

Factoring Review

Name _____

Exercises

Use the GCF to factor each polynomial.

1. $21x - 14$

4. $3x^2 + 6x^4$

7. $12k^3 + 6k^2 - 18k$

10. $36x^2 - 18x$

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

16. $10x^2 + 35x$

2. $5y^3 - 10y^2 + 15y$

5. $18x^3 - 6x^2 + 24x$

8. $6x^3 - 4x^2 + 8x$

11. $6x^2 + 18x$

14. $5x^3 + 5x^2$

17. $8x^5 + 16x^4 - 8x^3$

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

6. $z^3 - 3z^2$

9. $8p^4 + 12p^2 + 4p$

12. $6x^3 - 2x^2 + 8x$

15. $3x^2 + 6x + 3$

18. $9x^3 - 6x^2 - 15x$

Exercises

Factor each expression.

1. $y^2 + 11y + 18$

4. $y^2 - 5y + 4$

7. $r^2 + 13r + 12$

10. $x^2 - x - 2$

13. $x^2 + 7x + 10$

2. $x^2 - 8x + 15$

5. $x^2 + 6x + 8$

8. $x^2 - 16x + 39$

11. $x^2 - 4x - 32$

14. $x^2 - 11x + 24$

3. $x^2 - 11x + 18$

6. $y^2 - 8y + 12$

9. $x^2 - 10x + 16$

12. $x^2 - 7x - 18$

15. $x^2 + 16x + 63$

Exercises

Factor each expression.

1. $2x^2 + 11x + 14$

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

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

7. $2x^2 - 5x + 3$

9. $6x^2 - 7x - 3$

2. $4x^2 - 12x + 5$

4. $6x^2 + 7x - 20$

6. $8x^2 - 13x - 6$

8. $5x^2 - 26x - 24$

10. $6x^2 + 7x - 3$

Factor each expression.

1. $a^2 - 36$

4. $4x^2 - 25$

7. $3x^2 - 12$

10. $x^2 - 225$

13. $6x^2 - 54$

2. $x^2 - 64$

5. $9y^2 - 16$

8. $2x^2 - 18$

11. $x^2 - 144$

14. $7x^2 - 112$

3. $y^2 - 49$

6. $25x^2 - 64$

9. $4x^2 - 16$

12. $16x^2 - 49$

15. $5x^2 - 125$

Example \Rightarrow GCF

Factor $18x^3 + 6x^2 - 12x$.

a. First find the GCF.

$$18x^3 = \textcircled{2} \textcircled{3} 3 \textcircled{x} x x$$

$$6x^2 = \textcircled{2} \textcircled{3} x \textcircled{x}$$

$$12x = \textcircled{2} 2 \textcircled{3} \textcircled{x}$$

$$2 \cdot 3 \cdot x = 6x$$

b. Factor out the GCF from each term.

$$\frac{18x^3}{6x} = 3x^2$$

$$\frac{6x^2}{6x} = x$$

$$\frac{-12x}{6x} = -2$$

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

— List the factors of each term. Circle the factors common to all terms.

— Multiply the circled terms together to get the GCF.

— Divide each term by the GCF.

— Solution

Examples Trinomial $a=1$

Factor $x^2 + 6x + 8$.

$$(x \quad)(x \quad)$$

$$+1 \text{ and } +8 \quad -1 \text{ and } -8$$

$$\textcircled{+2} \text{ and } \textcircled{+4} \quad -2 \text{ and } -4$$

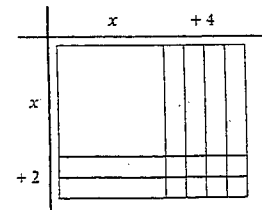
$$(x + 2)(x + 4)$$

— Write factors of x^2 , the first term of the trinomial, at the beginning of each set of parentheses. Note that the coefficient of x^2 is 1.

— List pairs of numbers that are factors of +8, which is the constant term of the trinomial. Choose the pair of factors that add to equal +6, the coefficient of the middle term of the trinomial.

— Write those two factors, with their signs, at the end of each set of parentheses.

— The trinomial $x^2 + 6x + 8$ represents the area of a rectangle with side of length $(x + 4)$ and $(x + 2)$.



