Math 3   Classwork 4

WARM-UP

1 Find the results for each expression without calculations:

$67 + 29 - 29 =$ _____ $67 + 29 - 29 + 54 - 54 =$ _____

$54 - 47 + 47 =$ _____ $54 - 47 + 47 + 81 - 81 - 49 + 49 =$ _____

$28 + 69 - 69 =$ _____ $28 + 69 - 69 - 17 + 17 + 53 - 53 =$ _____

2 Compare, using <, = or >

4 tens + 3 ones _____ 4 tens + 2 ones

8 tens + 0 ones _____ 0 tens + 8 ones

2 hundreds + 0 tens + 5 ones _____ 2 hundreds + 5 tens + 0 ones

5 hundreds + 2 ones _____ 50 tens + 2 ones

3 Find the missing number and place it in the box.

$55 + \square = 100$ $44 + \square = 100$ $39 + \square = 100$

$32 + \square = 100$ $67 + \square = 100$ $13 + \square = 100$

New Material

Numbers

Have you ever wondered what our lives would be like without these 10 elegant digits and the infinite array of other numbers that they can create?

Birthdays, ages, heights, weights, dimensions, addresses, telephone numbers, license plate numbers, credit card numbers, PIN numbers, bank account numbers, radio/TV station numbers, time, dates, years, directions, sports scores, prices.

Engineers, accountants, store clerks, manufacturers, cashiers, bankers, stockbrokers, carpenters, mathematicians, scientists, and so on, could not survive without them.

Basic definitions:

Digits - the 10 symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9, used to create numbers in the base 10 decimal number system.

Numerals - the symbols used to denote the natural numbers. The Arabic numerals 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 are those used in the Hindu-Arabic number system to define numbers.

Natural Numbers - the set of numbers, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17..., that we see and use every day. The natural numbers are often referred to as the counting numbers.

Whole Numbers - the natural numbers plus the zero.

Number Sequences.

A **Sequence** is a list of things (usually numbers) that are in order.
When we say the terms are "in order", we are free to define **what order that is**! They could go forwards, backwards ... or they could alternate ... or any type of order we want!

To write a sequence, we should write the list of elements, separated by a comma, and then put curly brackets around the whole thing. {3, 5, 7, ...}

{1, 2, 3, 4, ...} is a very simple sequence of consecutive numbers and it goes forever (**infinite sequence**)
1, 2, 3, 4, ... are "terms" or "elements" or "members" of sequence.

When the sequence goes on forever it is called an **infinite sequence**,
otherwise it is a **finite sequence**.

A Sequence might have a **Rule**, which is a way to find the value of each term.
The pattern rule for the sequence {2, 4, 6, 8, …} is adding 2 to the previous term.
Example: The 10th term of this sequence will be $2 + 2 \times 9 = 20$.

5

a) Write the first 6 terms of sequence, where the first term is 3 and the pattern rule is " add 4 to get the next term": _____
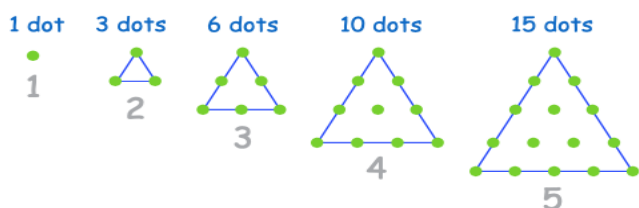
Q: Is this sequence infinite or not?

b) Find a pattern rule. Using this rule find the 11th term in the sequence:{1, 4, 7, 10,… }.
    Rule of the pattern: _____
    11th term: _____

Triangle Numbers

Below are the numbers 1, 3, 6, 10 and 15 pictured in the form of triangles.

