Areas of shapes on grids

If the required segments are NOT on the grids of the chart paper, an old friend called the Box Method will come to your aid. The Box method is simple, easy to calculate and works for all polygons drawn on a coordinate axis. The Box method is based on the concept that the whole is equal to the sum of its parts. The field is divided into its parts, one of which is the figure whose surface you want to calculate. As the example on the right shows, after drawing the field, all lengths related to the field can be counted, except for the lengths in 'ABC. Read more about this method in Box Method. September 3, 2020 Reading time: 5 min. Introduction Our world is full of amazing shapes. Circles & Ovals Square & Rectangles, Stars & Triangles. It's fun to know about different shapes and their structure. We use many objects with different shapes in our daily and working life. In this article, we learn about different shape types and how to calculate the area of shapes. Geometry is a science in which we study forms, their dimensions. It has developed formulas to find out the range of specific forms. It is often necessary to calculate the area covered by these objects. Let us understand these formulas. What is Area? Word area means free area in Latin. The surface can be defined as the surface that is covered by a flat surface of a particular shape. It is measured in the form of the number of square units. [1] (square centimeter, square inch, square foot, etc.). The knowledge of the area of the shape of the surface helps us in our daily life. It helps to communicate in practical life or to give information. For example, the area of a plot can be used to calculate the available area or area of space that can be calculated to determine the size of the carpet to be used. Most objects or shapes have edges and corners. The length and width of these edges is taken into account to calculate the surface of a particular shape. Grid Technique Grid techniques can help us better understand these formulas. Let's draw a shape on a scaled grid. You can find the surface by counting the number of squares that cover the inner area of the shape. In this image, there are 6 grid squares in a rectangle. One should know the dimensions of the grid square. It could be in centimeters, inches or feet. Suppose the width of 1 square is 1cms, then the area of the rectangle would be 6 squarecms after this picture. The idea is how many squares cover the inner space of the shape. Formulas for calculating surfaces Shapes For the calculation of the area for a square, one only needs to know the length of one side of the square and multiply this number itself. Eg. If the length of the square is 4 cms, then the area is 4 cm x 4 cm = 16 sqm. Rectangle How to find the area of a one of the it is necessary to know the length and width. Simply by multiplying its length by width, the area can be calculated .B. The length of the rectangle is 4 cm and the width is 5 cm. so area would be: 4cms x 5 cms = 20 sq cms. Triangle Check out the image below. When you observe, the triangle is half the square or parallelogram. Of course, its area would be half of the square/parallelogram. i.e. (length x height) /2 Now the height of the triangle can be measured by drawing a straight line (right-angled line) from the base of the triangle to the vertex (upper corner of the triangle). Here in the above example the area of the triangle would be: 4 × 3 /2 = 6 sqm. Circle To obtain the area of the circle, one should know its diameter or radius, The radius of the circle is the length of the line from the center of the circle towards its edge. The radius is half the diameter. Diameter is the line drawn between two edges of circles that pass through the center of the same circle. The formula for finding the circle is π × r2, where the value of π is constant. It is 3.142 Therefore, the area of a circle is: 3,142 × radius of the circle2 Eg. The radius of the circle is 3 cm. then the area would be: 3,142 × 32 = 28,278 sqm. Real-life examples We can apply these formulas to preserve the range of different shapes. 