2) 14, 6

42

3) 15, 6

30

4) 15, 20

60

5) 27, 18

54

6) 4, 30

60

7) 24, 32

96

8) 20, 30

60

9) 24, 36

72

10) 35, 25

175

11)  $18xy^2$ ,  $15y^3$

$90xy^3$

12)  $20x^3$ ,  $16x^4$

$80x^4$

13)  $18, 6v$   
 $18v$

14)  $3x^2, 10$   
 $30x^2$

15)  $20y, 14y^2$   
 $140y^2$

16)  $25x^2, 25y$   
 $25x^2y$

17)  $32u^2, 14v^2$   
 $224u^2v^2$

18)  $18m^2, 24nm$   
 $72m^2n$

19)  $16x^2y, 32x$   
 $32x^2y$

20)  $30ab^3, 20ab^3$   
 $60ab^3$

21)  $30, 25, 10$   
 $150$

22)  $28, 14, 21$   
 $84$

23)  $10, 4, 18$   
 $180$

24)  $10ba, 20ba, 28ba$   
 $140ba$

25)  $8y^2, 16xy, 16y$   
 $16y^2x$

26)  $28b^2, 20ab^3, 16b^4$   
 $560b^4a$



## Multiplying Polynomials

**Find each product.**

1)  $6v(2v + 3)$

2)  $7(-5v - 8)$

3)  $2x(-2x - 3)$

4)  $-4(v + 1)$

5)  $(2n + 2)(6n + 1)$

6)  $(4n + 1)(2n + 6)$

7)  $(x - 3)(6x - 2)$

8)  $(8p - 2)(6p + 2)$

9)  $(6p + 8)(5p - 8)$

10)  $(3m - 1)(8m + 7)$

11)  $(2a - 1)(8a - 5)$

12)  $(5n + 6)(5n - 5)$

$$13) (4p - 1)^2$$

$$14) (7x - 6)(5x + 6)$$

$$15) (6n + 3)(6n - 4)$$

$$16) (8n + 1)(6n - 3)$$

$$17) (6k + 5)(5k + 5)$$

$$18) (3x - 4)(4x + 3)$$

$$19) (4a + 2)(6a^2 - a + 2)$$

$$20) (7k - 3)(k^2 - 2k + 7)$$

$$21) (7r^2 - 6r - 6)(2r - 4)$$

$$22) (n^2 + 6n - 4)(2n - 4)$$

$$23) (6n^2 - 6n - 5)(7n^2 + 6n - 5)$$

$$24) (m^2 - 7m - 6)(7m^2 - 3m - 7)$$

## Multiplying Polynomials

**Find each product.**

1)  $6v(2v + 3)$

$12v^2 + 18v$

2)  $7(-5v - 8)$

$-35v - 56$

3)  $2x(-2x - 3)$

$-4x^2 - 6x$

4)  $-4(v + 1)$

$-4v - 4$

5)  $(2n + 2)(6n + 1)$

$12n^2 + 14n + 2$

6)  $(4n + 1)(2n + 6)$

$8n^2 + 26n + 6$

7)  $(x - 3)(6x - 2)$

$6x^2 - 20x + 6$

8)  $(8p - 2)(6p + 2)$

$48p^2 + 4p - 4$

9)  $(6p + 8)(5p - 8)$

$30p^2 - 8p - 64$

10)  $(3m - 1)(8m + 7)$

$24m^2 + 13m - 7$

11)  $(2a - 1)(8a - 5)$

$16a^2 - 18a + 5$

12)  $(5n + 6)(5n - 5)$

$25n^2 + 5n - 30$

$$13) (4p - 1)^2 \\ 16p^2 - 8p + 1$$

$$14) (7x - 6)(5x + 6) \\ 35x^2 + 12x - 36$$

$$15) (6n + 3)(6n - 4) \\ 36n^2 - 6n - 12$$

$$16) (8n + 1)(6n - 3) \\ 48n^2 - 18n - 3$$

$$17) (6k + 5)(5k + 5) \\ 30k^2 + 55k + 25$$

$$18) (3x - 4)(4x + 3) \\ 12x^2 - 7x - 12$$

$$19) (4a + 2)(6a^2 - a + 2) \\ 24a^3 + 8a^2 + 6a + 4$$

$$20) (7k - 3)(k^2 - 2k + 7) \\ 7k^3 - 17k^2 + 55k - 21$$

$$21) (7r^2 - 6r - 6)(2r - 4) \\ 14r^3 - 40r^2 + 12r + 24$$

$$22) (n^2 + 6n - 4)(2n - 4) \\ 2n^3 + 8n^2 - 32n + 16$$

$$23) (6n^2 - 6n - 5)(7n^2 + 6n - 5) \\ 42n^4 - 6n^3 - 101n^2 + 25$$

$$24) (m^2 - 7m - 6)(7m^2 - 3m - 7)$$
$$7m^4 - 52m^3 - 28m^2 + 67m + 42$$

## Multiplying Radical Expressions

**Simplify.**

1)  $3\sqrt{12} \cdot \sqrt{6}$

2)  $\sqrt{5} \cdot \sqrt{10}$

3)  $\sqrt{6} \cdot \sqrt{6}$

4)  $\sqrt{5} \cdot -4\sqrt{20}$

5)  $-4\sqrt{15} \cdot -\sqrt{3}$

6)  $\sqrt{20x^2} \cdot \sqrt{20x}$

