FIND THE VALUE OF π IN USING TRIGONOMETRI THROUGH MATHEMATICS GAME OF TEN GRADE STUDENTS IN SMA NEGERI 1 AIR JOMAN

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ABSTRACT

Determining a value of π is very important in mathematics. So, presented to find a value of π in using trigonometri through mathematics game of ten grade students in SMA Negeri 1 Air Joman. Actually, finding a value of π can be done through exterior and interior circle of poligon with trigonometry function. Poligon exterior circle consists of (1) the angles of the regular hexagon on a circle finding a value of π is 3, 141433159 or 3,14. (2) the angles of regular n sides on a circle finding a value of π is 3, 141592654 or 3,14. Poligon interior circle consists of (1) the regular hexagon whose sides tangent the circle finding a value of π is 3, 141911687 or 3,14. (2) the angles of regular n sides on a circle finding a value of π is 3, 141592654 or 3,14. The main problem is that people often say the value of π is irrational. But they can't show why it is irrational. While in the students case, they don't know the value of π clearly. So, the writer's discovery from some references discussing the materials about how to find the value of π through exterior and interior circle of polygon with trigonometry function.

Kata Kunci : Poligon exterior circle, Poligon interior circle.

INTRODUCTION

The material of circle is learned by students from Elementary School up to University. This material generally discusses about the circumference and the area of a circle which both contain the value of π, that is the value of the ratio of the circumference divided by the diameter of a circle. The material aims to make the teaching and learning process attractive for students, and is explained through Mathematics game.

So far, to find the value of π, students do experiment by measuring objects like cylinder, cone, or sphere. Teacher generally explains directly that the value of π is 3.14, and that the value of π is irrational, i.e. 3.141592654…., without explaining where from they get the value of π.

Those activities are all right. However, all teachers have to know that the value of π is irrational. Then, where do we get 3.141592654 from? Based on this reason, the writer arranges paper on the research on the value of π entitled "Find The Value of π in Using Trigonometry Through Mathematics Game of Ten Grade Students in SMA Negeri 1 Air Joman".

