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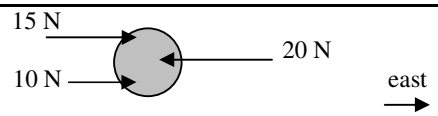
Physics worksheet solutions – Resultant (net) force

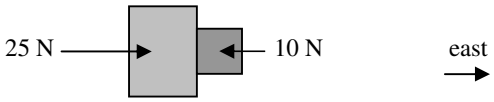
Q1



Find the resultant of the three forces on the object.

$+15+10-20=+5$, 5 N east

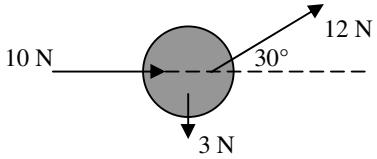
Q2



Find the net force on the system of two objects.

$+25-10=+15$ N, 15 N east

Q3a



Resolve the forces into horizontal and vertical components to find the resultant force on the object.

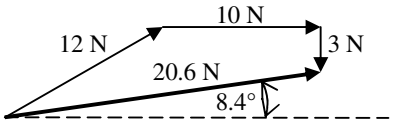
Horizontal component $=10+12\cos 30° \approx 20.4$

Vertical component $=-3+12\sin 30° = 3$

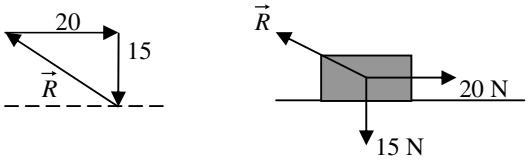
Resultant force $\approx \sqrt{20.4^2+3^2} \approx 20.6$ N

Direction: $\theta \approx \tan^{-1}\left(\dfrac{3}{20.4}\right) \approx 8.4°$ above the horizontal

Q3b Add the force vectors graphically (by scale drawing) to find the net force on the object.



Q4a A block slides on a horizontal surface at constant velocity. The forces on the block are shown in the diagram, and the resultant force is zero. Draw a vector diagram to show the addition of the forces.

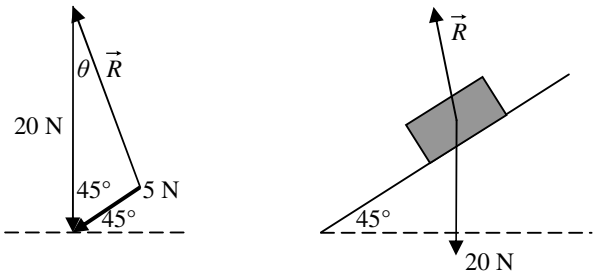


Q4b Find the magnitude and direction of $\vec{R}$.

Magnitude: $R=\sqrt{15^2+20^2}=25$ N

Direction: $\theta \approx \tan^{-1}\left(\dfrac{15}{20}\right) \approx 37°$ above the horizontal

Q5a A block slides down an inclined plane with increasing speed. The forces on the block are shown in the diagram, and the net force is 5 N. Draw a vector diagram to show the addition of the two forces to give the net force.

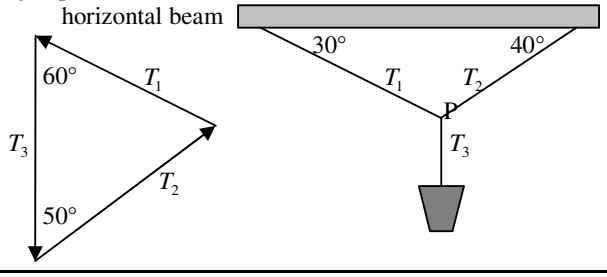


Q5b Find the magnitude and direction of $\vec{R}$.

The cosine rule: $R=\sqrt{20^2+5^2-2(20)(5)\cos 45°} \approx 16.8$ N

The sine rule: $\dfrac{\sin\theta}{5} \approx \dfrac{\sin 45°}{16.8}$, $\theta \approx 12°$

Q6a A bucket of water is suspended by three cords of negligible mass. The tensions in the cords are T_1 , T_2 and T_3 . Draw a vector diagram to show the addition of the three forces acting at point P.



Q6b Given $T_3=20$ N, find T_1 and T_2 .

The third angle in the vector diagram is $70°$.

The sine rule: $\dfrac{T_1}{\sin 50°}=\dfrac{T_2}{\sin 60°}=\dfrac{20}{\sin 70°}$

$T_1 \approx 16.3$ N, $T_2 \approx 18.4$ N