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HOW DO YOU CALCULATE THE AREA OF DIFFERENT SHAPES?

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ABSTRACT: Most students in high school and college math ask the question, "When will I ever use this concept in real life?" In reality, geometry has many practical applications to the everyday world as well as the computer world.

Geometry can be interesting when you think about how it is connected to the design of computer applications including real and virtual objects, or if you are trying to determine information about and properties of a geospatial location or area. In this module, you will discuss area of geometric figures and objects. By the end of the module, you should know the meaning and notation for area and the area formulas for some common geometric figures, and be able to calculate the area of some common geometric figures.

KEYWORDS-area, shapes, geometry, calculate, different

I. INTRODUCTION

Area

The area of a surface is the amount of square length units contained in the surface.

You will begin by learning the formulas for calculating the area of various geometric figures. Each figure has a certain formula that you need to calculate the area, which is the amount of square length units contained in the surface.

For example, 3 sq. in. means that 3 squares, 1 inch on each side, can be placed precisely on a surface. (The squares may have to be cut and rearranged so they match the shape of the surface.)[1,2,3]

Select the following link to see a representation of area using a sheet of paper. You will be able to see how area is measured by dividing the paper into small square units.

Area

Now that you have a better idea of what area is, look at a square. It has four equal sides and four equal angles: Each angle is 90°. To determine the area of a square, use the following formula.

Area of Square

Area = side · side = $side^2$

II. DISCUSSION

Area Formulas

The area of these geometric figures can be determined using the following formulas.

Figure	Area Formula	Statement
Triangle	A = b · h	Area of a triangle is one-half the base times the height.

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Rectangle	$A = l \cdot w$	Area of a rectangle is the length times the width.
Parallelogram	$A = b \cdot h$	Area of a parallelogram is base times the height.
Trapezoid	$A = \cdot(b_1 + b_2) \cdot h$	Area of a trapezoid is one half the sum of the two bases times the height.
Circle	$A = \pi r^2$	Area of a circle is π times the square of the radius.

III. RESULTS

In Geometry, a shape is defined as the figure closed by the boundary. The boundary is created by the combination of lines, points and curves. Basically, there are two different types of geometric shapes such as:

- Two – Dimensional Shapes
- Three – Dimensional Shapes[4,5,6]

Each and every shape in the Geometry can be measured using different measures such as area, volume, surface area, perimeter and so on. In this article, let us discuss the area of shapes for 2D figures and 3D figures with formulas.

An area is a quantity that expresses the extent of a two-dimensional figure or shape or planar lamina in the plane. Lamina shapes include 2D figures that can be drawn on a plane, e.g., circle, square, triangle, rectangle, trapezium, rhombus and parallelogram. Area of shapes such as circle, triangle, square, rectangle, parallelogram, etc. are the region occupied by them in space.

Polygon shape: A polygon is a two-dimensional shape that is formed by straight lines. The examples of polygons are triangles, hexagons and pentagons. The names of shapes describe how many sides exist in the shape. For instance, a triangle consists of three sides and a rectangle has four sides. Hence, any shape that can be formed using three straight lines is known as a triangle and any shape that can be drawn by linking four lines is known as a quadrilateral. The area is the region inside the boundary/perimeter of the shapes which is to be considered.

What are 2D shapes?

The two-dimensional shapes (2D shapes) are also known as flat shapes, are the shapes having two dimensions only. It has length and breadth. It does not have thickness. The two different measures used for measuring the flat shapes are area and the perimeter. Two-dimensional shapes are the shapes that can be drawn on the piece of paper. Some of the examples of 2D shapes are square, rectangle, circle, triangle and so on.

Area of 2D Shapes Formula

In general, the area of shapes can be defined as the amount of paint required to cover the surface with a single coat. Following are the ways to calculate area based on the number of sides that exist in the shape[7,8,9]

Let us write the formulas for all the different types of shapes in a tabular form.

Shape	Area	Terms
Circle	$\pi \times r^2$	r = radius of the circle

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Triangle	½ × b × h	b = base h = height
Square	a^2	a = length of side
Rectangle	l × w	l = length w = width
Parallelogram	b × h	b=base h=vertical height
Trapezium	½(a+b) × h	a and b are the length of parallel sides h = height
Ellipse	πab	a = ½ minor axis b = ½ major axis

IV. CONCLUSION

What are 3D shapes?

The three-dimensional shapes (3D shapes), known as solid shapes, are the shapes that have three dimensions such as length, breadth and thickness. The two distinct measures used to define the three-dimensional shapes are volume and surface area. Generally, the three-dimensional shapes are obtained from the rotation of two-dimensional shapes. Thus, the surface area of any 2D shapes should be a 2D shape. If you want to calculate the surface area of solid shapes, we can easily calculate from the area of 2D shapes.

