

## Simplify Radicals

$$\textcircled{1} \quad 9\sqrt{50w^2} = 45w\sqrt{2}$$

$$\textcircled{2} \quad \sqrt{9x^2y^3} = 3xy\sqrt{y}$$

$$\textcircled{3} \quad \sqrt{84mh^4} = 2h^2\sqrt{21m}$$

$$\textcircled{4} \quad -7\sqrt{54x^3} = -21x\sqrt{6x}$$

$$\textcircled{5} \quad \cancel{2} \sqrt{25x^5} = 10x^2\sqrt{x}$$

$$\textcircled{6} \quad \sqrt{180a^{11}b^{14}c^{15}} = 6a^5b^7c^7\sqrt{5ac}$$

## Multiply Polynomials

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

$$\boxed{15x^7 + 10x^3 - 30x^2}$$

2.  $(3x-6)(x+4)$

$$3x^2 + 12x - 6x - 24$$

$$\boxed{3x^2 - 6x - 24}$$

3.  $(8x+11)(2x-9)$

$$16x^2 - 72x + 22x - 99$$

$$\boxed{16x^2 - 50x - 99}$$

4.  $(2x^2 + 3x - 4)(x^2 - 2x + 5)$

$$2x^2 \quad 3x \quad -4$$

$x^2$	$2x^4$	$3x^3$	$-4x^2$
$-2x$	$-4x^3$	$-6x^2$	$8x$
$5$	$10x^2$	$15x$	$-20$

$$\boxed{2x^4 - x^3 + 23x - 20}$$

5.  $(x+1)(x+3)(x+5)$

$$x^2 + 3x + x + 3$$

$$(x^2 + 4x + 3)(x+5)$$

$$x^2 \quad 4x \quad 3$$

$x$	$x^3$	$4x^2$	$3x$
$5$	$5x^2$	$20x$	$15$

$$\boxed{x^3 + 9x^2 + 23x + 15}$$

6.  $(x^2 - 6x + 2)(3x^2 + 7x - 4)$

$$x^2 \quad -6x \quad 2$$

$3x^2$	$3x^4$	$-18x^3$	$6x^2$
$-7x$	$-7x^3$	$-42x^2$	$14x$
$-4$	$-4x^2$	$24x$	$-8$

