Teachers Explanatory Notes
TI-15 Explorer™: Pieces of Pi

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1. Discuss with students a review of the meaning of perimeter and practise some sample problems as may be required.

   PPT

   Have students trace their finger along the sides of a square and say,
   The path that your finger is tracing is called the perimeter of the square.

   Have students trace their finger along the sides of a triangle and say,
   The path that your finger is tracing is called the perimeter of the triangle.

   Have students trace their finger along the sides of an irregular polygon and say,
   The path that your finger is tracing is called the perimeter of the polygon.

   Talk about perimeter formulas for a square and a rectangle and pose the questions;
   What special name do we give to the perimeter of a circle? and
   Do we have a formula for this?

2. Review definitions of *radius* and *diameter*. Conclude that a circle of larger diameter will also have a larger circumference. Have students investigate the relationship between circumference and diameter by taking these measurements for a range of different circles and recording their data and calculations on Worksheet 1. Note: You might like to let students find their own circles to measure (e.g. paper plates, lids, jars – but remember that in each case they will not only need to measure the circumference of the circle, but also the diameter

   PPT

   W1

3. Provide a formal definition of Pi (π) as being the *ratio* of a circle's circumference to its diameter, but point out that pi itself is an *irrational* number, i.e. it can never be exactly represented as a numerical ratio (fraction) or as a decimal. Therefore the only way of exactly writing pi is as a symbol – π. Explain that this is a letter of the Greek alphabet. Point out that while most calculators display pi as an *approximate* decimal value (e.g. 3.141592654), the TI-15 Explorer™ displays pi *exactly* as a symbol and that calculations such as $2\pi + 3\pi$ will result in the exact answer of 5π. (Note: The TI-15 Explorer ™ can also provide decimal approximations by pressing the F↔D key).

   PPT

4. Explain that if $\frac{C}{D} = \pi$

   $(\times D) \quad (\times D)$

   then $C = \pi \times D$

   This is good if we know the diameter of a circle and wish to calculate the circumference, but what if instead of knowing the diameter, we only know the radius?

Point out that the radius length is half that of the diameter,

so $D = 2 \times R$
or $D = 2R$

So $C = \pi \times D$
$C = \pi \times 2R$.

These formulas are more commonly written as: $C = \pi D$ and $C = 2\pi r$

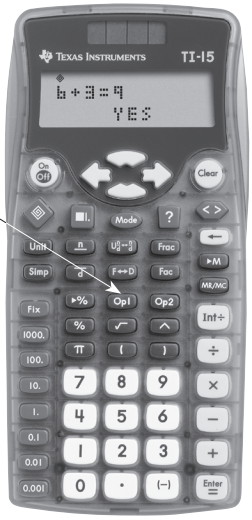
They will both give the circumference length, but work on different input information.

5. Show how the formula operations Op1 and Op2 on the TI-15 Explorer™ can be defined to perform these operations and have students practise the use of these with problems on Worksheet 2.

PPT
W2

The formula work is now being done by the calculator.
Op1 will give a circle circumference if we know the diameter.
Op2 will give a circle circumference if we know the radius.

To define an operation (formula) first press the Op1 (or Op2) key then type the steps of the operation and then press Op1 (or Op2) to set the operation



To set the formula $C = \pi D$
Press [Op1] [×] [π] [Op1]

To set the formula $C = 2\pi r$
Press [Op2] [×] [2] [×] [π] [Op2]

6. **Extension 1:** Rope around the World.

Consider the following problem:

"If it were possible to place a long rope all the way around the world's equator (so that the rope exactly fits at ground level) and have people line up all along the rope and then have the people all lift the rope 1m off the ground, how much longer would the rope need to be for it to still connect end to end?"

(Note: to simplify this problem, consider the equator to be a perfect circle)

7. **Extension 2:** Trundle wheel diameter.

   Have students measure some short distances with a trundle wheel and then ask them to consider these questions:

   – In thinking about how the trundle wheel works, what must be the circumference of the wheel?
   – Using your knowledge of how circumference is related to diameter, calculate the diameter of the wheel.
   – Use a ruler to measure the diameter and check this length against your calculation.

8. Assessment Task