

Translate The Sentence Into An Inequality.Twice The Difference Of A Number And 7 Is At Most 30.Use The

Translate The Sentence Into An Inequality.Twice The Difference Of A Number And 7 Is At Most 30.Use The guide to understanding how to convert verbal statements into algebraic inequalities is an essential skill in mathematics. Whether you're a student learning algebra for the first time or someone brushing up on foundational math concepts, mastering this process can help you solve real-world problems effectively. In this article, we will walk through the steps to translate the sentence "Twice the difference of a number and 7 is at most 30" into an inequality, explore related concepts, and provide practical examples to solidify your understanding.

Understanding the Components of the Sentence

Before translating the sentence into an inequality, it's crucial to dissect its components carefully.

Identifying the Variables

- The phrase "a number" indicates the variable involved, typically represented as x .
- Since the sentence does not specify the number, we assign x to represent the unknown number.

Breaking Down the Sentence

- "Twice the difference of a number and 7" refers to multiplying 2 by the difference between x and 7.
- "Is at most 30" indicates that this value is less than or equal to 30.

Step-by-Step Translation Process

Let's proceed step by step to convert the verbal statement into its algebraic inequality form.

Step 1: Express the Difference of a Number and 7

Mathematically, this is written as:

$$\begin{aligned} & \backslash[\\ & x - 7 \\ & \backslash] \end{aligned}$$

Step 2: Multiply the Difference by 2

This gives:

$$\begin{aligned} & \backslash[\\ & 2(x - 7) \\ & \backslash] \end{aligned}$$

Step 3: Interpret "Is at Most 30"

The phrase "at most" indicates an inequality where the expression is less than or equal to 30:

$$\begin{aligned} & \backslash[\\ & 2(x - 7) \leq 30 \\ & \backslash] \end{aligned}$$

Resulting Inequality:

$$\begin{aligned} & \backslash[\\ & 2(x - 7) \leq 30 \\ & \backslash] \end{aligned}$$

This is the algebraic inequality that models the original sentence.

Understanding Inequalities and Their Symbols

Inequalities are expressions that compare two quantities, indicating that one is less than, greater than, or equal to the other. The common inequality symbols include:

- $<$: less than
- $\leq$: less than or equal to
- $>$: greater than
- $\geq$: greater than or equal to

In our case, since the phrase "at most" corresponds to "less than or equal to," we use the $\leq$ symbol.

Solving the Inequality

Once the inequality is written, solving it involves finding the range of x that satisfies the condition.

Step 1: Expand the Inequality

$$\begin{aligned} & 2(x - 7) \leq 30 \\ & 2x - 14 \leq 30 \end{aligned}$$

Step 2: Isolate the Variable

Add 14 to both sides:

$$\begin{aligned} & 2x \leq 30 + 14 \\ & 2x \leq 44 \end{aligned}$$

Divide both sides by 2:

$$\begin{aligned} & x \leq \frac{44}{2} \\ & x \leq 22 \end{aligned}$$

Solution:

$$x \leq 22$$

This means the original sentence describes all real numbers x that are less than or equal to 22.

Interpreting the Solution in Context

The inequality indicates that any number x less than or equal to 22 satisfies the original statement. To better understand, consider some examples:

- If $(x = 20)$:
 - Difference: $(20 - 7 = 13)$
 - Twice the difference: $(2 \times 13 = 26)$
 - Compare with 30: $(26 \leq 30)$ – True

- If $(x = 22)$:
 - Difference: $(22 - 7 = 15)$
 - Twice the difference: $(2 \times 15 = 30)$
 - Compare with 30: $(30 \leq 30)$ – True

- If $(x = 25)$:
 - Difference: $(25 - 7 = 18)$
 - Twice the difference: $(2 \times 18 = 36)$
 - Compare with 30: $(36 \leq 30)$ – False

Thus, any x less than or equal to 22 satisfies the original statement's conditions.

Application and Practice Problems

To reinforce understanding, here are some practice problems related to translating sentences into inequalities:

1. Translate the sentence: "Three times a number increased by 5 is at least 20."
2. Express: "The sum of a number and 10 is less than 50."
3. Translate into an inequality: "Four less than twice a number is greater than or equal to 10."

4. Write the inequality for: "A number divided by 3 is at most 8."

Answers:

1. $(3x + 5 \geq 20)$
2. $(x + 10 < 50)$
3. $(2x - 4 \geq 10)$
4. $(\frac{x}{3} \leq 8)$

Common Mistakes to Avoid

When translating sentences into inequalities, be cautious of these common errors:

- Misinterpreting "at most" as "at least" – remember, "at most" corresponds to less than or equal to.
- Forgetting to include the variable in the expression, especially when dealing with differences or sums.
- Incorrectly expanding or simplifying expressions – always double-check algebraic steps.
- Switching the inequality sign when multiplying or dividing by a negative number – remember to flip the sign in such cases.

