Name ____________________________

Algebra 2 Honors Summer Assignment

tracimerritt@salemvikings.org

This assignment is due the FIRST day of class. It will be counted as 2 daily grades. This assignment is a prerequisite for the Honors Algebra 2 class. Incompletion of this assignment does not disqualify you from being in Honors Algebra 2. This is your independent work. Do not copy another's work or the internet.

Rubric for the assignment:

- **Complete all Exercises for each section. (45%)**
- **Show all work on a separate sheet of paper. (20%)**
- **NEATNESS COUNTS! (10%)**
- **Points will be rewarded for steps and answers. (25%)**

An online resource for this assignment is www.khanacademy.org.

Please contact me at the above email address if you have any questions. Please allow 24 hours for a response...so don't wait until the last minute!!

0-1 Representing Functions

:: Objective

- Identify the domain and range of functions.

New Vocabulary
domain
range
quadrants
mapping
function

Recall that a *relation* is a set of ordered pairs. The **domain** of a relation is the set of all first coordinates (x-coordinates) from the ordered pairs, and the **range** is the set of all second coordinates (y-coordinates) from the ordered pairs.

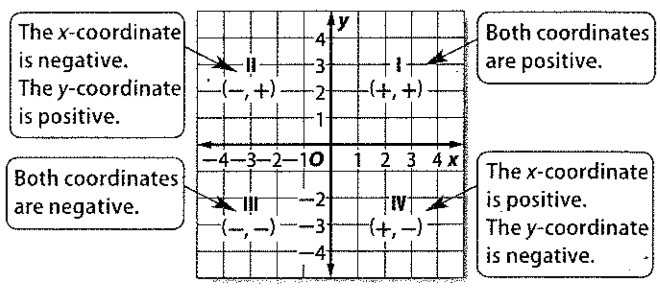
Example 1 Domain and Range

State the domain and the range of the relation.
$\{(-3, 3), (0, -7), (1, -5), (2, 4)\}$

The domain is the set of x-coordinates.
$D = \{-3, 0, 1, 2\}$

The range is the set of y-coordinates.
$R = \{-7, -5, 3, 4\}$

A relation can be graphed on a coordinate plane. A coordinate plane is formed by the intersection of the horizontal axis, or x-axis, and the vertical axis, or y-axis. The axes meet at the origin (0, 0) and divide the plane into four **quadrants**. Any ordered pair in the coordinate plane can be written in the form (x, y).



Example 2 Locate Coordinates

Name the quadrant in which $T(-8, 5)$ is located.

Point T has a negative x-coordinate and a positive y-coordinate. The point is located in Quadrant II.

A relation can also be represented by a table or a mapping. A **mapping** illustrates how each element of the domain is paired with an element in the range.

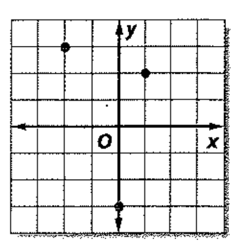
Ordered Pairs

(1, 2)
(−2, 3)
(0, −3)

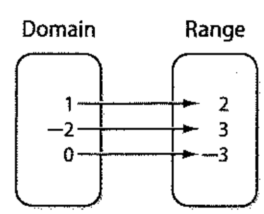
Table

x	y
1	2
−2	3
0	−3

Graph



Mapping



A **function** is a relation in which each element of the domain is paired with *exactly one* element of the range.

Example 3 Identify Domain and Range

WatchOut!

Functions Remember that in a function, an element of the range can be paired with more than one element of the domain. But an element of the domain cannot be paired with more than one element of the range.

State the domain and range of each relation. Then determine whether each relation is a function.

a. {(10, 3), (6, −2), (7, 4), (−8, −9)}

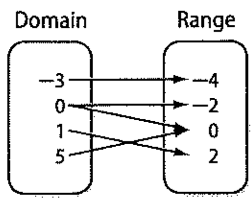
D = {−8, 6, 7, 10}
R = {−9, −2, 3, 4}
For each element of the domain, there is only one corresponding element in the range. So, this relation is a function.

b.

x	y
1	3, 4
2	7
3	4

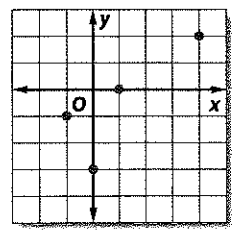
D = {1, 2, 3}
R = {3, 4, 7}
Because 1 is paired with 3 and 4, this is not a function.

c.



