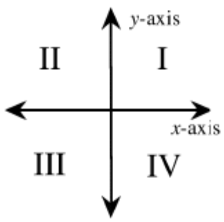
Unit 1 Basic Skills Toolkit

Axes, Quadrants & Coordinates

4-quadrant graph:

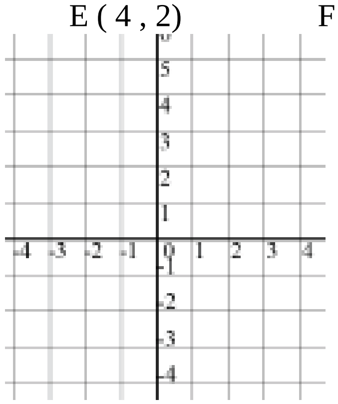


COORDINATES /ORDERED PAIR: (,)

Plot the points with the following coordinates:

A(4 , -2) B (-2, - 5) C (0, 3)

D(3, 0) E (4 , 2) F (-1, 2)



Working with Fractions

To add and subtract fractions ______________________

$\frac{3}{5}+\frac{7}{100}=$ $\frac{2}{3}-\frac{5}{8}=$ $2\frac{1}{4}-\frac{7}{12}$

To multiply fractions ____________________________

$\frac{3}{5}\bullet\frac{7}{100}=$ $\frac{2}{3}\bullet\frac{5}{8}=$ $6\frac{1}{8}\left(\frac{9}{11}\right)$

To divide fractions ______________________________

$\frac{3}{5}\div\frac{7}{100}=$ $\frac{2}{3}\div\frac{5}{8}=$ $15\frac{3}{4}\div\left(-\frac{1}{12}\right)$

Find the LCD of:

3 and 4 2 and 7 6 and 8

Adding & Subtracting Integers

<u>Adding:</u>

SAME signs: __________ and _________ same sign

6 + 1 = ____ - 3 + (-7) = ____

DIFFERENT signs:

____________ and keep sign of larger digit.

-3 + 8 = ____ 1 + (-4) = ____

<u>Subtracting: "Add the opposite"</u>

Change subtraction symbol to ____________ and switch sign of _____________ number, then follow rules for adding.

5 – 9 = ____ 2 - (-3) = ___ -4 – 1 = ___

Multiplying & Dividing Integers

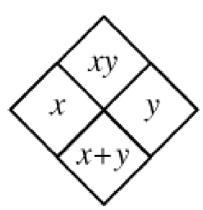
If signs are the same, the answer is ______________

If signs are different, the answer is ______________

$-20\div 2=$____ $-15\div(-5)=$ ______

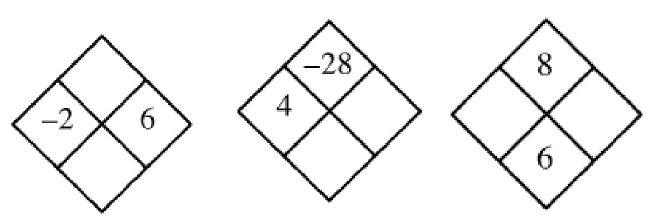
$7\bullet(-3)=$ ______ $-5\bullet(-10)=$ _____

<u>Diamond Problems</u>



Number on top is the _________ of side numbers

Number on bottom is the ______ of the side numbers.



Word Problem Vocabulary

Translate the following into math expressions:

+ Add

x increased by 8 ____________________

The total of m and 9 ____________________

- Subtract/Minus

6 less x ____________________

6 less than x ____________________

× ( ) Multiply

the product of x and 5 ____________________

6 more than twice x ____________________

triple the difference of 10 and w ________________

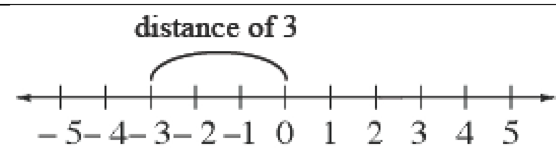
÷ Divide

the quotient of x and 7 _______

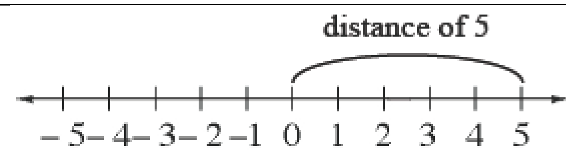
Absolute Value

Absolute Value represents the numerical value of a number without regard to its sign. The symbol for absolute value is two vertical bars, | |. Absolute value can represent the **distance** on a number line between a number and zero. Since a distance is always positive, the absolute value is *always* either a positive value or zero. The absolute value of a number is *never* negative.