Since 1, 3, 6, 10, … can be pictured in the form of a triangle, these numbers are called - **Triangular.**
This is the Triangular Number Sequence: 1, 3, 6, 10, 15, 21, 28, 36, …

To find the next number of the sequence we should simply add another row of dots and count all the dots.
 The first triangle has just one dot.
- The second triangle has another row with 2 extra dots, making $1 + \mathbf{2} = 3$
- The third triangle has another row with 3 extra dots, making $1 + 2 + \mathbf{3} = 6$
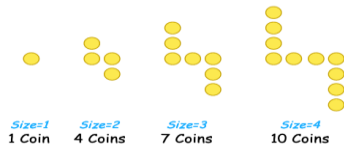- The fourth has $1 + 2 + 3 + \mathbf{4} = 10$ dots, etc.!

6

You are stacking logs. There is enough ground for you to lay 7 logs side-by-side. How many logs can you fit in the stack? Make a diagram with dots to calculate.

7

You can make your own number patterns using coins or matchsticks or buttons. Here is an example using coins:

Size=1   Size=2   Size=3   Size=4
1 Coin   4 Coins   7 Coins   10 Coins

Q: How many coins do you need for Size=5? For size = 6? Draw a diagram if you need.

REVIEW

Basic Objects of Geometry

Point, Line and Plane are basic objects of Geometry. These terms cannot be precisely defined; however, their meaning can be explained through examples.

All other objects are defined using points, lines, and planes.

This is a point P. We define a point as a location. Points do not have size. Points are named by capital letters and is shown by a dot.
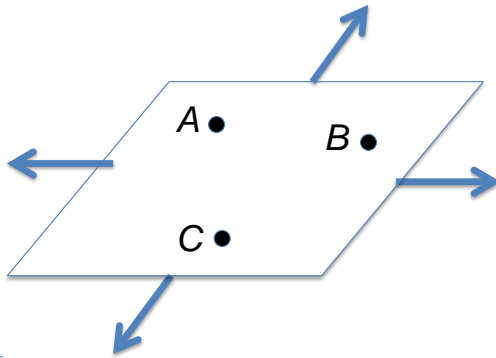
P •

This is a line EF. Line has no beginning point and no end point. Line extends infinitely in two opposite directions.
We label a Line by any 2 points on it $\overleftrightarrow{EF}$ or by any lowercase letter: s

F

E

s

3
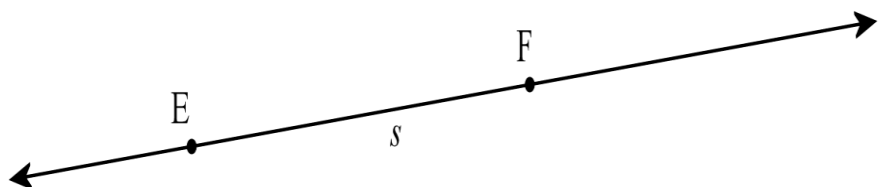
This is a <u>plane</u> ABC or R. A plane is a flat surface. It extends infinitely in all directions. We label a plane by one capital letter R or by 3 points – A, B, C not lying on the same line.

8 Let's imagine that our page is a small part of the plane (remember, that a plane can be extended infinitely in all directions, but our page has four borders which define its size).

a) Using a ruler, draw a line *l* (any line in any direction you want). Put a point A on the line. Now we have two rays in addition of one line.

b) Put another point – B on the line. Now we have a line segment $\overline{AB}$ and two rays – $\overrightarrow{AB}\ and\ \overleftarrow{BA}$, one ray begins at point A and goes to the direction of a point B; another ray begins at point B and goes in the direction of point A.

<u>Ray</u> is a part of a line starting at a particular point and going on forever in one direction. $\overrightarrow{AB}$

