



π IN THE SKY¹¹

ANSWER KEY



RECEIVER RIDDLE

How many kilometers ahead along Earth's orbit did the team need to aim the laser?

- 1 Rearrange the distance formula to solve for time (t) and compute the length of time it took the transmission, traveling at the speed of light, to reach Earth.

$$D = rt \Rightarrow t = D/r$$

$$t = (30,199,000 \text{ km}) / (299,792 \text{ km/s}) \approx 101 \text{ seconds}$$

- 2 Use the formula for circumference of a circle to compute the circumference of Earth's orbit.

$$C = 2\pi r = 2 \cdot \pi \cdot 149,000,000 \text{ km} \approx 936,194,611 \text{ km}$$

- 3 Rearrange the distance formula to solve for rate (r) and convert units to compute Earth's rate of travel in kilometers per second.

$$D = rt \Rightarrow r = D/t$$

$$((936,194,611 \text{ km}) / (1 \text{ year})) (365.24 \text{ days} / 1 \text{ year}) (24 \text{ hours} / 1 \text{ day}) (60 \text{ min} / 1 \text{ hour}) (60 \text{ sec} / 1 \text{ min})$$

$$\approx 29.67 \text{ km/s}$$

- 4 Use the distance formula once again to compute the distance Earth will have traveled during the time it took the transmission to arrive.

$$D = rt \approx (29.67 \text{ km/s}) \cdot (101 \text{ s}) \approx \mathbf{3,000 \text{ km}}$$

