

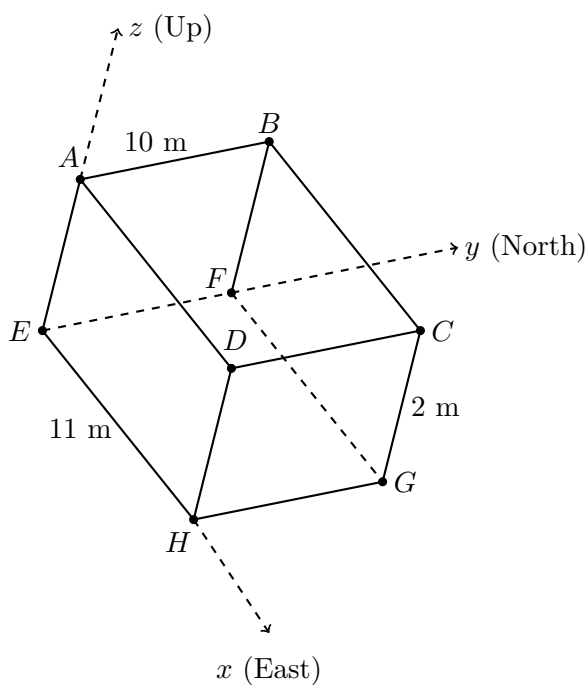
Applied Mathematics APM01A1, 2017

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Tutorial 2

Question 1

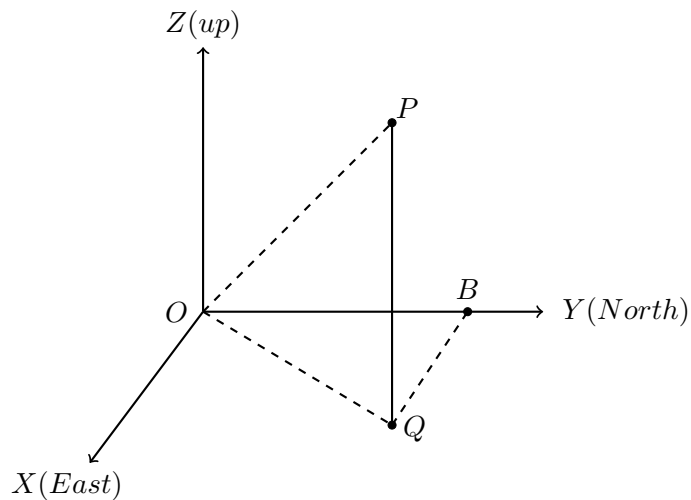
Consider the following rectangular box with the origin fixed at point E .



1. Find the coordinates of points A, B, C, G and H .
2. Find the x, y and z components of vectors \overline{EC} , \overline{HB} and \overline{AG} .

3. Find the direction cosines of \overline{AG} .
4. What angle does \overline{AG} make with \overline{AB} ?
5. Find the cardinal direction of \overline{HB} in degrees North or South of East or West. Then, find the angle of elevation of \overline{HB} .

Question 2



In the above diagram, Q lies in the first quadrant of the XY -plane, P is vertically above Q , and B is the point of the Y -axis, which is nearest to P and Q .

1. Suppose $\angle POX = 60^\circ$ and $\angle POY = 70^\circ$. Find the cardinal direction of P relative to O , in degrees North or South of East or West.
2. Find the angle of elevation of P relative to O .
3. Suppose $PB = 20\text{m}$, $PO = 25\text{m}$ and \overline{OP} is $41, 41^\circ$ East of North. Find $|\overline{OB}|$, $|\overline{OQ}|$ and the x coordinate of P .

Question 3

Let ABCD be a parallelogram with $\overline{AB} = \vec{a}$ and $\overline{AD} = \vec{b}$. The point E is such that $\overline{DE} = 3\vec{b}$. Express \overline{AE} , \overline{AC} and \overline{EC} in terms of \vec{a} and \vec{b} .

Question 4

Let $ABCD$ be a parallelogram with $\bar{a} = \overline{AC}$ and $\bar{b} = \overline{BD}$ be directed diagonals. Express \overline{AB} and \overline{BC} in terms of \bar{a} and \bar{b} .

Hint: The diagonals of a parallelogram bisect each other.