1. Suppose Jini got 4 pieces of a medium size of pizza and Jony got 3 pieces of another big pizza. How do Jini and Jony know who got more pizza? Answer: First step: We have to calculate the area of both pizzas. For this we will look at the radius of its diameter, since pizza has a circular shape. Suppose the medium-sized pizza has a radius of 10 cm. Its area would be 3,142 × 102 per formula. i.e. π × R2 The area would be: 314.2 cms. Likewise, a large pizza has a radius of 16 cm, the area would be: 3,142 × 162 = 804,352 cm. Well, if we have the area, let's see how many shares of Pizza Gini and Jon have. Gini has 4 same pieces of 6 medium-sized pizza, which has an area of 62,84 sqm. Gini's share is 314.2 / 6 × 4 = 209.466 cm. And Jony has 3 equal pieces of 6 medium-sized pizza. The proportion has an area of 100.544 cms Its share would be 804,352 / 6 × 3 = 402.176 cms. From above we can say Johnny has more pizza. Johnny has more Pizza 2. You have to find out the area of a wall to carry painting. Answer: The first step is to calculate the entire wall area by measuring height and width. Subtract the window/door area by measuring the height and width of the window/door. And you can find out the exact working area. Suppose the height is 11Sq Feet and the width is 10 Sq The area of the wall would be: 11 feet × 10 feet (height × width) = 110sq feet From this area we must exclude the area of window. Let's calculate the area area window by taking into account the height and width of the window. The same would be 3feet height and 4 feet in width. So the area of the window would be 3 feet × 4feet = 12 feet. Therefore, the entire work surface would be: 110 sq feet - 12 sq feet = 98 sq feet. The example above is an example of calculating shapes of the surface that are useful in daily life. There are several other areas in which we need to calculate shapes. Formulas are useful for maintaining the range with different and complex shapes. What we have learned The table below contains some basic forms and formulas to calculate their ranges. Form drawing formula square a2 (a stand for the length of one side of the square) Right cklänge × width triangle 1/2 (base × height) Circle π x R2 (π stand for - 3.142 & R stand for - radius of the circle) Summary From the clay tables of the Babylonian era shows the area calculation of the trapezoid to the modern formulas for the various forms , calculation area was not only a fascinating field of study, but also has a fascinating field of study, but has also been a fascinating field of study, The same shapes with different areas and different shapes with the same areas, all must be calculated for different purposes such as building buildings, painting areas, putting tiles, selling items and the list is endless. References [1] Basic principles of soil technology. Written by Swati Panchal, Cuemath Teacher If you see this message, it means that we have problems loading external resources on our website. If you are behind a web filter, please make sure that the *.kastatic.org and *.kasandbox.org domains are unmarked. When this message is displayed, it means that we are having trouble loading external resources on our website. If you are behind a web filter, please make sure that the *.kastatic.org and *.kasandbox.org domains are unmarked. See also: Polygon surface properties are a measure of how much space is within a shape. Calculating the area of a shape or surface can be useful in everyday life – for example, you may need to know how much paint you need to buy to cover a wall, or how much grass you need to sow a lawn. This page covers the basics you need to know to understand and calculate the areas of common shapes such as squares and rectangles, triangles, and circles. Calculate the area using the raster method When a shape is drawn on a scaled grid, you can find the area by counting the number of grid squares within the shape. In this example, there are 10 grid squares within the rectangle. To use a surface value to Grid method, we need to know the size that represents a grid square. This example uses centimeters, but the same method applies to each unit of length or distance. For example, you could use inches, meters, miles, feet, etc. In this example, each grid square has a width of 1cm and a height of 1cm. In In Words each grid square is a square centimeter. Count the grid squares within the large square to find its surface. There are 16 small squares, so the area of the large square is 16 square centimeters. In mathematics, we shorten square centimeters to cm2. The 2 means square. Each grid square is 1cm2 in size. The area of the large square is 16cm2. Counting squares on a grid to find the surface works for all shapes—as long as the grid sizes are known. However, this method becomes more difficult when shapes do not fit exactly into the grid or when you need to count fractions of grid squares. In this example, the square does not fit exactly into the grid. We can still calculate the area by counting grid squares. There are 25 fully gridded squares (shaded in blue). 