



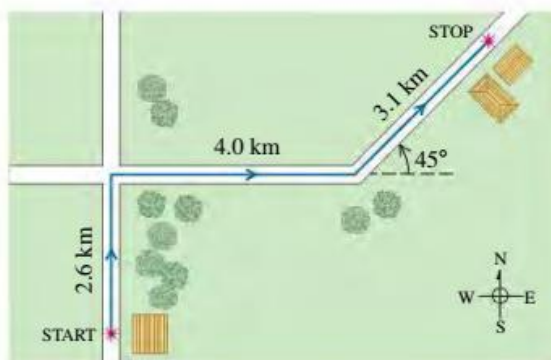
# Applied Physics

PH-101 Fall 2024

## Assignment 1; Chapter 1

Deadline of submission: 16.09.2024

**Q1.** A postal employee drives a delivery truck along the route shown in Fig. Determine the magnitude and direction of the resultant displacement by drawing a scale diagram.

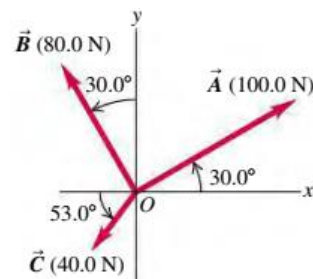


**Q2.** A spelunker is surveying a cave. She follows a passage 180 m straight west, then 210 m in a direction  $45^\circ$  east of south, and then 280 m at  $30^\circ$  east of north. After a fourth displacement, she finds herself back where she started. Use a scale drawing to determine the magnitude and direction of the fourth displacement.

**Q3.** Let  $\theta$  be the angle that the vector  $\mathbf{A}$  makes with the  $+x$ -axis, measured counterclockwise from that axis. Find angle  $\theta$  for a vector that has these components: (a)  $A_x = 2.00$  m,  $A_y = -1.00$  m; (b)  $A_x = 2.00$  m,  $A_y = 1.00$  m.

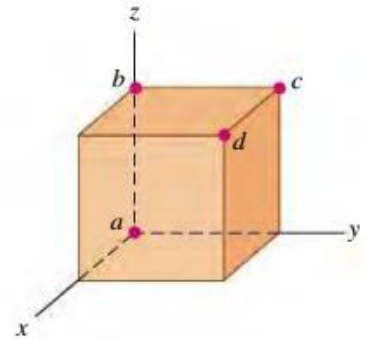
**Q4.** A plane leaves the airport in Galisteo and flies 170 km at  $68.0^\circ$  east of north; then it changes direction to fly 230 km at  $36.0^\circ$  south of east, after which it makes an immediate emergency landing in a pasture. When the airport sends out a rescue crew, in which direction and how far should this crew fly to go directly to this plane?

**Q5.** Three horizontal ropes pull on a large stone stuck in the ground, producing the vector forces  $\mathbf{A}$ ,  $\mathbf{B}$ , and  $\mathbf{C}$  shown in Fig. Find the magnitude and direction of a fourth force on the stone that will make the vector sum of the four forces zero.



**Q6.** Two ropes in a vertical plane exert equal-magnitude forces on a hanging weight but pull with an angle of  $72.0^\circ$  between them. What pull does each rope exert if their resultant pull is 372 N directly upward?

**Q7.** A cube is placed so that one corner is at the origin and three edges are along the  $x$ -,  $y$ -, and  $z$ -axes of a coordinate system Fig. Use vectors to compute (a) the angle between the edge along the  $z$ -axis (line  $ab$ ) and the diagonal from the origin to the opposite corner (line  $ad$ ), and (b) the angle between line  $ac$  (the diagonal of a face) and line  $ad$ .



**Q8.** To keep an object moving in a circle at constant speed requires a force called the "centripetal force". Do a dimensional analysis of the centripetal force. (Hint: centripetal force depends on mass, velocity and distance).

**Q9.** A ship leaves the island of Guam and sails 285 km at  $62.0^\circ$  north of west. In which direction must it now head and how far must it sail so that its resultant displacement will be 115 km directly east of Guam?

**Q10.** You are given vectors  $\mathbf{A} = 5\hat{i} - 6\hat{j}$  and  $\mathbf{B} = 3.5\hat{i} - 7\hat{j}$ . A third vector,  $\mathbf{C}$ , lies in the  $xy$ -plane. Vector  $\mathbf{C}$  is perpendicular to vector  $\mathbf{A}$ , and the scalar product of  $\mathbf{C}$  with  $\mathbf{B}$  is 15.0. From this information, find the components of vector  $\mathbf{C}$ .