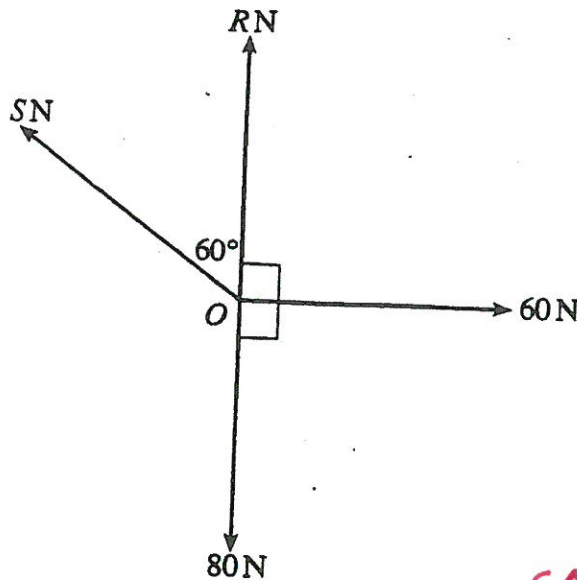


# M1 - Resolving Forces (1)

① The diagram shows four coplanar forces of magnitude  $S$  N,  $R$  N,  $60$  N and  $80$  N acting at a point  $O$  in the directions shown.

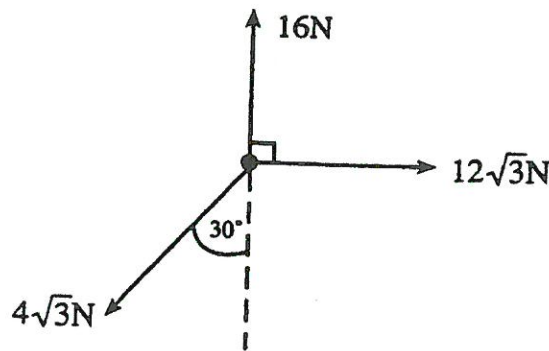


Given that the forces are in equilibrium, find the values of  $R$  and  $S$ .

$S = 69.3$   
 $R = 45.4$

[6]

② A particle  $A$  is moving on a smooth horizontal floor under the resultant action of three horizontal forces of magnitudes  $16$  N,  $12\sqrt{3}$  N and  $4\sqrt{3}$  N acting in directions shown in the diagram below.

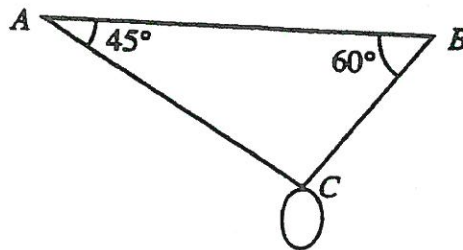


(a) Show that the resultant of the three forces has magnitude  $20$  N and find the angle it makes with the force of magnitude  $16$  N.

$60^\circ$

[7]

③ The diagram shows a body of mass  $6$  kg suspended in equilibrium by two light inextensible strings  $AC$  and  $BC$ , attached to two fixed points  $A$  and  $B$  on the same horizontal level. The strings  $AC$  and  $BC$  are inclined at angles  $45^\circ$  and  $60^\circ$  to the horizontal respectively.



Find the tension in the string  $AC$  and the tension in the string  $BC$ .

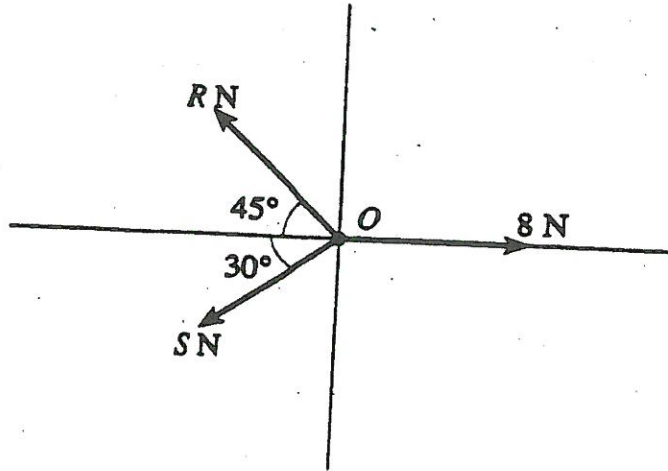
$AC = 30.4$   
 $BC = 43.0$

[7]

# M1 - Resolving Forces (2)

4

The diagram shows a particle lying in equilibrium at the origin  $O$  under the action of three horizontal forces of magnitudes  $8\text{ N}$ ,  $S\text{ N}$  and  $R\text{ N}$ .



Find the values of  $R$  and  $S$ , giving your answers correct to two decimal places.

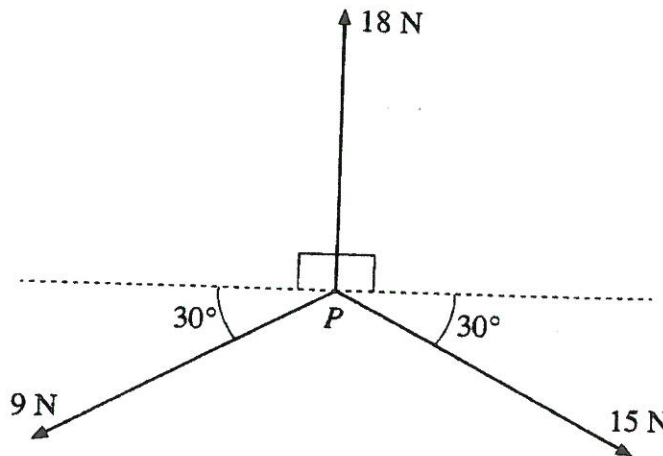
$R = 4.1$

$S = 5.9$

[8]

5

8. Three horizontal forces, with magnitudes  $18\text{ N}$ ,  $15\text{ N}$  and  $9\text{ N}$ , act at a point  $P$  in directions as shown in the diagram.