7)  $\sqrt{15n^2} \cdot \sqrt{10n^3}$

8)  $\sqrt{18a^2} \cdot 4\sqrt{3a^2}$

9)  $-3\sqrt{7r^3} \cdot 6\sqrt{7r^2}$

10)  $-4\sqrt{28x} \cdot \sqrt{7x^3}$

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

12)  $2\sqrt{5}(\sqrt{6} + 2)$

13)  $-3\sqrt{3}(2 + \sqrt{6})$

14)  $\sqrt{3}(-5\sqrt{10} + \sqrt{6})$

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

16)  $5\sqrt{42x}(4 + 4\sqrt{7x})$

17)  $\sqrt{14x}(3 - \sqrt{2x})$

18)  $\sqrt{6n}(7n^3 + \sqrt{12})$

19)  $\sqrt{3v}(\sqrt{6} + \sqrt{10})$

20)  $\sqrt{21r}(5 + \sqrt{7})$

21)  $(-2\sqrt{3} + 2)(\sqrt{3} - 5)$

22)  $(5 - 4\sqrt{5})(-2 + \sqrt{5})$

23)  $(-2 - 3\sqrt{5})(5 - \sqrt{5})$

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

25)  $(5\sqrt{2x} + \sqrt{5})(-4\sqrt{2x} + \sqrt{5x})$

26)  $(-3\sqrt{3k} + 4)(\sqrt{3k} - 5)$

27)  $(5 + 4\sqrt{3})(3 + \sqrt{3})$

28)  $(3\sqrt{2} + \sqrt{5})(\sqrt{2} - 3\sqrt{5r})$



## Multiplying Radical Expressions

**Simplify.**

1)  $3\sqrt{12} \cdot \sqrt{6}$   
 $18\sqrt{2}$

2)  $\sqrt{5} \cdot \sqrt{10}$   
 $5\sqrt{2}$

3)  $\sqrt{6} \cdot \sqrt{6}$   
6

4)  $\sqrt{5} \cdot -4\sqrt{20}$   
-40

5)  $-4\sqrt{15} \cdot -\sqrt{3}$   
 $12\sqrt{5}$

6)  $\sqrt{20x^2} \cdot \sqrt{20x}$   
 $20x\sqrt{x}$

7)  $\sqrt{15n^2} \cdot \sqrt{10n^3}$   
 $5n^2\sqrt{6n}$

8)  $\sqrt{18a^2} \cdot 4\sqrt{3a^2}$   
 $12a^2\sqrt{6}$

9)  $-3\sqrt{7r^3} \cdot 6\sqrt{7r^2}$   
 $-126r^2\sqrt{r}$

10)  $-4\sqrt{28x} \cdot \sqrt{7x^3}$   
 $-56x^2$

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

12)  $2\sqrt{5}(\sqrt{6} + 2)$   
 $2\sqrt{30} + 4\sqrt{5}$

13)  $-3\sqrt{3}(2 + \sqrt{6})$   
 $-6\sqrt{3} - 9\sqrt{2}$

14)  $\sqrt{3}(-5\sqrt{10} + \sqrt{6})$   
 $-5\sqrt{30} + 3\sqrt{2}$

$$15) \frac{-2\sqrt{15}(-3\sqrt{3} + 3\sqrt{5})}{18\sqrt{5} - 30\sqrt{3}}$$

$$16) \frac{5\sqrt{42x}(4 + 4\sqrt{7x})}{20\sqrt{42x} + 140x\sqrt{6}}$$

$$17) \frac{\sqrt{14x}(3 - \sqrt{2x})}{3\sqrt{14x} - 2x\sqrt{7}}$$

$$18) \frac{\sqrt{6n}(7n^3 + \sqrt{12})}{7n^3\sqrt{6n} + 6\sqrt{2n}}$$

$$19) \frac{\sqrt{3v}(\sqrt{6} + \sqrt{10})}{3\sqrt{2v} + \sqrt{30v}}$$

$$20) \frac{\sqrt{21r}(5 + \sqrt{7})}{5\sqrt{21r} + 7\sqrt{3r}}$$

$$21) \frac{(-2\sqrt{3} + 2)(\sqrt{3} - 5)}{-16 + 12\sqrt{3}}$$

$$22) \frac{(5 - 4\sqrt{5})(-2 + \sqrt{5})}{-30 + 13\sqrt{5}}$$

$$23) \frac{(-2 - 3\sqrt{5})(5 - \sqrt{5})}{5 - 13\sqrt{5}}$$

$$24) \frac{(\sqrt{5} - \sqrt{3})(\sqrt{5} + \sqrt{3})}{2}$$

$$25) \frac{(5\sqrt{2x} + \sqrt{5})(-4\sqrt{2x} + \sqrt{5x})}{-40x + 5x\sqrt{10} - 4\sqrt{10x} + 5\sqrt{x}}$$

$$26) \frac{(-3\sqrt{3k} + 4)(\sqrt{3k} - 5)}{-9k + 19\sqrt{3k} - 20}$$

$$27) \frac{(5 + 4\sqrt{3})(3 + \sqrt{3})}{27 + 17\sqrt{3}}$$

$$28) \frac{(3\sqrt{2} + \sqrt{5})(\sqrt{2} - 3\sqrt{5r})}{6 - 9\sqrt{10r} + \sqrt{10} - 15\sqrt{r}}$$

