Purpose: Calculate the height of objects on the moon by studying the length of their shadows.

References: Activities in Astronomy, p. 105-108

Procedure: From the Activities in Astronomy lab manual, we obtained a photo showing a number of features, such as craters and mountains, on the lunar surface. We then proceeded to measure the radius of several features in the image. Now, by comparing the Image feature diameter (IFD) to the ratio of the image lunar diameter (ILD) to the actual lunar diameter (ALD), we can estimate the actual feature diameter.

We then proceeded to estimate the height of a feature (MP) by comparing the length of its shadow in the image (AP) to the ratio formed by the distance between the terminator and the feature (TM) and the radius of the moon (OM).

Data:

Size of Lunar Features:

Measured lunar diameter (mm)	534
Actual Lunar Diameter (Km)	3476
MFD (mm)	
Feature 1	5
Feature 2	2
Feature 3	3
Feature 4	1.5
Feature 5	20

Height of a Lunar Mountain or Crater Wall:

OM	267	
Feature #	TM	AP
1	3.4	0.65
2	1.8	0.4
3	8.2	0.2
4	6.2	0.1
5	2.7	0.9

Calculations:

Size of Lunar Features:

$$AFD(Km) = \frac{ALD(Km)}{ILD(mm)} MFD(mm)$$

Ex: $$AFD = \frac{3476}{534} 5 = 32.55Km$$

Height of a Lunar Mountain or Crater Wall:

To calculate the height of a lunar feature, we must first calculate the scale height of the feature.

$$Mp(mm) = \frac{Tm(mm)}{Om(mm)} Ap(mm)$$

Ex: $$Mp(mm) = \frac{3.44}{267}(.65) = .008277(mm)$$

We can then calculate the height.

$$Actual\ Height(Km) = \frac{Actual\ Lunar\ Radius(Km)}{image\ lunar\ radius(mm)} Scale\ Height\ of\ Feature(mm)$$

Ex: $$Actual\ Height(Km) = \frac{1738}{267}.008277 = .054(Km)$$

Results:

Size of Lunar Features:

Feature #	AFD (Km)
1	32.55
2	13.02
3	19.53
4	9.76
5	130.19

Height of a Lunar Mountain or Crater Wall:

OM (mm)	267	
ALR (Km)	1738	
Feature #	MP (mm)	AH (Km)
1	0.008277	0.054
2	0.002697	0.018
3	0.006142	0.040
4	0.002322	0.015
5	0.009109	0.059

Conclusion:

Using the ratios and images provided in the Activities in Astronomy Manual, we were able to practice calculating the diameter and height of several lunar features. We could have improved the accuracy of these calculations by using a diagram with a larger scale. This would have allowed for more precise measurements of distances on the image.