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Trítio é um isótopo radioativo do hidrogênio, simbolizado como ${}^3\text{H}$ ou ${}^3\text{H}$. O contrário do hidrogênio comum, que possui apenas um próton no núcleo, o trítio possui um próton e dois nêutrons. Isso dá ao trítio uma massa atômica de aproximadamente 3. Propriedades do Trítio

Radioatividade O trítio é radioativo, o que significa que ele decai ao longo do tempo, emitindo radiação beta. O tempo de meia-vida do trítio é de cerca de 12,3 anos. Isso significa que, após esse período, metade da quantidade original de trítio terá decaído em hélio-3, um isótopo estável. Aplicações Trítio é utilizado em várias aplicações, principalmente em ciência e tecnologia. Alguns exemplos incluem: Iluminação de baixa luz: Trítio é usado em dispositivos de iluminação autônoma, como sinais de saída de emergência e visores de relógios, porque sua radiação beta pode excitar fósforos, emitindo luz sem a necessidade de uma fonte de energia externa. Fusão Nuclear: Trítio é um componente crucial em reações de fusão nuclear, onde é combinado com deutério (outro isótopo de hidrogênio) para liberar grandes quantidades de energia. Rastreamento Ambiental: Devido à sua radioatividade, o trítio é usado em estudos ambientais para rastrear a movimentação e a distribuição de água subterrânea. Segurança e Precauções

Exposição Embora o trítio emita radiação beta, que é relativamente fraca e não penetra profundamente na pele, ele pode ser perigoso se ingerido ou inalado. Portanto, é crucial manusear trítio com cuidado em ambientes controlados. Armazenamento O trítio deve ser armazenado em contêineres apropriados que bloqueiem a radiação beta e evitem a liberação do gás. Estes contêineres frequentemente são feitos de materiais como vidro ou aço inoxidável. Conclusão O trítio é um isótopo fascinante com várias aplicações úteis, desde iluminação até fusão nuclear. No entanto, devido à sua radioatividade, é importante manuseá-lo com cuidado e seguir todas as diretrizes de segurança. Calcular

medidas em triângulos é uma parte essencial da geometria. Existem várias fórmulas e teoremas que ajudam a encontrar comprimentos de lados, ângulos e áreas de triângulos. Vamos explorar os métodos mais comuns. Teorema de Pitágoras O Teorema de Pitágoras é usado em triângulos retângulos, onde um ângulo é de 90 graus. Ele afirma que o quadrado da hipotenusa (o lado oposto ao ângulo reto) é igual à soma dos quadrados dos outros dois lados.
$$a^2 + b^2 = c^2$$
 Por exemplo, se um triângulo tem lados de 3 cm e 4 cm, a hipotenusa será:
$$c = \sqrt{3^2 + 4^2} = \sqrt{9 + 16} = \sqrt{25} = 5$$
 cm Senos e Cossenos A Lei dos Senos é útil para encontrar um lado ou ângulo em triângulos não retângulos. A fórmula é:
$$\frac{a}{\sin(A)} = \frac{b}{\sin(B)} = \frac{c}{\sin(C)}$$
 Se você conhece os ângulos A e B e o lado a, pode encontrar b e c usando essa fórmula. Lei dos Cossenos A Lei dos Cossenos é útil para encontrar um lado ou ângulo em triângulos não retângulos. A fórmula é:
$$c^2 = a^2 + b^2 - 2ab \cos(C)$$
 Por exemplo, se você conhece os lados a, b e o ângulo C, pode encontrar o lado c. Área de um Triângulo Existem várias maneiras de calcular a área de um triângulo: Fórmula Básica Para um triângulo com base (b) e altura (h), a área é:
$$A = \frac{1}{2}bh$$
 Fórmula de Heron Para um triângulo com lados a, b e c, use a Fórmula de Heron:
$$s = \frac{a+b+c}{2}$$

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$
 Usando Senos Se você conhece dois lados e o ângulo entre eles, a área é:
$$A = \frac{1}{2}ab \sin(C)$$
 Exemplo: Um triângulo com lados de 5 cm e 7 cm, e um ângulo de 60 graus entre eles. A área é:
$$A = \frac{1}{2} \times 5 \times 7 \times \sin(60^\circ) \approx 9.8$$
 cm² Conclusão Compreender essas fórmulas e teoremas é crucial para resolver problemas envolvendo triângulos. Pratique usando diferentes combinações de lados e ângulos para ganhar confiança. Introduces the concepts of converting between model and actual dimensions based on scale factors. Determine the missing dimensions. View worksheet This lesson demonstrates the use of large scale factors. View worksheet Students practice determine the scale when given an actual and model dimension. Round your answer to the nearest tenth. The answers can be found below. View worksheet Students practice with scale factors. The answers can be found below. View worksheet Reviews all skills in the unit. A great take home sheet. Also provides a practice problem. View worksheet 10 problems that test the ability to convert number when using a scale as a reference. View worksheet Answers for the homework and quiz. View worksheet Answers for the lesson and practice sheets. View worksheet What did the Metric Aliens say when they landed on earth? Take us to your liter. In the metric system, the liter is the basic unit of capacity. It is equal in volume to 1,000 cubic centimeters. The liter is used for