## Multiplying Rational Expressions

**Simplify each expression.**

1)  $\frac{59n}{99} \cdot \frac{80}{33n}$

2)  $\frac{53}{43} \cdot \frac{46n^2}{31}$

3)  $\frac{93}{21n} \cdot \frac{34n}{51n}$

4)  $\frac{79n}{25} \cdot \frac{85}{27n^2}$

5)  $\frac{96}{38n} \cdot \frac{25}{45}$

6)  $\frac{84}{3} \cdot \frac{48x}{95}$

7)  $\frac{6(r+2)}{20} \cdot \frac{4r}{6(r+2)}$

8)  $\frac{7n^2(n+4)}{(n-3)(n+4)} \cdot \frac{n-3}{(n+8)(n+6)}$

9)  $\frac{2(p+6)}{4} \cdot \frac{p-3}{2(p-3)}$

10)  $\frac{9(r+4)}{r+4} \cdot \frac{9r}{9(r-5)}$

11)  $\frac{8(m+1)}{7m} \cdot \frac{9}{8(m+1)}$

12)  $\frac{(p+6)(p-4)}{p-4} \cdot \frac{1}{(p-4)(p-2)}$

13)  $\frac{1}{v+10} \cdot \frac{10v+30}{v+3}$

14)  $\frac{7n}{24n^3 - 64n^2} \cdot \frac{9n-24}{7n}$

15) 
$$\frac{x+7}{7x+35} \cdot \frac{x^2-3x-40}{x-8}$$

16) 
$$\frac{20a^2-100a}{a-1} \cdot \frac{1}{16a^3-80a^2}$$

17) 
$$\frac{3b^2+18b}{b+6} \cdot \frac{1}{b+8}$$

18) 
$$\frac{p+7}{p-10} \cdot \frac{p+2}{7p+14}$$

19) 
$$\frac{21x^2-21x}{18x^2-18x} \cdot \frac{6x}{6x^2}$$

20) 
$$\frac{1}{p-9} \cdot \frac{p^2+6p-27}{p+9}$$

21) 
$$\frac{v-7}{v+6} \cdot \frac{10v+60}{v-7}$$

22) 
$$\frac{5r+50}{r+10} \cdot \frac{r-2}{5}$$

23) 
$$\frac{x^2-10x+25}{10x-100} \cdot \frac{x-10}{45-9x}$$

24) 
$$\frac{45x^2}{x-9} \cdot \frac{x^2-5x-36}{3x^3+12x^2}$$

25) 
$$\frac{8v-56}{8v+48} \cdot \frac{v^2+9v+18}{8v^2+24v}$$

26) 
$$\frac{9r^3-54r^2}{9r^2+45r} \cdot \frac{9r^2+9r}{9r^3-54r^2}$$

27) 
$$\frac{m+1}{3m-15} \cdot \frac{8m-80}{m^2-9m-10}$$

28) 
$$\frac{6n+6}{n+9} \cdot \frac{n^2+6n-27}{6n+6}$$

## Multiplying Rational Expressions

Simplify each expression.