For example, the number −3 is 3 units away from 0, as shown on the number line at right. Therefore, the absolute value of −3 is 3. This is written $|-3| = 3$.



Likewise, the number 5 is 5 units away from 0. The absolute value of 5 is 5, written $|5| = 5$.



Solving equations with absolute value:

a. $|-100| - 98$ b. $|6 - 11 + 3|$ c. $-9 - |-2|$ d. $5|6| - 2$ e. $2 \div |3-4|$ f. $11|-6| + 15$

Radical Expressions

Square root is a number multiplied by itself two times. There is an invisible “2” in the symbol notation.

a. $\sqrt{18}$ b. $\sqrt{9}$ c. $-11 - \sqrt{16}$ d. $\sqrt{144}$ e. $\sqrt{3^2}$

The solution to the equation $x^3 = 64$ is called the **cube root** of 64. The idea is similar to the idea of a square root, except that the value must be cubed (multiplied by itself three times) to become 64. One way to write the cube root of 64 is using the notation $\sqrt[3]{64}$. Use this information to evaluate each of the following expressions.

$\sqrt[3]{64}$ b. $\sqrt[4]{16}$ c. $\sqrt[3]{-8}$ d. $\sqrt[3]{125}$ e. $\sqrt[3]{27}$ f. $-19 + \sqrt[3]{-8}$

Unit 1: Functions Toolkit

Functions

A relationship between inputs and outputs is called a **function** if the inputs and outputs behave like a soda machine that is functioning properly.

Output ______ Input _______

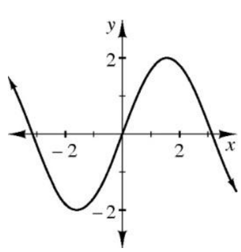
ALL functions have only _____________for every _______________.

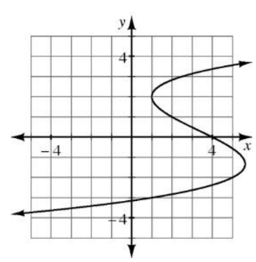
Tables

x	–3	–2	–1	0	-2	5	3
y	0	3	5	7	-3	9	13

x	y
-3	8
-2	-2
3	0
4	-5
-5	-2

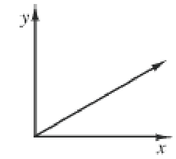
Graphs





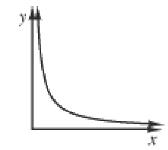
Families of Relations

There are several "families" of special functions that you will study in this course. One of these is called **direct variation** (also called **direct proportion**) which is a **linear** function. The data you gathered in the "Sign on the Dotted Line" lab (in problem 1-9) is an example of a linear relation.



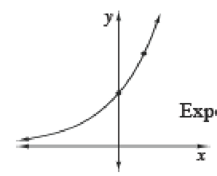
Linear

Another function is **inverse variation** (also called **inverse proportion**). The data collected in the "Hot Tub Design" lab (in problem 1-9) is an example of inverse variation.



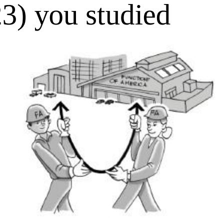
Inverse Variation

You also observed an **exponential** function. The growth of infected people in the "Local Crisis" (in problem 1-9) was exponential.