both liquid and dry measures. A scale factor represents the ratio of corresponding sides between two similar shapes. For example, a scale factor of 3 means that the new shape is three times larger than the original. Conversely, a scale factor of one-third indicates that the new shape is one-third the size of the original. Scale Factor is a numerical representation that describes the proportional relationship between the corresponding dimensions of an original figure and its resized version. It quantifies the degree of enlargement or reduction in size during geometric transformations, aiding in precise adjustments. In this article, we have covered the meaning of scale factor, its formula, types of scale factor — upscale and downscale, methods to find scale factor in different geometry shapes and applications of the scale factor. What is the Scale Factor? Scale factor is a metric we use to measure how a geometric figure changes in size when we adjust it. Using the symbol "k" to represent this factor, acts as a special number indicating the relationship between the original figure and its resized version. It's important to note that the scale factor only influences the size of the figure, not its appearance. Taking a square as an example, the scale factor helps us figure out how to adjust its size. If the scale factor is more than 1, the square after resizing will be bigger than the original. For example, if the scale factor is 2, the new square will be twice the size on each side. Scale Factor Meaning Scale Factor is the ratio of dimension of size changing shape, that tells you how much bigger or smaller a new object is compared to its original version. Scale Factor Symbol Scale Factor is represented by english alphabet "k". Note: If the scale factor is greater than 1, the new object is bigger; if it's less than 1, the new object is smaller; and if it's 1, the two objects are the same size. Scale Factor Formula The formula for the scale factor is calculated by dividing the dimensions of the new shape by the dimensions of the original shape. If you know the measurements of both the original figure and the dilated figure (whether it's increased or decreased in size), you can decide the scaling direction—making it smaller or larger. Subsequently, the scale factor is found by applying this formula. Scale Factor = Dimensions of New Shape / Dimension of Original Shape For example, with a scale factor of 0.5, the new square will be half the size of the original on each side. When the scale factor is precisely 1, the resized square maintains the same size as the original, without any change. Types of Scale Factor There are two main types of Scale factor: Up Scale or Enlargement Scale Factor Down Scale or Reduction Scale Factor Let's discuss these types in detail as follows: Up Scale or Enlargement Scale Factor The enlargement scale factor is a number greater than 1, indicating an increase in size or expansion of the original figure. When the scale factor is greater than 1, each dimension of the original figure is multiplied by this factor to obtain the corresponding dimension in the enlarged figure. This will result in a larger version of the original shape. Enlargement Scale Factor = Dimensions of Enlarged Shape / Dimension of Original Shape Down Scale or Reduction Scale Factor The reduction scale factor is a number between 0 and 1, signifying a decrease in size or a shrinking of the original figure. With a reduction scale factor, each dimension of the original figure is multiplied by a fraction or a decimal less than 1 to get the corresponding dimension in the reduced figure. This will lead to a smaller version of the original shape. Reduction Scale Factor = Dimensions of Reduced Shape / Dimension of Original Shape How to Find the Scale Factor The steps to find scale factor are mentioned below: Step 1: Check if the figures are similar, meaning their side lengths are proportional or correspond in some way, indicating equal angles. Step 2: Identify corresponding side lengths on each figure. This may involve flipping or rotating the shapes to align them. Step 3: Set up a ratio for scaling up (larger to smaller) or scaling down (smaller to larger): For scaling up: Scale-up = Larger figure Measurement / Smaller figure Measurement For scaling down: Scale-down = Smaller figure Measurement / Larger figure Measurement Step 4: Simplify the ratio. If scaling down, the scale factor will be a proper fraction; if scaling up, it will be a whole number. These steps help determine how much larger or smaller one figure is compared to the other. Scale Factor of Triangle To identify the scale factor of triangles, it is essential to establish their similarity. Two triangles are considered similar if: One triangle is a resized version of the other, with their respective sides being proportional. The scale factor quantifies the extent of this resizing. Suppose we have two triangles, ABC