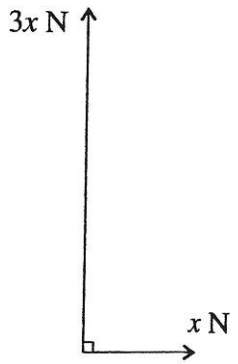
Resolving Forces (Ch 4, 9 + 10)

1

Jun '09



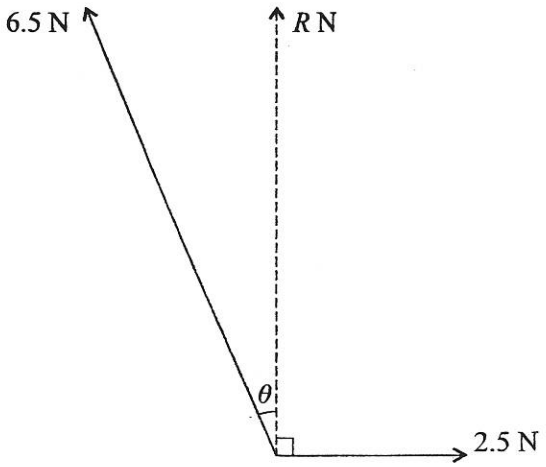
Two perpendicular forces have magnitudes x N and $3x$ N (see diagram). Their resultant has magnitude 6 N.

(i) Calculate x. **[3]**

(ii) Find the angle the resultant makes with the smaller force. **[3]**

2

Jun '06



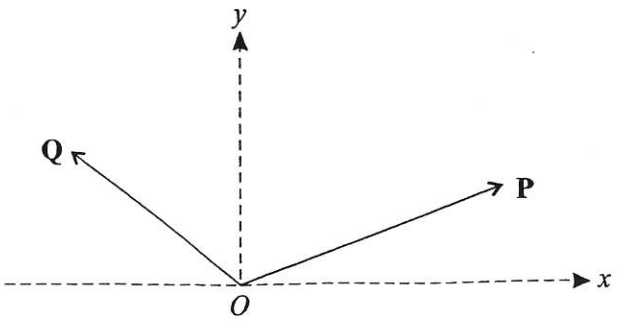
Forces of magnitudes 6.5 N and 2.5 N act at a point in the directions shown. The resultant of the two forces has magnitude R N and acts at right angles to the force of magnitude 2.5 N (see diagram).

(i) Show that $\theta = 22.6°$, correct to 3 significant figures. [3]

(ii) Find the value of R. [3]

1

Jun '07



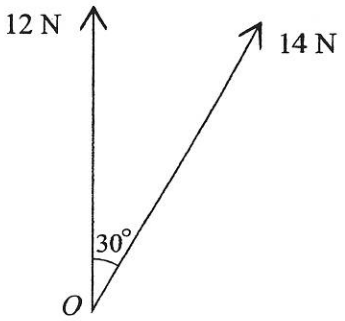
Two horizontal forces **P** and **Q** act at the origin O of rectangular coordinates Oxy (see diagram). The components of **P** in the x- and y-directions are 14 N and 5 N respectively. The components of **Q** in the x- and y-directions are -9 N and 7 N respectively.

(i) Write down the components, in the x- and y-directions, of the resultant of **P** and **Q**. [2]

(ii) Hence find the magnitude of this resultant, and the angle the resultant makes with the positive x-axis. [4]

2

Jun '08



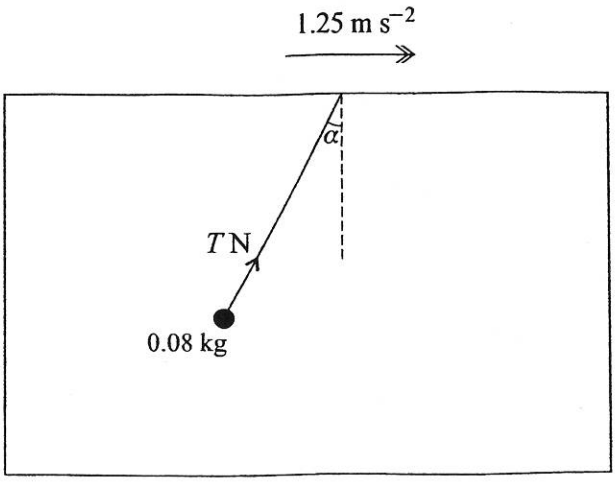
Two horizontal forces act at the point O. One force has magnitude 12 N and acts along a bearing of 000°. The other force has magnitude 14 N and acts along a bearing of 030° (see diagram).

