Math 3, Classwork 27

WARM UP

1. Rewrite the expressions and do calculations in the column:

a) 847 + 8027 =

b) 8020 – 847 =

c) 5, 082 ÷ 6 =

d) 847 × 240 =

2. In each line, find two pairs of expressions with the same value (circle them):

a) 8,000 ÷ 80	80,000 ÷ 80	800 ÷ 8	8,000 ÷ 800
b) 320 × 200	32 × 200	3,200 × 20	3,200 × 200
c) 284 + 34	294 + 44	274 + 44	264 + 14
d) 901 – 65	801 - 165	911 – 65	911 – 75

REVIEW

Using inverse operations and parenthesis

Parenthesis – a pair of symbols used to enclose sections of mathematical expression. The part of the expression in the parenthesis is calculated FIRST. *Example*: (2 + 7) – 4 = 9 – 4 = 5

Inverse operation – the operation that reverses the effect of another operation.

Example: Addition and subtraction are inverse operations. Start with 7, then add 3 we get 10, now subtract 3 and we get back to 7.

Another Example: Multiplication and division are inverse operations. Start with 6, multiply by 2 we get 12, now divide by 2 and we get back to 6.

3. Make an equation and solve the problems:

a) Julia is thinking of the number. She adds 5 to her number, then divides by 2. Her answer is 6. What number is Julia thinking of?

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b) Victoria is thinking of the number. She multiplies her number by 3, then subtract 2. Her answer is 4. What number is Victoria thinking of?

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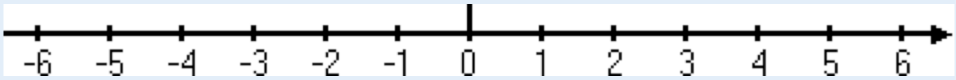
Moving along the number line.



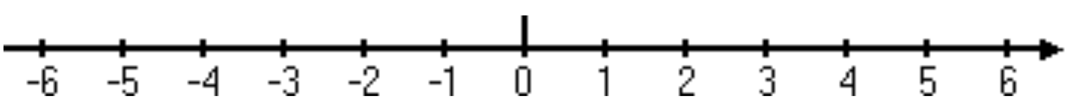
Note the arrowhead on the far right end of the number line above. That arrow tells you the direction in which the numbers are getting bigger. In particular, that arrow also tells you that the negatives are getting *smaller* as they move off to the left. That is, –5 is *smaller* than –4.

4.

Find the points which would be opposite to the following points (reflection over Point 0):

a) 6 →   b)(–3)→   c) 1 →

d) (– 1)→   e) (– 2)→   f) (–5) →

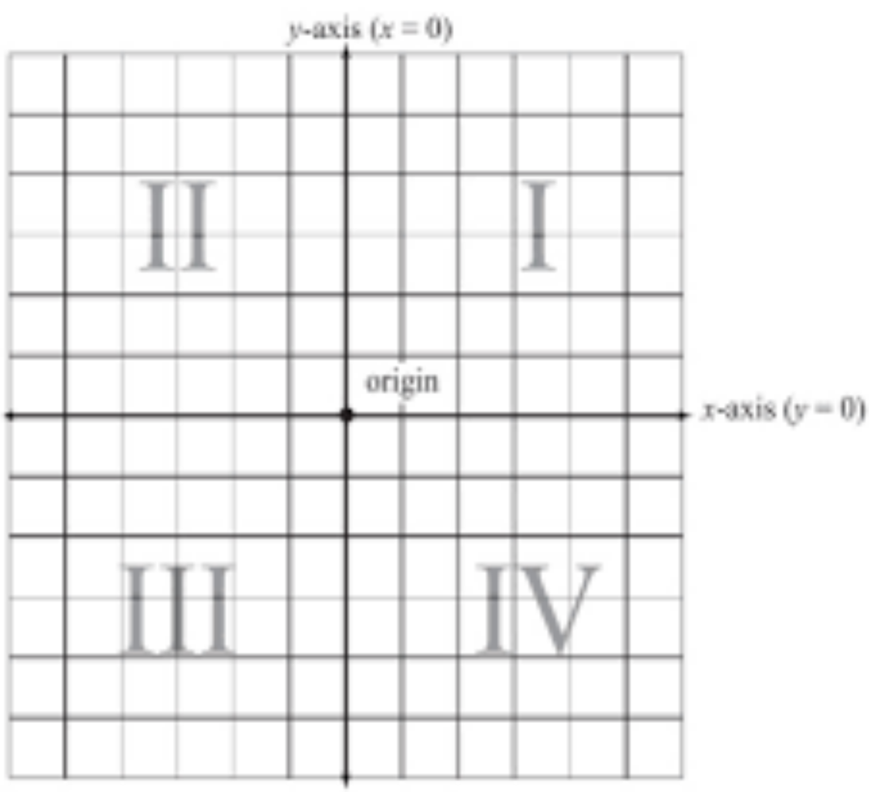


NEW MATERIAL

Coordinate Plane (coordinate graphs)