$$1) \frac{59n}{99} \cdot \frac{80}{33n}$$

$$\frac{4720}{3267}$$

$$2) \frac{53}{43} \cdot \frac{46n^2}{31}$$

$$\frac{2438n^2}{1333}$$

$$3) \frac{93}{21n} \cdot \frac{34n}{51n}$$

$$\frac{62}{21n}$$

$$4) \frac{79n}{25} \cdot \frac{85}{27n^2}$$

$$\frac{1343}{135n}$$

$$5) \frac{96}{38n} \cdot \frac{25}{45}$$

$$\frac{80}{57n}$$

$$6) \frac{84}{3} \cdot \frac{48x}{95}$$

$$\frac{1344x}{95}$$

$$7) \frac{6(r+2)}{20} \cdot \frac{4r}{6(r+2)}$$

$$\frac{r}{5}$$

$$8) \frac{7n^2(n+4)}{(n-3)(n+4)} \cdot \frac{n-3}{(n+8)(n+6)}$$

$$\frac{7n^2}{(n+8)(n+6)}$$

$$9) \frac{2(p+6)}{4} \cdot \frac{p-3}{2(p-3)}$$

$$\frac{p+6}{4}$$

$$10) \frac{9(r+4)}{r+4} \cdot \frac{9r}{9(r-5)}$$

$$\frac{9r}{r-5}$$

$$11) \frac{8(m+1)}{7m} \cdot \frac{9}{8(m+1)}$$

$$\frac{9}{7m}$$

$$12) \frac{(p+6)(p-4)}{p-4} \cdot \frac{1}{(p-4)(p-2)}$$

$$\frac{p+6}{(p-4)(p-2)}$$

$$13) \frac{1}{v+10} \cdot \frac{10v+30}{v+3}$$

$$\frac{10}{v+10}$$

$$14) \frac{7n}{24n^3 - 64n^2} \cdot \frac{9n-24}{7n}$$

$$\frac{3}{8n^2}$$

$$15) \frac{x+7}{7x+35} \cdot \frac{x^2-3x-40}{x-8}$$

$$\frac{x+7}{7}$$

$$16) \frac{20a^2-100a}{a-1} \cdot \frac{1}{16a^3-80a^2}$$

$$\frac{5}{4a(a-1)}$$

$$17) \frac{3b^2+18b}{b+6} \cdot \frac{1}{b+8}$$

$$\frac{3b}{b+8}$$

$$18) \frac{p+7}{p-10} \cdot \frac{p+2}{7p+14}$$

$$\frac{p+7}{7(p-10)}$$

$$19) \frac{21x^2-21x}{18x^2-18x} \cdot \frac{6x}{6x^2}$$

$$\frac{7}{6x}$$

$$20) \frac{1}{p-9} \cdot \frac{p^2+6p-27}{p+9}$$

$$\frac{p-3}{p-9}$$

$$21) \frac{v-7}{v+6} \cdot \frac{10v+60}{v-7}$$

$$10$$

$$22) \frac{5r+50}{r+10} \cdot \frac{r-2}{5}$$

$$r-2$$

$$23) \frac{x^2-10x+25}{10x-100} \cdot \frac{x-10}{45-9x}$$

$$-\frac{(x-5)}{90}$$

$$24) \frac{45x^2}{x-9} \cdot \frac{x^2-5x-36}{3x^3+12x^2}$$

$$15$$

$$25) \frac{8v-56}{8v+48} \cdot \frac{v^2+9v+18}{8v^2+24v}$$

$$\frac{v-7}{8v}$$

$$26) \frac{9r^3-54r^2}{9r^2+45r} \cdot \frac{9r^2+9r}{9r^3-54r^2}$$

$$\frac{r+1}{r+5}$$

$$27) \frac{m+1}{3m-15} \cdot \frac{8m-80}{m^2-9m-10}$$

$$\frac{8}{3(m-5)}$$

$$28) \frac{6n+6}{n+9} \cdot \frac{n^2+6n-27}{6n+6}$$

$$n-3$$

## More Properties of Exponents

**Simplify. Your answer should contain only positive exponents.**

1)  $(x^{-2}x^{-3})^4$

2)  $(x^4)^{-3} \cdot 2x^4$

3)  $(n^3)^3 \cdot 2n^{-1}$

