

key

# Factoring Quadratics

Name \_\_\_\_\_

List the factors of each number. Then find the GCF (Greatest Common Factor) of the numbers.

- |            |                    |                           |           |
|------------|--------------------|---------------------------|-----------|
| 1. 20, 32  | 1, 2, 4, 5, 10, 20 | 1, 2, 4, 8, 16, 32        | <u>4</u>  |
| 2. 21, 24  | 1, 3, 7, 21        | 1, 2, 3, 4, 6, 8, 12      | <u>3</u>  |
| 3. 50, 35  | 1, 2, 5, 25, 50    | 1, 5, 7, 35               | <u>5</u>  |
| 4. 35, 56  | 1, 5, 7, 35        | 1, 2, 4, 7, 8, 14, 28, 56 | <u>7</u>  |
| 5. 42, 65  |                    |                           | <u>1</u>  |
| 6. 36, 54  |                    |                           | <u>9</u>  |
| 7. 70, 140 |                    |                           | <u>70</u> |
| 8. 40, 72  |                    |                           | <u>8</u>  |

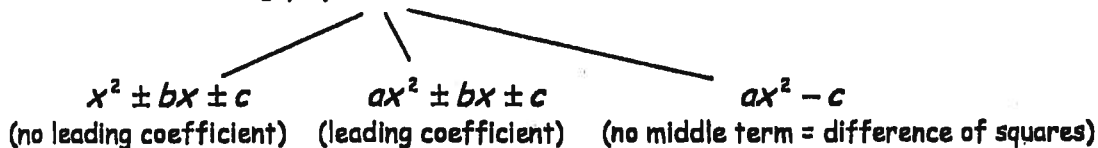
Find the GCF of the variables expressions.

- |                         |                             |
|-------------------------|-----------------------------|
| 9. $x^2y, xy$           | <u><math>xy</math></u>      |
| 10. $2xyz, 4z^2$        | <u><math>2z</math></u>      |
| 11. $2y^2z, 8yz^2$      | <u><math>2yz</math></u>     |
| 12. $11ac, 33ab$        | <u><math>11a</math></u>     |
| 13. $3x^2y^2, 15x^2y$   | <u><math>3x^2y</math></u>   |
| 14. $9r^2z, 21rz$       | <u><math>3rz</math></u>     |
| 15. $100abc, 200xyz$    | <u><math>100</math></u>     |
| 16. $27m^3n^3, 9m^2n^5$ | <u><math>9m^2n^3</math></u> |

**Factoring trinomials completely! (Putting it all together...)**

**Step 1) Look for a GCF. If there is one, factor it out and leave it in the front of the solution.**

**Step 2) Look at the remaining polynomial and use notes to factor into two binomials.**



**Step 3) Check!**

**Example)  $2x^2 - 10x + 12$**

**Step 1) Factor out a GCF of 2.**

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

**Step 2) Factor what is left, keeping the GCF in the front.**

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

**Step 3) Check by FOILING and distributing in the GCF!**

**Factor the following completely. (Not every problem will have a GCF.)**

1.  $3x^3 - 12x$

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

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

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

3.  $8x^2 + 20x - 48$

$$4(2x^2 + 5x - 12)$$
$$4(2x-3)(x+4)$$

4.  $a^3 + a^2 - 2a$

$$a(a^2 + a - 2)$$
$$a(a+2)(a-1)$$

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

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

6.  $3x^2 + 18x + 27$

$$3(x^2 + 6x + 9)$$
$$3(x+3)(x+3)$$

7.  $5m^3 - 45m$

$$5m(m^2 - 9)$$
$$5m(m+3)(m-3)$$

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

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

9.  $5x^2 - 18x - 8$

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



## Factoring: Putting It All Together

Factor completely, write prime if prime.

$$1. 2x^2 - 8 \quad 2(x^2 - 4) \\ 2(x+2)(x-2)$$

$$2. 2x^2 + 8x + 6 \\ 2(x^2 + 4x + 3) \\ 2(x+3)(x+1)$$

$$3. 3n^2 + 9n - 30 \\ 3(n^2 + 3n - 10) \\ 3(n+5)(n-2)$$

$$4. 6x^2 - 26x - 20 \\ 2(3x^2 - 13x - 10) \\ 2(3x+2)(x-5)$$

$$5. 2x^2 + 12x - 80 \\ 2(x^2 + 6x - 40) \\ 2(x+10)(x-4)$$

$$6. 5t^2 + 15t + 10 \\ 5(t^2 + 3t + 2) \\ 5(t+2)(t+1)$$

$$7. 8n^2 - 18 \\ 2(4n^2 - 9) \\ 2(2n+3)(2n-3)$$

$$8. 14x^2 + 7x - 21 \\ 7(2x^2 + x - 3) \\ 7(2x+3)(x-1)$$

$$9. 4x^2 + 16x + 16 \quad 4(x^2 + 4x + 4) \\ 4(x+2)(x+2)$$

$$10. 18x + 12x^2 + 2x^3 \\ 2x^3 + 12x^2 + 18x = 2x(x^2 + 6x + 9) \\ 2x(x+3)(x+3)$$

$$11. 2x - 2xy^2 \\ 2x(1 - y^2) \\ 2x(1+y)(1-y)$$

$$12. 3t^3 - 27t \\ 3t(t^2 - 9) \\ 3t(t+3)(t-3)$$

$$13. 24a^2 - 30a + 9 \\ 3(8a^2 - 10a + 3) \\ 3(4a-3)(2a-1)$$

$$14. 10x^2 + 15x - 10 \\ 5(2x^2 + 3x - 2) \\ 5(2x-1)(x+2)$$

$$15. 3x^2 - 42x + 147 \\ 3(x^2 - 14x + 49) \\ 3(x-7)(x-7)$$

$$16. 4x^4 - 4x^2 \\ 4x^2(x^2 - 1) \\ 4x^2(x+1)(x-1)$$

Name: \_\_\_\_\_

Factoring

# Factoring Trinomials of the form $ax^2 + bx + c$

$$3x^2 - 9x - 12 = 3(x^2 - 3x - 4) = 3(x - 4)(x + 1)$$

Factor.

