

 \triangle

Jet Propulsion Laboratory California Institute of Technology

1.

3.)

Π IN THE SKY⁹

Answer Key

Telescope Tango

How many kilometers would TESS need to travel to successfully transmit its data if its velocity stayed uniform?

Plug in the values for the semi-major axis (apogee axis/2) and the semi-minor axis (perigee axis/2) into the equation for the perimeter of an ellipse to find the total distance TESS travels throughout its orbit.

• 54,200 km))]

2. Divide the downlink time by the time it takes TESS to complete its orbit to find the percentage of the orbit spent sending data back to Earth.

3 hours / (13.7 days • 24 hours)
$$\approx$$
 0.9% of perimeter

Multiply the percent of time transmitting by the total perimeter to get the distance covered in this time:

Note: There are many ways to solve this problem. One way is to use the Ramanujan approximation as shown above. However, calculus can also be used.