**Year 10 Science – Astronomy investigation**

**The distance to the Moon**



**Aim:** To determine a value for the distance from the Earth to the Moon using string and a five cent coin and compare it to the known value.

**Apparatus:**  5 cent coin

length of string

metre ruler

graphics calculator

Moon visible in the sky (full Moon is best but other sizes will also work)

**Theory:** This experiment uses ratio to determine the distance from the Earth to the Moon.

If we know the distance to the 5 cent coin and its diameter, and the diameter of the Moon we can calculate the unknown (the distance to the Moon)

5 cent coin

Moon

Based on ratio, in the space below, write an equation using the following symbols:

length of string = ds

distance to the Moon = dM

diameter of 5 cent coin = C

diameter of the Moon = M

**Method:** Go outside and observe the Moon. One person in the group is the observer and the other person is the assistant. The observer holds one end of the string next to their observing eye. The assistant holds the 5 cent coin in front of the Moon and positions the string just below the coin. The observer’s job is to look along the string at the Moon and tell the assistant to move the 5 cent coin closer or further away until it just covers the full size of the Moon. The length of the string between the observer’s eye and the coin and the diameter of the coin are recorded.

You may like to swap jobs and record both string lengths.

**Results:**

ds 1 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ m ds 2 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ m (optional)

C = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ m

M = 3 476 000 m (i.e. 3.476 × 106m) (this is the accepted value for the diameter of the Moon)

Make dM  the subject of your formula from before and write it below.

Perform a calculation below, based on your measurements to determine a value for dM.

The correct value for the distance to the Moon is 384,400,000 m.

**Error Calculation (optional)**

Work out the difference between your value and this value. Call this value the difference.

Difference = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ m

Divide the difference by the correct value and multiply by 100. This converts it to a percentage and is called the **percentage error**. Round it off to the nearest whole number.

My percentage error is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ %

In Scientific experiments, scientists try to design experiments that reduce the error values to as low as possible. This makes their results more reliable.

**Conclusion:** Write a good conclusion to this experiment that relates your findings to the aim. Mention the size of your percentage error and comment about how the experiment could have been modified so as to reduce the errors.

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