and XYZ. If the length of side AB is half the length of corresponding side XY, and the length of side BC is also half the length of corresponding side YZ, these triangles are similar, and the scale factor is 0.5. The congruence of two corresponding angles is another indicator of similarity between triangles. Consider triangles PQR and LMN. If angle P is congruent to angle L, angle Q to angle M, and angle R to angle N, then the triangles are similar based on angle congruence. Scale Factor of a Circle In the context of circles, the similarity between any two circles involves a scaling factor. This factor is determined by comparing the radii of the circles. The formula for calculating the scale factor of a circle is expressed as follows: Scale Factor of Circle = Radius of the New Circle / Radius of the Original Circle For example, two circles with radii of 3 centimeters and 6 centimeters are similar, and the scale factor is 2. This means the larger circle's radius is twice that of the smaller circle. When dealing with a rectangular object, adjusting the size involves multiplying both the length and width by the same factor. The scale factor, representing how much we're resizing the rectangle, can be determined by comparing the dimensions of the old and new rectangles. For each dimension, we can use the following formulas: Width Scale factor = New width / Current width Length Scale factor = New length / Current length If given that the dimensions of the current rectangle and one of the dimensions of the new rectangle (for example, the new width), we can use substitution to find an equation for the new length: New length = New width × [Current length / Current width] Alternatively, we can consider scaling using the rectangle's area. The equation for that is: New area = Area scale factor × Current area Suppose the current rectangle has a length of 8 units, a width of 4 units, and we want to increase the width by a factor of 1.5. Using Width Scale Factor Scale factor = New width / Current width = (1.5 × 4) / 4 = 1.5 So, the scale factor is 1.5. New length = 1.5 × 8 / 4 = 3 × 2 = 6 The new length is 6 units. Using Area Scale Factor New Area = 1.5 × (8 × 4) = 1.5 × 32 = 48 The new area is 48 square units. Scale Factor of Other Figures To find the scale factor between similar figures, compare their corresponding sides or dimensions. For instance, in cylinders, compare heights, radii, or volumes. Similarly, for squares, compare corresponding sides, and for cones, compare slant height, radii, or volume. If a smaller cube has a side length of 3 cm, the larger cube might have a side length of 6 cm. The volume of the smaller cube is 3 × 3 × 3 = 27 cm³, and the larger cube's volume is 6 × 6 × 6 = 216 cm³. The scale factor is then 216/27 = 8. This means the larger cube is 8 times the volume of the smaller one. Applications of Scale Factor Some of the most common applications of Scale Factor are: Architectural Design: Architects use scale factors to create models and drawings of buildings. A model might be built at a smaller scale, allowing architects to represent a life-sized structure in a more manageable and comprehensive way. Map Making: Cartographers employ scale factors in map creation. Maps are often smaller representations of larger geographical areas, and the scale factor helps maintain accuracy when translating real-world distances to the map. 3D Printing: In the realm of 3D printing, scale factors are crucial for adjusting the size of a digital model before printing. This ensures that the physical object matches the intended dimensions in the digital design. Engineering Prototypes: Engineers use scale factors when developing prototypes. By creating scaled-down models, they can assess the structural integrity, functionality, and aesthetics of a product before committing to a full-scale production. Geometry in Art: Artists use scale factors to create proportional and visually appealing artwork. Whether designing sculptures or paintings, artists may employ scale factors to ensure accurate and harmonious representations. People Also Read: Scale Factor Examples Example 1: A rectangle undergoes a reduction with a scale factor of 0.5, resulting in new dimensions of 4 meters by 6 meters. Determine the dimensions of the original rectangle before the reduction. Solution: Given that the rectangle underwent a reduction with a scale factor of 0.5, and the new dimensions are 4 meters by 6 meters, we can find the original dimensions using the formula: Original Dimension = New Dimension / Scale Factor Original Length = 4m / 0.5 = Original Length = 8 meters Original Width = 6m / 0.5 = Original Width = 12 meters . The dimensions of the original rectangle before the reduction were 8 meters by 12 meters. Example 2: A map has a scale factor of 1 inch to 5 miles. If two cities are 30 miles apart, what is the distance between them on the map? Solution: Given the scale factor of 1 inch to 5 miles, we can set up a proportion to find the distance on the map. Let x be the distance on the map (in inches). 