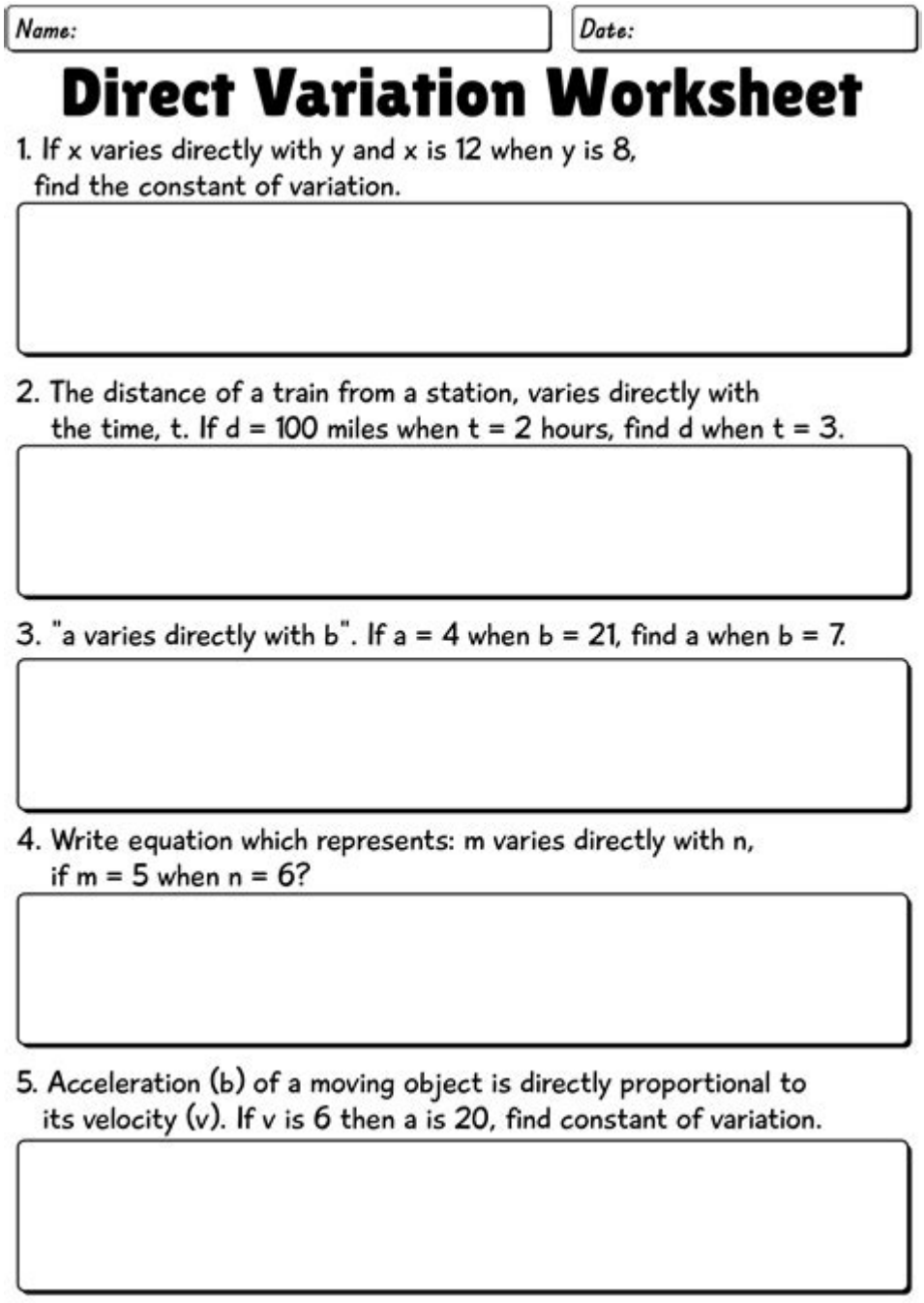
Worksheet On Direct Variation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Direct Variation Worksheet

1. If x varies directly with y and x is 12 when y is 8, find the constant of variation.

2. The distance of a train from a station, varies directly with the time, t. If d = 100 miles when t = 2 hours, find d when t = 3.

3. "a varies directly with b". If a = 4 when b = 21, find a when b = 7.

4. Write equation which represents: m varies directly with n, if m = 5 when n = 6?

5. Acceleration (b) of a moving object is directly proportional to its velocity (v). If v is 6 then a is 20, find constant of variation.

Worksheet on Direct Variation

Direct variation is a fundamental concept in mathematics that describes a relationship between two variables that change in tandem. When one variable increases or decreases, the other variable does so in a predictable manner. This relationship can be represented by the equation $y = kx$, where y and x are the variables, and k is a constant known as the constant of variation. Understanding direct variation is essential for solving various mathematical problems and for grasping more complex concepts in algebra and calculus. This article will explore the concept of direct variation, provide examples, and suggest a worksheet that can enhance comprehension and application of this important topic.

