5.9

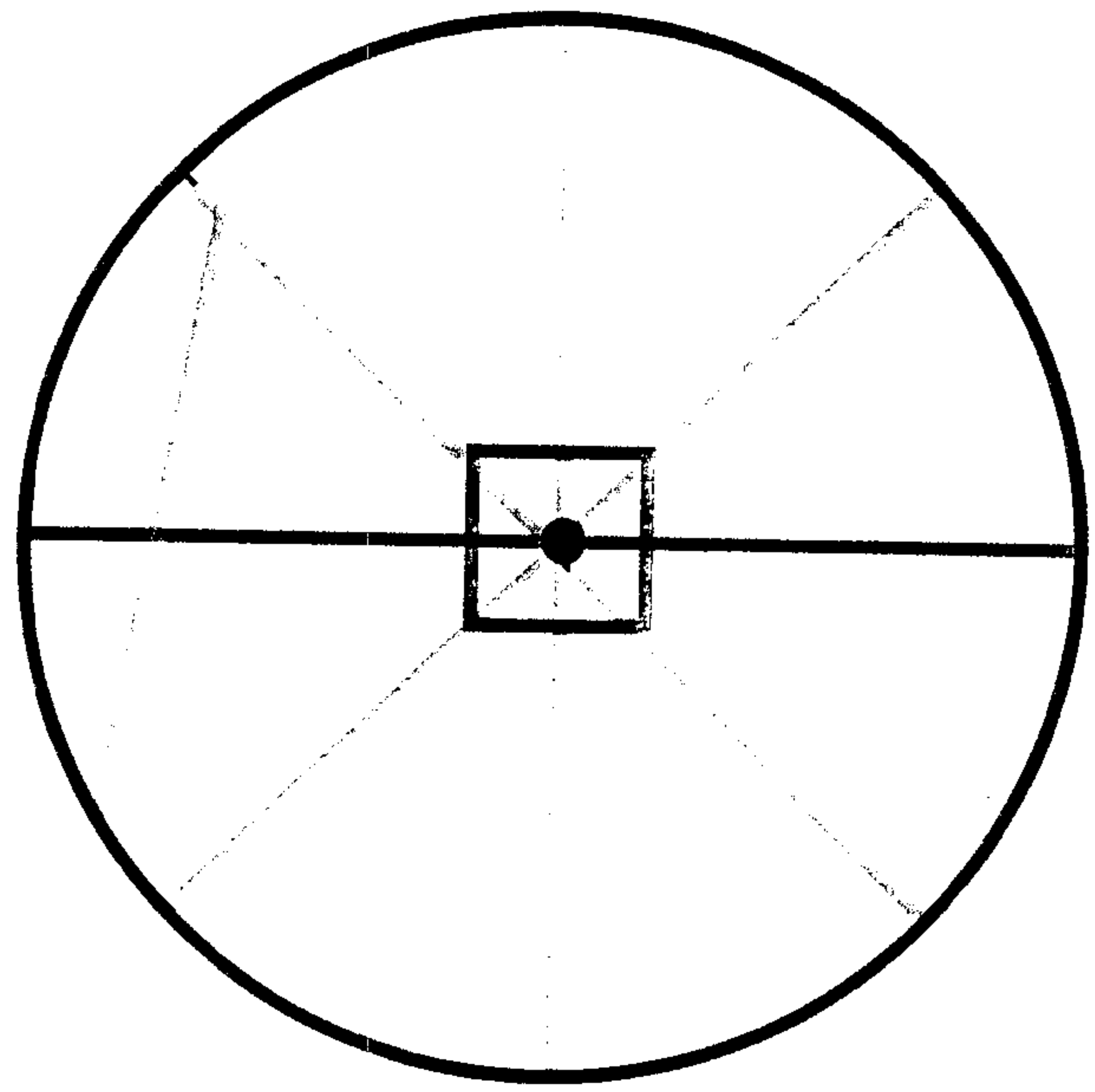
Serving Up Circles

Looking for ideas that deliver plenty of hands-on learning about circles? Then serve up these "pizza-riffic" activities and reproducibles!

by Lori Sammartino, Cranberry Township, PA

Any Way You Slice It

Introduce students to the basic parts and attributes of a circle with this pizza-slicing activity. First, ask students to identify a pizza's shape *(circle).* Next, give each child a four-inch white paper circle (or have him use a compass to construct his own), scissors, a ruler, and crayons in the following colors: red, black, green, blue, orange, and purple. Guide students through the steps below in order. Then conclude by having students brainstorm real-life objects—other than pizzas!—that are circular or contain circular shapes. List students' responses on chart paper to use with "Concentric Pizzas" on page 27. Challenge students to add items to this list throughout the unit.



Steps:

1. **Circumference (the distance around the outside of a circle):** Use the black crayon to trace the outer edge of the circle.
2. **Diameter (any straight line that passes through the center of a circle):** Fold the circle in half. Unfold it. Use the red crayon to trace the fold line. Measure the diameter *(four inches).*
3. **Center of circle (the point in the exact middle of the circle):** Refold the circle in half and fold it in half again to make fourths. Unfold it. Use the black crayon to mark the point where the fold lines intersect.
4. **Radius (the distance from the center of the circle to any point on the circumference of the circle):** Use the green crayon to trace the new fold line outward in each direction from the center. Measure each radius *(two inches).* Identify the angles formed *(four right angles)* by marking them as shown. Calculate the total degrees in a circle *($4 \times 90^\circ = 360^\circ$)* and in a half circle *(180°).* Fold the circle in fourths and then in half again to make eighths. Use the blue crayon to trace the new fold lines. Find the degrees in $^1/_8$ circle *(45°).*
5. **Arc (any section of the circumference):** Use the orange crayon to trace $^1/_8$ of the circle. Determine if tracing $^1/_4$, $^3/_8$, $^1/_2$, $^5/_8$, $^3/_4$, or $^7/_8$ of the circle each represents an arc. *(yes)*
6. **Chord (a straight line that connects any two points on the circle):** Use the purple crayon to trace a line from one point on the circle to another without passing through the center.

