Counting Stars

How many stars can you see when you look in our hemisphere? In the following activity, you will use sampling to calculate the number of stars in our hemisphere. Ideally, this activity should be done from a city location and a dark sky location to illustrate the effect of light pollution.

Equipment:

A cardboard or equivalent cylinder or tube (eg from a paper roll)

Activity:

Ideally, this exercise has to be conducted under clear skies, ie no clouds, no moon and after astronomical twilight, ie +1.5 hours after sunset (when the Sun's centre is more than 18° below the horizon).

Face south. Look through the tube at an angle of about 30 degrees above the horizon. Count the stars you can see through the tube. Be careful to keep the tube steady. Record your results in the table below.

Make another 7 such observations at this 30 degree elevation in the directions SW, W, NW, N, NE, E, and SE.

Repeat the procedure using an angle of 60 degrees.

Make one observation with the tube pointing at the zenith, ie, directly overhead.

Observation Results

OBSERVATION	30 degrees	60 degrees
S		
SW		
W		
NW		
N		
NE		
E		
SE		
ZENITH		

Calculate the total number of stars viewed through the tube after 17 samples.

Total *Number Of Stars In 17 Samples* (N) = _____

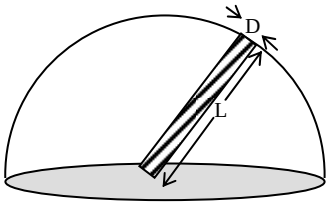
Calculations

Length of tube (L) = _____

Diameter of tube (D) = _____

Consider a hemisphere of radius equal to the length of the tube.

Area of hemisphere:



$$A_{hemisphere} = 2\pi(radius)^2$$

$$A_{hemisphere} = 2\pi L^2$$

$$A_{hemisphere} =$$

Area Viewed in each sample:

$$A_{viewed} = \pi\left(\frac{D}{2}\right)^2$$

$$A_{viewed} =$$

Total area sampled:

$$A_{sampled} = 17 \times (A_{viewed})$$

$$A_{sampled} = 17 \times$$

$$A_{sampled} =$$

$$\frac{Number \cdot of \cdot visible \cdot stars}{Number \cdot of \cdot stars \cdot in \cdot 17 \cdot samples} = \frac{Area \cdot of \cdot hemisphere}{total \cdot area \cdot sampled} = \frac{A_{hemisphere}}{A_{sampled}}$$

$$Number \cdot of \cdot visible \cdot stars = \frac{A_{hemisphere}}{A_{sampled}} \times N$$

$$Number \cdot of \cdot visible \cdot stars \ = \_\_\_\_\_$$

Questions:

1. What is the generally accepted answer to the numbers of stars visible with the naked eye in the non-light polluted sky?
2. How does your final answer compare with the accepted answer?
3. How could you improve on the accuracy of your final answer?
4. Would it make any difference if you used a longer tube?

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