Summary and Key Takeaways

- The sentence "Twice the difference of a number and 7 is at most 30" translates to the inequality $(2(x - 7) \leq 30)$.
- Understanding the language used in statements ("at most," "at least," "greater than," "less than") is essential for selecting the correct inequality symbol.
- Solving inequalities involves algebraic manipulation similar to solving equations, with attention to inequalities' rules.
- The solution to the inequality provides a range of possible values for the variable, which can be interpreted in real-world contexts.
- Practice translating various sentences into inequalities to develop confidence and proficiency.

Conclusion

Mastering the process of translating verbal statements into algebraic inequalities is foundational in mathematics, especially in problem-solving and real-world applications. By carefully analyzing the language, identifying variables, and applying algebraic operations, you can convert complex sentences into manageable inequalities that can be solved systematically. Whether dealing with real-life scenarios like budgeting, measurements, or scientific data, these skills enable you to interpret and analyze quantitative information effectively.

Remember, practice makes perfect. Use the steps outlined in this guide to approach similar problems confidently, and you'll develop a strong understanding of translating sentences into inequalities in no time.

Frequently Asked Questions

How do I translate the sentence 'Twice the difference of a number and 7 is at most 30' into an inequality?

First, let the number be x . The difference of the number and 7 is $(x - 7)$. Twice that difference is $2(x - 7)$. 'At most 30' means less than or equal to 30. So, the inequality is $2(x - 7) \leq 30$.

What is the step-by-step process to convert the sentence into an inequality?

Step 1: Let the number be x . Step 2: Write the difference: $(x - 7)$. Step 3: Double the difference: $2(x - 7)$. Step 4: Set up the inequality 'at most 30', which means: $2(x - 7) \leq 30$.

Can you provide the final inequality form of the sentence?

Yes, the inequality is $2(x - 7) \leq 30$.

How would I solve the inequality $2(x - 7) \leq 30$ to find the range of x ?

First, divide both sides by 2: $x - 7 \leq 15$. Then, add 7 to both sides: $x \leq 22$. So, x can be any number less than or equal to 22.

What does the phrase 'at most 30' signify in the inequality translation?

It indicates an upper bound, meaning the expression is less than or equal to 30, which is represented as ' ≤ 30 ' in the inequality.

How can I check if a specific number, say $x=20$, satisfies the inequality?

Substitute $x=20$ into the inequality: $2(20 - 7) = 2(13) = 26$, which is less than or equal to 30. Therefore, $x=20$ satisfies the inequality.

Additional Resources

Understanding and Translating Word Problems into Inequalities: A Comprehensive Guide

When dealing with mathematical word problems, one of the most essential skills is translating verbal statements into algebraic expressions or inequalities. This process allows us to solve real-world problems systematically and accurately. In this detailed guide, we will explore how to interpret and convert a specific sentence into an inequality: "Twice the difference of a number and 7 is at most 30." We will dissect the sentence, identify key components, and formulate the corresponding inequality step-by-step.

Deciphering the Sentence: Breaking Down the Problem

Before translating any sentence into an inequality, it's crucial to understand its language and what each part signifies. Let's analyze the sentence:

"Twice the difference of a number and 7 is at most 30."

Key components to identify:

- A number: This is the unknown we will represent with a variable, commonly (x) .
- Difference of a number and 7: This indicates a subtraction operation involving the variable and 7.
- Twice the difference: We are asked to consider two times (or "twice") this difference.
- Is at most 30: The phrase "at most" corresponds to the inequality symbol $(\leq)$.

$\leq$).

Step-by-Step Translation Process

Converting this sentence into an inequality involves understanding and translating each component carefully:

1. Assign a Variable

- Let x represent the unknown number.

2. Express the "Difference of a Number and 7"

- The difference of a number and 7 is written as $(x - 7)$.

3. "Twice the Difference"

- "Twice" indicates multiplication by 2.
- So, twice the difference becomes $2(x - 7)$.

4. "Is at most 30"

- The phrase "at most" corresponds to the inequality symbol $\leq$.
- The entire expression is less than or equal to 30.

5. Final Inequality Formation

- Combining all parts, the sentence translates to:

$$2(x - 7) \leq 30$$

Understanding the Inequality: Implications and Interpretations

Once the inequality is formulated, it's important to interpret what it means in context.