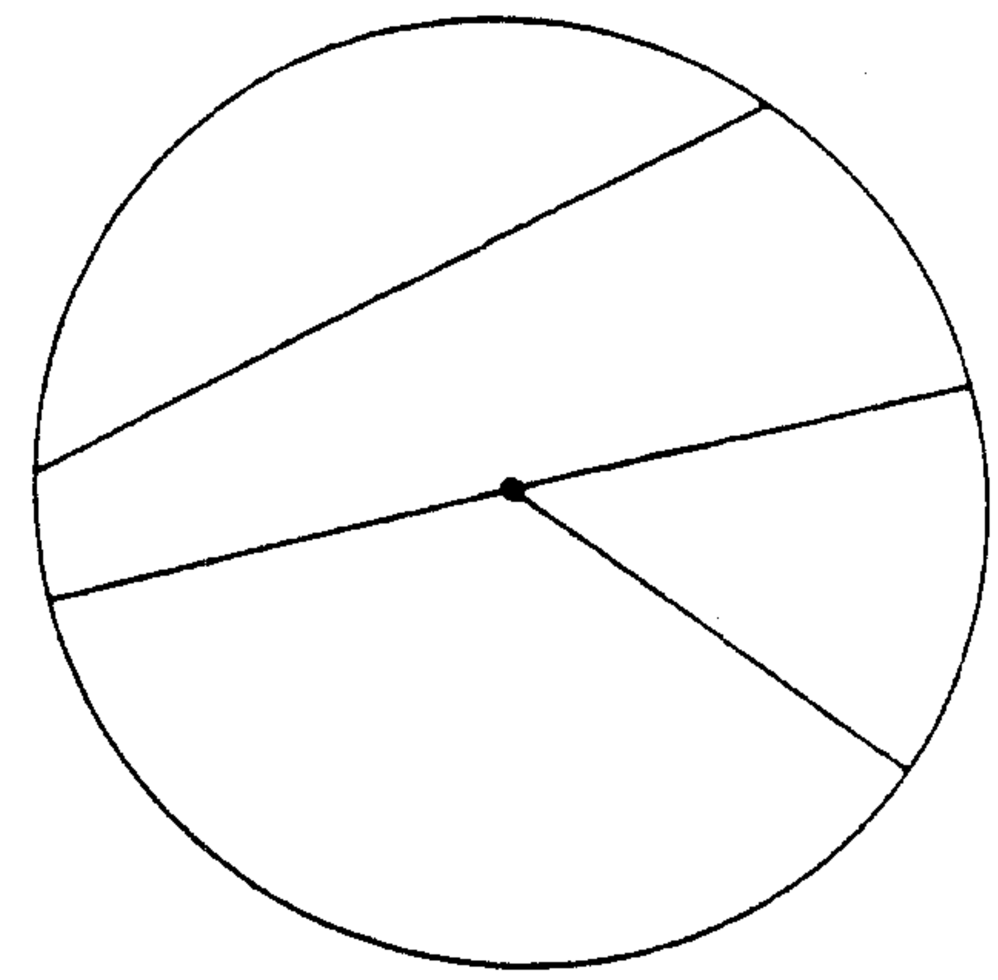
If desired, extend the activity by having students use protractors to help them create two circles, one having six equal pieces (60° angles) and another with nine equal pieces (40° angles).

Skills Maintenance 13-10

Name ____________________

Circles

Label these parts of the circle:
1. a chord
2. a radius
3. a diameter



Use a compass and centimeter ruler to draw circles with these dimensions.

