Classwork 19. Algebra.

Algebra.

Inequalities.

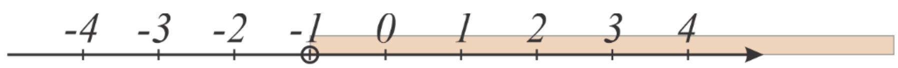
There is another type of problems, when we need ti find all possible values of varible which are greater (or smalle) than a particular number. In more sofisticated case, for which values of variable, one expression is greater (smaller) than another expression, for example:

$$x + 3 > 2x - 5$$

The simplest inequality is

$$x > a, \qquad x < a, \qquad where\ x\ is\ variable\ and\ a\ is\ a\ number.$$

$x > -1$, the solution is all x, greater than 1,



Solution can be shown graphically are as $x\epsilon(-1, +\infty)$, or can be leaved as it is, it's already a solution (similarly as a solution of an equation $x = 2.$)

We can add any number to both part of the inequality, the sign (< or >) will not change:

$x > -1$

$x + 2 > -1 + 2 \Rightarrow x + 2 > 1$

$y - 3 < 5$

$y - 3 + 3 < 5 + 3$

$y < 8, \qquad y \in (-\infty, 8)$

1. $x + 3 > -5$

Now let's try to multiply or divide both part of the inequality by the positive number.

If $x > 3$, then $2x$ will be grater then 6.

$x > 3\,, \qquad 2x > 6$

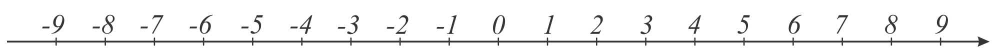
If $x > 3$ what can we tell about $-x$?

$-x \qquad 3 \cdot (-1)$

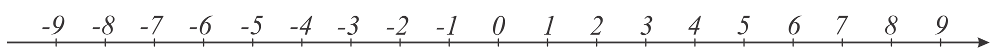
2. $x + 3 > 5x - 5$
3. $4\text{x} - 3 \neq 0$
4. $3(\text{x} - 1) < 5\text{x} + 9$
5. $2x - 1 > -x + 3$
6. $|x| > 8$

7. Show on the number line points that are satisfying the following inequalities:

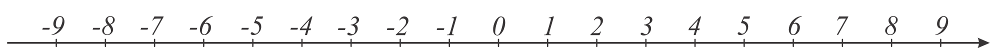
a) $|x| < 4$



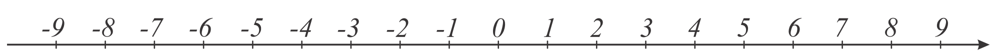
b) $|x| > 3$



c) $\left|x - \frac{1}{2}\right| > 3$



d) $\left|x - \frac{1}{2}\right| < 8$



8. $M = \{x \mid x > 5\}$, $K = \{x \mid x < 20\}$

   $M \cap K =$

   $M \cup K =$

9. $M = \{x \mid x \leq 5\}$, $K = \{x \mid x \geq 20\}$

   $M \cap K =$

   $M \cup K =$

10. Points a, 0, and b are marked on the number line below:

Which of the following expressions is true?

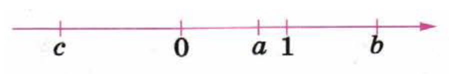
1) $a + b > 0$ or $a + b < 0$

2) $a - b > 0$ or $a - b < 0$

3) $ab > 0$ or $ab < 0$

4) $\frac{b}{a} > 1$ or $\frac{b}{a} < 1$

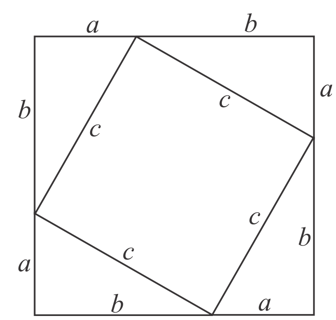
11. Points a, b, c, 0, and 1 are marked on the number line below:



Which of the following expressions is true?

1) $ab < b \; or \; ab > b$
2) $abc < a \; or \; abc > a$
3) $-ac < c \; or - ac > c$

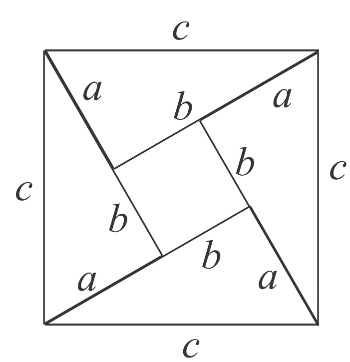
Pyphagorian theorem.



4 identical right triangles are arranged as shown on the picture. He area of the big square is $S = (a + b) \cdot (a + b) = (a + b)^2$, the are of the small square is $s = c^2$. The area of 4 triangles is $4 \cdot \frac{1}{2} ab = 2ab$. But also cab be represented as $S - s = 2ab$

$2ab = (a + b) \cdot (a + b) - c^2 = a^2 + 2ab + b^2 - c^2$

$\Rightarrow \qquad a^2 + b^2 = c^2$



12. The legs of a right triangle are 3, 4 cm. What is the hypotenuse.
13. The legs of a right triangle are 5 and 8 cm. What is hypotenuse?
14. Hypotenuse of a right triangle is 12 cm and the leg is 10 cm. Find another leg.