SOLUTION | PROBLEM SET 2 | April 2, 2021

Aristarchus determines size of Moon

1a. 30° of pie crust is $\frac{1}{12}$ of 360°

The whole circumference is $2\pi \cdot 5''$ which is $31.4''$ and $\frac{1}{12}\ 31.4'' = 2.6''$

b. 4" of crust and again $\frac{1}{12}$ of circumference.

Circumference is 48".

$2\pi r = C \Rightarrow r = \frac{48''}{2\pi} = 7.6''$

2. The eclipse shadow is

$\frac{3}{720}$ of $360° = 1.5°$

3. The Moon's diameter / width occupies $\frac{1}{3}$ of the shadow

4. $D_{Moon} = \frac{1}{3} D_{Earth}$

(actually the umbra tapers, so a correct answer, if Aristarchus could figure that would be more like $D_{Moon} = \frac{1}{4} D_{Earth}$)

5. $r = \frac{57.3°}{0.5°} D_{Moon} = 114.6\, D_{Moon}$

$= 114.6\ \frac{D_{Earth}}{3} = 38\, D_{Earth}$

6.

38 D_{Earth} distant and Moon is $\frac{1}{3}$ D_{Earth}

30 D_{Earth} distant and Moon is $\frac{1}{4}$ D_{Earth}

7.