4)  $(2v)^2 \cdot 2v^2$

5)  $\frac{2x^2y^4 \cdot 4x^2y^4 \cdot 3x}{3x^{-3}y^2}$

6)  $\frac{2y^3 \cdot 3xy^3}{3x^2y^4}$

7)  $\frac{x^3y^3 \cdot x^3}{4x^2}$

8)  $\frac{3x^2y^2}{2x^{-1} \cdot 4yx^2}$

9)  $\frac{x}{(2x^0)^2}$

10)  $\frac{2m^{-4}}{(2m^{-4})^3}$

11)  $\frac{(2m^2)^{-1}}{m^2}$

12)  $\frac{2x^3}{(x^{-1})^3}$

13)  $(a^{-3}b^{-3})^0$

14)  $x^4y^3 \cdot (2y^2)^0$

15)  $ba^4 \cdot (2ba^4)^{-3}$

16)  $(2x^0y^2)^{-3} \cdot 2yx^3$

17)  $\frac{2k^3 \cdot k^2}{k^{-3}}$

18)  $\frac{(x^{-3})^4 x^4}{2x^{-3}}$

19)  $\frac{(2x)^{-4}}{x^{-1} \cdot x}$

20)  $\frac{(2x^3z^2)^3}{x^3y^4z^2 \cdot x^{-4}z^3}$

21)  $\frac{(2pm^{-1}q^0)^{-4} \cdot 2m^{-1}p^3}{2pq^2}$

22)  $\frac{(2hj^2k^{-2} \cdot h^4j^{-1}k^4)^0}{2h^{-3}j^{-4}k^{-2}}$



## More Properties of Exponents

Date \_\_\_\_\_ Period \_\_\_\_\_

**Simplify. Your answer should contain only positive exponents.**

1)  $(x^{-2}x^{-3})^4$

$$\frac{1}{x^{20}}$$

2)  $(x^4)^{-3} \cdot 2x^4$

$$\frac{2}{x^8}$$

3)  $(n^3)^3 \cdot 2n^{-1}$

$$2n^8$$

4)  $(2v)^2 \cdot 2v^2$

$$8v^4$$

5)  $\frac{2x^2y^4 \cdot 4x^2y^4 \cdot 3x}{3x^{-3}y^2}$

$$8x^8y^6$$

6)  $\frac{2y^3 \cdot 3xy^3}{3x^2y^4}$

$$\frac{2y^2}{x}$$

7)  $\frac{x^3y^3 \cdot x^3}{4x^2}$

$$\frac{x^4y^3}{4}$$

8)  $\frac{3x^2y^2}{2x^{-1} \cdot 4yx^2}$

$$\frac{3xy}{8}$$

9)  $\frac{x}{(2x^0)^2}$

$$\frac{x}{4}$$

10)  $\frac{2m^{-4}}{(2m^{-4})^3}$

$$\frac{m^8}{4}$$

$$11) \frac{(2m^2)^{-1}}{m^2}$$

$$\frac{1}{2m^4}$$

$$12) \frac{2x^3}{(x^{-1})^3}$$

$$2x^6$$

$$13) (a^{-3}b^{-3})^0$$

$$1$$

$$14) x^4y^3 \cdot (2y^2)^0$$

$$x^4y^3$$

$$15) ba^4 \cdot (2ba^4)^{-3}$$

$$\frac{1}{8b^2a^8}$$

$$16) (2x^0y^2)^{-3} \cdot 2yx^3$$

$$\frac{x^3}{4y^5}$$

$$17) \frac{2k^3 \cdot k^2}{k^{-3}}$$

$$2k^8$$

$$18) \frac{(x^{-3})^4 x^4}{2x^{-3}}$$

$$\frac{1}{2x^5}$$

$$19) \frac{(2x)^{-4}}{x^{-1} \cdot x}$$

$$\frac{1}{16x^4}$$

$$20) \frac{(2x^3z^2)^3}{x^3y^4z^2 \cdot x^{-4}z^3}$$

$$\frac{8x^{10}z}{y^4}$$

$$21) \frac{(2pm^{-1}q^0)^{-4} \cdot 2m^{-1}p^3}{2pq^2}$$

$$\frac{m^3}{16p^2q^2}$$

$$22) \frac{(2hj^2k^{-2} \cdot h^4j^{-1}k^4)^0}{2h^{-3}j^{-4}k^{-2}}$$

$$\frac{h^3j^4k^2}{2}$$

## Solving Quadratic Equations by Factoring

Solve each equation by factoring.

