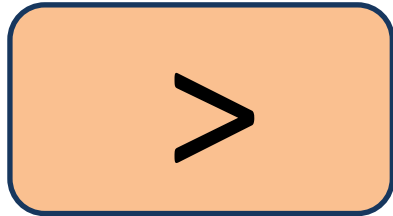# Inequalities Guide Notes   Math 6
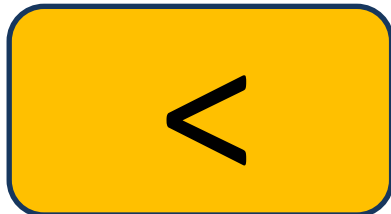
Inequality

An inequality is a statement that compares two or more quantities.
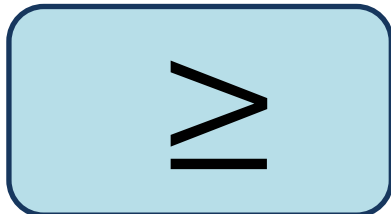
The comparison of quantities involves one of the four symbols below:
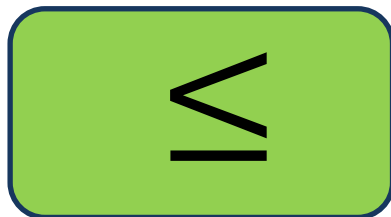
| > | "greater than" |

| < | "less than" |

| ≥ | "greater than or equal to" |

| ≤ | "less than or equal to" |

Inequality symbols **>** and **<** are **NON-STRICT**.

Inequality symbols ≥ and ≤ are **STRICT**
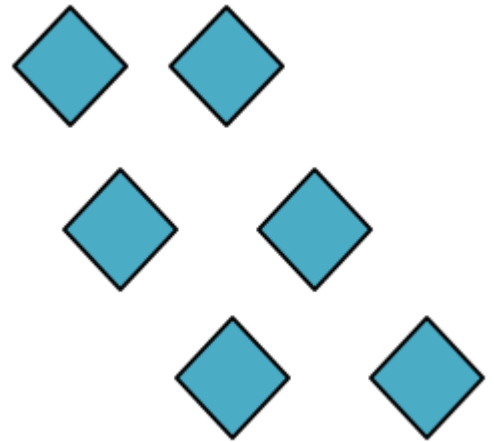
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Inequalities Guide Notes

Math 6

Problem 1:

Compare the two quantities and insert the correct inequality in the box below.

1.

Solution: >

2.

-7   -2

Solution: <

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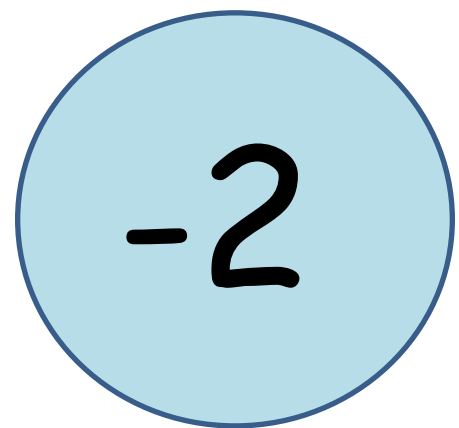
Inequalities Guide Notes   **Math 6**

The Meaning of Inequality Symbols

The statements below illustrate the meaning of the inequality symbols.

Statements	Read as:	Meaning
$x > 7$	"x is greater than 7"	"x" can be of any value as long as it is greater than 7. Some of the values can be 8, 11, 15, etc.
$x < -5$	"x is less than -5"	"x" can be of any value as long as it is less than -5. Some of the values can be -6, -7, -13, etc.
$x \geq 1$	"x is greater than or equal to 1"	"x" can be of any value as long as it is greater than or equal to 1. Some of the values can be 1, 2, 14, etc.
$x \leq -8$	"x is less than or equal to -8"	"x" can be of any value as long as it is less than or equal to -8. Some of the values can be -8, -9, -14, etc.