4. Radius 2 cm

5. Diameter 5 cm

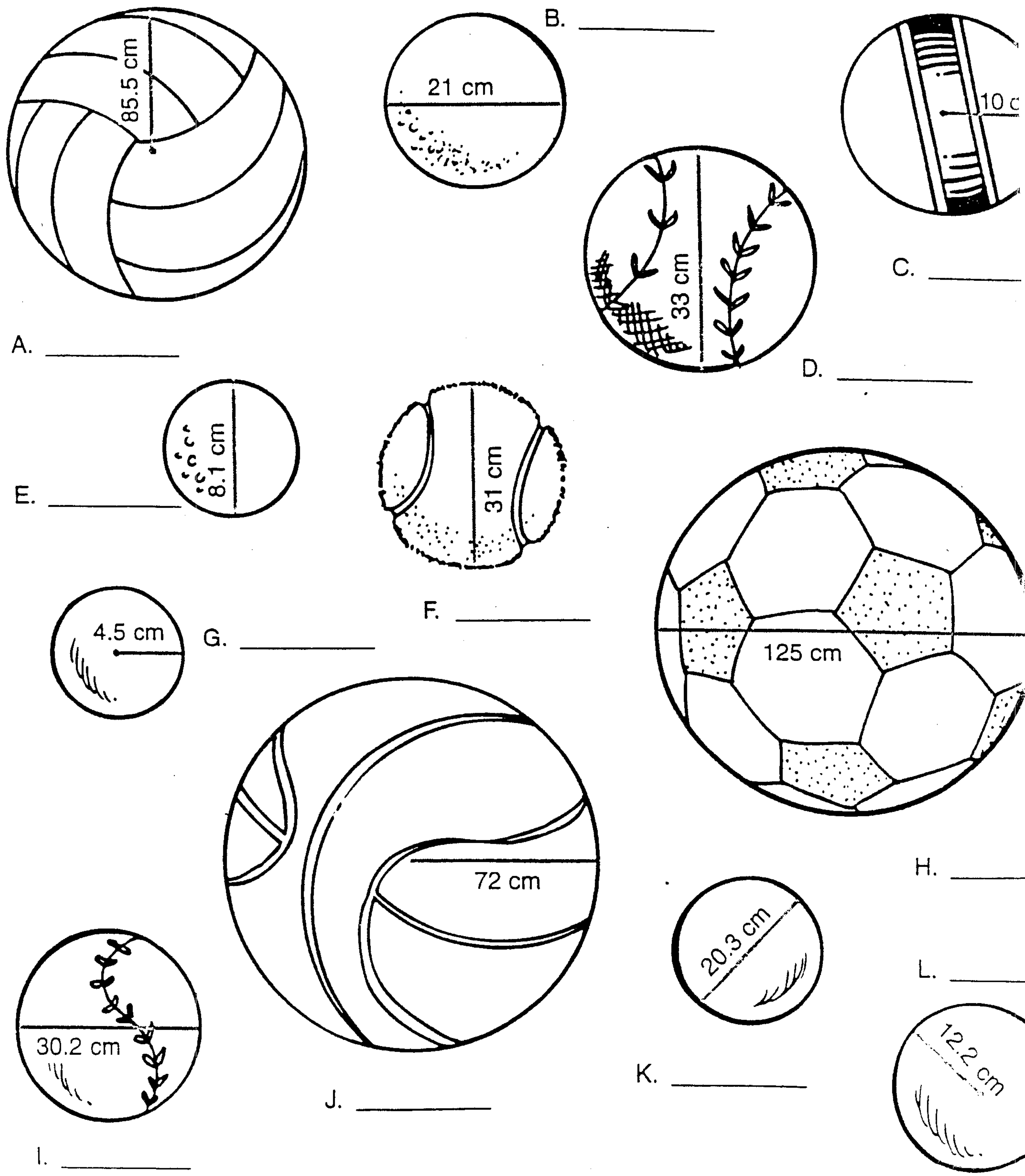
6. Diameter 6.2 cm

7. Radius 2.6 cm

Have a Ball!

Name ____

George the Giant loves to play sports. Of course, his equipment is quite large. Find the circumference of the balls below that he uses. Use 3.14 for π.



5.9

Thinking About Circumference and Diameter

by Richard Thiessen

The formula $C = \pi d$ expresses a relationship between the circumference and the diameter of a circle. This is one of many such formulas which students encounter in school mathematics. Too often students are simply given a formula, either by the teacher or as a statement in the textbook, with little or no explanation as to the reasonableness of the formula and with little by way of concrete experiences that would provide a basis for thought about the relationship. For many students, their only use of the formula is to apply it to situations where the diameter or radius is given and the circumference is to be found, or the circumference is given and the diameter or radius is to be found.

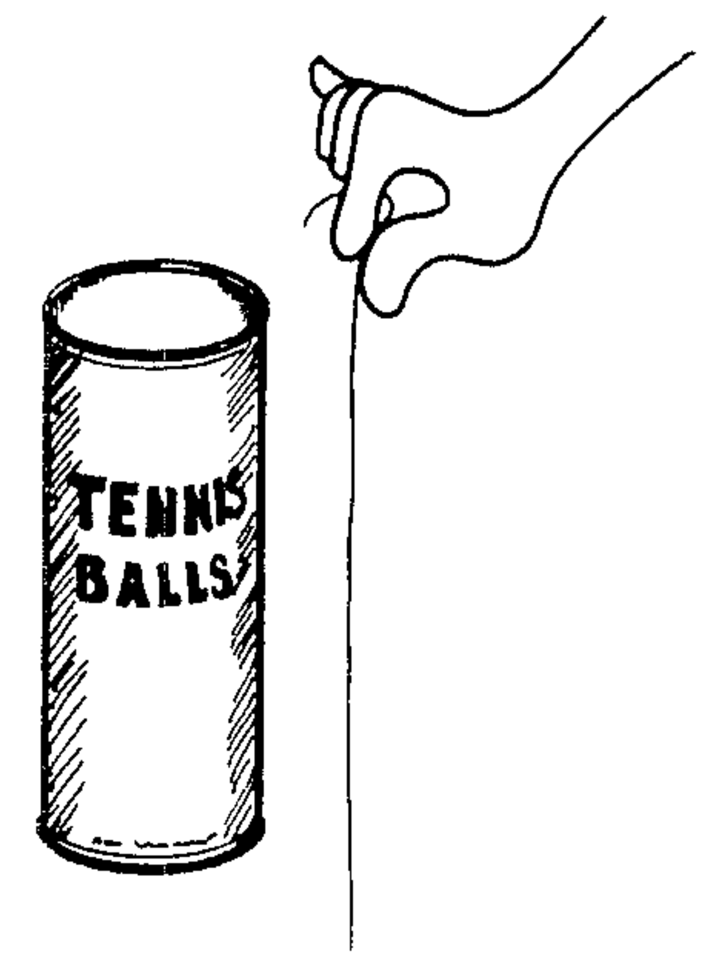
At the very least, a relationship such as this should be learned by measuring the circumference and diameter of many circular objects and then noticing that in each case the circumference divided by the diameter is a little more than 3. However, even doing this does not assure an adequate understanding of the relationship.

