

MATH 6

HOMEWORK2: SOLVING EQUATIONS AND INEQUALITIES

SOLVING INEQUALITIES INVOLVING NEGATIVE NUMBERS

Today we discussed inequalities and their solutions, discussing how one solves inequalities involving negative numbers. The rule here is

$$a < b \iff (-a) > (-b)$$

(note that the sign of inequality is reversed!). For example, $3 < 5$, but $-3 > -5$.

More generally, if we multiply or divide both sides of an inequality by a negative number, we need to change the sign of inequality, replacing $<$ by $>$ and vice versa. For example, to solve $-3x > -6$, we divide both sides by -3 and change $>$ to $<$, giving $x < 2$.

PRODUCTS

The following rules are frequently used when dealing with equations or inequalities where the left-hand side is a product of two factors:

- A product of two numbers is zero if and only if one of them is zero:

$$ab = 0 \iff (a = 0) \text{ OR } (b = 0)$$

- A product of two numbers is positive if and only if both numbers are positive or both numbers are negative:

$$ab > 0 \iff (a > 0 \text{ AND } b > 0) \text{ OR } (a < 0 \text{ AND } b < 0)$$

- A product of two numbers is negative if and only if one of numbers is positive and the other one is negative:

$$ab < 0 \iff (a > 0 \text{ AND } b < 0) \text{ OR } (a < 0 \text{ AND } b > 0)$$

HOMEWORK

1. (This problem is for students who have some difficulty with negative numbers and need extra practice).

Compute the following expressions:

$-3 - (-2)$	$-3 - 3$	$((-4) \times 6) - 7$
$(-6) \div (-2) + 3$	$(-2) \div (-3)$	$(-4) \times (-7) \div (+9)$
$(-4) - (-3) + (-5)$	$(-6) + (-2) \div (-3)$	

2. Solve the following inequalities

(a) $-x < 2$	(b) $2 - 3x > 5$	(c) $3x + 1 < 5x + 7$
(d) $1 + 5x < 3x$	(e) $x - 1 < x - 7$	

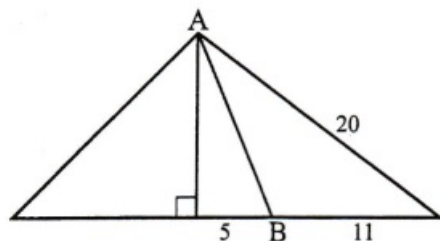
3. Solve the following equations and inequalities:

(a) $(x - 1)(x - 2) = 0$ (b) $x(x + 1) < 0$ (c) $\frac{1}{x} > 2$ [Hint: multiply by x]
(d) $x^2 - 4 = 0$ (e) $\frac{x}{x+1} > 1$ [Hint: consider separately two cases: $x + 1 > 0$ and $x + 1 < 0$]

4. In the figure below, each symbol stands for a number. The sum of numbers in each column or row is written next to the column or row — except for the second column, where the sum is not known. Can you find this missing sum?

⊙	☆	▲	▲	96
▲	⊙	⊙	⊙	92
☆	☆	☆	▲	140
⊙	▲	⊙	☆	108
108	?	108	96	

5. Old MacDonald raises sheep and chickens on his farm. His livestock has a total of 55 heads and 142 legs among them (not counting the farmer!). How many chickens and how many sheep does he have?
6. Mr. Sim jogs at 9 km per hour over a certain distance and walks back the same distance at 6 km per hour. What is his average speed? [Hint: the answer $(6 + 9)/2 = 7.5$ is wrong!].
7. Show that in a class of 40 students, there must be two students whose birthdays are less than 10 days apart. ‘
8. January 1, 2018 was a Monday. What is the next year in which January 1 will fall on a Monday? (Mathcounts)
9. Find AB (Mathcounts).



10. Three cubes are stacked as shown. If the cubes have edge 1, 2 and 3 what is AB? (Mathcounts)

