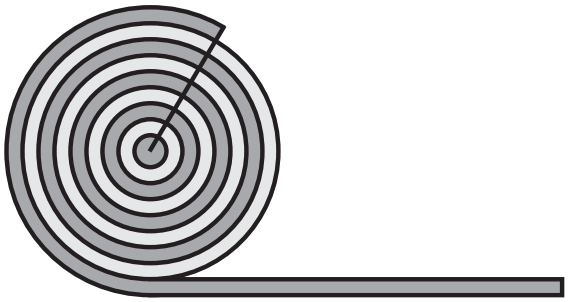
Activity 13A



Area of a circle

Objective
To give suggestive demonstration of the formula that the area of the circle is half the product of its circumference and radius.

Pre-requisite knowledge
Formula for the circumference of a circle.
Formula for the area of a triangle.

Material Required
Coloured thread, a pair of scissors.

Procedure

1. Draw a circle of a certain radius say r.
2. Fill up the circle with concentric circles made of different coloured threads as shown in Fig 13A (a) so that there is no gap left in between. Obviously, the smallest circle will be a point circle.
3. Cut off the circle formed by threads along the radius of the circle starting from a point 'O'.
4. Open all the threads, arrange them from the smallest to the longest forming a triangle.

Observations

1. Area of the circle is same as the area of triangle.
2. The triangle so formed has the base equal to the circumference of the outermost circle, which is $2\pi r$. Height of the triangle is equal to the radius of the circle. Thus the area of the circle is $2\pi r \times r/2 = \pi r^2$

Learning Outcomes
The students express the area of a circle in terms of the area of a more elementary figure, namely a triangle, and thus build a geometrical intuition of the formula πr^2 for the area of circle.

Remark
The teacher may point out the fact that this is not a rigorous mathematical proof for the formula for area of a circle.

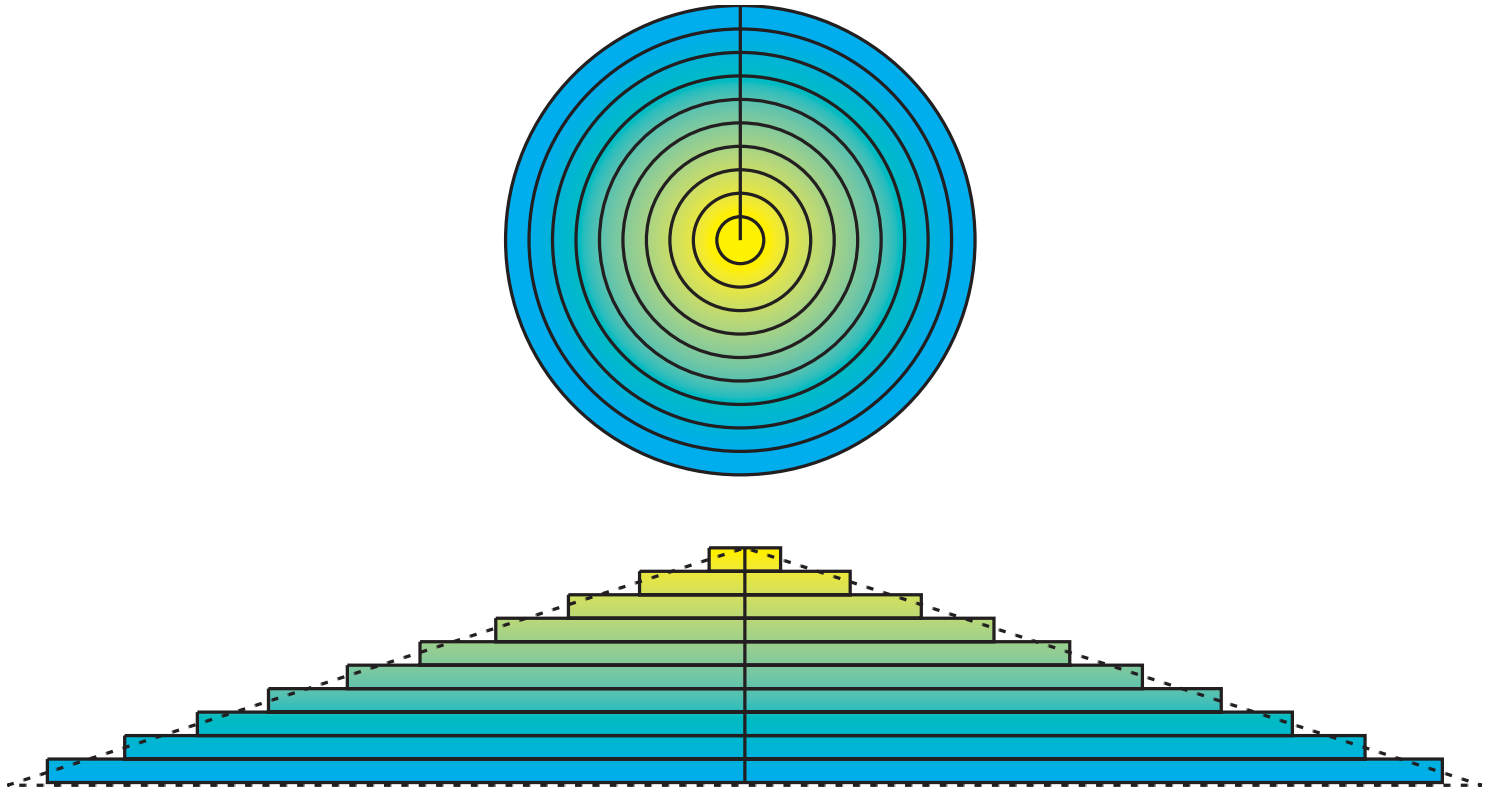
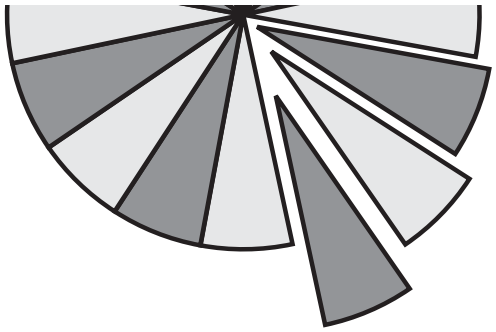


