

## TEAM COMPETITION

### Solution

The position of the observer is given after being determined using GPS: longitude, latitude, and altitude. In fact, only latitude is necessary in the analysis. We have two spatial points (observer position and reference point/peak of main stupa), so we can use the classical formula to calculate the declination of celestial bodies, that is,

$$\sin \delta = \sin \phi \sin h + \cos \phi \cos h \cos A_z$$

in order to determine the alignment direction.

Thus, students should :

- determine azimuth of the object using a magnetic compass (assuming that it points to the true north);
- determine the elevation angle between their position and the peak of the stupa using protractor and a weighted string;
- determine the declination using the measured parameters;
- identify the constellation using provided star chart based on the results a-c, assuming that the observations are performed at 18:00.

See Table below.

Solution to Team Competition										
Position	longitude	latitude	Altitude (m)	lat	h (deg)	$A_z$ (deg)	$\delta$	arc sin $\delta$	Constellation	Object
1	110° 12' 16.52?	-7° 36' 30.10?	264	-7.6083611	21.5	74.5	0.19793	11.41588681	Leo	Regulus
2	110° 12' 16.69?	-7° 36' 29.80?	264	-7.6082778	22	98	-0.1775	-10.22422264	Hydra	
3	110° 12' 16.82?	-7° 36' 29.62?	264	-7.6082278	20.5	45.5	0.60438	37.18391917	Leo Minor	
4	110° 12' 16.65?	-7° 36' 28.85?	265	-7.6080139	22	62.5	0.37476	22.00954381	Leo	gamma-Leo
5	110° 12' 16.54?	-7° 36' 28.26?	264	-7.60785	19.5	135.5	-0.71061	-45.28493973	Vela	

(This is an example only)



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Example of panel.

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Longitude:  $110^{\circ} 12' 16.52''$       Latitude:  $-7^{\circ} 36' 30.10''$       Altitude: 264 m