Factor $x^2 + 4x - 21$.

$$(x \quad)(x \quad)$$

$$-1 \text{ and } +21 \quad +1 \text{ and } -21$$

$$-3 \text{ and } +7 \quad +3 \text{ and } -7$$

$$(x - 3)(x + 7)$$

— List pairs of numbers that are factors of -21.

— Choose the pair of factors that add to equal +4.

$$\begin{array}{c} ac \\ 8 \times 2 \\ 4 \times 6 \\ b \\ (x+4)(x+2) \end{array}$$

$$\begin{array}{c} ac \\ -21 \\ 7 \times -3 \\ 4 \\ b \\ (x+7)(x-3) \end{array}$$

Trinomial $a \neq 1$

Factor $2x^2 + 13x + 20$.

Write the first term in the top left box of the table.

Write the constant term in the bottom right box of the table.

Find the product ac .

Find two numbers whose product is ac and sum is b .

These numbers are the coefficients of the x terms that are written in the remaining boxes of the table.

(Note: Try repeating these steps, exchanging the locations of $5x$ and $8x$.)

Now, find the greatest common factors of the terms in each row and column. Write these above and to the left of the table.

Read across the top of the table to find one factor.

Read down the left of the table to find the other factor.

So, $2x^2 + 13x + 20 = (x + 4)(2x + 5)$.

You can check your answer using FOIL.

Factor $3x^2 - 2x - 8$.

$$ac = 3(-8) = -24$$

$$b = -2$$

The numbers whose product is -24 and sum is -2 are -6 and 4. Write -6x and 4x in the table and find the GCFs of each row and column.

$$3x^2 - 2x - 8 = (3x + 4)(x - 2)$$

$$\begin{array}{|c|c|} \hline 2x^2 & 20 \\ \hline 5x & 8x \\ \hline \end{array}$$

— Since $a = 2$ and $c = 20$, $ac = 40$

— Since $ac = 40$ and $b = 13$, the numbers are 8 and 5.

$$\begin{array}{|c|c|} \hline 2x^2 & 8x \\ \hline 5x & 20 \\ \hline \end{array}$$

$$\begin{array}{|c|c|c|} \hline & x & 4 \\ \hline 2x & 2x^2 & 8x \\ \hline 5 & 5x & 20 \\ \hline \end{array}$$

$$\begin{array}{l} \rightarrow x + 4 \\ \rightarrow 2x + 5 \end{array}$$

$$\begin{array}{c} ac \\ 40 \\ 8 \times 5 \\ b \\ 13 \\ 2x^2 + 8x + 5x + 20 \end{array}$$

Group

$$\begin{array}{cc} (2x^2 + 8x) & (5x + 20) \\ 2x & 2x \quad 5 \quad 5 \end{array}$$

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

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

Examples Difference of 2 squares

Factor $a^2 - 16$.

$$a^2 - 16$$

$$a^2 - 4^2$$

$$a^2 - b^2 = (a + b)(a - b)$$

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

$$(a + 4)(a - 4)$$

Factor $3a^2 - 75$.

$$3a^2 - 75$$

$$3(a^2 - 25)$$

$$3(a^2 - 5^2)$$

$$a^2 - b^2 = (a + b)(a - b)$$

$$3(a^2 - 5^2) = 3(a + 5)(a - 5)$$

$$3(a + 5)(a - 5)$$

— Both terms are perfect squares.

— Rewrite 16 as 4^2 .

— Write the formula.

— Replace b with 4.

— Solution

— Both terms are *not* perfect squares.

— Both $3a^2$ and 75 are divisible by 3. Factor out 3. **GCF = 3**

— 25 is a perfect square. Rewrite 25 as 5^2 .

— Write the formula.

— Replace b with 5.

— Solution

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Key

Exercises

Use the GCF to factor each polynomial.