Fig 13A (a)



Activity 13B

Area of a circle

Objective

To give a suggestive demonstration of the formula that the area of circle is half the product of its circumference and radius.

Pre-requisite knowledge

1. Formula for the circumference of a circle.
2. Formula for the area of a rectangle.

Material Required

Coloured paper, compass, scale, a pair of scissors, gum, colours.

Procedure

1. Draw a circle of radius r = 4 cm (say) on the paper.
2. Divide the circle into 16 equal parts. [Fig 13B (a)]
3. Cut all the 16 parts and arrange them to get the Fig 13B (b).
4. Take any part from any side and further divide it into 2 parts. [Fig 13B (c)]
5. To complete the shape of rectangle arrange these two smaller parts at the corners of the shape obtained in Fig 13B (b).
6. Find the length and the breadth of the rectangle so formed [Fig 13B (d)].
7. Find the area of the rectangle.

Observations

1. The students will observe that the area of rectangle $[(2\pi r/2) \times r] = \pi r^2$
2. The students will observe that the rectangle is obtained from parts of circle. Hence area of circle = πr^2

Learning Outcomes

1. The students will learn the skill of transforming one geometrical shape into another.
2. They will also learn the elementary idea of approximation by transforming a circle into a rectangle like figure.
3. They will also learn that approximation becomes better and better as the number of parts increases.
4. The students express the area of a circle in terms of the area of a more elementary figure, namely a rectangle, and thus build a geometrical intuition of the formula πr^2 for the area of circle.

Remark

1. Teacher may ask the students to cut the circle into greater number of equal parts. Eg. 32, 64, … So as to convert the circle into a figure which appears more and more like a rectangle.
2. The teacher may point out the fact that this is not a rigorous mathematical proof for the formula for area of a circle.

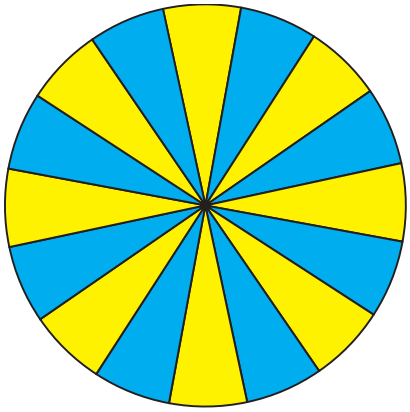


Fig 13B (a)

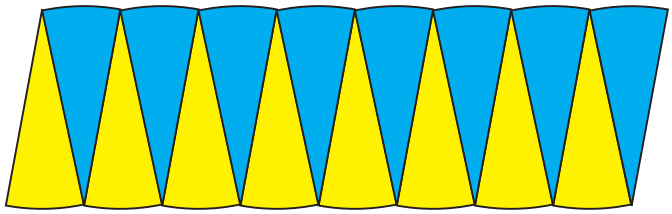


Fig 13B (b)

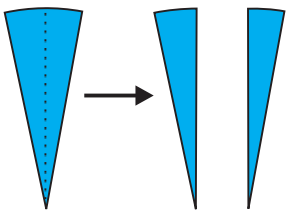


Fig 13B (c)

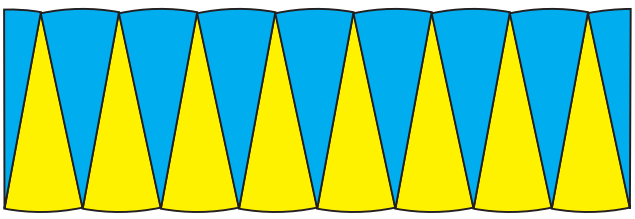


Fig 13B (d)