

unit transformations homework 6 scale factor and dilations answer key

Unit transformations homework 6 scale factor and dilations answer key is an essential topic in geometry and mathematics that allows students to understand how shapes can be resized while maintaining their proportionality. This concept is crucial for various applications, including architectural design, engineering, and computer graphics. In this article, we will explore the principles behind scale factors and dilations, provide examples of how to apply these concepts, and offer an answer key for the homework assignment to help students check their understanding.

Understanding Scale Factors

Scale factors are numerical values that describe how much a shape is enlarged or reduced during a transformation. When a shape undergoes dilation, the scale factor determines the new dimensions of the shape as compared to its original size.

Definition of Scale Factor

The scale factor (k) can be defined using the following formula:

- If $k > 1$: The shape is enlarged.
- If $0 < k < 1$: The shape is reduced.
- If $k = 1$: The shape remains unchanged.

Calculating the Scale Factor

To calculate the scale factor between two similar shapes, follow these steps:

1. Identify the corresponding sides of the two shapes.
2. Divide the length of a side of the new shape by the length of the corresponding side of the original shape.

For example, if the original triangle has sides of lengths 3, 4, and 5, and the new triangle has sides of lengths 6, 8, and 10, the scale factor can be calculated as follows:

- For the side measuring 3: $6/3 = 2$
- For the side measuring 4: $8/4 = 2$
- For the side measuring 5: $10/5 = 2$

Thus, the scale factor is 2.

Understanding Dilations

Dilations are transformations that produce an image that is the same shape as the original figure but is a different size. The center of dilation and the scale factor play a crucial role in determining the outcome of a dilation.

Key Components of Dilations

- Center of Dilation: This is a fixed point in the plane about which the shape will be enlarged or reduced. It can be located inside, outside, or on the shape itself.
- Scale Factor: As previously mentioned, the scale factor determines the degree of enlargement or reduction.

Properties of Dilations

Dilations have several important properties:

1. Proportionality: Corresponding sides of the original shape and the dilated shape maintain the same ratio.
2. Angle Preservation: The angles of the original shape remain unchanged after dilation.
3. Collinearity: If three points are collinear, their images after dilation will also be collinear.

Applying Scale Factor and Dilations

Understanding how to apply scale factors and dilations is crucial in solving problems involving geometric transformations. Here, we will go through a few examples to illustrate these concepts.

Example 1: Finding the New Coordinates

Given a triangle with vertices at A(1, 2), B(3, 4), and C(5, 2), find the coordinates of the triangle after a dilation with a scale factor of 2 and center at the origin (0, 0).

To find the new coordinates, use the formula:

$$\begin{aligned} & \backslash \\ (x', y') &= (k \cdot x, k \cdot y) \\ & \backslash \end{aligned}$$

1. For point A:
 - $A' = (2 \cdot 1, 2 \cdot 2) = (2, 4)$
2. For point B:

- $B' = (2 \cdot 3, 2 \cdot 4) = (6, 8)$
- 3. For point C:
- $C' = (2 \cdot 5, 2 \cdot 2) = (10, 4)$

The new vertices after dilation are $A'(2, 4)$, $B'(6, 8)$, and $C'(10, 4)$.

Example 2: Finding the Scale Factor

A rectangle has a length of 4 cm and a width of 2 cm. After dilation, its dimensions change to a length of 8 cm and width of 4 cm. Find the scale factor.

1. Calculate the scale factor for the length:
 - Scale factor for length = New length / Original length = $8 \text{ cm} / 4 \text{ cm} = 2$
2. Calculate the scale factor for the width:
 - Scale factor for width = New width / Original width = $4 \text{ cm} / 2 \text{ cm} = 2$

Thus, the scale factor for the dilation is 2.

Answer Key for Unit Transformations Homework 6

Now, let us provide an answer key for a typical unit transformations homework assignment focusing on scale factors and dilations. Below are sample problems along with their respective answers.

Homework Problems:

1. Problem 1: A square has a side length of 5 cm. If it is dilated with a scale factor of 3, what will be the new side length?
2. Problem 2: Given a triangle with vertices at $D(2, 1)$, $E(4, 3)$, and $F(6, 1)$, if it is dilated by a scale factor of 0.5, what are the new coordinates of the vertices?
3. Problem 3: A circle with a radius of 10 cm is reduced by a scale factor of 0.2. What is the new radius?
4. Problem 4: A rectangle has dimensions of 6 m by 3 m. After a dilation with a scale factor of 1.5, what are the new dimensions?
5. Problem 5: Find the scale factor if the original side of a polygon is 12 m, and the new corresponding side is 9 m.

Answers:

1. Answer 1: New side length = $5 \text{ cm} \cdot 3 = 15 \text{ cm}$
2. Answer 2: New coordinates:
 - $D'(1, 0.5)$, $E'(2, 1.5)$, $F'(3, 0.5)$
3. Answer 3: New radius = $10 \text{ cm} \cdot 0.2 = 2 \text{ cm}$
4. Answer 4: New dimensions = $6 \text{ m} \cdot 1.5 = 9 \text{ m}$ and $3 \text{ m} \cdot 1.5 = 4.5 \text{ m}$

5. Answer 5: Scale factor = New side / Original side = 9 m / 12 m = 0.75

Conclusion

Understanding unit transformations homework 6 scale factor and dilations is vital for students to grasp the concepts of geometry and their applications in real life. By mastering the calculation of scale factors and the principles of dilations, students can confidently tackle a variety of geometric problems. The provided examples and answer key serve as a helpful resource for reinforcing these concepts, ensuring a solid foundation for further mathematical studies. As students practice these transformations, they will develop critical reasoning skills that extend beyond geometry, empowering their overall mathematical prowess.

Frequently Asked Questions

What is a scale factor in unit transformations?

A scale factor is a number that scales, or multiplies, the dimensions of a figure to create a similar figure. It determines how much larger or smaller a figure will become after dilation.

How do you find the scale factor between two similar figures?

To find the scale factor, divide the length of a side of the larger figure by the corresponding side of the smaller figure. The resulting number will be the scale factor.

What is the relationship between scale factor and area during dilations?

When a figure is dilated by a scale factor 'k', the area of the figure changes by a factor of 'k²'. For example, if the scale factor is 2, the area increases by a factor of 4 (2²).

What does it mean for a transformation to be a dilation?

A dilation is a transformation that changes the size of a figure without altering its shape. It involves expanding or contracting a figure from a center point using a scale factor.

Can a scale factor be negative, and what does it imply?

Yes, a scale factor can be negative. A negative scale factor indicates that the figure is not only dilated but also reflected across the center point of dilation.

How do you apply a scale factor to coordinates in a dilation?

To apply a scale factor 'k' to a point with coordinates (x, y), multiply both coordinates by 'k'. The new coordinates will be (kx, ky).

What are the key steps to solving unit transformations homework problems involving dilations?

The key steps include identifying the center of dilation, determining the scale factor, applying the scale factor to each vertex of the figure, and checking that the new figure is similar to the original.

How can dilations help in real-world applications, such as architecture?

Dilations allow architects to create scaled models of buildings, ensuring that proportions and dimensions are maintained while adjusting sizes for practical purposes.

What is the significance of the center of dilation in transformations?

The center of dilation is the fixed point from which all points of the figure are expanded or contracted. It affects the orientation and position of the transformed figure.

What should you do if the answer key for unit transformations homework is not matching your answers?

If your answers do not match the answer key, review your calculations, ensure you correctly applied the scale factor, and double-check your understanding of the concepts. If discrepancies persist, consider discussing with a teacher or peers.

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