Although students encountering this relationship for the first time in sixth or seventh grade are not prepared to understand that pi is an irrational number and that 3.14 and 22/7 are simply rational approximations, they can understand that the number they find when dividing the circumference of a circular object by its diameter is a little larger than 3. If they do this many times and then find the average of these quotients, they can be guided to conclude that it will turn out to be close to 3.14 or 22/7. An AIMS activity called *Practically Pi* can be used to structure this activity and lead children to this generalization.

However, knowing the formula for the relationship and even understanding how it is derived does not assure that students will be able to think about and apply the relationship beyond the simple kinds of applications already described. This article describes two activities, a problem, and a graphing exercise, each of which points out limitations in thinking about this relationship, and also points out ways in which we can help students extend their thought about it.

Can You Believe It?

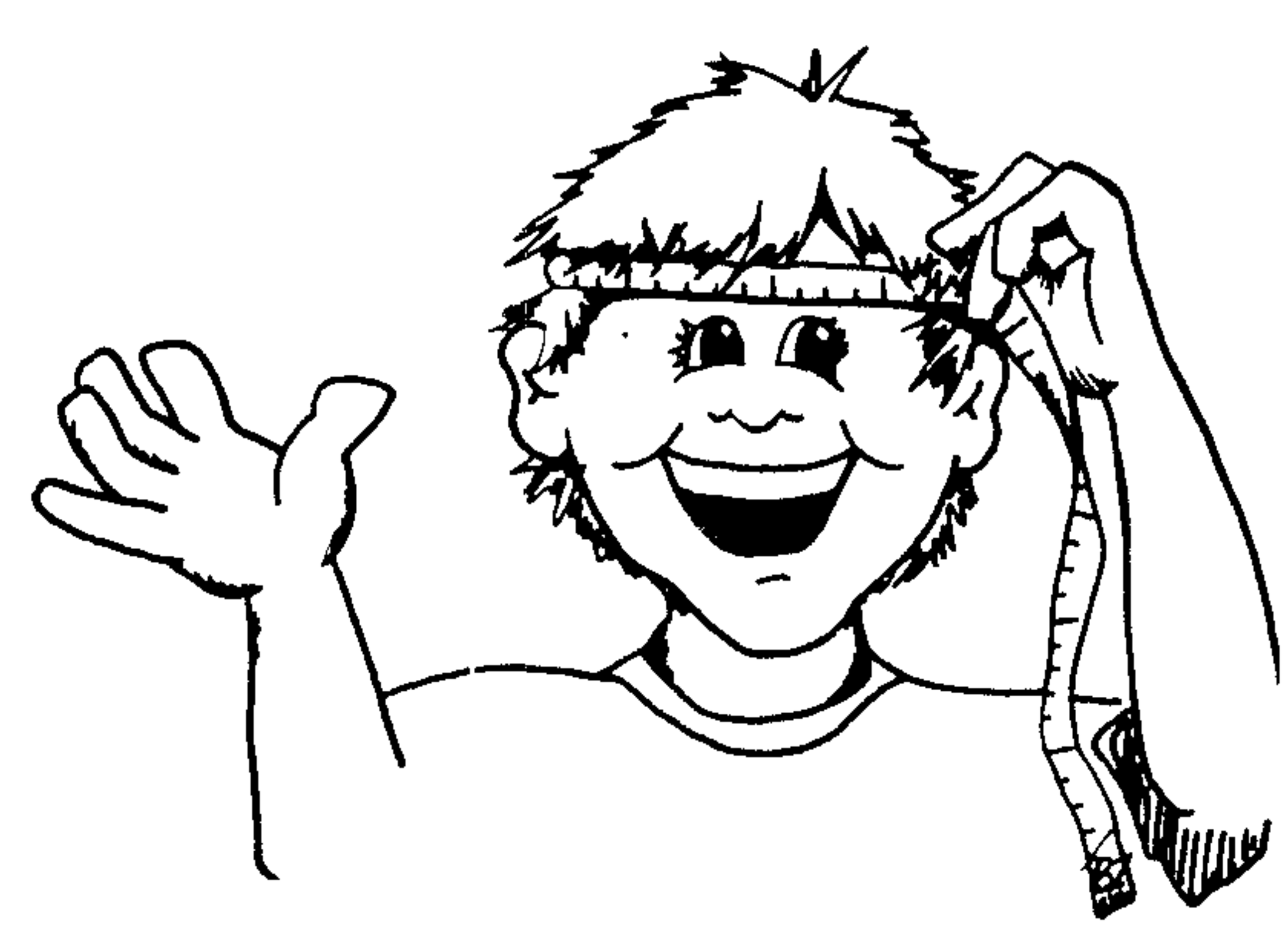
Which length is the greater for most cans, the circumference or the height? This question introduces an activity in which students examine numerous cans having a variety of different diameters and heights. For each can, the student is asked to predict which length is the greatest, the circumference or the height. A set of five cans might include a small juice can such as is often available from vending machines, a can such as those containing green beans or peas, a large tomato juice can, a tennis ball can, and a Pringles Potato Chip can. This activity, which was printed in an earlier issue the *Newsletter*, includes a table such as the one below which the student is asked to examine each can and to indicate with an h, C, or = that one of the lengths is greatest or that they are equal. After making the predictions, students are given string to wrap around each can in order to compare the circumference and height. This is a very interesting activity with results that are generally quite surprising to students. For example, many students will feel certain that for the tennis ball