1. $21x - 14$ $7(3x - 2)$
2. $5y^3 - 10y^2 + 15y$ $5y(y^2 - 2y + 3)$
3. $x^3 + 3x^2 + x$ $x(x^2 + 3x + 1)$
4. $3x^2 + 6x^4$ $3x^2(1 + 2x^2)$
5. $18x^3 - 6x^2 + 24x$ $6x(3x^2 - x + 4)$
6. $z^3 - 3z^2$ $z^2(z - 3)$
7. $12k^3 + 6k^2 - 18k$ $6k(2k^2 + k - 3)$
8. $6x^3 - 4x^2 + 8x$ $2x(3x^2 - 2x + 4)$
9. $8p^4 + 12p^2 + 4p$ $4p(2p^3 + 3p + 1)$
10. $36x^2 - 18x$ $18x(2x - 1)$
11. $6x^2 + 18x$ $6x(x + 3)$
12. $6x^3 - 2x^2 + 8x$ $2x(3x^2 - x + 4)$
13. $6x^3 + 6x^2 - 6x$ $6x(x^2 + x - 1)$
14. $5x^3 + 5x^2$ $5x^2(x + 1)$
15. $3x^2 + 6x + 3$ $3(x^2 + 2x + 1)$
16. $10x^2 + 35x$ $5x(2x + 7)$
17. $8x^5 + 16x^4 - 8x^3$ $8x^3(x^2 + 2x - 1)$
18. $9x^3 - 6x^2 - 15x$ $3x(3x^2 - 2x - 5)$

Exercises

Factor each expression.

1. $y^2 + 11y + 18$ $(y + 9)(y + 2)$
2. $x^2 - 8x + 15$ $(x - 5)(x - 3)$
3. $x^2 - 11x + 18$ $(x - 9)(x - 2)$
4. $y^2 - 5y + 4$ $(y - 4)(y - 1)$
5. $x^2 + 6x + 8$ $(x + 4)(x + 2)$
6. $y^2 - 8y + 12$ $(y - 6)(y - 2)$
7. $r^2 + 13r + 12$ $(r + 12)(r + 1)$
8. $x^2 - 16x + 39$ $(x - 13)(x - 3)$
9. $x^2 - 10x + 16$ $(x - 8)(x - 2)$
10. $x^2 - x - 2$ $(x - 2)(x + 1)$
11. $x^2 - 4x - 32$ $(x - 8)(x + 4)$
12. $x^2 - 7x - 18$ $(x - 9)(x + 2)$
13. $x^2 + 7x + 10$ $(x + 5)(x + 2)$
14. $x^2 - 11x + 24$ $(x - 8)(x - 3)$
15. $x^2 + 16x + 63$ $(x + 9)(x + 7)$

Exercises

Factor each expression.

1. $2x^2 + 11x + 14$ $(2x + 7)(x + 2)$
2. $4x^2 - 12x + 5$ $(2x - 5)(2x - 1)$
3. $6x^2 - 13x + 2$ $(6x - 1)(x - 2)$
4. $6x^2 + 7x - 20$ $(3x - 4)(2x + 5)$
5. $3x^2 + 4x - 4$ $(3x - 2)(x + 2)$
6. $8x^2 - 13x - 6$ $(8x + 3)(x - 2)$
7. $2x^2 - 5x + 3$ $(2x - 3)(x - 1)$
8. $5x^2 - 26x - 24$ $(5x + 4)(x - 6)$
9. $6x^2 - 7x - 3$ $(3x + 1)(2x - 3)$
10. $6x^2 + 7x - 3$ $(2x + 3)(3x - 1)$

Factor each expression.

1. $a^2 - 36$ $(a + 6)(a - 6)$
2. $x^2 - 64$ $(x + 8)(x - 8)$
3. $y^2 - 49$ $(y - 7)(y + 7)$
4. $4x^2 - 25$ $(2x + 5)(2x - 5)$
5. $9y^2 - 16$ $(3y - 4)(3y + 4)$
6. $25x^2 - 64$ $(5x - 8)(5x + 8)$
7. $3x^2 - 12$ $3(x - 2)(x + 2)$
8. $2x^2 - 18$ $2(x - 3)(x + 3)$
9. $4x^2 - 16$ $4(x - 2)(x + 2)$
10. $x^2 - 225$ $(x - 15)(x + 15)$
11. $x^2 - 144$ $(x + 12)(x - 12)$
12. $16x^2 - 49$ $(4x - 7)(4x + 7)$
13. $6x^2 - 54$ $6(x - 3)(x + 3)$
14. $7x^2 - 112$ $7(x - 4)(x + 4)$
15. $5x^2 - 125$ $5(x - 5)(x + 5)$