ASG v2 Ex 2.3 (Polygon paradox)

Referring to Fig 22, we find that

a) $\measuredangle AGB = 60$ degrees (since ABCDEF is a hexagon)

If $\overline{AG} = 1$ and $\overline{AG} = 2\overline{AH}$ then

$\overline{HI} = \frac{1}{2}$, $\overline{IO} = \frac{1}{2}$, $\overline{AS} = 6$

b) There are 5 gaps in segment $\overline{HT}$.

Excluding these gaps, $\overline{HT} = 6\overline{HI} = 3$ and

$\frac{\overline{HT}}{\overline{AS}} = \frac{1}{2}$. If we include the gaps, then

$\frac{\overline{HT}}{\overline{AS}} = \frac{11}{12}$.

c) There are 5 gaps in $\overline{GV}$. Excluding the gaps, $\overline{GV} = 0$

Including the gaps, $\overline{GV} = 5$.

d) For a 12-sided polygon, there would be 11 gaps in $\overline{HT}$.

$\overline{HT}$ would be $12\overline{HI}$, and $\overline{HI} = \sin(15°)$. Since $\overline{AB} =$

$2\sin 15°$, we would still have

$\overline{HT}/\overline{AS} = 1/2$ (excluding gaps) or $23/24$ (including gaps)

e) For a circle, there would be an infinite number of gaps.

So the inner circle, when rolling, travels a farther distance than its circumference.

f) This implies that an apparently continuous substance can have "holes" in it. Perhaps solid matter has holes, too?