1)  $(k + 1)(k - 5) = 0$

2)  $(a + 1)(a + 2) = 0$

3)  $(4k + 5)(k + 1) = 0$

4)  $(2m + 3)(4m + 3) = 0$

5)  $x^2 - 11x + 19 = -5$

6)  $n^2 + 7n + 15 = 5$

7)  $n^2 - 10n + 22 = -2$

8)  $n^2 + 3n - 12 = 6$

9)  $6n^2 - 18n - 18 = 6$

10)  $7r^2 - 14r = -7$

$$11) n^2 + 8n = -15$$

$$12) 5r^2 - 44r + 120 = -30 + 11r$$

$$13) -4k^2 - 8k - 3 = -3 - 5k^2$$

$$14) b^2 + 5b - 35 = 3b$$

$$15) 3r^2 - 16r - 7 = 5$$

$$16) 6b^2 - 13b + 3 = -3$$

$$17) 7k^2 - 6k + 3 = 3$$

$$18) 35k^2 - 22k + 7 = 4$$

$$19) 7x^2 + 2x = 0$$

$$20) 10b^2 = 27b - 18$$

$$21) 8x^2 + 21 = -59x$$

$$22) 15a^2 - 3a = 3 - 7a$$

## Solving Quadratic Equations by Factoring

**Solve each equation by factoring.**

1)  $(k + 1)(k - 5) = 0$

$\{-1, 5\}$

2)  $(a + 1)(a + 2) = 0$

$\{-1, -2\}$

3)  $(4k + 5)(k + 1) = 0$

$\left\{-\frac{5}{4}, -1\right\}$

4)  $(2m + 3)(4m + 3) = 0$

$\left\{-\frac{3}{2}, -\frac{3}{4}\right\}$

5)  $x^2 - 11x + 19 = -5$

$\{3, 8\}$

6)  $n^2 + 7n + 15 = 5$

$\{-5, -2\}$

7)  $n^2 - 10n + 22 = -2$

$\{6, 4\}$

8)  $n^2 + 3n - 12 = 6$

$\{3, -6\}$

9)  $6n^2 - 18n - 18 = 6$

$\{4, -1\}$

10)  $7r^2 - 14r = -7$

$\{1\}$

11)  $n^2 + 8n = -15$

$\{-5, -3\}$

12)  $5r^2 - 44r + 120 = -30 + 11r$

$\{6, 5\}$

13)  $-4k^2 - 8k - 3 = -3 - 5k^2$

$\{8, 0\}$

14)  $b^2 + 5b - 35 = 3b$

$\{-7, 5\}$

15)  $3r^2 - 16r - 7 = 5$

$\left\{-\frac{2}{3}, 6\right\}$

16)  $6b^2 - 13b + 3 = -3$

$\left\{\frac{2}{3}, \frac{3}{2}\right\}$

17)  $7k^2 - 6k + 3 = 3$

$\left\{\frac{6}{7}, 0\right\}$

18)  $35k^2 - 22k + 7 = 4$

$\left\{\frac{1}{5}, \frac{3}{7}\right\}$

19)  $7x^2 + 2x = 0$

$\left\{-\frac{2}{7}, 0\right\}$

20)  $10b^2 = 27b - 18$

$\left\{\frac{6}{5}, \frac{3}{2}\right\}$

21)  $8x^2 + 21 = -59x$

$\left\{-\frac{3}{8}, -7\right\}$

22)  $15a^2 - 3a = 3 - 7a$   $\left\{\frac{1}{3}, -\frac{3}{5}\right\}$

