Circumpolar Stars

Most of the questions involve the use of the declination of a star and an observer's latitude, to determine whether the star will be circumpolar.

The condition for circumpolarity is:

$$D \geq 90° - L$$

where D is the declination of the star and L is the latitude of the observer.

Reminder: from a given location (eg 57° N) the angle of elevation of Polaris above the Northern horizon will equal the latitude of the location, that is, Polaris will be 57° above the horizon. If the angular distance of a star from Polaris is less than this, then it will never set as the Earth rotates on its axis. Since the declination of Polaris is + 90°, the angular distance of a star from Polaris is $(90° - D)$. So, if $(90° - D)$ is less than L, the star will be circumpolar.

④ An observer in the Shetland Isles (latitude 60° N) observes two stars in Pegasus. Which, if either, will be circumpolar?

Ans. (a) β Peg. (declination + 28°)

$$(90 - L) = 90° - 60°$$
$$= 30°$$

declination of β Peg. $< 30°$ ∴ the star is not circumpolar.

(b) π Peg (declination + 33°)

$$(90 - L) = 30°$$

declination of π Peg. $> 30°$

∴ π Peg. is circumpolar.

(5) Find the smallest (that is, southernmost) latitude for which Thuban (α Draconis) with a declination of 64° would be circumpolar.

Ans.

For the smallest latitude, $D = (90° - L)$

$\therefore \quad L = (90° - D)$

$\therefore \quad L = (90° - 64°)$

$\therefore \quad \underline{L = 26°}$

D. F.

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