<u>Line segment</u> is the part of the line between two given points (including the given points themselves). Line segment is named by its 2 endpoints $\overline{AB}$
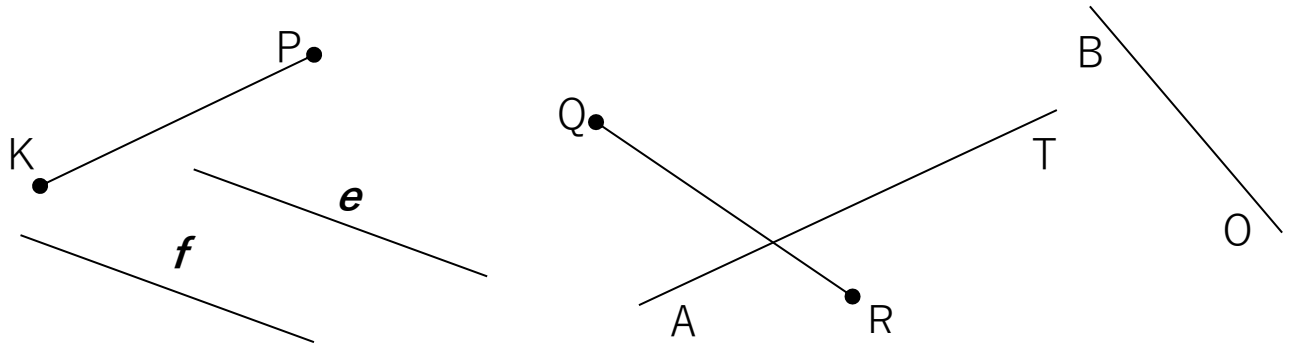
9 Circle the endpoint of each ray. How is the first ray named? Name the other two rays the same way.
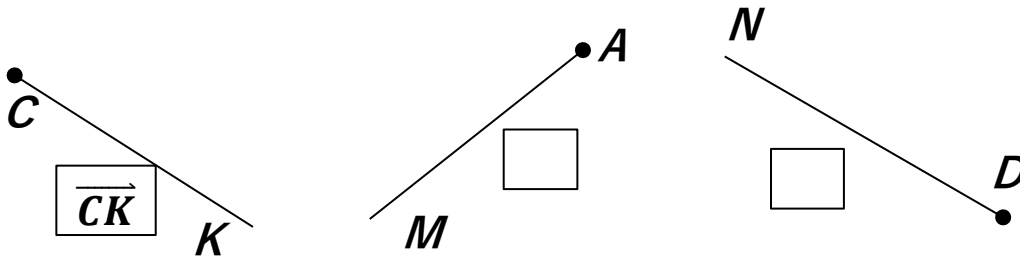
Find straight lines and line segments. How many straight lines and how many line segments did you find?

How many lines?_____   Name them: _____

How many segments?_____   Name them:_____

P

K

B

Q

T

e

O

f

A

R

Question: What mathematical discovery more than 1500 years ago:

• Is one of the greatest, if not the greatest, single discovery in the field of mathematics?

• Was fiercely resisted in Europe for hundreds of years after its discovery?

Answer: Our modern system of positional decimal notation with zero, together with the basic arithmetic computational schemes, which were discovered in India about 500 AD.

Place value is very interesting to think about. Believe it or not, place value is a relatively new notion in mathematics. It took humans 28,000 years to come up with the notion of place value. Before the place value system was invented, symbols had to be repeated to express the right amount.

Modern societies use decimal place-value notation in daily life and commerce. With just 10 symbols—0, 1, 2,…, 9— any number, no matter how big or small in magnitude, can be represented. For example, there are roughly 300,000,000 people in the United States. Or the distance from the earth to the sun is about 150,000,000km.

The decimal place-value system is one of the most significant intellectual constructs of humankind, and it has played a decisive role in the development of mathematics and science.

The story of ZERO: The journey from an abstract idea of "nothing" to the actual number "zero" was a very long one, helped by contribution from civilizations all over the world. Zero was invented independently by the Babylonians, Mayans and Indians. Though ancient civilizations already knew the concept of 'nothing,' they did not have a symbol or letter for it.

Zero soon spread to China and the Middle East. **Mohammed ibn-Musa al-Khwarizmi**, a Persian mathematician, proposed that a small circle be used if no number was being used in the tens place. Later the number system was brought to Europe, around 900 AD, by the Arab traders and was called the Hindu-Arabic system. Till then the Romans did not have zero in their number system. Zero is now an integral part of mathematics all over the world.