



Lesson 23: True and False Number Sentences

Inequality Symbols

Student Outcomes

- Students explain what the equality and inequality symbols including $=$, $<$, $>$, \leq , and \geq stand for. They determine if a number sentence is true or false based on the given symbol.

Opening Exercise

Determine what each symbol stands for and provide an example.

Symbol	What the Symbol Stands For	Example
=	is equal to	$2 = 2$
>	greater than	$5 > 2$
<	less than	$4 < 8$
\leq	less than or equal to	$2 \leq 4$ or $2 \leq 2$
\geq	greater than or equal to	$5 \geq 3$ or $6 \geq 6$

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Example 1

For each inequality or equation your teacher displays, write the equation or inequality, then substitute 3 for every x . Determine if the equation or inequality results in a true number sentence or a false number sentence.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

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$5 + x = 8$	True	$5 + 3 = 8$ $\quad \quad \quad \checkmark$ $\quad \quad \quad 8 = 8$
$5x = 8$	False	$5 \cdot 3 = 8$ $15 \neq 8$
$5 + x > 8$	False	$5 + 3 > 8$ $8 > 8$
$5x > 8$	True	$5 \cdot 3 > 8$ $15 > 8$
$5 + x \geq 8$	True	$5 + 3 \geq 8$ $8 \geq 8$

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Exercises

Substitute the value into the variable and state (in a complete sentence) whether the resulting number sentence is true or false. If true, find a value that would result in a false number sentence. If false, find a value that would result in a true number sentence.

1. $4 + x = 12$. Substitute 8 for x . True False = $x = 6$
 $12 = 12$ When substituting 8 for x , it is true because $4 + 8 = 12$.
2. $3g > 15$. Substitute $4\frac{1}{2}$ for g . False True = $g = 5$
 When substituting $4\frac{1}{2}$ for g , it is false because $13\frac{1}{2}$ is less than 15.
3. $\frac{f}{4} < 2$. Substitute 8 for f .
4. $14.2 \leq h - 10.3$. Substitute 25.8 for h .
5. $4 = \frac{8}{d}$. Substitute 6 for d .

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6. $3 > k + \frac{1}{4}$. Substitute $1\frac{1}{2}$ for k .

7. $4.5 - d > 2.5$. Substitute 2.5 for d .

8. $8 \geq 32p$. Substitute $\frac{1}{2}$ for p .

9. $\frac{w}{2} < 32$. Substitute 16 for w .

10. $18 \leq 32 - b$. Substitute 14 for b .

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Lesson Summary

Number Sentence: A *number sentence* is a statement of equality (or inequality) between two numerical expressions.

Truth Values of a Number Sentence: A number sentence that is an equation is said to be *true* if both numerical expressions evaluate to the same number; it is said to be *false* otherwise. True and false are called *truth values*.

Number sentences that are inequalities also have truth values. For example, $3 < 4$, $6 + 8 > 15 - 12$, and $(15 + 3)^2 < 1000 - 32$ are all true number sentences, while the sentence $9 > 3(4)$ is false.

Problem Set

Substitute the value into the variable and state (in a complete sentence) whether the resulting number sentence is true or false. If true, find a value that would result in a false number sentence. If false, find a value that would result in a true number sentence.

1. $3\frac{5}{6} = 1\frac{2}{3} + h$. Substitute $2\frac{1}{6}$ for h .

2. $39 > 156g$. Substitute $\frac{1}{4}$ for g .

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3. $\frac{f}{4} \leq 3$. Substitute 12 for f .

4. $121 - 98 \geq r$. Substitute 23 for r .

5. $\frac{54}{q} = 6$. Substitute 10 for q .

Create a number sentence using the given variable and symbol. The number sentence you write must be true for the given value of the variable.

6. Variable: d Symbol: \geq The sentence is true when 5 is substituted for d .

$$d + 2 \geq 3$$

7. Variable: y Symbol: \neq The sentence is true when 10 is substituted for y .

8. Variable: k Symbol: $<$ The sentence is true when 8 is substituted for k .

9. Variable: a Symbol: \leq The sentence is true when 9 is substituted for a .

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Exit Ticket

Substitute the value for the variable and state (in a complete sentence) whether the resulting number sentence is true or false. If true, find a value that would result in a false number sentence. If false, find a value that would result in a true number sentence.

1. $15a \geq 75$. Substitute 5 for a .

2. $23 + b = 30$. Substitute 10 for b .

3. $20 > 86 - h$. Substitute 45 for h .

4. $32 \geq 8m$. Substitute 5 for m .

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Lesson 24: True and False Number Sentences

Classwork

Opening Exercise

State whether each number sentence is true or false. If the number sentence is false, explain why.

1. $4 + 5 > 9$ **False**
9 is not greater than 9
2. $3 \cdot 6 = 18$
3. $32 > \frac{64}{4}$
4. $78 - 15 < 68$
5. $22 \geq 11 + 12$

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Example 1

Write true or false if the number substituted for g results in a true or false number sentence.

Substitute g with	$4g = 32$	$g = 8$	$3g \geq 30$	$g \geq 10$	$\frac{g}{2} > 2$	$g > 4$	$30 \geq 38 - g$	$g \geq 8$
8	T							
4	F							
2								
0								
10								

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Exercises

Complete the following problems in pairs. State when the following equations and inequalities will be true and when they will be false.

1. $15c > 45$

True when c is 4 or greater.

False when c is 3 or less

2. $25 = d - 10$

3. $56 \geq 2e$

4. $\frac{h}{5} \geq 12$

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5. $45 > h + 29$

6. $4a \leq 16$

7. $3x = 24$

Identify all equality and inequality signs that can be placed into the blank to make a true number sentence.

8. $15 + 9 \underline{\hspace{1cm}} 24$

$24 =$ $=$ or \geq or \leq

9. $8 \cdot 7 \underline{\hspace{1cm}} 50$

10. $\frac{15}{2} \underline{\hspace{1cm}} 10$

11. $34 \underline{\hspace{1cm}} 17 \cdot 2$

12. $18 \underline{\hspace{1cm}} 24.5 - 6$

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Problem Set

State when the following equations and inequalities will be true and when they will be false.

1. $36 = 9k$

True when
False when

2. $67 > f - 15$

3. $\frac{v}{9} = 3$

4. $10 + b > 42$

5. $d - 8 \geq 35$

6. $32f < 64$

7. $10 - h \leq 7$

8. $42 + 8 \geq g$

9. $\frac{m}{3} = 14$

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Exit Ticket

State when the following equations and inequalities will be true and when they will be false.

1. $5g > 45$

2. $14 = 5 + k$

3. $26 - w < 12$

4. $32 \leq a + 8$

5. $2 \cdot h \leq 16$

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