Area of 3D Shapes Formula

According to the International System of Units (SI), the standard unit of area is the square meter (written as m^2) and is the area of a square whose sides are one meter long. For example, a particular shape with an area of three square meters would have the same area as three such squares. The surface area of a solid object is a measure of the total area that the surface of the object occupies.[10,11,12]

For 3D/ solid shapes like cube, cuboid, sphere, cylinder and cone, the area is updated to the concept of the surface area of the shapes.[19,20,21] The formulas for three-dimension shapes are given in the table here:

Shape	Surface area	Terms
Cube	$6a^2$	a = length of the edge
Rectangular prism	2(wl+hl+hw)	l = length w = width h = height
Cylinder	2πr(r + h)	r = radius of circular base h = height of the cylinder
Cone	πr(r + l)	r = radius of circular base l = slant height
Sphere	$4\pi r^2$	r = radius of sphere

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Hemisphere	$3\pi r^2$	r = radius of hemisphere

In addition to the area of the planar shapes, an additional variable i.e the height or the radius are taken into account for computing the surface area of the shapes.

Consider a circle of radius r and make endless concentric circles. Now from the centre to the boundary make a line segment equal to the radius and cut the figure along with that segment. [16,17,18]It'll be formed a triangle with base equal to the circumference of the circle and height is equal to the radius of the outer circle, i.e., r. The area can thus be calculated as ½ * base * height i.e

½ * 2πr*r[13,14,15]

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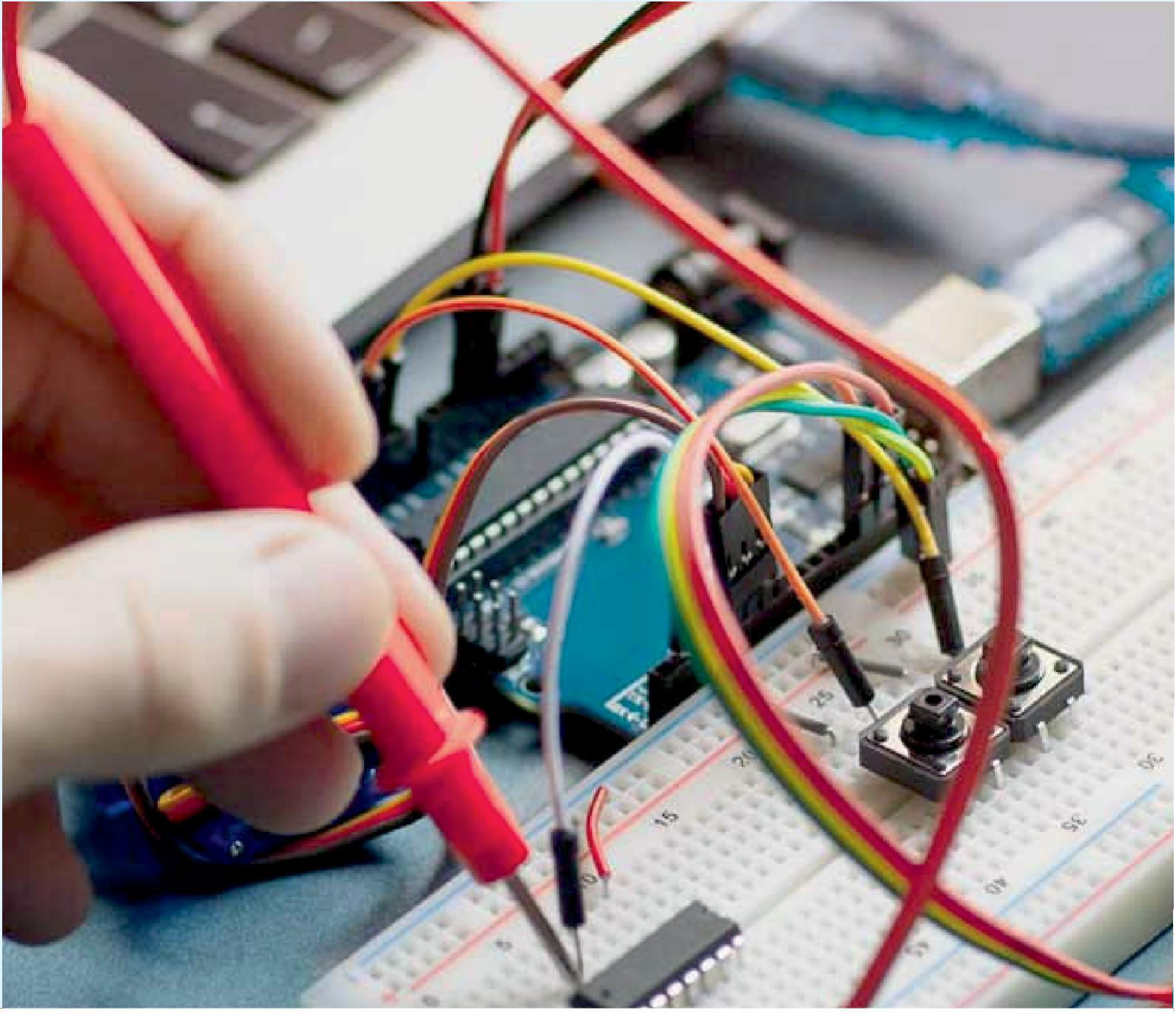

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