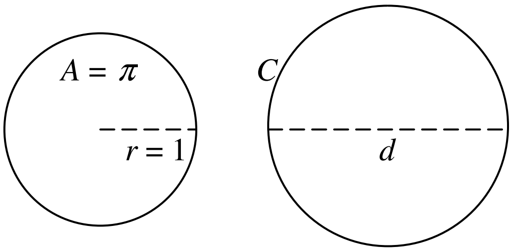
Math Lesson (Suitable for Years 7 to 10)
Where is pi on the number line?

π **= 3.14159 26535 89793 23846 26433 83279**
50288 41971 69399 37510 58209 74944
59230 78164 062.... ....

This non-terminating and non-recurring number is the most famous of all numbers. Many past (and present) mathematicians were fascinated by this number. Some spent much of their lives on the calculation of this number. It is called pi.

It is the ratio of the circumference of a circle to its diameter, i.e. $\pi = \frac{C}{d}$.



It is also the area of a unit circle (a circle of radius 1 unit).

The following fractions were used to calculate the approximate value of π.

The Babylonians, 2000 BC, $\pi = \frac{25}{8}$

Ahmes, Egyptian, 1600 BC, $\pi = \left(\frac{16}{9}\right)^2$

Archimedes, Greek, 250 BC, $\pi = \frac{22}{7}$

Ptolemy, Greek, 110, $\pi = \frac{377}{120}$

Zu Chongzhi, Chinese, 480, $\pi = \frac{355}{113}$

Johann Lambert, Swiss-German, 1750,
$\pi = \frac{103993}{33102}$, $\pi = \frac{1,019,514,486,099,146}{324,521,540,032,945}$

Srinivasa Ramanujan, Indian, 1910,
$\pi = \frac{99^2}{2206\sqrt{2}}$, $\pi = \frac{63\left(17+15\sqrt{5}\right)}{25\left(7+15\sqrt{5}\right)}$

Formulae (infinite sums or products) for pi

Francois Viete, French, 1592,

$$\frac{\pi}{2} = \frac{1}{\sqrt{\frac{1}{2}}\sqrt{\frac{1}{2}+\frac{1}{2}\sqrt{\frac{1}{2}}}\sqrt{\frac{1}{2}+\frac{1}{2}\sqrt{\frac{1}{2}+\frac{1}{2}\sqrt{\frac{1}{2}}}}\ldots\ldots}$$

John Wallis, English, around 1600,

$$\frac{\pi}{2} = \frac{2}{1}\times\frac{2}{3}\times\frac{4}{3}\times\frac{4}{5}\times\frac{6}{5}\times\frac{6}{7}\times\frac{8}{7}\times\frac{8}{9}\times\frac{10}{9}\times\frac{10}{11}\times\ldots\ldots$$

Gottfried Leibniz, German, 1673,

$$\frac{\pi}{4} = \frac{1}{1}-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\frac{1}{9}-\frac{1}{11}+\frac{1}{13}-\frac{1}{15}+\frac{1}{17}-\ldots\ldots$$

Others,

$$\frac{\pi\sqrt{2}}{4} = \frac{1}{1}+\frac{1}{3}-\frac{1}{5}-\frac{1}{7}+\frac{1}{9}+\frac{1}{11}-\frac{1}{13}-\frac{1}{15}+\ldots\ldots$$

$$\frac{\pi-3}{4} = \frac{1}{2\times3\times4}-\frac{1}{4\times5\times6}+\frac{1}{6\times7\times8}-\ldots\ldots$$

$$\frac{\pi^2}{6} = \frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\frac{1}{5^2}+\frac{1}{6^2}+\ldots\ldots$$

$$\frac{\pi^2}{6} = \frac{2^2}{2^2-1}\times\frac{3^2}{3^2-1}\times\frac{5^2}{5^2-1}\times\frac{7^2}{7^2-1}\times\frac{11^2}{11^2-1}\times\ldots$$

$$\frac{\pi^2}{8} = \frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\frac{1}{7^2}+\frac{1}{9^2}+\frac{1}{11^2}+\ldots\ldots$$

Although the value of pi can be calculated by any of the above definite processes, there is no apparent pattern at all in the decimal expansion of pi.

In 1999, Kanada and Takahashi calculated pi to 206 158 430 000 decimal digits.

In 2017, pi enthusiast Peter Trueb's computer calculated 22 459 157 718 361 fully verified digits of pi.

