

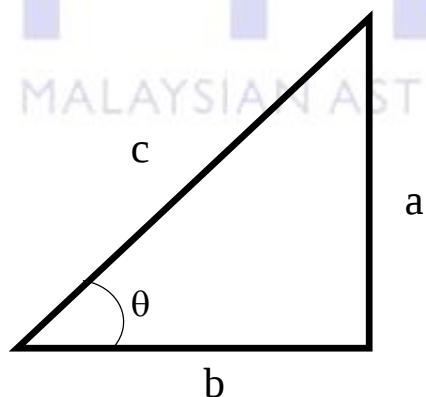
MyAO 2018 ANSWER SCHEME

Objective question

1.	B	11.	C	21.	D
2.	D	12.	A	22.	A
3.	C	13.	C	23.	B
4.	A	14.	A	24.	D
5.	B	15.	D	25.	C
6.	C	16.	D	26.	B
7.	A	17.	C	27.	B
8.	A	18.	C	28.	C
9.	A	19.	A	29.	A
10.	A	20.	D	30.	A

Subjective question (10 marks)

Using photo viewer software in a computer, we hover our cursor around the limb of the moon to calculate the width/diameter of the moon in the unit of pixel. We gather the information of the actual width/diameter of the moon in kilometers or meters. We equate the width of the moon in pixel count with the width of the moon in kilometers. We calculate the ratio of pixel to km or m. The length of the shadow of the crater is measured from the tip of the mountain to the tip of respective shadow in pixel to be then converted to the unit of km or m. Looking at a moon map, we determine the coordinate of the mountain/ crater we are measuring. Referring to the time of picture taken and the determined coordinate of the mountain/crater, the altitude of the moon as observed from the moon is calculated. We can also use software available online. Using trigonometry (tangent formula), the height of the mountain/crater is calculated.



a = height of the mountain/crater
b = length of the shadow in km/m
θ = altitude of the sun

$$\tan \theta = \frac{a}{b} \quad \text{or} \quad \tan(\text{sun altitude}) = \frac{\text{height of the mountain or crate}}{\text{shadow length}}$$

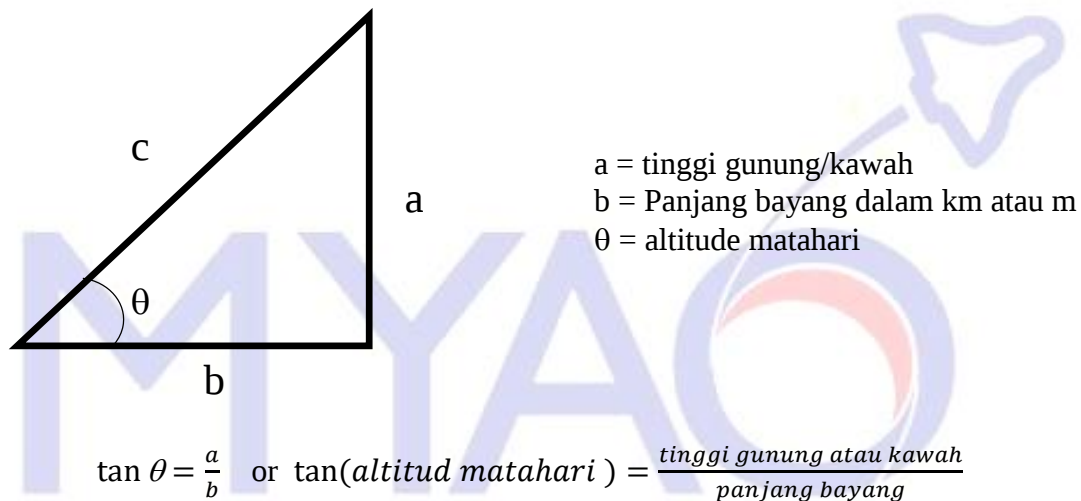
$$\text{height of the mountain or crater} = \text{shadow length (km or m)} \times \tan(\text{sun altitude})$$

or

$$a = b \times \tan(\text{sun altitude})$$

Soalan subjektif (10 markah)

Menggunakan perisian melihat gambar dalam komputer, gerakkan kursor sekitar gambar dari hujung sisi bulan ke sisi lain untuk mengukur lebar/diameter bulan dalam unit pixel. Kumpul maklumat tentang diameter sebenar bulan dalam unit km atau m. Panjang bayang gunung/kawah di dalam gambar diukur dari hujung gunung/kawah ke hujung bayangnya. Kemudian, menggunakan nisbah yang telah dikira sebelum ini, panjang bayang ditukar ke unit km atau m. Merujuk gambar dan peta bulan, koordinat gunung/kawah yang sedang diukur ditentukan. Merujuk kepada waktu gambar diambil dan koordinat gunung/kawah, altitud/sudut dongak matahari dikira. Kita juga boleh menggunakan perisian simulasi langit seperti *starry night*, *stellarium* dan *sky map*. Kaedah trigonometri (formula tangent) digunakan untuk mengira ketinggian gunung/kawah.



$$\text{tinggi gunung atau kawah} = \text{panjang bayang (km or m)} \times \tan(\text{altitud matahari})$$

or

$$a = b \times \tan(\text{altitud matahari})$$