

**Pie**

$\pi$

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# *Pi (T)*

SUBMITTED BY \_\_\_\_\_

CLASS : X \_\_\_\_\_

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$$\pi = \frac{22}{7}$$

**Write Acknowledgement**

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**$\pi = 3.14159$**

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# Objective

To know about  $\pi$  the ratio of circumference of a circle to its diameter

# Procedure

1. Collected information about  $\pi$  from teachers, books and internet
2. Collected work done by various mathematicians on  $\pi$ .
3. Written value of  $\pi$  up to 50 places of decimal.

## What is $\pi$ ?

It is the sixteenth letter of Greek alphabets. Old Greek texts used it to represent number 80. Many mathematical, science and engineering formulae involve  $\pi$ , which makes it one of the most important mathematical constants.

**$\pi = 3.14159\ 26535$   
**89793 23846 26433**  
**83279 50288 41971**  
**69399 37510****

## When was $\pi$ first used in its present form?

It is believed that pie was first used to represent ratio of circumference of a circle to its diameter by William Jones in 1706 in his book *Palmoriorum Matheseos*. Leonhard Euler a swiss mathematician also used  $\pi$  in its present way.

## What is value of $\pi$ ?

1. After the invention of wheel perhaps it was required to know the distance travelled by a wheel with particular diameter.

Initially it was found that the distance travelled by a wheel was a little more than three time the diameter. Further research showed that distance travelled by wheel was approximately equal to 3 times

diameter +  $\frac{\pi r^2}{(2r)^2} = \frac{11}{14}$  of diameter.

2. Ahmes – An an Egyptian Mathematician calculated the value of  $\pi$  as  $\frac{256}{81}$  using area. This is good approximation of value of  $\pi$ .



$$\pi = 3.1415926535$$

8979323846 2643383279

5028841971 6939937510

5820974944 5923078164

0628620899 8628034825

3421170679

3. Who gave  $\pi = \frac{22}{7}$ ? Archimedes said that ratio of area of a circle To that of square with side equal to circles diameter is close to 11:14. Solving this we get the value of  $\pi = \frac{22}{7}$

### Calculation

$$\frac{\text{area of circle}}{\text{area of square}} = \frac{11}{14}$$

$$\text{or } \frac{\pi r^2}{(2r)^2} = \frac{11}{14}$$

$$\text{or } \pi = \frac{22}{7}$$

### 4. Chinese Contribution

- (a) Liu Hui in 263 used regular polygons with increased number of sides to approximate the value of  $\pi$  as  $\frac{3927}{1250}$
- (b) Zu Chongzhi gave value of value of  $\pi$  as  $\frac{355}{113}$

$\pi$ 

3.1415926535 8979323846 2643383279 5028841971 6939937510  
5820974944 5923078164 0628620899 8628034825 3421170679  
8214808651 3282306647 0938446095 5058223172 5359408128  
4811174502 8410270193 8521105559 6446229489 5493038196  
4428810975 6659334461 2847564823 3786783165 2712019091  
4564856692 3460348610 4543266482 1339360726 0249141273  
7245870066 0631558817 4881520920 9628292540 9171536436  
7892590360 0113305305 4882046652 1384146951 9415116094  
3305727036 5759591953 0921861173 8193261179 3105118548  
0744623799 6274956735 1885752724 8912279381 8301194912  
9833673362 4406566430 8602139494 6395224737 1907021798  
6094370277 0539217176 2931767523 8467481846 7669405132  
0005681271 4526356082 7785771342 7577896091 7363717872  
1468440901 2249534301 4654958537 1050792279 6892589235  
4201995611 2129021960 8640344181 5981362977 4771309960  
5187072113 4999999837 2978049951 0597317328 1609631859  
5024459455 3469083026 4252230825 3344685035 2619311881  
7101000313 7838752886 5875332083 8142061717 7669147303  
5982534904 2875546873 1159562863 8823537875 9375195778  
1857780532 1712268066 1300192787 6611195909 2164201989

## 5. Indian Contribution

- (a) Aryabhata in 499 gave value of  $\pi$  as  $\frac{62832}{20000}$
- (b) Brahmagupta in 640 gave value of  $\pi$  as  $\sqrt{10}$
- (c) S. Ramanujan gave value of  $\pi$  correct upto 8 places of decimal .
6. Yasumasa Kanada and his team in Tokyo calculated the value of  $\pi$  to 1.24 trillion decimal places.

## Is $\pi$ rational or irrational?

$\pi$  is an irrational number was first proved by Johann Heinrich Lambert by showing that this continued fraction expansion holds.

$$\tan(x) = \frac{x}{1 - \frac{x^2}{3 - \frac{x^2}{5 - \frac{x^2}{7 - \dots}}}}$$

Then Lambert proved that if  $x \neq 0$  is rational, then the right-hand side of this expression must be irrational. Since  $\tan(\pi/4) = 1$ , it follows that  $\pi/4$  is irrational and therefore that  $\pi$  is irrational

Ivan Niven and Mary Cartwright also gave their proofs.