Changing Times

Planisphere Activity

Answers:

1	**Which bright star (with a six letter name) is on (or very near) the meridian line and with a declination of -16 degrees at this date and time?**
	On the 2nd January **Sirius** (1) is on the meridian and at -16 degrees declination at midnight (00:00 UT).
2	**What has happened to the position of the bright star? Has it moved east/west and lower/higher in the sky?**
	On the 1st March at 00:00 UT, Sirius has moved lower and westwards until it has approached (for 40N and 50N) or reached (60N) the western horizon and is setting (2).
3	**Has the position of the bright star significantly changed?**
	At 20:00 UT on the 1st/2nd March the position of Sirius is (nearly) the same, i.e. on the meridian, as it was for 00:00 UT on the 2nd January. That means that Sirius has reached the same position four hours earlier than in January (1).
4	**What aspect of the Earth's motion causes this?**
	The Earth's rotates from west to east (i.e. anticlockwise as viewed from above the North Pole) so the stars in the sky appear to move from east to west as our viewing position changes. A similar experience is when we look out of a railway carriage as our train moves forwards; another train carriage beside us appears to go backwards. Astronomers have drive their telescopes from east to west to counter the rotation of the Earth beneath their observatory and thus track the stars (1).
5	**What aspect of the Earth's motion causes this?**
	The Earth also travels around the Sun in its orbit, again anticlockwise as viewed from 'above'. Don't give any precise numbers to the students at this stage because they will find out more in the following questions. For your information; each day, the Earth moves approximately one degree around its orbit so the stars appear to shift westwards by about 1 degree each night. About 60 days elapse between 2nd January and 2nd March so the stars appear to move about 60 degrees westwards. This is equivalent to 4 hours of right ascension and so the stars reach the same position 4 hours earlier in March than in January (1).
6	**How many days are there between 18th August and 19th September?**
	For 40 degrees north: 32 days, rounded to 30 days. For 50 degrees north: 31 days, rounded to 30 days. For 60 degrees north: 31 days, rounded to 30 days.
7	**Approximately, what is the difference in right ascension (RA) between Aldebaran and Alhena (they have broadly the same declination.)?**
	6:35 – 4:35 = 2 hours of right ascension (RA) (1).

8	**How many degrees (of azimuth) is this difference in right ascension (RA) equivalent to?**
	This is equivalent to (2/24) x 360 = 30 degrees of azimuth (1).
9	**Calculate how many degrees (to the nearest whole degree) the sky moves westward between identical clock times which are 24 hours apart**
	Approximately, 30 degrees in 31 days gives a movement of (just under) 1 degree per solar day (1).
10	**How much earlier will a star rise from one 24 hour period to the next?**
	(1 degree / 360 degrees) x 24 hours = 1/15th hour or 4 minutes (1)
11	**Could you have worked out the number of degrees difference in a 24 hour period in a more direct way?**
	If the Earth completes one orbit, 360 degrees, in 365.23 days then we expect a change of about 1 degree per day, which is indeed what we find (2).