DISCUSSION

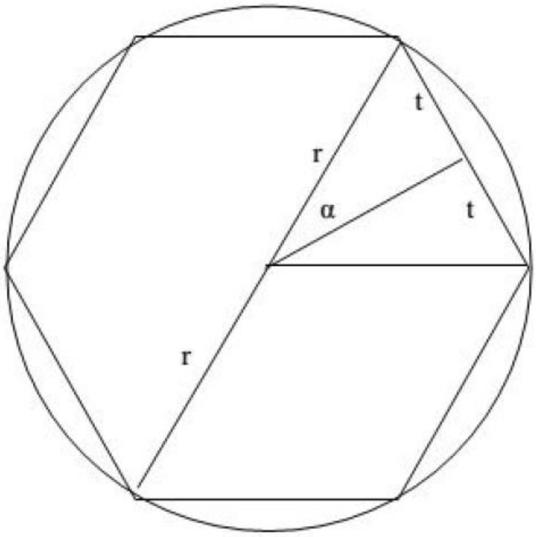
a. Polygon Exterior Circle

1. The angles of the regular hexagon on a circle.

Let K = the perimeter of polygon

r = the radius of a circle

t = semi side of polygon



$$K = 6(2t) = 12\,t$$

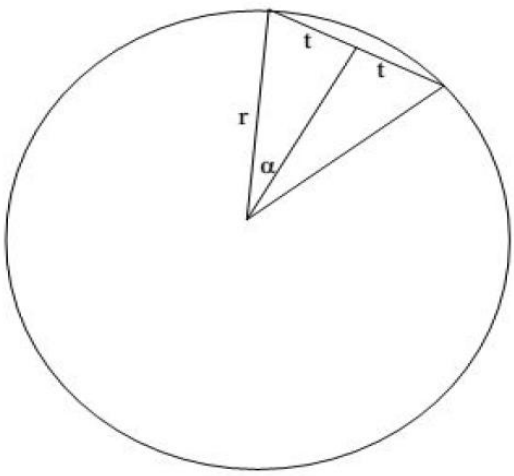
$$\alpha = \frac{360^0}{2x6} = 30^0$$

$$\sin 30^0 = \frac{t}{r} \Leftrightarrow t = r \sin 30^0$$

$$\frac{K}{D} = \frac{12t}{2r} = \frac{12 r \sin 30^0}{2r}$$

$$\frac{K}{D} = 6 \sin 30^0 = 6 \sin \frac{180^0}{6}$$

α = semi angle of circle center angle that the opposite the polygon side, then



$$\alpha = \frac{360^0}{2n} = \frac{180^0}{n}$$

$$\sin \alpha = \frac{t}{r} \Leftrightarrow t = r \sin \alpha$$

$$K = n(2t) = 2nt$$

$$D = 2r$$

$$\frac{K}{D} = \frac{2nt}{2r} = \frac{2nr \sin \alpha}{2r}$$

$$\frac{K}{D} = n \sin \alpha = n \sin \frac{180^0}{n}$$

2. The angles of regular n sides on a circle.

For example:
1. The regular polygon of 180 sides.

$$\frac{K}{D} = 180 \sin 1^0 = 3{,}141433159$$

The regular polygon of 123456789 sides.

$$\frac{K}{D} = 1234567890 \sin \frac{18^0}{123456789} = 3{,}141592654$$ (π rounded to 9 decimals).

n is a greater, then $\frac{K}{D}$ is closer to the value of π

b. Polygon Interior Circle

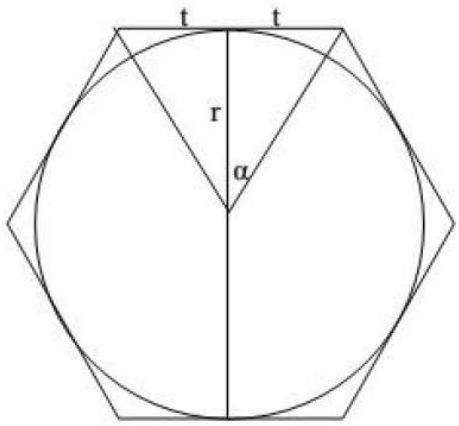
1. The regular hexagon whose sides tangent the circle

Let K = perimeter of polygon

r = the radius of a circle

t = semi side of polygon

α = semi angle that the opposite of polygon side, then:



$$K = 6(2t) = 12\,t$$

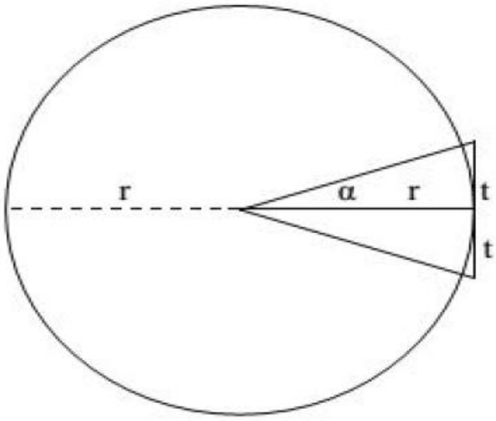
$$\alpha = \frac{360^0}{2x6} = 30^0$$

$$\tan \alpha = \frac{t}{r} \Leftrightarrow t = r \tan \alpha = r \tan 30^0$$

$$\frac{K}{D} = \frac{12t}{2r} = \frac{12 r \tan 30^0}{2r}$$

$$\frac{K}{D} = 6 \tan 30^0 = 6 \tan \frac{180^0}{6}$$

2. The regular polygon of n sides whose sides tangent of a circle



$$\alpha = \frac{360^0}{2n} = \frac{180^0}{n}$$

$$\tan\alpha = \frac{t}{r} \Leftrightarrow t = r\tan\alpha$$

$$K = n(2t) = 2nt$$

$$D = 2r$$

$$\frac{K}{D} = \frac{2nt}{2r} = \frac{2nr\tan\alpha}{2r}$$

$$\frac{K}{D} = n\tan\alpha = n\tan\frac{180^0}{n}$$

Example:

1. The regular polygon of 180 sides.

   $$\frac{K}{D} = 180\tan 1^0 = 3{,}141911687$$

2. The regular polygon of 123456789 sides

   $$\frac{K}{D} = 1234567890\tan\frac{18^0}{123456789} = 3{,}141592654 = (\pi \text{ rounded to}$$
   9 decimals).

n is a greater, then $\frac{K}{D}$ is closer to the value of π

CONCLUSION

1. The greater the value of n, the closer it is to the value of π.
2. The students will be able to find the value of π through this way. They will focus on the value of π to irrational number.

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