Elevation/depression and bearings

6 questions | 13 marks

Equivalent correct methods earn the corresponding marks.

1. A vertical tower is 16 m horizontally from an observer at ground level. Its top has elevation 35°. Find its height to one decimal place. [2 marks]

$h = 16\tan 35^\circ$.

$h \approx 11.2\,\text{m}$.

Answer: 11.2 m

2. Repeat the tower calculation if the observing instrument is 1.5 m above the ground. [2 marks]

The trigonometric rise is still $16\tan 35^\circ$.

Add the instrument height 1.5 m.

$H \approx 12.7\,\text{m}$.

Answer: 12.7 m

3. From an 8 m high platform, a boat is seen at a depression of 25°. Find its horizontal distance from the platform base. [2 marks]

The boat's elevation angle to the platform is 25°.

$\tan 25^\circ = \frac{8}{d}$, so $d = \frac{8}{\tan 25^\circ}$.

$d \approx 17.2\,\text{m}$.

Answer: 17.2 m

4. A point is 14 km east and 20 km north of a station. Find its bearing to the nearest degree. [2 marks]

$\beta = \tan^{-1}\left(\frac{14}{20}\right) = 34.992\ldots^\circ$.

It lies in the north-east quadrant, so the bearing is 035°.

Answer: 035°

5. Find the reverse bearing of 032°. [2 marks]

$032^\circ + 180^\circ = 212^\circ$.

Answer: 212°

6. A boat travels 24 km on bearing 210°. Find its southward and westward distances, each to one decimal place. [3 marks]

$E = 24\sin 210^\circ = -12\,\text{km}$.

$N = 24\cos 210^\circ \approx -20.7846\,\text{km}$.

The negative signs mean west and south respectively.

Answer: 20.8 km south; 12.0 km west