1 inch/5 miles = x/30 miles Cross-multiplying: 5x = 30 Dividing both sides by 5: x = 6 So, the distance between the two cities on the map is 6 inches. Practice Questions on Scale Factor Q1. A rectangle undergoes an enlargement with a scale factor of 3. If the original length is 4 meters, what is the length of the enlarged rectangle? Q2. Two similar triangles have a scale factor of 1.5. If the shorter side of the smaller triangle is 8 centimeters, find the length of the corresponding side in the larger triangle. Q3. A square is reduced by a scale factor of 0.7. If the original side length is 12 units, what is the length of the side in the smaller square? Q4. An architect creates a model building with a scale factor of 1:50. If the actual building is 100 meters tall, what is the height of the model? Q5. A photograph is enlarged with a scale factor of 2.5. If the original height is 8 inches, what is the height of the enlarged photograph? Scale factor serves as a crucial tool in geometry, helping us understand and manipulate the sizes of shapes during transformations. It's a numerical representation indicating how much larger or smaller a figure becomes after resizing, symbolized by the letter "k". When the scale factor is greater than 1, the figure enlarges; when it's less than 1, it shrinks; and when it's 1, the size remains the same. There are two main types: upscaling for enlargement and downscaling for reduction. Finding the scale factor involves comparing corresponding dimensions of the original and resized shapes. We use it across various shapes like triangles, circles, and rectangles, considering their sides, radii, or volumes. Scale factor finds practical applications in fields like architecture, map-making, 3D printing, engineering, and art, aiding in accurate representations and designs. home / geometry / transformation / scale factor a scale factor is the ratio between the size of an original and final object that vary only in size. For example, the penguin shown on the left below is 3 times larger than the penguin on the right. The factor we would scale the larger penguin by to get the smaller penguin is the scale factor. In this case, the scale factor is 1/3. Similarly, the pentagon shown in green is enlarged by a scale factor of 2 to produce the blue pentagon. What is a scale factor A scale factor is the ratio between corresponding measurements of two similar figures. In geometry, a similar figure is one that has the same shape and angle measurements but a different size; a corresponding side is one that is in the same relative position of the different figures. The scale factor is the factor by which the dimensions of one figure need to be multiplied by in order to make the other figure. There are a few different ways for an object to be scaled: Enlargement. When an object becomes larger as a result of the scale factor, this is referred to as enlargement. When an object is enlarged, the scale factor is always > 1. Reduction. When an object becomes smaller as a result of the scale factor, this is referred to as reduction. When an object is reduced, the scale factor is always < 1. Congruent. When an object stays the same size as a result of the scale factor, the objects are congruent, and the scale factor is = 1. Scale factor formula The formula for finding the scale factor is: For example, if the original shape is a square with side lengths of 4 and the final shape is a square with side lengths of 6, the scale factor is: This means that we multiply all sides of the original square by 3/2 to get the final square. Recall that when an object is scaled, only the dimensions change. The angle measures stay the same. Also, all dimensions of the object must be scaled by the same scale factor. If we compare two objects and find a different scale factor, this means that the two objects are not similar, and there is no scale factor. How to use scale factor There are a number of practical uses for scale factors: Drawing similar figures in geometry. Making scale models, such as train models that fit in a living room but have the same proportions as the real thing. Creating blueprints for large machinery or structures, which allows us to visualize large real-world objects in small spaces. Making maps that accurately represent real-world distances. Providing a reference scale on graphs that can clarify or simplify data presentation. Scaling geometric figures The scale factor tells us what to multiply each side length of a geometric figure by to produce a scaled, similar figure. Triangle ABC is similar to triangle DEF (ΔABC ~ ΔDEF), which means that the corresponding side lengths of the triangles are proportional: Any of the three ratios can be used to determine the scale factor. Example: Find the lengths of sides b and d for the triangles below given that ΔABC ~ ΔDEF. Since the triangles are similar, . We can find the scale factor using the ratio of a pair of corresponding sides: . This is the scale factor we multiply a side length of triangle ABC by to find its corresponding side length in DEF. We would multiply a side length of DEF by instead to find its corresponding side length in ABC. We could also set the ratios of the corresponding sides equal to find b and d. 18d = 216 d = 12 24b = 360 b = 15 1 Verify that the figures are similar. Similar figures, or shapes, are ones in which the angles are congruent, and the side lengths are in proportion. Similar figures are the same shape, only one figure is bigger than the other.