(i) Show that the resultant of the two forces has magnitude 25.1 N, correct to 3 significant figures. [5]

(ii) Find the bearing of the line of action of the resultant. [3]

2

Jan '06



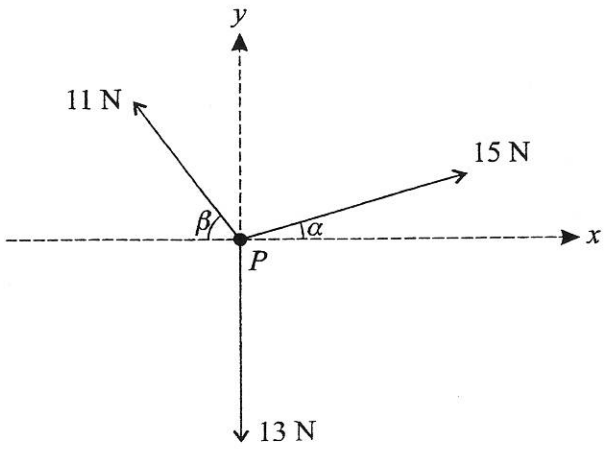
An object of mass 0.08 kg is attached to one end of a light inextensible string. The other end of the string is attached to the underside of the roof inside a furniture van. The van is moving horizontally with constant acceleration 1.25 m s^{-2}. The string makes a constant angle α with the downward vertical and the tension in the string is T N (see diagram).

(i) By applying Newton's second law horizontally to the object, find the value of $T \sin \alpha$. [2]

(ii) Find the value of T. [5]

2

Jan '07



Three horizontal forces of magnitudes 15 N, 11 N and 13 N act on a particle P in the directions shown in the diagram. The angles α and β are such that $\sin \alpha = 0.28$, $\cos \alpha = 0.96$, $\sin \beta = 0.8$ and $\cos \beta = 0.6$.

(i) Show that the component, in the y-direction, of the resultant of the three forces is zero. [4]

(ii) Find the magnitude of the resultant of the three forces. [3]

(iii) State the direction of the resultant of the three forces. [1]

3 Two horizontal forces **X** and **Y** act at a point O and are at right angles to each other. **X** has magnitude 12 N and acts along a bearing of 090°. **Y** has magnitude 15 N and acts along a bearing of 000°.

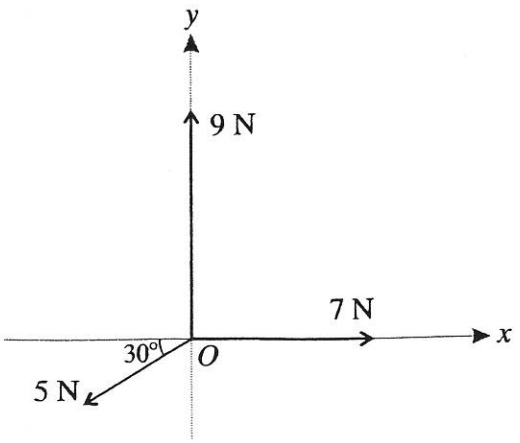
Jan '08

(i) Calculate the magnitude and bearing of the resultant of **X** and **Y**. [6]

(ii) A third force **E** is now applied at O. The three forces **X**, **Y** and **E** are in equilibrium. State the magnitude of **E**, and give the bearing along which it acts. [2]

3

Jan '09



Three horizontal forces act at the point O. One force has magnitude 7 N and acts along the positive x-axis. The second force has magnitude 9 N and acts along the positive y-axis. The third force has magnitude 5 N and acts at an angle of 30° below the negative x-axis (see diagram).

(i) Find the magnitudes of the components of the 5 N force along the two axes. **[2]**

(ii) Calculate the magnitude of the resultant of the three forces. Calculate also the angle the resultant makes with the positive x-axis. **[6]**