10 half-grid squares (yellow shaded) – 10 half squares equal to 5 full squares. There is also 1 quarter square (shaded in green) – (1/4 or 0.25 of an entire square). Add all the squares and fractions together: 25 + 5 + 0.25 = 30.25. The area of this place is thus 30,25cm2 . You can also write this as 301x4cm2. Although using a raster and counting squares within a shape is a very easy way to learn the concepts of the surface, it is less useful to find exact areas with more complex shapes when there are many fractions of grid squares that can be added together. The surface can be calculated using simple formulas, depending on the type of shape you are working with. The rest of this page explains and provides examples of how to calculate the area of a shape without using the raster system. Areas of simple squares: squares and rectangles and parallelograms The simplest (and most commonly used) area calculations are for squares and rectangles. To find the area of a rectangle, multiply its height by its width. For a square, you only need to find the length of one of the pages (because each page has the same length) and then multiply it yourself to find the area. This is the same as say length2 or length square. It is a good practice to check whether a shape is actually a square by measuring two sides. For example, the wall of a room may look like a square, but when you measure it, you notice that it is actually a rectangle. Often forms can be more complex in real life. Imagine, for example, that you want to find the area of a floor so that you can order the right amount of carpet. A typical floor plan of a room must not consist of a simple rectangle or square: in this example and other examples such as this the trick is to divide the shape into several rectangles (or squares). It doesn't matter how you share the shape - each of the three solutions will lead in the same answer. Solutions 1 and 2 require you to create two shapes and add their areas to find the total area. For Solution 3, create a larger shape (A) and subtract the smaller shape (B) from it to find the range. Another common problem to find the area of a frame—a shape within another shape. This example shows a path around a field—the path is 2 m wide. Again, there are several ways to work out the range of the path in this example. You can display the path as four separate rectangles, calculate their dimensions, and then calculate their area, and then add the faces to make a sum. A quicker way would be to work out the area of the entire shape and the area of the inner rectangle. Subtract the internal rectangle area from the entire exit of the path area. The area of the whole shape is 16m × 10m = 160m2. We can work out the dimensions of the middle section because we know that the path around the edge is 2m wide. The width of the entire shape is 16m and the width of the path over the entire shape is 4m (2m on the left side of the shape and 2m on the right). 16m - 4m = 12m We can do the same for height: 10m - 2m - 2m = 6m So we calculated that the middle rectangle is 12m × 6m. The area of the middle rectangle is therefore: 12m × 6m = 72m2. Finally, we take the area of the middle rectangle away from the area of the entire shape. 160 - 72 = 88m2. The area of the path is 88m2. A parallelogram is a four-sided shape with two pairs of sides of equal length—by definition, a rectangle is a parallelogram type. Most people, however, tend to view parallelograms as four-sided shapes with angled lines, as shown here. The area of a parallelogram is calculated in the same way as for a rectangle (height × width), but it is important to understand that height does not mean the length of the vertical (or vertical) sides, but the distance between the sides. From the chart you can see that the height is the distance between the top and bottom sides of the shape - not the length of the page. Think of an imaginary line, at right angles, between the top and bottom sides. That's the height. Areas of triangles It may be useful to consider a triangle as half of a square or parallelogram. Assuming you know (or can measure the dimensions of a triangle), then you can quickly work out its range. The area of a triangle is (height × width) ÷ 2. In other words, you can work out the area of a triangle in the same way as the area for a square or parallelogram and then simply split your answer by 2. The height of a triangle is measured as a right-angled line from the bottom line (base) to the peak point (top point) of the triangle. Here are some examples: The range of the three triangles in the diagram above is the same. Each triangle has a width and height of 3cm. The area is calculated: × width) ÷ 2 3 × 3 = 9 9 ÷ 2 = 4.5 The area of each triangle is 4.5 cm2. In real-world situations, you may be confronted with a problem that you need to find the area of a triangle, such as: you want to paint the gable end of a barn. You only want to visit the decoration shop once to the right amount of color. You know that a litre of paint covers 10m2 wall. How much paint do you need to cover the gable end? You need three dimensions: A - The total height up to the top of the roof. B - The height of the vertical walls. C - The width of the building. In this example, the measurements are: A - 12.4m B - 6.6m C - 11.6m The