[2] The problem should tell you that the shapes are similar, or it might show you that the angles are the same, and otherwise indicate that the side lengths are proportional, to scale, or that they correspond to each other. 2 Find a corresponding side length on each figure. You may need to rotate or flip the figure so that the two shapes align and you can identify the corresponding side lengths. You should be given the length of these two sides, or should be able to measure them.[3] If you do not know at least one side length of each figure, you cannot find the scale factor. For example, you might have a triangle with a base that is 15 cm long, and a similar triangle with a base that is 10 cm long. Advertisement 3 Set up a ratio. For each pair of similar figures, there are two scale factors: one you use when scaling up, and one you use when scaling down. If you are scaling up from a smaller figure to a larger one, use the ratio Scale Factor = l a r g e r l e n g t h s m a l l e r l e n g t h {\displaystyle {\text{Scale Factor}}={\frac {largerlength}{smallerlength}}}. If you are scaling down from a larger figure to a smaller one, use the ratio Scale Factor = s m a l l e r l e n g t h l a r g e r l e n g t h {\displaystyle {\text{Scale Factor}}={\frac {smallerlength}{largerlength}}}. Filling in the appropriate values, it becomes Scale Factor = 10/15 {\displaystyle {\text{Scale Factor}}={\frac {10}{15}}} . 4 Simplify the ratio. The simplified ratio, or fraction, will give you your scale factor.[5] If you are scaling down, your scale factor will be a proper fraction.[6] If you are scaling up, it will be a whole number or improper fraction, which you can convert to a decimal. For example, the ratio 10/15 {\displaystyle {\frac {10}{15}}} simplifies to 2/3 {\displaystyle {\frac {2}{3}}} . So the scale factor of two triangles, one with a base of 15 cm and one with a base of 10 cm, is 2/3 {\displaystyle {\frac {2}{3}}} . Advertisement 1 Find the side lengths of the figure. You should have one figure of which the side lengths are given or measurable. If you cannot determine the side lengths of the figure, you cannot make a similar figure.[7] For example, you might have a right triangle with sides measuring 4 cm and 3 cm, and a hypotenuse 5 cm long. 2 Determine whether you are scaling up or down. If you are scaling up, your missing figure will be larger, and the scale factor will be a whole number, improper fraction, or decimal.[8] If you are scaling down your missing figure will be smaller, and your scale factor will most likely be a proper fraction. For example, if the scale factor is 2, then you are scaling up, and a similar figure will be larger than the one you have. 3 Multiply one side length by the scale factor. The scale factor should be given to you. When you multiply the side length by the scale factor, this gives you the missing corresponding side length on the similar figure. [9] For example, if the hypotenuse of a right triangle is 5 cm long, and the scale factor is 2, to find the hypotenuse of the similar triangle, you would calculate 5 × 2 = 10 {\displaystyle 5\times 2=10} . So the similar triangle has a hypotenuse that is 10 cm long. 4 Find the remaining side lengths of the figure. Continue to multiply each side length by the scale factor. This will give you the corresponding side lengths of the missing figure. For example, if the base of a right triangle is 3 cm long, with a scale factor of 2, you would calculate 3 × 2 = 6 {\displaystyle 3\times 2=6} to find the base of the similar triangle. If the height of a right triangle is 4 cm long, with a scale factor of 2 you would calculate 4 × 2 = 8 {\displaystyle 4\times 2=8} to find the height of the similar triangle. Advertisement 1 Find the scale factor of these similar figures: a rectangle with a height of 6 cm, and a rectangle with a height of 54 cm. Create a ratio comparing the two heights. Scaling up, the ratio is Scale Factor = 54/6 {\displaystyle {\text{Scale Factor}}={\frac {54}{6}}} . Scaling down, the ratio is Scale Factor = 6/54 {\displaystyle {\text{Scale Factor}}={\frac {6}{54}}} . Simplify the ratio. The ratio 54/6 {\displaystyle {\frac {54}{6}}} simplifies to 9/1 = 9 {\displaystyle {\frac {9}{1}}=9} . The ratio 6/54 {\displaystyle {\frac {6}{54}}} simplifies to 1/9 {\displaystyle {\frac {1}{9}}} . So the two rectangles have a scale factor of 9 {\displaystyle 9} or 1/9 {\displaystyle {\frac {1}{9}}} . 