Each point on a number line is assigned a number. In the same way, each point in a plane is assigned a pair of numbers. These numbers represent the placement of the point relative to two intersecting lines. In **coordinate graphs** two perpendicular number lines are used and are called **coordinate axes.** One axis is horizontal and is called the ***x*□axis.** The other is vertical and is called the ***y*□axis.** The point of intersection of the two number lines is called the **origin** and is represented by the coordinates (0, 0).
Each point on a plane is located by a unique **ordered pair** of numbers called the *coordinates.*
Notice that on the *x*□axis numbers to the right of 0 are positive and to the left of 0 are negative. On the *y*□axis, numbers above 0 are positive and below 0 are negative. Also, note that the first number in the ordered pair is called the ***x*□coordinate,** or **abscissa,** and the second number is the ***y*□coordinate,** or **ordinate.** The *x*□coordinate shows the right or left direction, and the *y*□coordinate shows the up or down direction.

The coordinate graph is divided into four quarters called **quadrants.** These quadrants are labeled in Figure below.



Important:

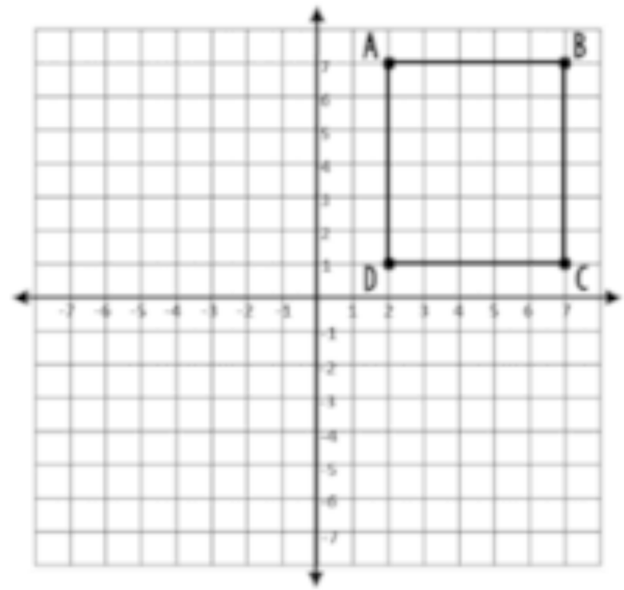
- In quadrant I, *x* is always positive and *y* is always positive.
- In quadrant II, *x* is always negative and *y* is always positive.
- In quadrant III, *x* and *y* are both always negative.
- In quadrant IV, *x* is always positive and *y* is always negative.

5.

a) Find the coordinates of each vertex of a rectangle:

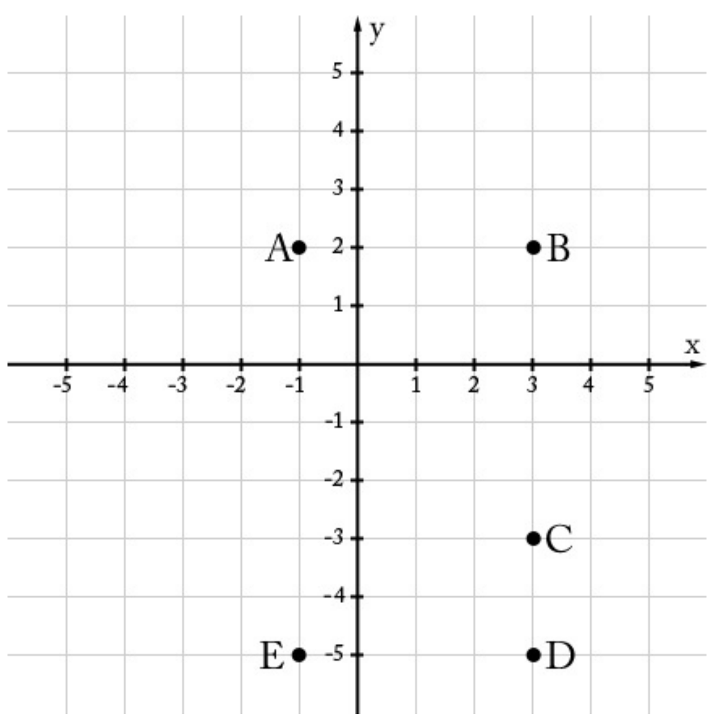
A (,   ), B (,   ), C (,   ), D (,   )

b) Find the length of its sides.



