Math 4. Class Work 2

Natural numbers: In this part of our course, we discuss natural numbers, which are used for counting and start from 1: 1, 2, 3, and so on. I will omit the word 'natural' and use 'number'.

Multiplication is an arithmetic operation equivalent to the repetitive addition of the same number.

$$c \times b = \underbrace{c + c + c + \cdots + c}_{b\ times} = \underbrace{b + b + b + \cdots + b}_{c\ times} = a$$

The result of multiplication is called the *product*, and the participants in the operation are called *factors*. c and b are factors, and a is a product.

$$\overset{\text{factor}}{\searrow} \quad \overset{\text{factor}}{\swarrow} \qquad\qquad \overset{\text{product}}{\nwarrow}$$
$$5 \cdot 3 = 5 + 5 + 5 = 3 + 3 + 3 + 3 + 3 = 15$$

Division is closely connected to multiplication; when we perform division of a number (this number is called the *dividend*) by a *divisor*, we are seeking a number (a *quotient*) that, when multiplied by the divisor, gives us the dividend.
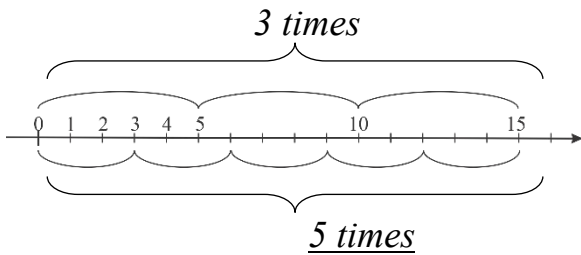

3 times

5 times

If there is a number c, that $c \times b = a$, then we can say that $a \div b = c$. This means that a **is divisible by** b, and b can be "fit" into a a whole number of times. c is also a factor of a, $a \div c = b$.

For example: $3 \times 5 = 15$; $\quad 15 \div 3 = 5$, $\quad 15 \div 5 = 3$
$\Rightarrow$ 5 can fit into 15 exactly 3 times, and 3 can go into 15 exactly 5 times $\Rightarrow$ 15 is divisible by 3 and by 5.

If there is no number such that the divisor enters the dividend several times, then we can say that this number **is not divisible by the divisor**. In such cases, we can <u>use division with a remainder.</u>
For example: $15 \div 4 = 3\ with\ a\ remainder\ of\ 3$
$15 : 4 = 3R(3)$, or $15 = 4 \times 3 + 3$

3 units

3 times
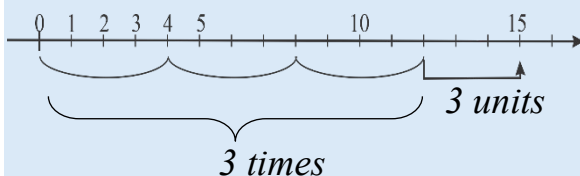
$$\overset{\nearrow}{dividend} \quad \overset{a:b=c}{\underset{\uparrow}{}} \quad \overset{\nwarrow}{}$$
$$divisor \quad quotient$$

$$\overset{\nearrow}{dividend} \quad \overset{a=b \cdot c + r}{\underset{\uparrow}{}} \quad \overset{\nwarrow}{remainder}$$
$$divisor \quad quotient$$

Why can't we divide by 0? By definition, multiplying 0 by anything results in 0. Dividing by 0 would imply that there is a number that, when multiplied by 0, does not yield 0. But this is impossible. So, division by 0 <u>is undefined</u>; it simply does not exist, and we cannot perform such an operation!

1. Division with remainder. Write the answer in the form $a : b = cR(r)$.
Example: $25 : 4 = 6R(1);$ $\qquad 28 : 7 = 4R(0)$

$\qquad$ 76 : 9 $\qquad\qquad\qquad\qquad\qquad$ 231 : 15 $\qquad\qquad\qquad\qquad\qquad$ 622 : 9

2. Claus has \$2. How many 27-cent chocolate bars can he buy?

3. A plastic bag may hold 15 cans of yogurt without tearing. How many plastic bags are needed to carry 72 cans of yogurt?

Divisibility rules: help predict whether a given number is divisible by 2, 3, 4, and so on

4. Divisibility rules:
- any natural number is divisible by 1

- a number is divisible by 2 if it ends in an even digit (0,2,4,6,8(
  Underline numbers divisible by 2: 25, 36, 80, 47

- a number is divisible by 3 if the sum of its digits is divisible by 3
  Underline numbers divisible by 3: 87, 34, 57, 91

- a number is divisible by 5 if it ends in 0 or 5
  Underline numbers divisible by 5: 25, 40, 56, 75

- a number is divisible by 9 if the sum of its digits is divisible by 9
  Underline numbers divisible by 9: 45, 49, 91, 135

- a number is divisible by 11 if the alternating sum (+ - + ...) of its digit is divisible by 11
  Example: is number 517 divisible by 11?
  $5 - 1 + 7 = 11.$ 11 is divisible by 11, so 517 is also divisible.