2 Try this problem. An irregular polygon is 14 cm long at its widest point. A similar irregular polygon is 8 inches at its widest point. What is the scale factor? Irregular figures can be similar if all of their sides are in proportion. Thus, you can calculate a scale factor using any dimension you are given.[10] Since you know the width of each polygon, you can set up a ratio comparing them. Scaling up, the ratio is Scale Factor = 14/8 {\displaystyle {\text{Scale Factor}}={\frac {14}{8}}} . Scaling down, the ratio is Scale Factor = 8/14 {\displaystyle {\text{Scale Factor}}={\frac {8}{14}}} . Simplify the ratio. The ratio 14/8 {\displaystyle {\frac {14}{8}}} simplifies to 7/4 = 1.75 {\displaystyle {\frac {7}{4}}=1.75} . The ratio 8/14 {\displaystyle {\frac {8}{14}}} simplifies to 4/7 {\displaystyle {\frac {4}{7}}} . So the two irregular polygons have a scale factor of 1.75 {\displaystyle 1.75} or 4/7 {\displaystyle {\frac {4}{7}}} . 3 Use the scale factor to answer this problem. Rectangle ABCD is 8cm x 3cm. Rectangle EFGH is a larger, similar rectangle. Using a scale factor of 2.5, what is the area of Rectangle EFGH? Multiply the height of Rectangle ABCD by the scale factor. This will give you the height of Rectangle EFGH: 3 × 2.5 = 7.5 {\displaystyle 3\times 2.5=7.5} . Multiply the width of Rectangle ABCD by the scale factor. This will give you the width of Rectangle EFGH: 8 × 2.5 = 20 {\displaystyle 8\times 2.5=20} . Multiply the height and width of Rectangle EFGH to find the area: 7.5 × 20 = 150 {\displaystyle 7.5\times 20=150} . So, the area of Rectangle EFGH is 150 square centimeters. Advertisement 1 Divide the molar mass of the compound by that of the empirical formula. When you have the empirical formula of a chemical compound and you need to find the molecular formula of that same chemical compound, you can find the scaling factor you need by dividing the molar mass of the compound by the molar mass of the empirical formula. Scaling factor = 54.05 / 18.0152 = 3.2 Multiply the empirical formula by the scaling factor. Multiply the subscripts of each element within the empirical formula by the scaling factor you just calculated. This will give you the molecular formula of the chemical compound sample involved in the problem. For example, to find the molecular formula of the compound in question, multiply the subscripts of H2O by the scaling factor of 3. 3 Write the answer. With this answer, you have successfully found the answer to the empirical formula as well as the molecular formula of the chemical compound involved in the problem. For example, the scaling factor for the compound is 3. The molecular formula of the compound is H6O3. Advertisement Add New Question Question Once I have found the scale factor how do I enlarge by the scale factor? Enlarge the figure by multiplying each side by the scale factor. Question How do you find the linear scale factor of an irregular shape? You can find the scale factor of an irregular shape just as you would find the scale factor of a regular shape. As long as you know that the two shapes are similar, you can use one dimension on both figures to calculate the scale factor. For example, if you know the width of the shape, divide one width by the other to find the scale factor. Question Are scale factors always fractions? Yes, although the fraction could be either less than or greater than 1. See more answers Ask a Question Advertisement 1 Co-authored by: Associate Professor of Mathematics This article was co-authored by Mario Banuelos, PhD. Mario Banuelos is an Associate Professor of Mathematics at California State University, Fresno. With over eight years of teaching experience, Mario specializes in mathematical biology, optimization, statistical models for genome evolution, and data science. Mario holds a BA in Mathematics from California State University, Fresno, and a Ph.D. in Applied Mathematics from the University of California, Merced. Mario has taught at both the high school and collegiate levels. This article has been viewed 923,457 times. Co-authors: 41 Updated: May 12, 2025 Views: 923,457 Categories: Mathematics Print Send fan mail to authors Thanks to all authors for creating a page that has been read 923,457 times. "I liked the examples of how to do the problem." Share your story Scale factor is a number by which the size of any geometrical figure or shape can be changed with respect to its original size. It is used to draw the enlarged or reduced shape of any given figure and to find the missing length, area, or volume of an enlarged or reduced figure. It should be noted that the scale factor helps in changing the size of the figure and not its shape. What is a Scale Factor? Scale factor is defined as the number