

# Fencing the Circle

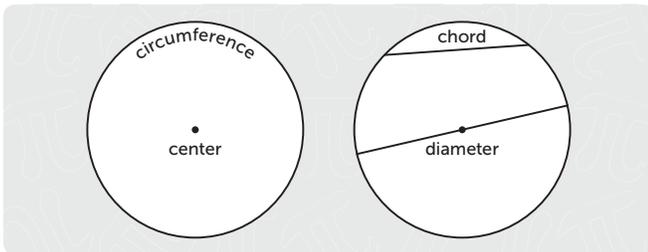
**Materials:**

Each pair of students will need:

- A centimeter ruler (or use the ruler on the worksheet)
- An inch ruler (or use the ruler on the worksheet)
- A pair of scissors (if necessary)
- A standard six-sided number cube
- 2 different color pencils
- A copy of the worksheet (print at 100%)

**Instructions:**

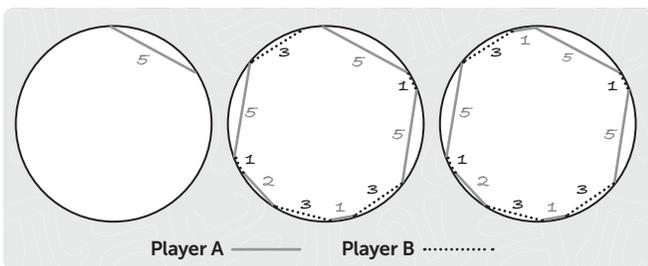
Organize the students into pairs and distribute the materials. Identify the following parts with the students:



**To play the game:**

The aim is to fence the circle by drawing the final chord so that it doesn't go beyond the first chord.

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- **Player A** rolls the number cube.
- They use a color pencil to draw a chord on a circle that is as long in centimeters as the number they rolled.
- The length of the chord is written beside the chord.
- **Player B** repeats the previous steps using the other color pencil. Their chord should start from the end of **Player A's** chord.
- Players alternate roles to draw chords around the circle.
- If a player's chord will go beyond the end points of the first chord, they lose and the game is over. A smaller chord is drawn to finish fencing the circle and that length is recorded to the nearest centimeter.



Example: **Player A** starts near the top with a roll of 5. Later, **Player B** almost finishes the fence with a roll of 3. **Player A** then rolls a 6 which is too much so they lose. The final distance is measured and rounded to 1 cm.

**Facts about pi**

**Pi** is the name given to the ratio between the circumference and diameter of any circle.

The symbol for the ratio is the Greek letter  $\pi$ .

It is an irrational number, which means its exact value can't be shown as a common fraction.

The first few digits are 3.1415.

In 2016, the record number of decimal places to represent pi was over 22,000,000,000,000.\*

Students can play the game again using the other circles. Afterward, have the students add all the chord lengths on a circle together and write the sum inside the circle. They should do this for all three circles.

Establish that the diameters of the two smaller circles are each 10 cm and the diameter of the larger circle is 15 cm. Say, Compare the total length of the chords for a circle to the length of its diameter. What do you notice?

Bring out the fact that the total length of the chords is about three times the length of the diameter. Explain that the relationship between the circumference and the diameter of any circle shares this property.

To get the most from this activity, the following points can be discussed with students according to their level of knowledge and ability.

- How to measure with a ruler.
- Addition strategies for adding chord lengths.
- Division strategies for dividing the chord lengths by the diameter.
- Estimation with division.
- Recording division with fractional remainders.
- Ratios.
- Rational numbers.

Extending the activity:

- Investigate whether the ratio is true for a greater range of circles.
- Use blank number cubes to label with fractions (for inches) or to make 2-digit numbers for (millimetres).

Changing the game:

- Players can use all three circles at once when they choose where to draw a chord.

\*[www.newscientist.com/article/2124418-celebrate-pi-day-with-9-trillion-more-digits-than-ever-before/](http://www.newscientist.com/article/2124418-celebrate-pi-day-with-9-trillion-more-digits-than-ever-before/)

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