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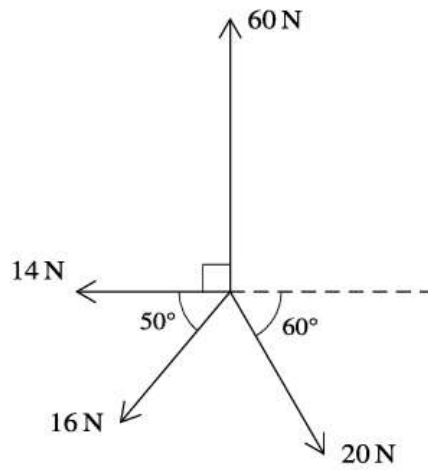
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Mathematics 9709/42

Paper 4 Mechanics May/June 2022

Question No (2)

2



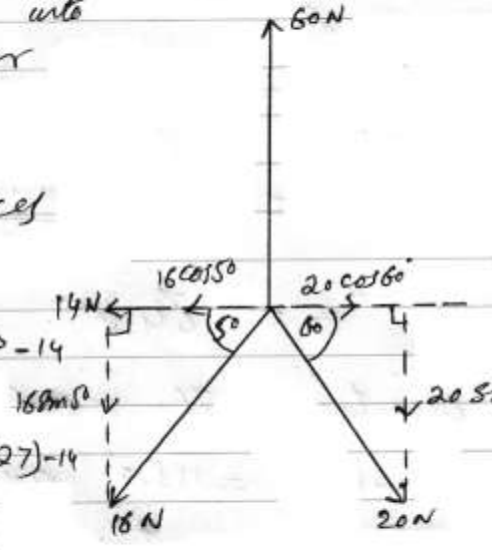
Coplanar forces of magnitudes 60 N, 20 N, 16 N and 14 N act at a point in the directions shown in the diagram.

Find the magnitude and direction of the resultant force.

Solution:

Resolve the forces
16 N and 20 N into
its rectangular
components.

Resolve the forces
horizontally



$$\Sigma F_x = 20 \cos 60 - 16 \cos 50 - 14$$

$$\Sigma F_x = 20(0.5) - 16(0.6427) - 14$$

$$= 10 - 10.2832 - 14$$

$$\Sigma F_x = -14.285 \text{ N}$$

Resolve the forces vertically

$$\Sigma F_y = 60 - 16 \sin 50 - 20 \sin 60$$

$$= 60 - 16(0.7660) - 20(0.8660)$$

$$= 60 - 12.256 - 17.32$$

$$\Sigma F_y = 30.423 \text{ N}$$

$\therefore$ Resultant force, $R = \sqrt{(F_x)^2 + (F_y)^2}$

$$= \sqrt{(14.285)^2 + (30.423)^2}$$

$$= \sqrt{1129.62}$$

$$R = 33.61 \text{ N}$$

let θ be the angle which the resultant force makes with the x -axis

basic angle

$$\theta = \tan^{-1}\left(\frac{F_y}{F_x}\right)$$

$$= \tan^{-1}\left(\frac{30.423}{14.285}\right)$$

$$\theta = 64.8^\circ$$

$\therefore$ Direction of the resultant force is
 $180^\circ - 64.8^\circ = 115.2^\circ$ anticlockwise
 from the positive x -axis.