

# If $F(x) = 9x - 10$ find $F(3) =$

## Understanding the Function $F(x) = 9x - 10$

If  $F(x) = 9x - 10$  find  $F(3) =$  is a basic algebraic problem that involves evaluating a linear function at a specific value of  $x$ . To solve this problem, it's essential to understand the structure of the function  $F(x)$ , how it operates, and the general process of plugging in a value for  $x$  to find the corresponding output. This type of problem is fundamental in algebra and serves as a foundation for more complex functions and mathematical concepts.

## Breaking Down the Function $F(x) = 9x - 10$

### The Nature of the Function

The function  $F(x) = 9x - 10$  is a linear function, which means its graph is a straight line. The general form of a linear function is:

- $F(x) = mx + b$

where:

1. **m** is the slope of the line, indicating how steep it is.
2. **b** is the y-intercept, the point where the line crosses the y-axis.

In this specific case, the slope  $m$  is 9, and the y-intercept  $b$  is -10, indicating that the line rises quickly due to the large slope and crosses the y-axis at -10.

### Implications of the Function

The function describes a relationship where the output  $F(x)$  depends linearly on the input  $x$ . As  $x$  increases or decreases,  $F(x)$  changes proportionally, scaled by the slope 9, and shifted vertically by -10.

Understanding this relationship allows us to predict the value of  $F(x)$  for any given  $x$ , including the specific value  $x=3$ , which is the focus of our problem.

# Calculating $F(3)$

## Step-by-step Evaluation

To find  $F(3)$ , substitute  $x=3$  into the function:

$$F(3) = 9(3) - 10$$

Next, perform the multiplication:

$$F(3) = 27 - 10$$

Finally, perform the subtraction:

$$F(3) = 17$$

Thus, the value of the function at  $x=3$  is 17.

## Verification of the Calculation

It's always good practice to verify the calculation. Double-checking:

1. Multiply the input by the slope:  $9 \times 3 = 27$ .
2. Subtract the y-intercept:  $27 - 10 = 17$ .

The calculation confirms that  $F(3) = 17$ .

## Understanding the Significance of $F(3)=17$

### Interpretation in Context

While the problem is purely algebraic, understanding what  $F(3)=17$  signifies can be insightful. For example, if  $F(x)$  represented a real-world quantity, such as the total cost based on the number of items ( $x$ ), then:

- When  $x=3$  (say, 3 items), the total cost would be 17 units of currency.

This illustrates the importance of evaluating functions at specific points to determine real-world outcomes.

## Graphical Representation

Plotting the function  $F(x) = 9x - 10$  on a graph helps visualize how the function behaves. Key points include:

- The y-intercept at  $(0, -10)$ .
- The point  $(3, 17)$ , which we calculated.

The line passing through these points demonstrates the linear relationship, with a steep slope of 9, indicating rapid change.

## Broader Applications of Linear Functions

### Real-World Examples

Linear functions like  $F(x) = 9x - 10$  are used extensively in various fields:

- **Economics:** Calculating profit based on units sold.
- **Physics:** Determining distance traveled over time with constant speed.
- **Statistics:** Modeling relationships between variables.

### Mathematical Significance

Understanding how to evaluate functions at specific points is fundamental in mathematics. It helps in:

1. Analyzing the behavior of functions.
2. Graphing functions accurately.
3. Understanding the relationship between variables.

## Practice Problems and Further Exploration

## Additional Evaluations

To deepen understanding, consider evaluating  $F(x)$  at different values:

- $F(0)$ : What is the output when  $x=0$ ?
- $F(5)$ : What about  $x=5$ ?
- $F(-2)$ : How does the function behave for negative  $x$ ?

## Sample Solutions

1.  $F(0) = 9(0) - 10 = -10$
2.  $F(5) = 9(5) - 10 = 45 - 10 = 35$
3.  $F(-2) = 9(-2) - 10 = -18 - 10 = -28$

## Conclusion

In summary, evaluating the function  $F(x) = 9x - 10$  at  $x=3$  involves straightforward substitution and arithmetic. The result,  $F(3) = 17$ , exemplifies the linear relationship defined by the function. This process underscores fundamental algebraic skills and highlights the importance of understanding function behavior, both in mathematical theory and real-world applications. Mastery of such evaluations forms the basis for more advanced studies in algebra, calculus, and applied mathematics.

## Frequently Asked Questions

### What is the value of $F(3)$ if $F(x) = 9x - 10$ ?

$F(3) = 9(3) - 10 = 27 - 10 = 17$ .

### How do you evaluate $F(3)$ given the function $F(x) = 9x - 10$ ?

Substitute  $x = 3$  into the function:  $F(3) = 9(3) - 10$ , which simplifies to 17.

## **What is the process to find $F(3)$ for the function $F(x) = 9x - 10$ ?**

Plug in 3 for  $x$ :  $F(3) = 9 \cdot 3 - 10$ , then compute to get 17.

## **If $F(x) = 9x - 10$ , what is the output when $x$ equals 3?**

The output is 17, since  $F(3) = 9 \cdot 3 - 10 = 17$ .

## **Can you explain how to evaluate the function $F(x) = 9x - 10$ at $x=3$ ?**

Yes, replace  $x$  with 3:  $F(3) = 9 \cdot 3 - 10 = 17$ .

## **What is the value of the function $F$ at $x = 3$ ?**

$F(3) = 17$ .

## **Is the calculation of $F(3)$ straightforward for the function $F(x) = 9x - 10$ ?**

Yes, just substitute 3 for  $x$  and simplify to find that  $F(3) = 17$ .