Exponential

In FUNCTIONS OF AMERICA (1-23) you studied equations that create a family of functions called **quadratics**. The graph of a quadratic function has the shape of a **parabola**. The exponent of 2 determines this curved shape. $y = x^2 - 4x + 5$



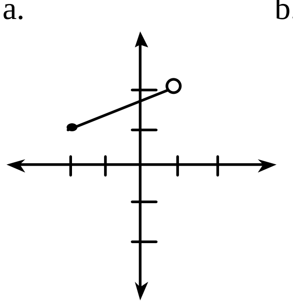
Domain and Range

The set (collection) of numbers that can be used for x in a function and still get an output is called the **domain** of the function. The domain is a description or list of all the possible x-values for the function.

Range: The possible outputs (y-values) is called the **range** of the function.

Describe the domain and range of each function below.

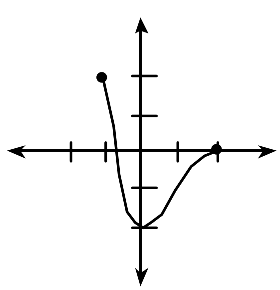
a.



D:

R:

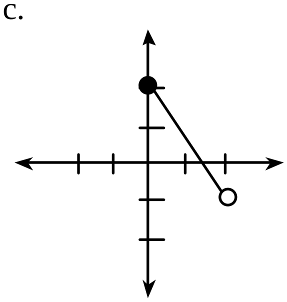
b.



D:

R:

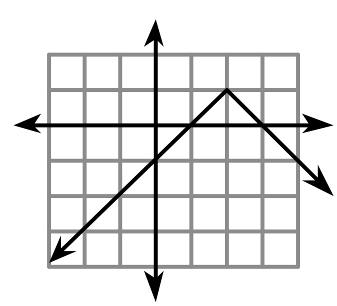
c.



D:

R:

d.



D:

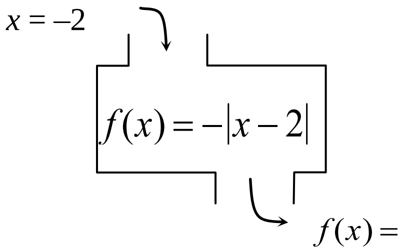
R:

Working with Relations

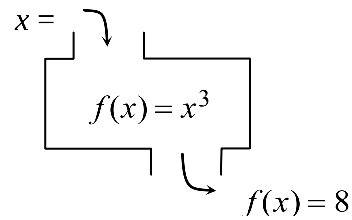
What value is not part of the domain of the function $f(x) = \frac{1}{x-4}$? Why? Explain completely why it is ***excluded***.

Find the missing inputs or outputs. If no input or output is possible, explain why not. Show all work

3.



4.



Evaluating Expressions

For $f(x) = \sqrt{2x-8}$, evaluate each of the following.

a. $f(12)$ b. $f(6)$ c. $f(4)$ d. $f(0)$

Order of Operations

Mathematicians have agreed on an **order of operations** for simplifying expressions.

Original expression:	$(10-3\cdot 2)\cdot 2^2 - \frac{13-3^2}{2} + 6$
Circle expressions that are grouped within **parentheses** or by a **fraction bar**	$(10-3\cdot 2)\cdot 2^2 - \frac{13-3^2}{2} + 6$
Simplify *within* circled terms using the order of operations Evaluate **exponents**.	$(10-3\cdot 2)\cdot 2^2 - \frac{13-3\cdot 3}{2} + 6$
Multiply or divide from **left to right**	$(10-6)\cdot 2^2 - \frac{13-9}{2} + 6$
Combine terms by adding or subtracting from **left to right**.	$(4)\cdot 2^2 - \frac{4}{2} + 6$
Circle the remaining terms:	$4\cdot 2^2 - \frac{4}{2} + 6$
Simplify *within* circled terms using the order of operations as above.	$4\cdot 2\cdot 2 - \frac{4}{2} + 6$ $16-2+6$ 20

a. $3\cdot(-8-2) - 6\cdot 3 + 12$ b. $\dfrac{-4+6(8-3)}{2\bullet 3 - 6\bullet 8}$ c. $15 \div 3\cdot 4 - (8-6)^2 + 6$