

13. The number π is defined to be the ratio of the circumference of a circle to the diameter. This ratio is constant from circle to circle. Supply the missing reasons in the outline of proof below.

Given: $\odot O$ and $\odot O'$ with circumferences C and C' and diameters d and d'

Prove: $\frac{C}{d} = \frac{C'}{d'}$

Outline of proof:

Inscribe in each circle a regular polygon of n sides. Let p and p' be the perimeters.

1. $p = ns$ and $p' = n's'$ (Why?)

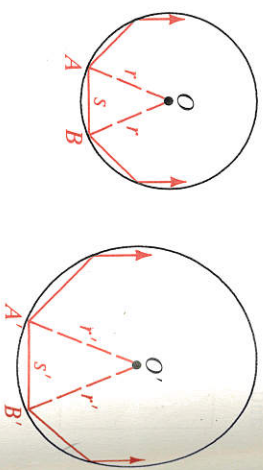
2. $\frac{p}{p'} = \frac{ns}{n's'} = \frac{s}{s'}$ (Why?)

3. $\triangle AOB \sim \triangle A'O'B'$ (Why?)

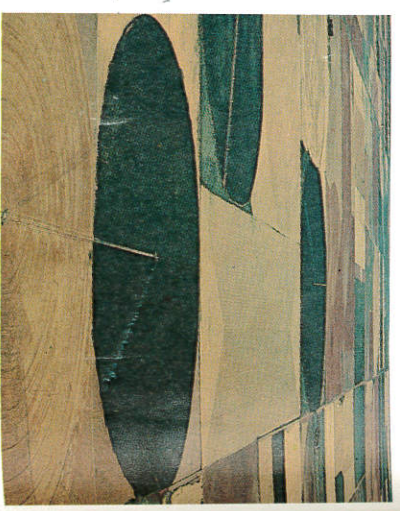
4. $\frac{s}{s'} = \frac{r}{r'} = \frac{d}{d'}$ (Why?)

5. Thus, $\frac{p}{p'} = \frac{d}{d'}$ (Steps 2 and 4)

6. Steps 1–4 hold for any number of sides n . We can let n be so large that p is practically the same as C , and p' is practically the same as C' . In advanced courses, you learn that C and C' can be substituted for p and p' in Step 5. This gives $\frac{C}{C'} = \frac{d}{d'}$, or $\frac{C}{d} = \frac{C'}{d'}$.



14. The photograph shows a piece of land that is supplied with water by a circular irrigation system. This system consists of a moving arm that sprinkles water over a circular region. If the arm is 430 m long, what is the area, correct to the nearest thousand square meters, of the region being irrigated? (Use $\pi \approx 3.14$)



Written Exercises

Complete the table. Leave answers in terms of π .

	1.	2.	3.	4.	5.	6.	7.	8.
Radius	7	120	$\frac{3}{2}$	$6\sqrt{2}$?	?	?	?
Circumference	?	?	?	?	20π	12π	?	?
Area	?	?	?	?	?	?	25π	50π

Find the circumference and area. Use $\pi \approx \frac{22}{7}$.

9. $r = 42$ 10. $d = \frac{7}{2}$ 11. $d = 2\frac{6}{11}$ 12. $r = 7k$

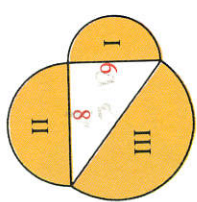
Find the circumference and area, correct to the nearest tenth. Use $\pi \approx 3.14$.

13. $r = 10$ 14. $d = 3$ 15. $d = 0.5$ 16. $r = 1.1$

17. Which is the better buy, a 10-inch round pizza costing \$4 or a 15-inch round pizza costing \$7?

18. A target consists of four concentric circles with radii 1, 2, 3, and 4. Find the area of the bull's-eye and of each ring of the target. (What would be the area of the n th ring?)

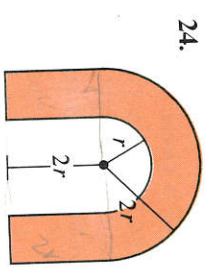
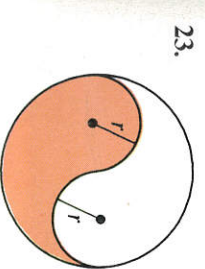
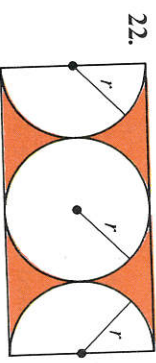
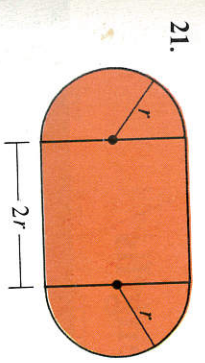
19. Semicircles are constructed on the sides of the right triangle shown at the right. Show that Area I + Area II = Area III.



Exs. 19, 20

20. Suppose that in Exercise 19 the lengths of the legs of the right triangle are a and b and the length of the hypotenuse is c . Show that Area I + Area II = Area III.

Find the area of each shaded region in terms of r .



In Exercises 25 and 26, the tires of a racing bike are approximately 70 cm in diameter.

25. How far does the bike travel if the tires make 10 revolutions? Use $\pi \approx \frac{22}{7}$.
26. About how many revolutions will the wheel make in a 22 km race? Recall that 1 km = 1000 m = 100,000 cm. Use $\pi \approx \frac{22}{7}$.