

<p><b>1.</b> Write the prime factorization of</p> <p>(a) <math>2 \overline{)12}</math>  <math>2 \overline{)6}</math>  <math>3</math>  <math>12 = 2^2 \cdot 3</math></p> <p>(b) <math>2 \overline{)50}</math>  <math>5 \overline{)25}</math>  <math>5</math>  <math>50 = 2 \cdot 5^2</math></p>	<p><b>2.</b> Find the GCF of</p> <p>(a) <math>2 \overline{)20}</math> and <math>2 \overline{)24}</math>  <math>2 \overline{)10}</math>      <math>2 \overline{)12}</math>  <math>5</math>              <math>2 \overline{)6}</math>  <math>3</math>  <math>20 = 2^2 \cdot 5</math>      <math>24 = 2^3 \cdot 3</math>  GCF (20, 24) = <math>2^2 = 4</math></p> <p>(b) <math>2 \overline{)300}</math> and <math>3 \overline{)345}</math>  <math>2 \overline{)150}</math>      <math>5 \overline{)115}</math>  <math>3 \overline{)75}</math>              <math>23</math>  <math>5 \overline{)25}</math>  <math>5</math>  <math>300 = 2^2 \cdot 3 \cdot 5^2</math>      <math>345 = 3 \cdot 5 \cdot 23</math>  GCF (300, 345) = <math>3 \cdot 5 = 15</math></p>
<p><b>3.</b> Factor out the GCF</p> <p>(a) <math>10a - 5</math>  <math>5(2a - 1)</math></p> <p>(b) <math>12c + 4d</math>  <math>4(3c + d)</math></p>	<p><b>4.</b> Factor out the GCF</p> <p>(a) <math>25xyz - 35x + 45xy</math>  <math>5x(5yz - 7 + 9y)</math></p> <p>(b) <math>12a^3b + 6a^2b^2 + 3ab^3</math>  <math>3ab(4a^2 + 2ab + b^2)</math></p>