## Using the Quadratic Formula

**Solve each equation with the quadratic formula.**

1)  $m^2 - 5m - 14 = 0$

2)  $b^2 - 4b + 4 = 0$

3)  $2m^2 + 2m - 12 = 0$

4)  $2x^2 - 3x - 5 = 0$

5)  $x^2 + 4x + 3 = 0$

6)  $2x^2 + 3x - 20 = 0$

7)  $4b^2 + 8b + 7 = 4$

8)  $2m^2 - 7m - 13 = -10$

$$9) 2x^2 - 3x - 15 = 5$$

$$10) x^2 + 2x - 1 = 2$$

$$11) 2k^2 + 9k = -7$$

$$12) 5r^2 = 80$$

$$13) 2x^2 - 36 = x$$

$$14) 5x^2 + 9x = -4$$

$$15) k^2 - 31 - 2k = -6 - 3k^2 - 2k$$

$$16) 9n^2 = 4 + 7n$$

$$17) 8n^2 + 4n - 16 = -n^2$$

$$18) 8n^2 + 7n - 15 = -7$$



## Using the Quadratic Formula

**Solve each equation with the quadratic formula.**

1)  $m^2 - 5m - 14 = 0$

$\{7, -2\}$

2)  $b^2 - 4b + 4 = 0$

$\{2\}$

3)  $2m^2 + 2m - 12 = 0$

$\{2, -3\}$

4)  $2x^2 - 3x - 5 = 0$

$\left\{\frac{5}{2}, -1\right\}$

5)  $x^2 + 4x + 3 = 0$

$\{-1, -3\}$

6)  $2x^2 + 3x - 20 = 0$

$\left\{\frac{5}{2}, -4\right\}$

7)  $4b^2 + 8b + 7 = 4$

$\left\{-\frac{1}{2}, -\frac{3}{2}\right\}$

8)  $2m^2 - 7m - 13 = -10$

$\left\{\frac{7 + \sqrt{73}}{4}, \frac{7 - \sqrt{73}}{4}\right\}$

9)  $2x^2 - 3x - 15 = 5$

$$\left\{4, -\frac{5}{2}\right\}$$

10)  $x^2 + 2x - 1 = 2$

$$\{1, -3\}$$

11)  $2k^2 + 9k = -7$

$$\left\{-1, -\frac{7}{2}\right\}$$

12)  $5r^2 = 80$

$$\{4, -4\}$$

13)  $2x^2 - 36 = x$

$$\left\{\frac{9}{2}, -4\right\}$$

14)  $5x^2 + 9x = -4$

$$\left\{-\frac{4}{5}, -1\right\}$$

15)  $k^2 - 31 - 2k = -6 - 3k^2 - 2k$

$$\left\{\frac{5}{2}, -\frac{5}{2}\right\}$$

16)  $9n^2 = 4 + 7n$

$$\left\{\frac{7 + \sqrt{193}}{18}, \frac{7 - \sqrt{193}}{18}\right\}$$

17)  $8n^2 + 4n - 16 = -n^2$

$$\left\{\frac{-2 + 2\sqrt{37}}{9}, \frac{-2 - 2\sqrt{37}}{9}\right\}$$

18)  $8n^2 + 7n - 15 = -7$

$$\left\{\frac{-7 + \sqrt{305}}{16}, \frac{-7 - \sqrt{305}}{16}\right\}$$

## Radical Equations - Part 1

Solve each equation. Remember to check for extraneous solutions.