can, the height is greater than the circumference. They, of course, are not really thinking about the relationship as they are making their predictions; otherwise, it would be clear that the height of the can containing three tennis balls is three diameters which is less than pi diameters. Even teachers who regularly teach this relationship seem to have difficulty actually thinking of the circumference as having a length that is a little more than three diameters.

Now That's Using Your Head

How does your height compare to the circumference of your head? If you were to cut a string so that its length is equal to your height, how many times could you wrap the string around your head? After you have made a prediction, find some string and check your prediction. Generally students will give responses that range from two to five.



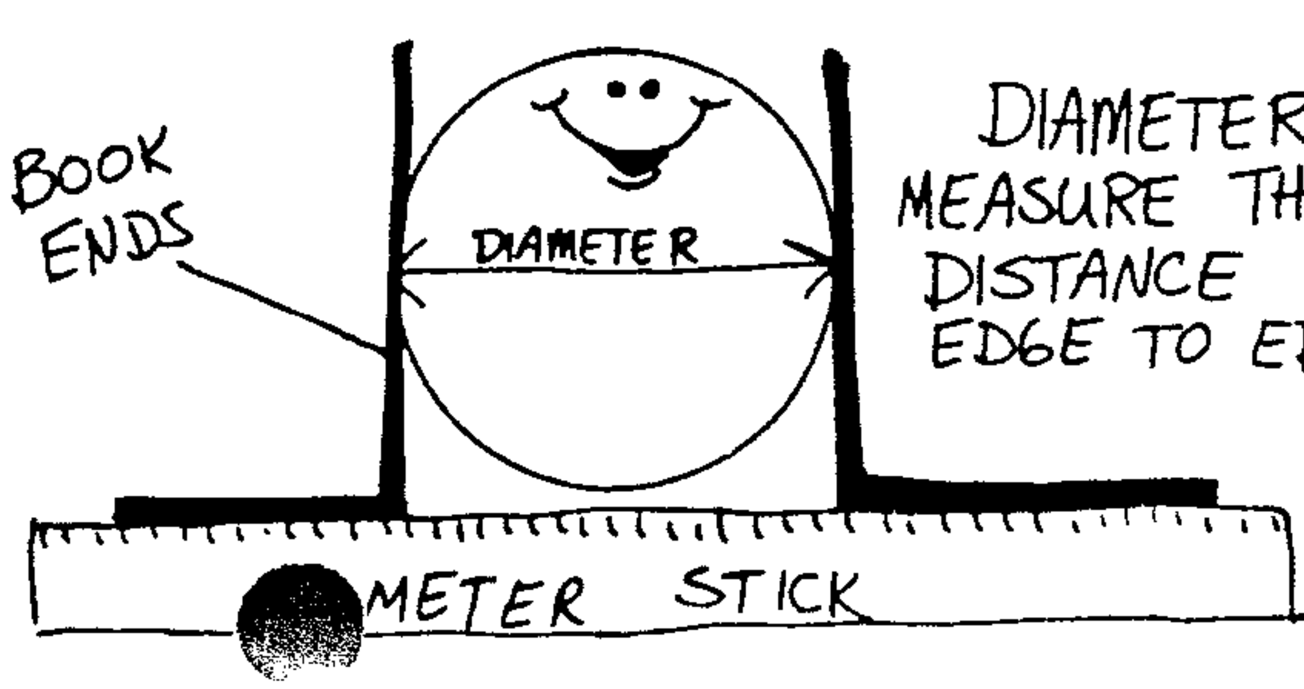
This activity, like the first one, provides a situation in which an understanding of the relationship between circumference and diameter of a circle should be helpful, yet many student responses indicate that this is clearly not the case. When confronted with these situations, both students and adults seem to have difficulty

NAME ____________________

Practically Pi

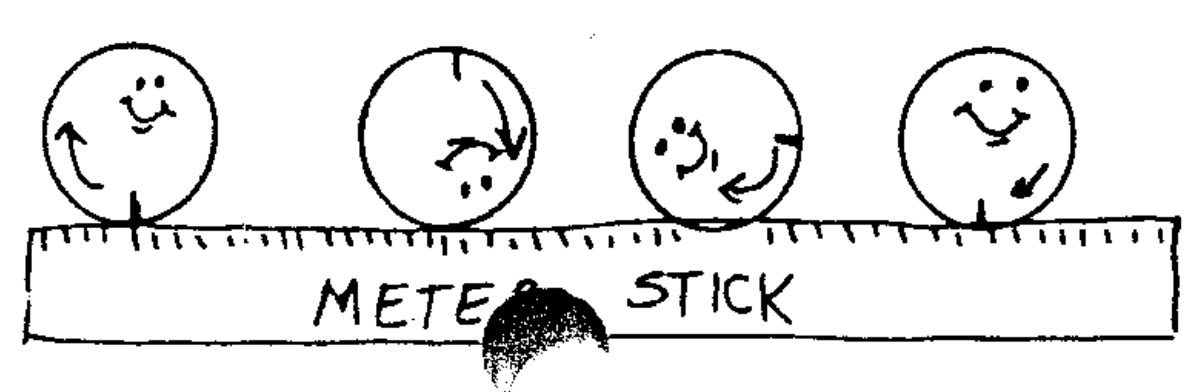
HOW DOES THE CIRCUMFERENCE OF ANY CIRCLE COMPARE WITH ITS DIAMETER?