**5. Factor**

**(a)**  $wz + mz + wy + ym$

$$= (z + y)(w + m)$$

	$w$	$m$
$z$	$wz$	$mz$
$y$	$wy$	$ym$

**(b)**  $w^2 - w - bw + b$

$$= (w - b)(w - 1)$$

	$w$	$-1$
$w$	$w^2$	$-w$
$-b$	$-bw$	$b$

**6. Factor**

**(a)**  $x^2 - 3x - 5x + 15$

$$= (x - 5)(x - 3)$$

	$x$	$-3$
$x$	$x^2$	$-3x$
$-5$	$-5x$	$15$

**(b)**  $2y^2 + 3y - 16y - 24$

$$= (2y + 3)(y - 8)$$

	$2y$	$3$
$y$	$2y^2$	$3y$
$-8$	$-16y$	$-24$

**7. Factor**

**(a)**  $x^2 - 9$

$$= (x + 3)(x - 3)$$

**(b)**  $25 - 9y^2$

$$= (5 + 3y)(5 - 3y)$$

**8. Factor**

**(a)**  $x^3 - 8$

$$= (x - 2)(x^2 + 2x + 4)$$

**(b)**  $m^3 + 27$

$$= (m + 3)(m^2 - 3m + 9)$$

9. Factor

(a)  $x^2 + 15x + 5$   
= prime

Prod 5	
1	5
Sum 15	

(b)  $y^2 + 6y + 5$   
=  $(y + 5)(y + 1)$

Prod 5	
1	5
Sum 6	

10. Factor

(a)  $a^2 - 7a + 12$   
=  $(a - 4)(a - 3)$

Prod 12	
1	12
2	6
3	4
-3	-4
Sum -7	

(b)  $m^2 - 9m + 14$   
=  $(m - 2)(m - 7)$

Prod 14	
1	14
2	7
-2	-7
Sum -9	

11. Factor

(a)  $x^2 + 11x - 60$   
=  $(x + 15)(x - 4)$

Prod -60	
-1	60
-2	30
-3	20
-4	15
Sum 11	

(b)  $w^2 + 5w - 10$   
prime

Prod -10	
-1	10
-2	5
Sum 5	

12. Factor

(a)  $x^2 - 9x - 36$   
=  $(x + 3)(x - 12)$

Prod -36	
-1	36
-2	18
-3	12
3	-12
Sum -9	

(b)  $x^2 - 13xy - 90y^2$   
=  $(x + 5y)(x - 18y)$

Prod -90	
-1	90
-2	45
-3	30
-5	18
5	-18
Sum -13	

13. Factor

$$2x^2 + 7x + 3$$

Prod 6	
1	6
Sum 7	

$$2x^2 + x + 6x + 3$$

$$= (x + 3)(2x + 1)$$

	2x	1
x	2x <sup>2</sup>	x
3	6x	3

14. Factor

$$5x^2 + 9x - 2$$

Prod -10	
-1	10
Sum 9	

$$5x^2 + -x + 10x - 2$$

$$= (x + 2)(5x - 1)$$

	5x	-1
x	5x <sup>2</sup>	-x
2	10x	-2

15. Factor

$$6x^2 - 19x + 15$$

Prod 90	
1	90
2	45
3	30
5	18
6	15
9	10
-9	-10
Sum -19	

$$6x^2 - 9x - 10x + 15$$

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

	2x	-3
3x	6x <sup>2</sup>	-9x
-5	-10x	15

16. Factor

$$2x^2 - xy - 6y^2$$

Prod -12	
-1	12
-2	6
-3	4
3	-4
Sum -1	

$$2x^2 + 3xy - 4xy + 6$$

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

	2x	3y
x	2x <sup>2</sup>	3xy
-2y	-4xy	6y <sup>2</sup>

17. Factor completely.

$$x^5 - 16x^3$$

$$= x^3(x^2 - 16)$$

$$= x^3(x - 4)(x + 4)$$

18. Factor completely.

$$5x^2 + 20x - 25$$

$$= 5(x^2 + 4x - 5)$$

$$= 5(x - 1)(x + 5)$$

Prod -5	
-1	5
Sum 4	

19. Factor completely.

$$x^3 - x^2 - 2x$$

$$= x(x^2 - x - 2)$$

$$= x(x + 1)(x - 2)$$

Prod -2	
-1	2
1	-2
Sum -1	

20. Factor completely.

$$5x^3 - 35x^2 + 60x$$

$$= 5x(x^2 - 7x + 12)$$

$$= 5x(x - 3)(x - 4)$$

Prod 12	
1	12
2	6
3	4
-3	-4
Sum -7	

21. Solve

$$(x - 10)(x + 12) = 0$$

$$\begin{array}{l}
 x - 10 = 0 \quad \text{or} \quad x + 12 = 0 \\
 \underline{+10} \quad \underline{+10} \qquad \underline{-12} \quad \underline{-12} \\
 x + 0 = 10 \quad x + 0 = -12 \\
 x = 10 \qquad \qquad x = -12
 \end{array}$$

Solution set:  $\{10, -12\}$

22. Solve

$$(2x - 1)(5x - 3) = 0$$

$$\begin{array}{l}
 2x - 1 = 0 \quad \text{or} \quad 5x - 3 = 0 \\
 \underline{+1} \quad \underline{+1} \qquad \underline{+3} \quad \underline{+3} \\
 2x + 0 = 1 \qquad 5x + 0 = 3 \\
 \frac{2x}{2} = \frac{1}{2} \qquad \frac{5x}{5} = \frac{3}{5} \\
 x = \frac{1}{2} \qquad \qquad x = \frac{3}{5}
 \end{array}$$

Solution set:  $\{\frac{1}{2}, \frac{3}{5}\}$

23. Solve

$$x^2 + 17x + 72 = 0$$

$$(x + 8)(x + 9) = 0$$

$$\begin{array}{l}
 x + 8 = 0 \quad \text{or} \quad x + 9 = 0 \\
 \underline{-8} \quad \underline{-8} \qquad \underline{-9} \quad \underline{-9} \\
 x + 0 = -8 \quad x + 0 = -9 \\
 x = -8 \qquad \qquad x = -9
 \end{array}$$

Prod 72	
1	72
2	36
3	24
4	18
6	12
8	9
Sum 17	

Solution set:  $\{-8, -9\}$

24. Solve

$$x^2 - 14x + 45 = 0$$

$$(x - 5)(x - 9) = 0$$

$$\begin{array}{l}
 x - 5 = 0 \quad \text{or} \quad x - 9 = 0 \\
 \underline{+5} \quad \underline{+5} \qquad \underline{+9} \quad \underline{+9} \\
 x + 0 = 5 \quad x + 0 = 9 \\
 x = 5 \qquad \qquad x = 9
 \end{array}$$

Prod 45	
1	45
3	15
5	9
-5	-9
Sum -14	

Solution set:  $\{5, 9\}$

25. Solve

$$3x^2 + 2x = 5$$

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

$$\underline{-5} \quad \underline{-5}$$

$$3x^2 + 2x - 5 = 0$$

$$3x^2 + 5x - 3x - 5 = 0$$

Prod -15	
-1	15
-3	5
Sum 2	

$$(3x + 5)(x - 1) = 0$$

$$3x + 5 = 0 \quad \text{or} \quad x - 1 = 0$$

$$\underline{-5} \quad \underline{-5} \quad \underline{+1} \quad \underline{+1}$$

$$3x + 0 = -5 \quad x + 0 = 1$$

$$\frac{3x}{3} = \frac{-5}{3} \quad x = 1$$

$$x = \frac{-5}{3}$$

	$3x$	$5$
$x$	$3x^2$	$5x$
$-1$	$-3x$	$-5$

Solution set:  $\left\{\frac{-5}{3}, 1\right\}$