next stage requires some additional calculations. Think of the building as two shapes, a rectangle and a triangle. From the measurements you have, you can calculate the additional measurement required to calculate the range of the gable end. Measurement D = 12.4 – 6.6 D = 5.8m You can now work out the area of the two parts of the wall: area of the rectangular part of the wall: 6.6 × 11.6 = 76.56m2 Area of the triangular part of the wall: (5.8 × 11 .6) ÷ 2 = 33.64m2 Add these two areas together, to find the total area: 76.56 + 33.64 = 110.2m2 As you know that a litre of paint covers 10m2 wall so we can find out how many liters we have to buy: 110.2 ÷ 10 = 11.02 liters. In reality, it can be seen that paint is only sold in 5 litres or 1 litre can, the result being just over 11 litres. You may be tempted to round off to 11 litres, but if we do not dilute the colour, that will not be enough. So you'll probably round up to the next whole liter and buy two 5-litre cans and two 1-litre cans that make a total of 12 liters of paint. This allows any waste and leaves most of the litre to be read later. And don't forget, if you need to apply more than one coat, you need to multiply the amount of color for a layer by the number of layers required! Areas of circles To calculate the area of a circle, you must know its diameter or radius. The diameter of a circle is the length of a straight line from one side of the circle to the other that passes through the central point of the circle. The diameter is twice as long as the radius (diameter = radius × 2) The radius of a circle is the length of a straight line from the central point of the circle to its edge. The radius is half the diameter. (Radius = diameter ÷ 2) You can measure the diameter or radius at any point around the circle –it is important to measure with a straight line that ends by (diameter) or ends in (radius) of the center of the circle. In practice, measuring circles often makes it easier to measure the diameter and then divide it by 2 to find the radius. You need the radius to calculate the range of a circle, the formula is: Circle = . R2. This means: π = Pi is a constant equal to 3,142. R = is the radius of the circle. R2 square) means radius × radius. Therefore, a circle with a radius of 5cm has an area of: 3,142 × 5 × 5 = 78.55cm2. A circle with a diameter of 3m has a surface: First we work out the radius (3m ÷ 2 = 1.5m) Then apply the formula: to: 3,142 × 1.5 × 1.5 = 7.0695. The area of a circle with a diameter of 3m is 7.0695m2. Last example This example appears on much of the content of this page to solve simple area problems. This is the Ruben M. Benjamin House in Bloomington, Illinois, which is listed on the United States National Register of Historic Places (record number: 376599). This example includes the search for the area of the front of the house, the wooden slat part – without door and window. The dimensions you need are: A - 9.7m B - 7.6m C - 8.8m D - 4.5m E - 2.3m F - 2.7m G - 1.2m H - 1.0m Notes: All measurements are approximate. You don't have to worry about the border around the house – this was not taken into account in the measurements. We assume that all rectangular windows are the same size. The round window measurement is the diameter of the window. The measurement for the door includes the steps. What is the area of the wooden slatted part of the house? Work and answers below: Answers to the above example First, work out the area of the main shape of the house – this is the rectangle and triangle that make up the shape. The main rectangle (B × C) 7.6 × 8.8 = 66.88m2. The height of the triangle is (A - B) 9.7 - 7.6 = 2.1. The area of the triangle is therefore (2.1 × C) ÷ 2.1 × 8.8 = 18.48. 18.48 ÷ 2 = 9.24 m2. The total combined area of the front of the house is the sum of the areas of the rectangle and triangle: 66.88 + 9.24 = 76.12m2. Next, work the areas of the windows and doors so that they can be subtracted from the entire surface. The range of the door and steps (D × E) is 4.5 × 2.3 = 10.35m2. The area of a rectangular window is (G × F) 1.2 × 2.7 = 3.24 m2. There are five rectangular windows. Multiply the area of a window by 5.3.24 × 5 = 16.2 m2. (the total area of the rectangular windows). The round window has a diameter of 1m, its radius is therefore 0.5m. Work out the area of the round window using R2: 3,142 × 0.5 × 0.5=. 0.7855m2. Next, add the areas of the door and window. (door area) 10.35 + (rectangular window area) 16.2 + (round window area) 0.7855 = 27.3355 Finally, subtract the total area for the windows and doors from the entire area. 76.12 – 27.3355 = 48.7845 The area of the wooden slat front of the house, and the answer to the problem is: 48.7845m2. You can round the answer to 48.8 m2 or 49 m2. See our page on estimation, approximation and rounding. Rounding.