CYLINDER	DIAMETER	CIRCUMFERENCE	RATIO = $\frac{\text{CIRCUMFERENCE}}{\text{DIAMETER}}$	DECIMAL CIRCUMFERENCE ÷ DIAMETER

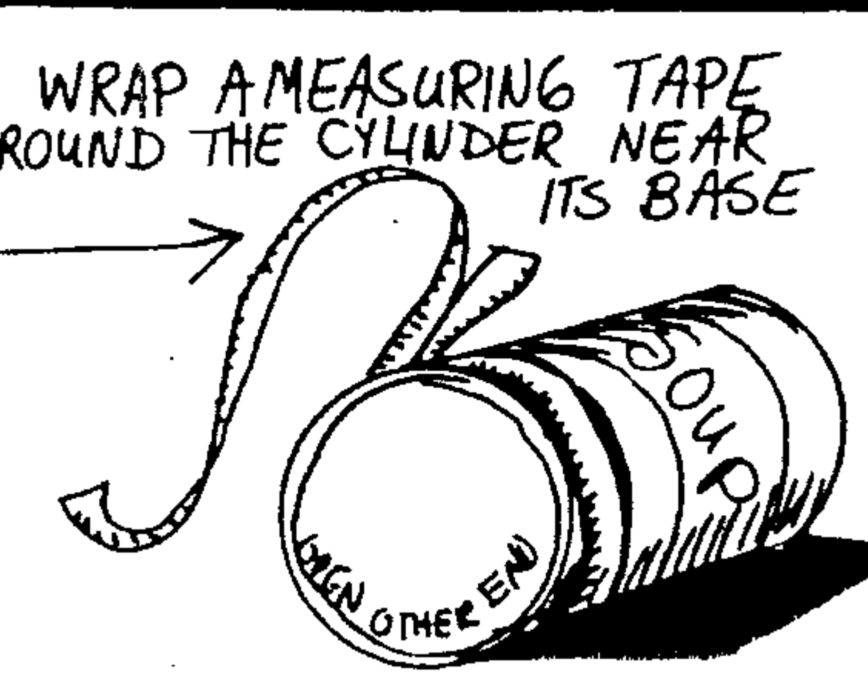


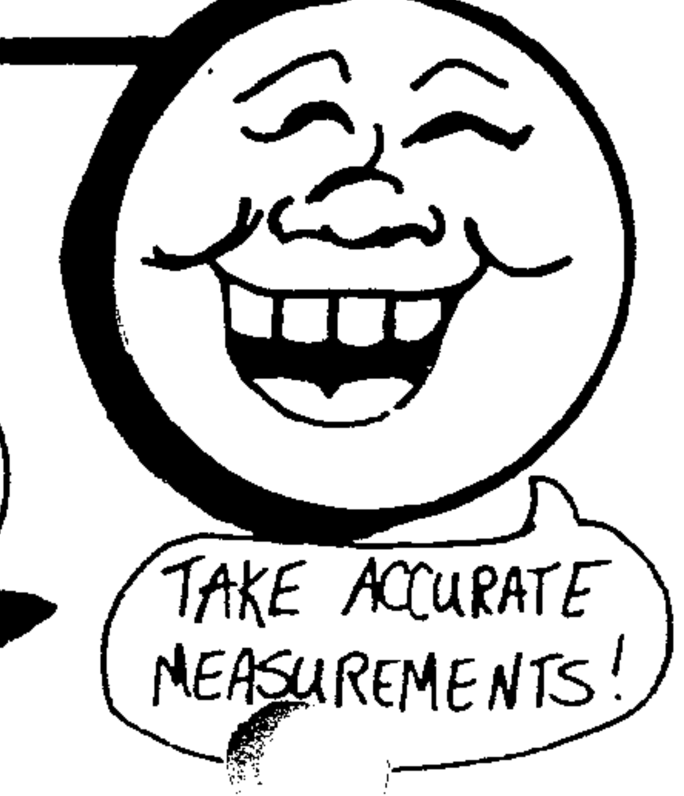
DIAMETER: MEASURE THE LONGEST DISTANCE FROM EDGE TO EDGE

CIRCUMFERENCE: ROLL THE CYLINDER 1 REVOLUTION ON A METER STICK. OR...