Problem 2:

Give the meaning of the inequality statement $x \geq 9$, and determine 3 possible values for x.

Solution:
"x" can be of any value as long as it is greater than or equal to 9.
x can be 9, 10, 11, etc.

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Inequalities Guide Notes

Math 6

Writing Inequalities

The table below shows the words that represent inequalities.

$<$	$>$	$\leq$	$\geq$	$\neq$
➢ less than	➢ greater than	➢ less than or equal	➢ greater than or	➢ is not equal to
➢ is under	➢ is more than	to	equal to	➢ is not the same
➢ is below	➢ above	➢ maximum	➢ minimum	as
➢ is lower than	➢ over	➢ bottom	➢ top	➢ is different
➢ is fewer than	➢ larger than	➢ is not greater than	➢ is not less than	from
➢ shorter than	➢ exceeds	➢ is at most	➢ is at least	➢ differs from
➢ smaller than	➢ increased	➢ is no more than		
➢ beneath	➢ longer than			
➢ a better deal	➢ is higher than			

Problem 3:

Rewrite the given verbal statements into its corresponding inequality statement.

A. The sum of x and 16 is greater than or equal to 32. $x + 16 \geq 32$

B. The product of 13 and x is less than 36. $13x < 36$

C. The difference of x and 9 is greater than 21. $x - 9 > 21$

D. The ratio of x and 4 is less than or equal to 15. $\dfrac{x}{4} \leq 15$

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TRUE or FALSE Inequality Statements

In determining whether a given inequality statement is TRUE or FALSE, the process of **substitution** is involved. The variable is replaced by a given number and the resulting statement can either be true or false.

If the resulting statement is TRUE, then the given number is a solution to the given inequality statement. Below is an example:

Example: Determine whether the given inequality statement below is TRUE or FALSE.

Is $x + 5 > 7$, if $x = 3$?

Step 1: Substitute the given value of x to the inequality statement.

$$x + 5 > 7, x = 3 \quad \longrightarrow \quad (3) + 5 > 7$$

Step 2: Perform the necessary operation.

$$(3) + 5 > 7 \quad \longrightarrow \quad 8 > 7$$

Step 3: Decide whether the given inequality statement is TRUE or FALSE based on the resulting statement.

$$8 > 7 \text{ is } \textbf{TRUE!}$$

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Inequalities Guide Notes   **Math 6**

Problem 4:

Is $x - 8 \leq -3$, if $x = 6$?

Solution:
Step 1: $x - 8 \leq -3$, $x = 6$
 $(6) - 8 \leq -3$
Step 2: $(6) - 8 \leq -3$
Step 3: $-2 \leq -3$ is FALSE because -2 is greater than -3.

Graphing Inequalities on a Number Line

An inequality is a set of points that can be represented on a number line. The inequality is either represented as an open circle or a closed circle.

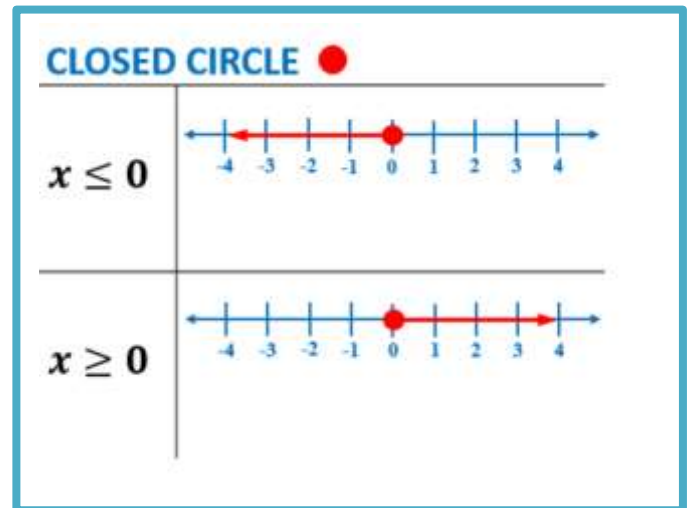Looking at the illustration below, the following interpretations can be obtained:

An **OPEN CIRCLE** indicates that the number on the other side of the inequality is not part of the solution.
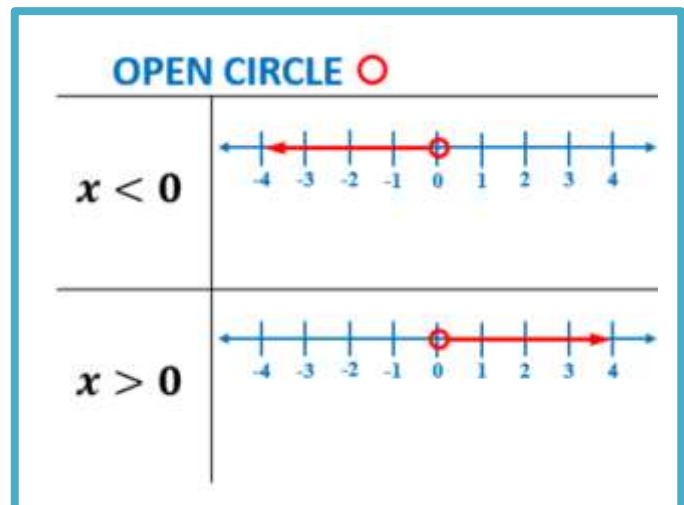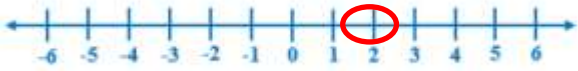
Inequalities Guide Notes

Math 6

CLOSED CIRCLE 🔴

A **CLOSED CIRCLE** indicates that the number on the other side of the inequality is a part of the solution.

$x \leq 0$

$x \geq 0$

How are inequalities graphed on a number line?

Below are the steps involved in graphing inequalities on a number line.

Graph the inequalities $y > 2$ and $y \geq 2$ on a number line.

	$y > 2$	$y \geq 2$
Step 1	Determine the number on the other side of the inequality. In this case, it is **2**.	Determine the number on the other side of the inequality. In this case, it is **2**.
Step 2	Construct a number line and draw a circle around that number.	Construct a number line and draw a circle around that number.

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Inequalities Guide Notes

Math 6

Step 3	Leave the circle open because **2** cannot be a value of *y*. It's not a part of the solution.	Shade the circle because **2** can be a value of *y*. It is a part of the solution.
Step 4	Shade ALL numbers that can be part of the solution. In this case, $y > 2$, so ALL numbers to the right of 2 must be shaded.	Shade ALL numbers that can be part of the solution. In this case, $y \geq 2$ so ALL numbers to the right of 2 must be shaded.

Problem 5:

Graph each inequality given below.

A. $x < -5$

B. $x \geq 3$

C. $x > -4$

D. $x \leq 8$

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Inequalities Guide Notes   **Math 6**

Solution:

A. $x < -5$

B. $x \geq 3$

C. $x > -4$

D. $x \leq 8$

Inequalities in Real World

The concept of inequalities is very useful in real life context. This can be applied in comparing which temperature is warmer, speed limit when driving, minimum payments for credit cards, etc.

The table below shows the application of inequalities in real life context and its corresponding mathematical inequality statements.

Real-life Situations	Mathematical Inequality Statements
Temperature	Temperature needed to bake a cake is $> 180°$
Credit Card Payment	Credit card payment is $\geq 10\%$ of the total amount due.
Time Traveled	The time it takes to travel from home to school is $<$ an hour.
Speed Limit	Speed limit on a highway is ≤ 70 miles/hr.

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Inequalities Guide Notes

Math 6

Problem 6:

Which is warmer, -11 °C or 0 °C?

Solution: 0 °C is warmer than -11 °C.