or the conversion factor which is used to change the size of a figure without changing its shape. It is used to increase or decrease the size of an object. The scale factor can be calculated if the dimensions of the original figure and the dimensions of the dilated (increased or decreased) figure are known. For example, a rectangle has a length of 5 units and a width of 2 units. Now, if we increase the size of this rectangle by a scale factor of 2, the sides will become 10 units and 4 units, respectively. Hence, we can use the scale factor to get the dimensions of the changed figures. Observe the following figure which shows how the scale factor can change the original figure to its larger and smaller versions. In the following figure, the original rectangle has the dimensions given as 3 units and 2 units. To create an enlarged figure, the dimensions are multiplied by the scale factor of 3 using the formula: Dimensions of the new shape = Dimensions of the original shape × Scale factor. This gives the new dimensions as 9 units and 6 units respectively. Similarly, to create a reduced figure, we multiply the original dimensions with the scale factor of 1/2. This gives the reduced dimensions as 1.5 units and 1 unit. Scale Factor Formula The basic formula to find the scale factor of a figure is expressed as, Scale factor = Dimensions of the new shape ÷ Dimensions of the original shape. This formula can also be used to calculate the dimensions of the new figure or the original figure by simply substituting the values in the formula. How to Find the Scale Factor? The scale factor can be calculated when the new dimensions and the original dimensions are given. However, there are two terms that need to be understood when using the scale factor. When the size of a figure is increased, we say that it has been scaled up and when it is decreased, we say that it has been scaled down. Scale Up Scaling up means that a smaller figure is enlarged to a bigger one. In this case, the scale factor can be calculated by a formula, which is another version of the basic formula given in the previous section. Scale factor = Larger figure dimensions ÷ Smaller figure dimensions The scale factor for scaling up is always greater than 1. For example, if the dimension of the larger figure is 15 and that of the smaller one is 5, let us place this in the formula which makes it: 15 ÷ 5 = 3. Thus, we can see that the scale factor is greater than 1. Scale Down Scaling down means that a larger figure is reduced to a smaller one. Even in this case, the scale factor can be calculated by a formula, which is another version of the basic formula. Scale factor = Smaller figure dimensions ÷ Larger figure dimensions The scale factor for scaling down is always less than 1. For example, if the dimension of the smaller figure is 8 and that of the larger one is 24, let us place this in the formula which makes it: 8 ÷ 24 = 1/3. Thus, we can see that the scale factor is less than 1. Observe the following triangles which explain the concept of a scaled-up figure and a scaled-down figure. Important Notes The following points should be remembered while studying about the scale factor: The scale factor of a dilated figure is denoted by 'r' or 'k'. If the scale factor is more than 1 (k > 1), the image is enlarged. If the scale factor is less than 1 (0 < k < 1). This means the image is scaled up. The scale factor formula = Larger figure dimensions ÷ Smaller figure dimensions b) If the image needs to be reduced, the scale factor is less than 1 (0 < 1), it means that the given figure needs to be enlarged. What Does a Scale Factor of 0.5 Mean? A scale factor of 0.5 means that the changed image will be scaled down. For example, the original figure of a square has one of its sides as 6 units. Now, let us use the scale factor of 0.5, to change its size. We will use the formula: Dimensions of the new shape = Dimensions of the original shape × Scale factor. Substituting the values in the formula: the dimensions of the new square will be = 6 × 0.5 = 3 units. This shows that a scale factor of 0.5 changed the figure to a smaller one. How do you Find the Scale Factor? The scale factor can be calculated when the new dimensions and the original dimensions are given. The basic formula to find the scale factor of a figure is: Scale factor = Dimension of the new shape ÷ Dimension of the original shape. For example, if the side length of a square is 6 units and if the size of the square has been increased such that the side length of the square becomes 18 units, let us find the scale factor. We will use the formula, Scale factor = Dimension of the new shape ÷ Dimension of the original shape. After substituting the given values we get, Scale factor = 18 ÷ 6 = 3. Therefore, the scale factor that is used to increase the size of the square is 3. What Happens if the Scale Factor is Less Than 1? If the scale factor is less than 1 (0 < k