Calculate the magnitude and direction of the resultant of the forces.

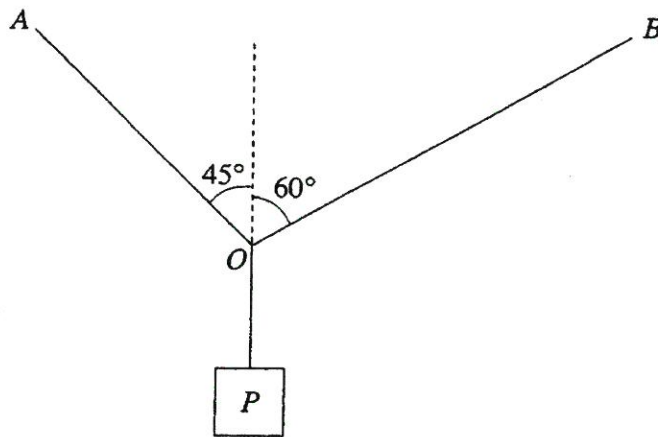
$\sqrt{63}$   
 $40.9^\circ$

[8]

# M1 - Resolving Forces (3)

2. The diagram shows a body  $P$ , of mass 30 kg, suspended in equilibrium by means of light inextensible strings  $OA$ ,  $OB$  and  $OP$ . The strings  $OA$  and  $OB$  are inclined at  $45^\circ$  and  $60^\circ$  to the vertical respectively.

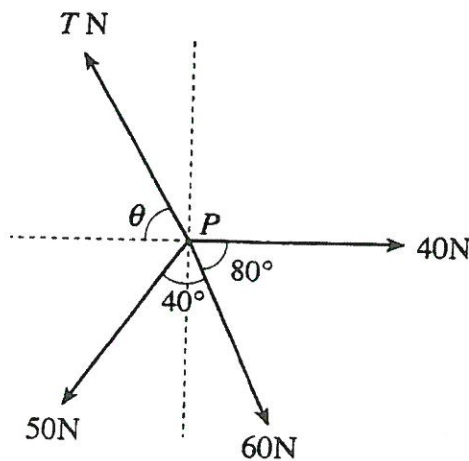
6



- (a) Find, in Newtons, the tension in the string  $OP$ . 294 N [1]
- (b) Draw a diagram showing the forces acting at the point  $O$ . [1]
- (c) Calculate the forces in the strings  $OA$  and  $OB$ .  $OA = 253.6$ ,  $OB = 215.2$  [8]

7

3. The diagram shows four horizontal forces acting at a point  $P$ .

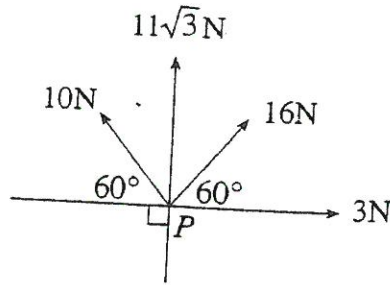


Given that the forces are in equilibrium, calculate the value of  $T$  and the size of the angle  $\theta$ . Give each of your answers correct to one decimal place.

$T = 105.5$   
 $\theta = 76.1$

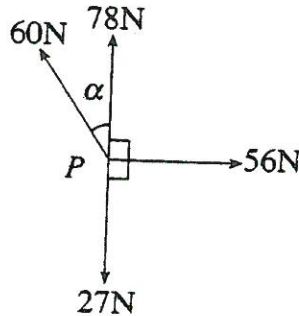
[9]

8. Four coplanar forces of magnitudes 10 N,  $11\sqrt{3}$  N, 16 N and 3 N act at the point  $P$  in the directions as shown in the diagram.



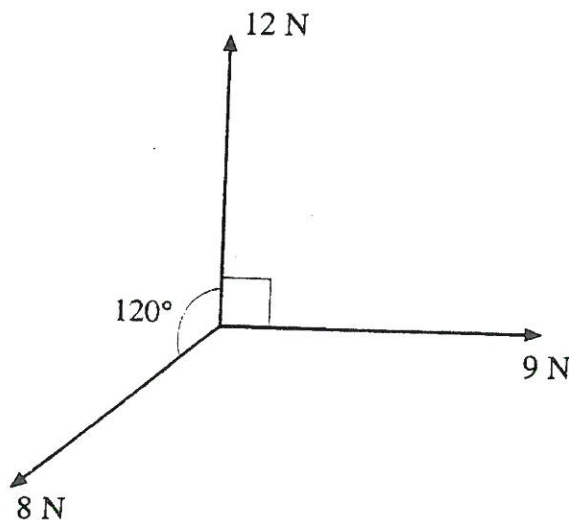
Resolve the forces in two perpendicular directions and deduce the magnitude and direction of the resultant force. 42 N, 81.8° [10]

9. Four horizontal coplanar forces have magnitudes 78 N, 56 N, 27 N, 60 N and act at the point  $P$  in the directions shown on the diagram, where  $\tan \alpha = \frac{3}{4}$ .



Find the magnitude and direction of the resultant. 101, 78.6° [8]

10. Three horizontal forces of magnitudes 8 N, 12 N and 9 N act at a point in directions as shown in the diagram.



Find the magnitude of the resultant of these three forces and the angle between the resultant and the 9 N force. 8.3 N, 75.5° [8]