

13. The number π is defined to be the ratio of the circumference of a circle to the diameter. This ratio is the same for all circles. Supply the missing reasons for the key steps of proof below.

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

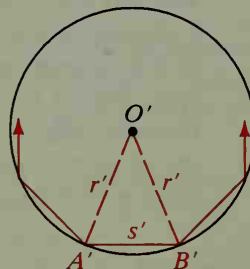
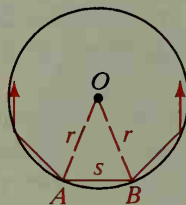
Prove: $\frac{C}{d} = \frac{C'}{d'}$

Key steps of proof:

- Inscribe in each circle a regular polygon of n sides. Let p and p' be the perimeters.
- $p = ns$ and $p' = ns'$ (Why?)
- $\frac{p}{p'} = \frac{ns}{ns'} = \frac{s}{s'}$ (Why?)
- $\triangle AOB \sim \triangle A'O'B'$ (Why?)
- $\frac{s}{s'} = \frac{r}{r'} = \frac{d}{d'}$ (Why?)
- Thus $\frac{p}{p'} = \frac{d}{d'}$. (Steps 3 and 5)
- Steps 2–5 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 6. This gives $\frac{C}{C'} = \frac{d}{d'}$, or $\frac{C}{d} = \frac{C'}{d'}$.

(This constant ratio is the number π . Then, since $\frac{C}{d} = \pi$, $C = \pi d$.)

14. Use the formula $C = \pi d$ to derive the formula $C = 2\pi r$.



Written Exercises

Complete the table. Leave answers in terms of π .

A

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

- Use $\pi \approx \frac{22}{7}$ to find the circumference and area of a circle when the diameter is (a) 42 and (b) $14k$.
- Use $\pi \approx 3.14$ to find the circumference and area of a circle when the diameter is (a) 8 (Answer to the nearest tenth.) and (b) $4t$.