1.  $5x^2 - 10x - 15$

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

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

2.  $6x^2 - 15x - 21$

$3(2x^2 - 5x - 7)$

$3(2x - 7)(x + 1)$

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

$(3x - 7)(x - 1)$

4.  $2x^2 - 11x - 21$

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

5.  $4x^2 + 2x - 20$

$2(2x^2 + x - 10)$

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

6.  $3x^2 - 5x - 12$

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

7.  $7x^2 - 26x - 8$

$(7x + 2)(x - 4)$

8.  $12x^2 - 6x - 18$

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

$6(2x - 3)(x + 1)$

9.  $6x^2 - 13x + 6$

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

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

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

11.  $3x^2 - 4x - 32$

$(3x + 8)(x - 4)$

12.  $4x^2 - 16x + 15$

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

13.  $4x^2 + 7x - 15$

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

14.  $6a^2 - 21a + 15$

$3(2a^2 - 7a + 5)$

$3(2a - 5)(a - 1)$

15.  $11x^2 + 122x + 11$

$(11x + 1)(x + 11)$

16.  $3x^2 - 20x - 7$

$(3x + 1)(x - 7)$

17.  $2y^2 - 17y + 35$

$(2y - 7)(y - 5)$

18.  $4x^2 - 16x + 15$

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

19.  $6x^2 + 25x + 25$

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

20.  $7c^2 - 16c + 9$

$(7c - 9)(c - 1)$

### Practice Problems

Factor completely:

1.  $x^2 - 13x + 36$

$$(x-9)(x-4)$$

3.  $x^2 + 12x - 45$

$$(x+15)(x-3)$$

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

$$(x-6)(x+1)$$

7.  $2x^2 + 11x + 15$

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

9.  $5x^2 + 28x + 15$

$$(5x+3)(x+5)$$

11.  $2x^2 - 7x - 72$

$$(2x+9)(x-8)$$

13.  $5x^3 + 20x^2 - 60x$

$$5x(x^2 + 4x - 12)$$

$$5x(x+6)(x-2)$$

2.  $x^2 - 2x - 48$

$$(x-8)(x+6)$$

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

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

6.  $4x^2 + 24x - 64$

$$4(x^2 + 6x - 16)$$

$$4(x+8)(x-2)$$

8.  $3x^2 - 13x + 14$

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

10.  $2x^2 - 3x - 35$

$$(2x+7)(x-5)$$

12.  $15x^2 - 33x - 36$

$$3(5x^2 - 11x - 12)$$

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

14.  $12x^4 + 60x^3 + 27x^2$

$$3x^2(4x^2 + 20x + 9)$$

$$3x^2(2x+1)(2x+9)$$

Factoring when the leading coefficient is not one

Name \_\_\_\_\_

Factor completely. If it can't be factored write prime.

1.  $2t^2 + 5t - 3$

$(2t - 1)(t + 3)$

2.  $3x^2 - 8x + 5$

$(3x - 5)(x - 1)$

3.  $3p^2 - 7p - 6$

$(3p + 2)(p - 3)$

4.  $4r^2 + 8r + 3$

$(2r + 1)(2r + 3)$

5.  $6x^2 + 7x - 10$

$(6x - 5)(x + 2)$

6.  $4y^2 - 17y + 15$

$(4y - 5)(y - 3)$

7.  $4r^2 - 9r + 6$  prime

8.  $25u^2 - 20u + 4$

$(5u - 2)(5u - 2)$

9.  $4r^2 + 16rs - 10s^2$   
 $2(2r^2 + 8rs - 5s^2)$

$2(2r - s)(r + 5s)$

10.  $12p^2 - 32pq - 5q^2$  prime

11.  $r^4 - 16s^4$

$(r^2 - 4s^2)(r^2 + 4s^2)$

$(r + 4s)(r - 4s)(r^2 + 4s^2)$

12.  $x^3 - 3x^2 - 4$

$(x^2 + 1)(x^2 - 4)$

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

$$13. z^4 - 10z^2 + 9$$

$$(z^2 - 1)(z^2 - 9)$$

$$(z+1)(z-1)(z+3)(z-3)$$

$$15. 9t^2 + 6t + 1$$

$$(3t+1)(3t+1)$$

$$17. 6t^2 + 4t - 2$$

$$2(3t^2 + 2t - 1)$$

$$2(3t-1)(t+1)$$

$$19. 6x^2 - 7xy - 3y^2$$

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

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

$$(x-1)(x-2)$$

$$16. 27x^3 - 12x$$

$$3x(9x^2 - 4)$$

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

$$18. 125s^3 - 8t^3$$

Skip

$$20. 6s^2 + st - 5t^2$$

$$(6s-5t)(s+t)$$