D = {−3, 0, 1, 5}
R = {−4, −2, 0, 2}
Because 0 is paired with −2 and 0, this is not a function.

d.



D = {−1, 0, 1, 4}
R = {−3, −1, 0, 2}
This is a function.

Exercises

State the domain and range of each relation. Then determine whether each relation is a function. Write *yes* or *no*.

1. {(2, 7), (3, 10), (1, 6)}

2. {(−6, 0), (5, 5), (9, −2), (−2, −9)}

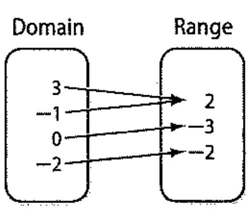
3.

x	y
1	5
2	7
1	9

4.

x	y
−12	0
−10	1
−8	2
−6	4

5.



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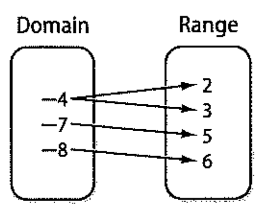

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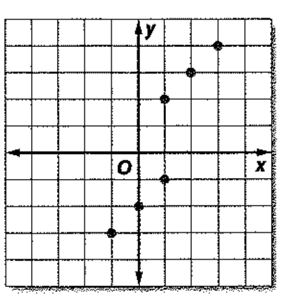

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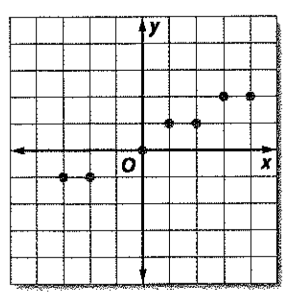

Name the quadrant in which each point is located.

9. (5, 3) **10.** (8, −6) **11.** (2, 0) **12.** (−7, −1)

0-2 FOIL

Objective

- Use the FOIL method to multiply binomials.

The product of two binomials is the sum of the products of the *first* terms, the *outer* terms, the *inner* terms, and the *last* terms.

F O I L

Example 1 Use the FOIL Method

Find each product.

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

F L First Outer Inner Last

$$(x + 3)(x - 5) = x \cdot x + x \cdot (-5) + 3 \cdot x + 3 \cdot (-5)$$

I

O

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

b. $(3y + 2)(5y + 4)$

$$(3y + 2)(5y + 4) = 3y \cdot 5y + 3y \cdot 4 + 2 \cdot 5y + 2 \cdot 4$$
$$= 15y^2 + 12y + 10y + 8$$
$$= 15y^2 + 22y + 8$$

Exercises

Find each product.

1. $(a + 2)(a + 4)$

2. $(v - 7)(v - 1)$

3. $(h + 4)(h - 4)$

4. $(d - 1)(d + 1)$

5. $(b + 4)(b - 3)$

6. $(t - 9)(t + 11)$

7. $(r + 3)(r - 8)$

8. $(k - 2)(k + 5)$

9. $(p + 8)(p + 8)$

10. $(x - 15)(x - 15)$

11. $(2c + 1)(c - 5)$

12. $(7n - 2)(n + 3)$

13. $(3m + 4)(2m - 5)$

14. $(5g + 1)(6g + 9)$

15. $(2q - 17)(q + 2)$

16. $(4t - 7)(3t - 12)$

0-3 Factoring Polynomials

Objective

- Use various techniques to factor polynomials.

Some polynomials can be factored using the Distributive Property.

Example 1 Use the Distributive Property

Factor $4a^2 + 8a$.

Find the GCF of $4a^2$ and $8a$.

$4a^2 = 2 \cdot 2 \cdot a \cdot a \quad 8a = 2 \cdot 2 \cdot 2 \cdot a \quad \rightarrow \quad$ GCF: $2 \cdot 2 \cdot a$ or $4a$

$4a^2 + 8a = 4a(a) + 4a(2)$ Rewrite each term using the GCF.

$= 4a(a + 2)$ Distributive Property

Thus, the completely factored form of $4a^2 + 8a$ is $4a(a + 2)$.

To factor trinomials of the form $x^2 + bx + c$, find two integers m and p with a product equal to c and a sum equal to b. Then write $x^2 + bx + c$ using the pattern $(x + m)(x + p)$.

Example 2 Use Factors and Sums

Factor each polynomial.

a. $x^2 + 5x + 6$ ← Both b and c are positive.

b is 5 and c is 6. Find two numbers with a product of 6 and a sum of 5.