- The inequality $2(x - 7) \leq 30$ implies that twice the difference between the number and 7 does not exceed 30.
- This inequality encompasses all possible values of x that satisfy

this condition.

Practical interpretation:

Suppose (x) is a certain quantity, such as the number of items, a measurement, or a variable in a real-world scenario. The inequality constrains (x) so that the doubled difference remains within a specific limit (30 in this case).

Solving the Inequality: Step-by-Step Approach

While the main goal here is translating the sentence into an inequality, understanding how to solve it is equally important to find the range of possible values for (x) .

1. Expand the Expression

$$\begin{aligned} & 2(x - 7) \leq 30 \\ & 2x - 14 \leq 30 \end{aligned}$$

2. Isolate (x)

Add 14 to both sides:

$$\begin{aligned} & 2x \leq 30 + 14 \\ & 2x \leq 44 \end{aligned}$$

Divide both sides by 2:

$$\begin{aligned} & x \leq 22 \end{aligned}$$

Result: The solution set is all real numbers (x) such that $(x \leq 22)$.

3. Interpret the solution

- The number (x) can be any value less than or equal to 22.

- If (x) represents a quantity in a real-world problem, it cannot be greater than 22 to satisfy the original condition.

Key Mathematical Concepts Involved

Understanding this problem involves several foundational concepts in algebra:

Variables and Constants

- Variable (x) : Represents an unknown quantity.
- Constants: Numbers like 7, 30, and 2 are constants, with specific fixed values.

Operations and Expressions

- Subtraction: $(x - 7)$
- Multiplication: $(2(x - 7))$
- Inequality: $(\leq)$

Translating Verbal Phrases into Symbols

- "Twice" $\rightarrow$ multiplication by 2.
- "Difference of a number and 7" $\rightarrow (x - 7)$.
- "Is at most" $\rightarrow (\leq)$.

Practical Examples and Applications

Understanding how to translate sentences into inequalities is not only a theoretical exercise but also a practical skill in various fields:

1. Budgeting and Finance

Suppose you're planning a budget, and a statement says, "Your expenses should be at most \$30 more than your savings." Translating this into an inequality helps determine acceptable ranges for expenses or savings.

2. Engineering and Design

Design specifications often require inequalities to ensure safety margins or performance bounds. For example, "The tension in a wire should be at most 30 units" can be translated into an inequality involving the tension variable.

3. Health and Nutrition

Dietary guidelines might state, "Your intake of sugar should be at most 30 grams more than your daily carbohydrate intake." Formulating such conditions mathematically helps in planning diets.

Common Challenges and Tips in Translating Sentences to Inequalities

While the process may seem straightforward, certain challenges can arise:

1. Ambiguous Phrases

- Phrases like "less than" and "at most" are similar but have subtle differences.
- At most corresponds to $\leq$, including equality.
- Less than corresponds to $<$.

2. Multiple Variables

- If sentences involve more than one unknown, carefully assign variables and interpret relationships.

3. Negative Quantities

- Be cautious with phrases involving negatives or subtraction to avoid errors.

4. Units and Context

- Always consider the units and context to ensure meaningful inequalities.

Tips:

- Break down the sentence into smaller parts.
- Translate each part into algebraic expressions before combining.
- Confirm the inequality symbol by understanding the phrase ("at most" $\rightarrow \leq$, "more than" $\rightarrow >$, etc.).
- Practice with various sentences to build intuition.

Extending the Concept: From Inequality to Equation and Beyond

While this guide focused on inequalities, similar principles apply when translating sentences into equations:

- Replace "at most" with "equals" to form an equation.
- For example, "Twice the difference of a number and 7 equals 30" becomes $2(x - 7) = 30$.

Understanding the distinction helps in solving different types of problems and applying the correct mathematical tools.

Summary and Final Thoughts

Translating the sentence "Twice the difference of a number and 7 is at most 30" into an inequality involves:

- Assigning a variable to the unknown.
- Identifying key phrases and their algebraic equivalents.
- Formulating the inequality based on the language, especially recognizing "at most" as $\leq$.
- Solving the inequality for the variable to understand the range of solutions.

This process exemplifies the importance of language comprehension in mathematics and highlights how verbal descriptions are systematically converted into algebraic expressions. Mastering this skill enhances problem-solving capabilities across disciplines and real-world applications.

By practicing similar translations and understanding the underlying concepts, students can develop strong mathematical reasoning, enabling them to approach complex problems with confidence and clarity.

Remember: The core of translating sentences into inequalities is careful reading, strategic variable assignment, and precise algebraic formulation. With practice, this becomes an intuitive process that bridges the gap between language and mathematics seamlessly.

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