WRAP A MEASURING TAPE AROUND THE CYLINDER NEAR ITS BASE



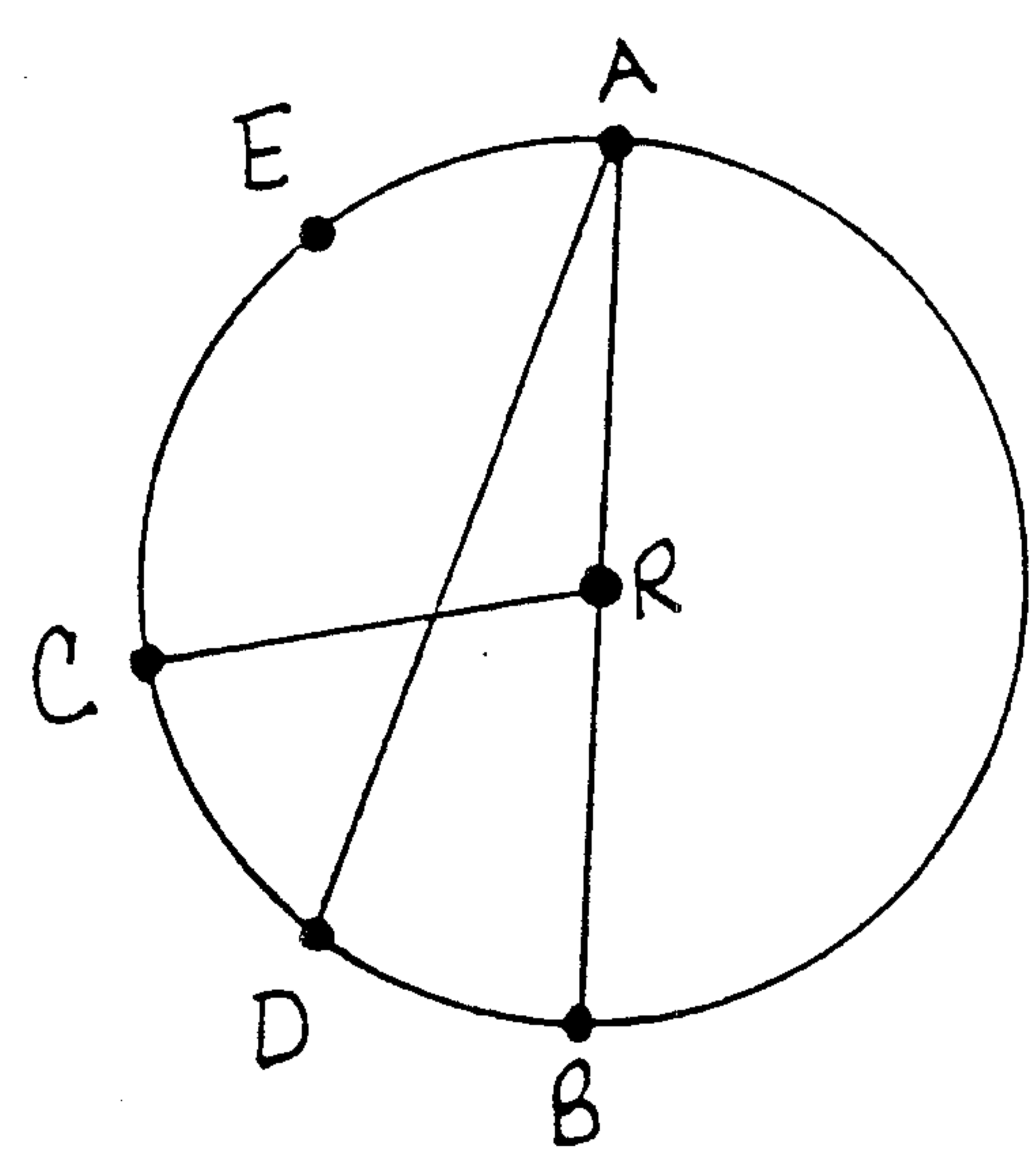


Name: ____________________

SOL Checkpoint Test

5.9	**The student will identify and describe the diameter, radius, chord, and circumference of a circle.**