Factors of 6	Sum of factors
1, 6	7
2, 3	5

The correct factors are 2 and 3.

$x^2 + 5x + 6 = (x + m)(x + p)$ Write the pattern.

$= (x + 2)(x + 3)$ $m = 2$ and $p = 3$

b. $x^2 - 8x + 12$ ← b is negative, and c is positive.

$b = -8$ and $c = 12$. This means that $m + p$ is negative and mp is positive. So m and p must both be negative.

Factors of 12	Sum of factors
−1, −12	−13
−2, −6	−8

The correct factors are −2 and −6.

$x^2 - 8x + 12 = (x + m)(x + p)$ Write the pattern.

$= [x + (-2)][x + (-6)]$ $m = -2$ and $p = -6$

$= (x - 2)(x - 6)$ Simplify.

c. $x^2 + 14x - 15$ ← b is positive, and c is negative.

$b = 14$ and $c = -15$. This means that $m + p$ is positive and mp is negative. So either m or p must be negative, but not both.

Factors of −15	Sum of factors
1, −15	−14
−1, 15	14

The correct factors are −1 and 15.

$x^2 + 14x - 15 = (x + m)(x + p)$ Write the pattern.

$= [x + (-1)](x + 15)$ $m = -1$ and $p = 15$

$= (x - 1)(x + 15)$ Simplify.

To factor quadratic trinomials of the form $ax^2 + bx + c$, find two integers m and p with a product equal to ac and a sum equal to b. Write $ax^2 + bx + c$ using the pattern $ax^2 + mx + px + c$. Then factor by grouping.

PT

Example 3 Use Factors and Sums

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

$a = 6$, $b = 7$, and $c = -3$. This means that $m + p$ is positive and mp is negative. So either m or p must be negative, but not both.

Factors of −18	Sum of factors	
1, −18	−17	
−1, 18	17	
2, −9	−7	
−2, 9	7	The correct factors are −2 and 9.

$$\begin{aligned} 6x^2 + 7x - 3 &= 6x^2 + mx + px - 3 && \text{Write the pattern.} \\ &= 6x^2 + (-2)x + 9x - 3 && m = -2 \text{ and } p = 9 \\ &= (6x^2 - 2x) + (9x - 3) && \text{Group terms with common factors.} \\ &= 2x(3x - 1) + 3(3x - 1) && \text{Factor the GCF from each group.} \\ &= (2x + 3)(3x - 1) && \text{Distributive Property} \end{aligned}$$

StudyTip

Checking Solutions You can check to see that you have factored correctly by multiplying the factors and comparing the product to the original polynomial.

Here are some special products.

Perfect Square Trinomials

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

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

Difference of Squares

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

PT

Example 4 Use Special Products

Factor each polynomial.

a. $4x^2 + 20x + 25$

The first and last terms are perfect squares.
The middle term is equal to $2(2x)(5)$.
This is a perfect square trinomial of the form $(a + b)^2$.

$$\begin{aligned} 4x^2 + 20x + 25 &= (2x)^2 + 2(2x)(5) + 5^2 && \text{Write as } a^2 + 2ab + b^2. \\ &= (2x + 5)^2 && \text{Factor using the pattern.} \end{aligned}$$

b. $x^2 - 4$

This is a difference of squares.

$$\begin{aligned} x^2 - 4 &= x^2 - (2)^2 && \text{Write in the form } a^2 - b^2. \\ &= (x + 2)(x - 2) && \text{Factor the difference of squares.} \end{aligned}$$

Exercises

Factor each polynomial.

1. $12x^2 + 4x$

2. $6x^2y + 2x$

3. $8ab^2 - 12ab$

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

5. $y^2 + 12y + 27$

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

7. $3y^2 + 13y + 4$

8. $7x^2 + 51x + 14$

9. $3x^2 + 28x + 32$

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

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

12. $6x^2 - 13x + 5$

13. $6a^2 - 50ab + 16b^2$

14. $11x^2 - 78x + 7$

15. $18x^2 - 31xy + 6y^2$

16. $x^2 + 4xy + 4y^2$

17. $9x^2 - 24x + 16$

18. $4a^2 + 12ab + 9b^2$

19. $x^2 - 144$

20. $4c^2 - 9$

21. $16y^2 - 1$

22. $25x^2 - 4y^2$

23. $36y^2 - 16$

24. $9a^2 - 49b^2$