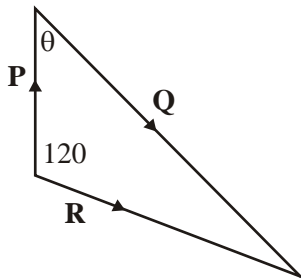


1. Two forces **P** and **Q** act on a particle. The force **P** has magnitude 7 N and acts due north. The resultant of **P** and **Q** is a force of magnitude 10 N acting in a direction with bearing 120° . Find
- (i) the magnitude of **Q**,
 - (ii) the direction of **Q**, giving your answer as a bearing.

(Total 9 marks)

1. $\mathbf{R} = 10\sqrt{3}/2 \mathbf{i} - 5\mathbf{j}$ M1 A1
- Using $\mathbf{P} = 7\mathbf{j}$ and $\mathbf{Q} = \mathbf{R} - \mathbf{P}$ to obtain $\mathbf{Q} = 5\sqrt{3}\mathbf{i} - 12\mathbf{j}$ M1 A1
- Magnitude = $\sqrt{[(5\sqrt{3})^2 + 12^2]} \approx \underline{14.8 \text{ N}}$ (AWRT) M1 A1
- angle with $\mathbf{i} = \arctan(12/5\sqrt{3}) \approx 64.2^\circ$ M1 A1
- bearing $\approx \underline{144^\circ}$ (AWRT) A1 9

Alternative method



- Vector triangle correct B1
- $Q^2 = 10^2 + 7^2 + 2 \times 10 \times 7 \cos 60$ M1 A1
- $Q \approx \underline{14.8 \text{ N}}$ (AWRT) A1
- $\frac{14.8}{\sin 120} = \frac{10}{\sin \theta}$ M1 A1
- $\Rightarrow \theta = 35.8, \Rightarrow \text{bearing } 144$ (AWRT) M1 A1, A1

[9]

1. This question proved to be the most demanding on the paper. The majority attempted it by trying to draw a vector triangle, but the triangles drawn were often unclear and rarely correct (with quite a few right-angled triangles drawn or assumed). Others attempted to use coordinates, though often made mistakes in using the implied equation $\mathbf{P} + \mathbf{Q} = \mathbf{R}$ (instead simply adding the two given vectors, i.e. assuming $\mathbf{P} + \mathbf{R} = \mathbf{Q}$). The presentation of work here was also very poor, with calculations or numbers often splayed all over the page with no clear justification for what was being attempted. Fully correct solutions were seen, but only occasionally!