6.

Five points are shown in the coordinate plane below



What are the coordinates of points

A(,   ), B (,   ), C (,   ),

D (,   ), E (,   )?

What is the distance between points A & B? __________

What is the distance between points D & E? __________

What is the distance between points B & C? __________

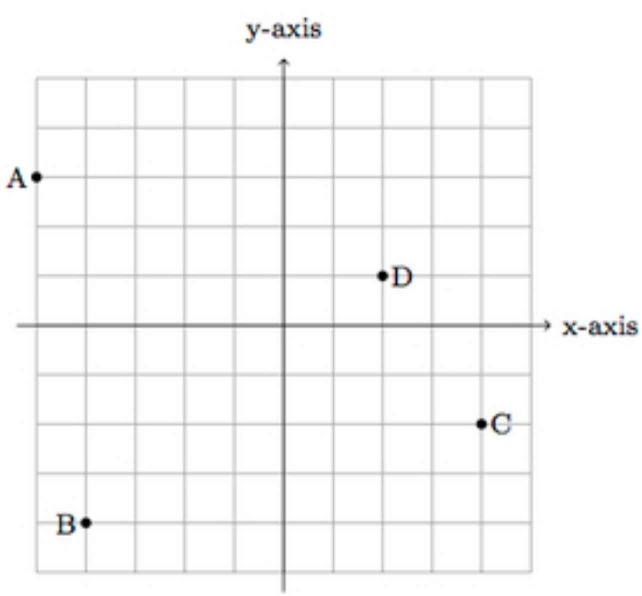
Reflecting points over coordinates

A reflection can be thought of as folding or "flipping" an object over the line of reflection. When you reflect a point across the *x*-axis, the *x*-coordinate remains the same, but the *y*-coordinate is transformed into its opposite (its sign is changed). Imagine that you fold a paper along x-axis.
When you reflect a point across the *y*-axis, the *y*-coordinate remains the same, but the *x*-coordinate is transformed into its opposite (its sign is changed). Imagine that you fold the paper along the y-axis.

The reflection of the point (x,y) across the x-axis is the point $(x,-y)$.

The reflection of the point (x,y) across the y-axis is the point $(-x,y)$.

7. On the coordinate plane below
a) Find the coordinates of the points
b) Reflect the point over the x-axis and find the coordinates of the new points: label the reflection of point A as A', the reflection of B as B', the reflection of C as C', and the reflection of D as D'.



A(,) → A' (,)

B (,) → B' (,)

C (,) → C' (,)

D(,) → D' (,)

Notice that each original point and its image are the same distance away from the line of reflection. You may be able to simply "count" these distances on the grid.

Did you know …

The **coordinate plane** was developed centuries ago and refined by the French mathematician and philosopher René Descartes. He was born in La Haye, France (now named in his honor) on March 31, 1596.
In 17th century, he was also known by the name **Renatus Cartesius.**

Descartes was rather sickly as a child, and as a result, he had to stay in bed for days and weeks at a time.
He was also a precocious young mathematician, so while he lay in bed he often thought about math and philosophy.

According to the legend, one day, as young Rene was lying in his bed, sick, he looked up at his ceiling and saw a fly. As he watched the fly, he realized that he could describe the fly's position by using just two numbers: one number gave the fly's distance from one wall, measured by a perpendicular from the fly to the wall. The other number gave the fly's distance from the other wall, again measured by making a perpendicular from the fly to the other wall.
This story is part of the legends of mathematics. We cannot be certain that it is altogether true, and while I have searched, I have not found an unimpeachable source who claims it is gospel. However, it is an entertaining story, and there could well be some truth to it.

René Descartes has been dubbed the "**Father of Modern Philosophy**", but he was also one of the key figures in the **Scientific Revolution of the 17th Century** and is sometimes considered the first of the modern school of mathematics.

His work was influential to the development of analytic geometry, calculus, and cartography.
Real-life application of Cartesian plane:

- air and sea navigation (planes and ships),
- The addressing system used in New York City (e.g. 47 W 13th St) — essentially a coordinate system, makes it easier to find the address compared to the traditional one where every street has its own name, as you do not have to remember where every street is.
- ***Find your own examples***