  Underline numbers divisible by 11: 121, 144, 567, 242

In addition:

- a number is divisible by 4 if the number formed by the last 2 digits is divisible by 4.
- a number is divisible by 6 if it is divisible by both 2 and 3. Explain why!
- a number is divisible by 7 if the result of subtracting twice the last digit from the remaining part of the number is also divisible by 7.
- A number is divisible by 8 if and only if the number formed by the last 3 digits is divisible by 8
- What can you say about the divisibility rule for division by 10? Write it here: _____
- What can you say about the divisibility rule for division by 12?

5. Number a is divisible by 5. Is the product $a \cdot b$ divisible by 5?

6. Without calculating, establish whether the product is divisible by a number.

a. $508 \cdot 12 \; by \; 3$ b. $85 \cdot 3719 \; by \; 5$
c. $2510 \cdot 74 \; by \; 37$ d. $45 \cdot 26 \cdot 36 \; by \; 15$
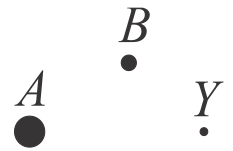e. $210 \cdot 29 \; by \; 3, by \; 29$ f. $3800 \cdot 44 \cdot 18 \; by \; 11, 100, 9$

Geometry

Point (an undefined term).

   In geometry, a point has no dimension (actual size). A point is an exact position or location on a plane surface. A point is not a thing, but **a place** and it has no width, or thickness. Our dot can be very tiny or very large and it still represents a point. A point is usually named with a capital letter.
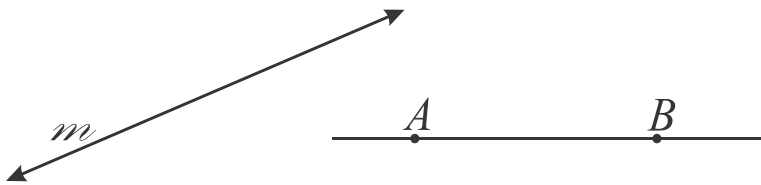
B

A Y

Line (an undefined term).

A line has no beginning point or end point. Imagine it continuing indefinitely in both directions.

A line has no thickness.

A line is drawn as a straight line (unless it is indicated that the line is not straight) with two arrowheads (or without them), indicating that the line extends without end in both directions.
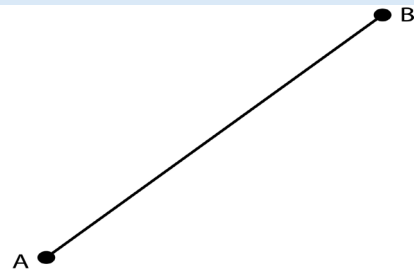
m

A B

A line is named by a single lowercase letter (*m*), or by any two points on the line, $\overleftrightarrow{AB}$ or AB.
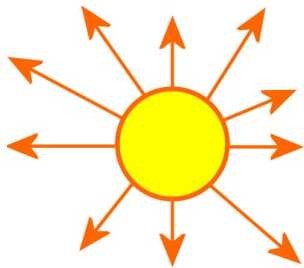
We get a **line segment** when two points are connected with a straight line,

A **line segment** is also a part of a straight line between two chosen points. These points are called endpoints.
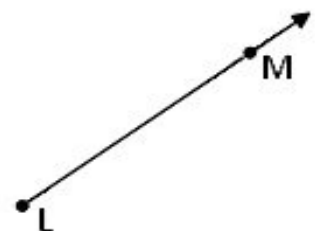
A segment is called by its endpoints, **segment $\overline{AB}$**

B

A

A **ray** is a part of a straight consisting of a point (endpoint) And all points of the straight line at one side of an endpoint.

A **ray** is named by endpoint and any other point, **ray $\overrightarrow{AB}$** or AB(where A is an endpoint)

A   B

Ray

M

L

7. Draw two line segments, AB and CD, in such a way that they intersect

    a. by a point

    b. by a segment

    c. don't intersect at all.

8. Using a ruler, draw a straight line, and put 3 points - A, B, and C - on it so that two rays are formed, ray *BC* and ray *BA*.

Remember the differences between the three:

SEGMENT

RAY

LINE