## **Additional Resources**

### **Understanding the Function $F(x) = 9x - 10$ and Calculating $F(3)$**

Mathematics often presents itself as a universal language, providing tools to model, analyze, and solve real-world problems. Among the foundational concepts in mathematics are functions—rules that assign a unique output to every input within a specified domain. In this article, we delve into a particular linear function,  $F(x) = 9x - 10$ , exploring its structure, properties, and implications. Our focus will be on understanding how to evaluate this function at a specific point, namely  $x = 3$ , and interpreting the result within a broader mathematical context.

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## **Introduction to Functions and Their Significance**

### **What Is a Function?**

A function is a mathematical relationship that assigns each element from a set called the domain to exactly one element in a set called the codomain. Think of it as a machine: input

a value, and the machine produces an output based on a specific rule.

For example, the function  $F(x) = 9x - 10$  takes an input  $x$ , multiplies it by 9, and then subtracts 10 from the product. This rule is straightforward but powerful, allowing us to generate outputs for any real number  $x$ .

## The Importance of Linear Functions

Linear functions are among the simplest yet most essential types of functions in mathematics. They have the form:

$$f(x) = mx + b$$

where:

- $m$  is the slope, indicating the rate of change or steepness of the line.
- $b$  is the y-intercept, the point where the line crosses the y-axis.

Linear functions are widely used in various fields, including physics for modeling motion, economics for representing cost functions, and engineering for signal processing. Their simplicity allows for easy interpretation and analysis, making them a fundamental concept for students and professionals alike.

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## Dissecting the Function $F(x) = 9x - 10$

### Understanding the Components

The given function:

$$F(x) = 9x - 10$$

is a linear function with:

- Slope ( $m$ ): 9

This indicates that for every unit increase in  $x$ ,  $F(x)$  increases by 9 units. The positive slope signifies a direct, proportional relationship between  $x$  and  $F(x)$ .

- Y-intercept ( $b$ ): -10

When  $x = 0$ , the function yields  $F(0) = -10$ . This is the point where the line crosses the y-axis.

# Graphical Representation

Graphing  $F(x) = 9x - 10$ :

- The line crosses the y-axis at  $(0, -10)$ .
- For  $x = 1$ ,  $F(1) = 9(1) - 10 = -1$ , so the point  $(1, -1)$ .
- For  $x = 2$ ,  $F(2) = 18 - 10 = 8$ , so the point  $(2, 8)$ .

Plotting these points and drawing a straight line through them illustrates the linear relationship. The steepness of this line reflects the slope of 9.

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## Calculating $F(3)$ : Step-by-Step Analysis

### Substituting the Input Value

To find  $F(3)$ , we substitute  $x = 3$  into the function:

$$F(3) = 9(3) - 10$$

The calculation involves straightforward algebraic steps:

1. Multiply 9 by 3:

$$9 \times 3 = 27$$

2. Subtract 10:

$$27 - 10 = 17$$

Thus,

$$F(3) = 17$$

### Interpreting the Result

The value  $F(3) = 17$  signifies that when the input  $x$  is 3, the output of the function is 17. Graphically, this corresponds to the point  $(3, 17)$  on the line representing  $F(x)$ .

From a real-world perspective, if  $F(x)$  models a particular quantity—such as total cost based on the number of items purchased—then purchasing 3 items results in a total of 17 units of currency.

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## Broader Implications and Applications

### Understanding the Rate of Change

The slope of 9 indicates a consistent rate of change. In practical terms, this means that for each additional unit increase in  $x$ , the output increases by 9. This property is essential in fields like physics (velocity), economics (marginal costs), and biology (growth rates).

### Predictive Power of Linear Functions

Linear functions like  $F(x) = 9x - 10$  enable predictions within their domain. Knowing the input  $x$ , one can quickly compute the output  $F(x)$ . Conversely, if the output  $F(x)$  is known, solving for  $x$  can determine the input needed to achieve a particular outcome.

For example, if a goal is to reach an output of 50, solving:

$$50 = 9x - 10$$

leads to:

$$9x = 60$$

$$x = \frac{60}{9} = \frac{20}{3} \approx 6.67$$

This calculation demonstrates how linear functions facilitate inverse operations and problem-solving.

### Limitations and Considerations

While linear functions are straightforward, they have limitations:

- They assume a constant rate of change, which may not reflect real-world complexities.
- They are only valid within the specified domain; extrapolating beyond may lead to inaccurate predictions.
- They do not account for nonlinear phenomena, such as saturation or exponential growth.

Understanding these limitations is vital for applying linear models appropriately.

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# Mathematical Significance and Educational Value

## Foundational Role in Mathematics

Functions like  $(F(x) = 9x - 10)$  serve as foundational building blocks for higher mathematics. They introduce students to concepts like slope-intercept form, graphing, and inverse functions. Mastery of such linear functions paves the way for understanding more complex functions, including quadratics, exponentials, and trigonometric functions.

## Skill Development

Evaluating functions at specific points, such as calculating  $(F(3))$ , enhances algebraic manipulation skills, critical thinking, and problem-solving abilities. These skills are transferable across disciplines and essential for scientific reasoning.

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## Conclusion: The Power of Simple Mathematical Models

The exploration of the function  $(F(x) = 9x - 10)$  exemplifies how simple mathematical models can provide profound insights into relationships between variables. By evaluating  $(F(3))$ , we've demonstrated the process of substituting a specific value into a function, performing algebraic operations, and interpreting the result within a broader context. Such exercises underscore the importance of understanding fundamental concepts in algebra, which serve as the backbone for numerous scientific and practical applications. Whether modeling economic costs, physical phenomena, or data trends, linear functions remain an indispensable tool in the mathematician's arsenal. As learners and professionals continue to develop their mathematical literacy, mastering these foundational functions will remain a critical step toward more advanced analytical capabilities.

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