1. What part of the circle is segment AB?



A. circumference
B. diameter
C. radius
D. chord

2. The radius of a circle is ---------

A. smaller than the circumference
B. larger than the diameter
C. larger than the circumference
D. smaller than any chord

3. What is the circumference?

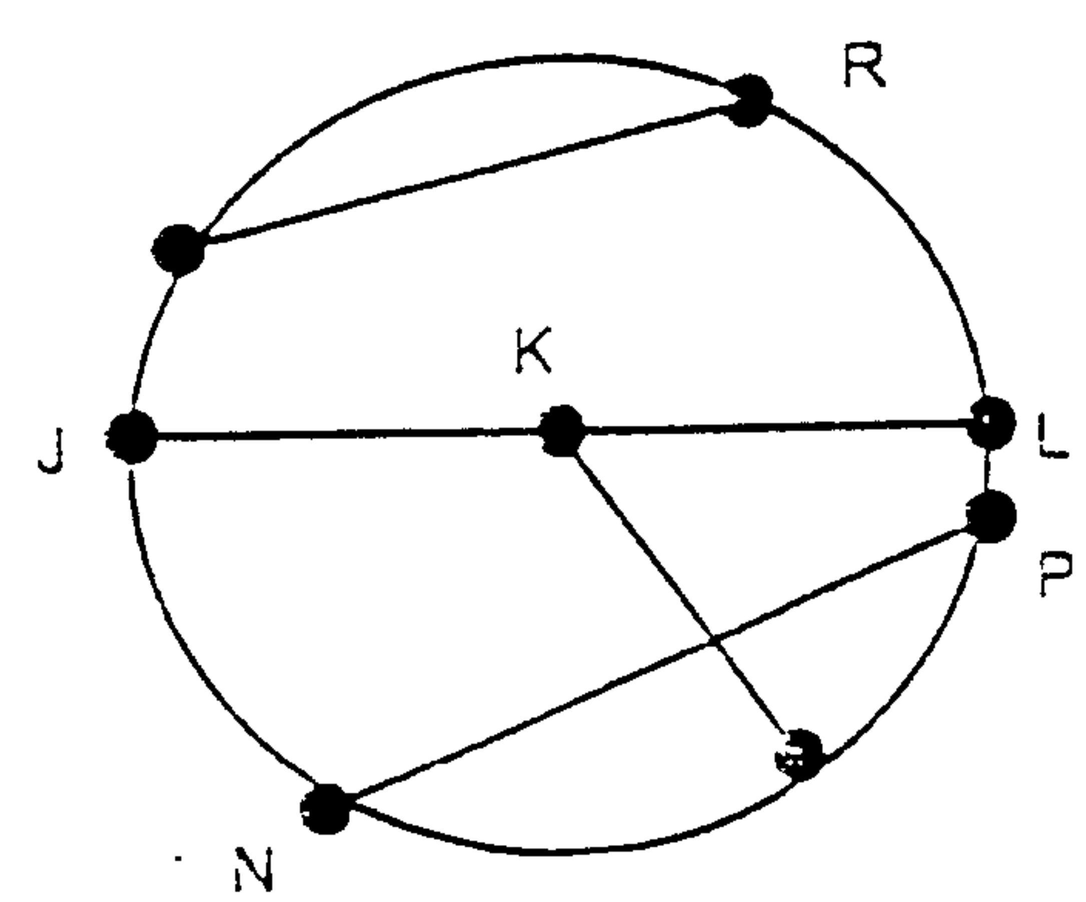
A. It is a line segment that passes through the center of a circle.
B. It is a line segment from the center of the circle to any point on the circle.
C. It is the distance around the circle.
D. It is the distance from one end of the circle to the other end.

4. A chord of a circle is always smaller than the ---------

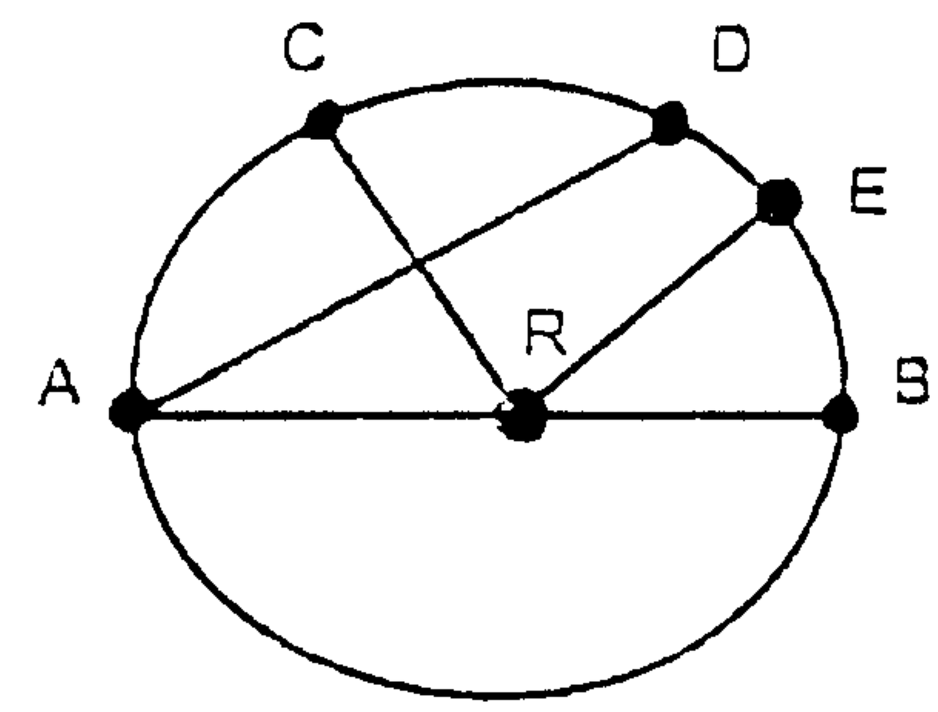
A. radius
B. diameter
C. circumference
D. center

5. In circle K, which of the following is an example of a chord?

A. $\overline{KL}$
B. $\overline{JL}$
C. $\overline{JK}$
D. $\overline{NP}$



Use the diagram to answer #6-9.



6. Identify each radius shown.

   A. $\overline{RA}$, $\overline{RB}$, $\overline{RE}$, $\overline{RC}$
   B. $\overline{RA}$, $\overline{RB}$, $\overline{CE}$, $\overline{RD}$
   C. $\overline{AB}$, $\overline{AD}$, $\overline{AC}$, $\overline{AE}$
   D. $\overline{RB}$, $\overline{RA}$, $\overline{RC}$

7. Identify a diameter of the circle.

   A. $\overline{BA}$
   B. $\overline{DA}$
   C. $\overline{EB}$
   D. $\overline{RC}$

8. Identify a chord of the circle.

   A. $\overline{BA}$
   B. $\overline{DA}$
   C. $\overline{EB}$
   D. $\overline{RC}$

9. If you walked along the border of the circle, from **B** to **E** to **D** to **C** to **A**, all the way around to **B**, this distance is called what?

   A. an arc
   B. the diameter
   C. the circumference
   D. a radius

10. The radius of a circle is $2\frac{1}{2}$ inches. What is the diameter?

A. 1 1/4 inches
B. 2 1/2 inches
C. 5 inches
D. 7 1/5 inches