1)  $\sqrt{x} = 10$

2)  $10 = \sqrt{\frac{m}{10}}$

3)  $\sqrt{v-4} = 3$

4)  $6 = \sqrt{v-2}$

5)  $\sqrt{n} = 9$

6)  $5 = \sqrt{x+3}$

7)  $2 = \sqrt{4b}$

8)  $\sqrt{n+9} = 1$

9)  $-8 + \sqrt{5a-5} = -3$

10)  $10\sqrt{9x} = 60$

11)  $1 = \sqrt{x-5}$

12)  $-10\sqrt{v-10} = -60$

$$13) 10 + \sqrt{10m - 1} = 13$$

$$14) -12 = -6\sqrt{b + 4}$$

$$15) \sqrt{v + 3} - 1 = 7$$

$$16) 90 = 9\sqrt{25v}$$

$$17) \sqrt{3n} = \sqrt{4n - 1}$$

$$18) \sqrt{2n - 88} = \sqrt{\frac{n}{6}}$$

$$19) \sqrt{\frac{x}{10}} = \sqrt{3x - 58}$$

$$20) \sqrt{3n + 12} = \sqrt{n + 8}$$

$$21) \sqrt{n} = \sqrt{2n - 6}$$

$$22) \sqrt{11 - x} = \sqrt{x - 7}$$

$$23) \sqrt{72 - x} = \sqrt{\frac{x}{5}}$$

$$24) \sqrt{x + 3} = \sqrt{1 - x}$$

$$25) \sqrt{2k + 40} = \sqrt{-16 - 2k}$$

$$26) \sqrt{x + 8} = \sqrt{3x + 8}$$

## Radical Equations - Part 1

Solve each equation. Remember to check for extraneous solutions.

1)  $\sqrt{x} = 10$   
{100}

2)  $10 = \sqrt{\frac{m}{10}}$   
{1000}

3)  $\sqrt{v-4} = 3$   
{13}

4)  $6 = \sqrt{v-2}$   
{38}

5)  $\sqrt{n} = 9$   
{81}

6)  $5 = \sqrt{x+3}$   
{22}

7)  $2 = \sqrt{4b}$   
{1}

8)  $\sqrt{n+9} = 1$   
{-8}

9)  $-8 + \sqrt{5a-5} = -3$   
{6}

10)  $10\sqrt{9x} = 60$   
{4}

11)  $1 = \sqrt{x-5}$   
{6}

12)  $-10\sqrt{v-10} = -60$   
{46}

$$13) 10 + \sqrt{10m - 1} = 13$$
$$\{1\}$$

$$14) -12 = -6\sqrt{b + 4}$$
$$\{0\}$$

$$15) \sqrt{v + 3} - 1 = 7$$
$$\{61\}$$

$$16) 90 = 9\sqrt{25v}$$
$$\{4\}$$

$$17) \sqrt{3n} = \sqrt{4n - 1}$$
$$\{1\}$$

$$18) \sqrt{2n - 88} = \sqrt{\frac{n}{6}}$$
$$\{48\}$$

$$19) \sqrt{\frac{x}{10}} = \sqrt{3x - 58}$$
$$\{20\}$$

$$20) \sqrt{3n + 12} = \sqrt{n + 8}$$
$$\{-2\}$$

$$21) \sqrt{n} = \sqrt{2n - 6}$$
$$\{6\}$$

$$22) \sqrt{11 - x} = \sqrt{x - 7}$$
$$\{9\}$$

$$23) \sqrt{72 - x} = \sqrt{\frac{x}{5}}$$
$$\{60\}$$

$$24) \sqrt{x + 3} = \sqrt{1 - x}$$
$$\{-1\}$$

$$25) \sqrt{2k + 40} = \sqrt{-16 - 2k}$$
$$\{-14\}$$

$$26) \sqrt{x + 8} = \sqrt{3x + 8}$$
$$\{0\}$$

## Vocabulary

Sum – answer to an addition problem

Difference – answer to a subtraction problem

Product – answer to a multiplication problem

Quotient – answer to a division problem

Factor – a number being multiplied

Coefficient – the constant value of an algebraic expression

Expression – a sum, difference, product or quotient containing variables and/or constants

Equation – a defined relationship between two expressions

Simplify – to do all operations that can be done (if there is no equal sign, you cannot solve for the unknown)

Factoring – to reverse the process of multiplication in order to identify the original factors

Solve – only equations can be solved for a variable

Evaluate – use substitution to rewrite an expression using only constants and find the overall value

Radicand – the expression found under a radical hat

Index – AKA “root” of a radical expression

Constant – a number or symbol that represents a constant value ( $\pi \approx 3.14$ ,  $e \approx 2.72$ )

Variable – represented with a letter; its value will vary (change)

Integer – (... , -3, -2, -1, 0, 1, 2, 3, ...)

Irrational – a number that *cannot* be expressed as a fraction of integers ( $\sqrt{3}$ ,  $\pi$ ,  $e$ , ...)

Rational – any number that can be expressed as a *fraction* of integers ( $\frac{1}{3}$ , 2.5,  $\sqrt{25}$ ,  $\frac{\sqrt[3]{27}}{\sqrt{16}}$ , ...)