$$\boxed{3x^4 - 11x^3 - 40x^2 + 38x - 8}$$

## Factoring out a GCF

1.  $8xy + 4xy^2$

$$\boxed{4xy(2 + y)}$$

2.  $20abc^3d - 5ab^2c^2$

$$\boxed{5abc^2(4bc^2d - 1)}$$

3.  $12w^3t^2 - 9wt^2 + 15w^2t^3$

$$\boxed{3wt^2(4w^2 - 3 + 5wt)}$$

4.  $-x^2 + 8x$

$$\boxed{-x(x - 8)}$$

5.  $14x^2y^2z + 21xy^2z^2$

$$\boxed{7xy^2z(2x + 3z)}$$

6.  $35t^5 + 40t^4 - 160t^3 - 20t^2$

$$\boxed{5t^2(7t^3 + 8t^2 - 32t - 4)}$$

# Factoring a=1

1.  $X^2 + X - 6$

$(X+3)(X-2)$

$\begin{array}{r} -6 \\ 3 \times -2 \\ \hline 1 \end{array}$

6.  $3X^2 - 15X + 18$

$3(X^2 - 5X + 6)$

$3(X-2)(X-3)$

$\begin{array}{r} 6 \\ -2 \times -3 \\ \hline -5 \end{array}$

2.  $X^2 + 9X + 20$

$(X+5)(X+4)$

$\begin{array}{r} 20 \\ 5 \times 4 \\ \hline 9 \end{array}$

3.  $3X^2 + 12X + 12$

$3(X^2 + 4X + 4)$

$3(X+2)(X+2)$

$3(X+2)^2$

$\begin{array}{r} 4 \\ 2 \times 2 \\ \hline 4 \end{array}$

4.  $X^2 - 11X + 18$

$(X-2)(X-9)$

$\begin{array}{r} 18 \\ -2 \times -9 \\ \hline -11 \end{array}$

5.  $X^2 + 4X - 21$

$(X+7)(X-3)$

$\begin{array}{r} -21 \\ 7 \times -3 \\ \hline 4 \end{array}$

# Factoring a > 1

1.  $2x^2 + x - 6$

$(2x^2 + 4x)(-3x - 6)$

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

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

$\begin{array}{r} -12 \\ 4 \times -3 \\ \hline 1 \end{array}$

or

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

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

2.  $4x^2 - 19x + 12$

$(4x^2 - 16x)(-3x + 12)$

$4x(x-4) - 3(x-4)$

$(x-4)(4x-3)$

$\begin{array}{r} 48 \\ 4 \times -3 \\ \hline -16 \\ -19 \end{array}$

or

$(x - \frac{16}{4})(x - \frac{3}{4})$

$(x-4)(4x-3)$

3.  $5x^2 - 13x + 6$

$(5x^2 - 10x)(-3x + 6)$

$5x(x-2) - 3(x-2)$

$(x-2)(5x-3)$

$\begin{array}{r} 30 \\ -10 \times -3 \\ \hline -13 \end{array}$

$(x - \frac{10}{5})(x - \frac{3}{5})$

$(x-2)(5x-3)$

continued...

4.  $4x^2 - 15x + 9$

$$\begin{aligned} & (4x^2 - 12x)(-3x + 9) \\ & 4x(x-3) - 3(x-3) \\ & \boxed{(x-3)(4x-3)} \end{aligned}$$

~~$\begin{array}{r} 36 \\ -12 \quad -3 \\ -15 \end{array}$~~   
or

$$\left( \frac{x-12}{4} \right) \left( \frac{x-3}{4} \right)$$

$$\boxed{(x-3)(4x-3)}$$

5.  $6x^2 + x - 2$

$$\begin{aligned} & 6x^2 + 4x - 3x - 2 \\ & 2x(3x+2) - 1(3x+2) \\ & \boxed{(3x+2)(2x-1)} \end{aligned}$$

~~$\begin{array}{r} -12 \\ 4 \quad -3 \\ 1 \end{array}$~~   
or

$$\left( \frac{x+4}{6} \right) \left( \frac{x-3}{6} \right)$$

$$\left( x + \frac{2}{3} \right) \left( x - \frac{1}{2} \right)$$

$$\boxed{(3x+2)(2x-1)}$$

6.  $12x^2 + 5x - 2$

$$\begin{aligned} & (12x^2 + 8x)(-3x - 2) \\ & 4x(3x+2) - 1(3x+2) \\ & \boxed{(3x+2)(4x-1)} \end{aligned}$$

~~$\begin{array}{r} -24 \\ +8 \quad -3 \\ 5 \end{array}$~~   
or

$$\left( \frac{x+8}{12} \right) \left( \frac{x-3}{12} \right)$$

$$\left( x + \frac{2}{3} \right) \left( x - \frac{1}{4} \right)$$

$$\boxed{(3x+2)(4x-1)}$$

# Difference of Squares

$$\textcircled{1} 81x^2 - 49$$

$$\sqrt{81} = 9$$

$$\sqrt{49} = 7$$

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

$$\boxed{(9x-7)(9x+7)}$$

$$\textcircled{2} x^2 - y^2$$

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

$$\sqrt{y^2} = y$$

$$\boxed{(x-y)(x+y)}$$

$$\textcircled{3} 169y^2 - 100$$

$$\sqrt{169} = 13$$

$$\sqrt{100} = 10$$

$$\boxed{(13y-10)(13y+10)}$$

$$\textcircled{4} 25x^6 - 144$$

$$\boxed{(5x^3-12)(5x^3+12)}$$

$$\textcircled{6} 16y^2 - 64z^{10}$$

$$(4y-8z^5)(4y+8z^5)$$

$$\textcircled{5} 36y^8 - z^2$$

$$\boxed{(6y^4-z)(6y^4+z)}$$