Understanding Direct Variation

To appreciate the concept of direct variation, let’s break it down into its key components.

Definition of Direct Variation

Direct variation indicates a linear relationship between two variables. In this relationship:

- As one variable increases, the other variable also increases.
- As one variable decreases, the other variable decreases.

Mathematically, this can be expressed as:
$$
y = kx
$$
Here, k is a non-zero constant that represents the ratio of y to x. This ratio remains constant throughout the relationship, indicating that for every unit increase in x, y increases by k units.

Characteristics of Direct Variation

1. Proportionality: The variables are directly proportional to each other. If x is doubled, y will also double.
2. Graphical Representation: The graph of a direct variation relationship is a straight line passing through the origin (0,0).
3. Constant Ratio: The ratio $ \frac{y}{x} $ remains constant and equal to k.

Examples of Direct Variation

To solidify the understanding of direct variation, let’s explore a few practical examples.

Example 1: Distance and Time

Consider a scenario where a car travels at a constant speed. If the speed of the car is 60 miles per hour, the distance traveled (d) can be expressed as:
$$
d = 60t
$$
Where t is the time in hours. Here, the constant of variation k is 60.

- If $t = 1$ hour, then $d = 60 \times 1 = 60$ miles.
- If $t = 2$ hours, then $d = 60 \times 2 = 120$ miles.

As time increases, the distance also increases proportionally.

Example 2: Cost of Apples

Suppose the cost of apples is $2 per pound. The total cost (C) can be represented as:
$$
C = 2p
$$
Where p is the number of pounds of apples bought. The constant of variation k is 2.

- If $p = 3$ pounds, then $C = 2 \times 3 = 6$ dollars.
- If $p = 5$ pounds, then $C = 2 \times 5 = 10$ dollars.

Again, as the number of pounds increases, the cost increases in a direct manner.

Identifying Direct Variation

To determine whether a given relationship represents direct variation, follow these steps:

1. Check the Equation: Does it fit the form $y = kx$?
2. Calculate Ratios: For various pairs of x and y, calculate the ratio $\frac{y}{x}$. If this ratio is constant, then the relationship is a direct variation.
3. Graph the Relationship: Plot the pairs of variables on a graph. If the points form a straight line that passes through the origin, it indicates direct variation.

Worksheet on Direct Variation

To reinforce the understanding of direct variation, creating a worksheet can be beneficial. Here is a suggested structure for a worksheet on direct variation:

Section 1: Identifying Direct Variation

1. Determine if the following relationships are direct variations. If they are, identify the constant of variation k.
- $y = 4x$
- $y = 3x + 2$
- $y = -5x$
- $y = \frac{1}{2}x$

Section 2: Solving Direct Variation Problems

2. Solve for y in the following direct variation equations:
- If $x = 10$ in $y = 3x$, what is y?
- If $x = 5$ in $y = -2x$, what is y?

Section 3: Real-Life Applications

3. A recipe requires 3 cups of flour to make 24 cookies. How many cups of flour are needed to make 72 cookies?

- Let x be the number of cups of flour and y be the number of cookies made. Write an equation for this direct variation and solve for x when $y = 72$.

Section 4: Graphing Direct Variation

4. Graph the following equations and identify the constant of variation:
- $y = 2x$
- $y = -3x$

Conclusion

Direct variation is a vital concept in mathematics that helps in understanding how two quantities are interrelated. Whether it's through real-world applications like speed and distance or costs and quantities, mastering direct variation is essential for students. The worksheet provided serves as a practical tool to practice identifying and solving problems related to direct variation, ensuring students have a solid grasp of the concept. By engaging with these exercises, learners can better appreciate the predictability and structure that direct variation offers in mathematical relationships.

Frequently Asked Questions

What is direct variation?

Direct variation is a relationship between two variables where one variable is a constant multiple of the other, typically expressed as y = kx, where k is a non-zero constant.

How do you determine if two quantities are in direct variation?

To determine if two quantities are in direct variation, check if the ratio of the two variables is constant. If y/x = k for some constant k, then y varies directly with x.

Can you give an example of direct variation?

Yes, an example of direct variation is the relationship between distance and

time at a constant speed. If a car travels at a speed of 60 miles per hour, the distance (d) varies directly with time (t) as d = 60t.

What is the significance of the constant of variation (k)?

The constant of variation (k) indicates the rate at which one variable changes with respect to another in a direct variation relationship. It represents the proportionality factor.

How can I graph a direct variation equation?

To graph a direct variation equation like y = kx, plot the origin (0,0) and another point (x, kx). The graph will be a straight line passing through the origin with a slope of k.

What are common mistakes when solving direct variation problems?

Common mistakes include forgetting to use the origin as a reference point, confusing direct variation with inverse variation, and incorrectly calculating the constant of variation.

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