Physicsaholics

DPP – 3

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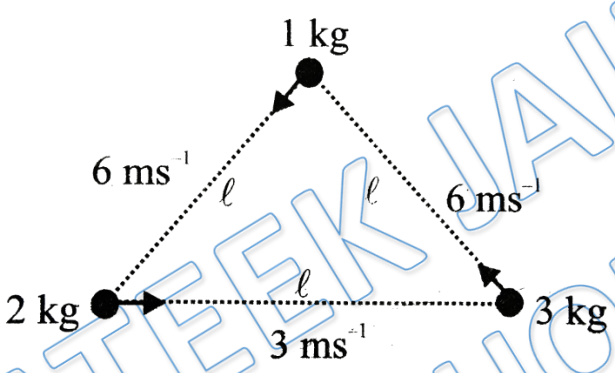
Q 1. Three particles of masses 1 kg, 2 kg and 3 kg are situated at the comers of an equilateral triangle move at speed 6 m/s, 3 m/s and 2 m/s respectively. Each particle maintains a direction towards the particle at the next comer symmetrically. Find velocity of CM of the system at this instant

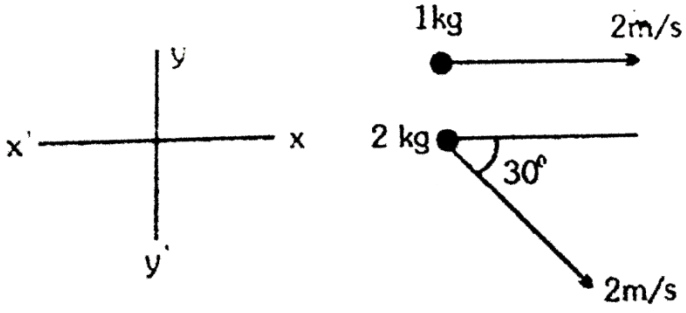


(a) 3 m/s (b) 5 m/s
(c) 6 m/s (d) zero

Q 2. Four particles of masses 1 kg, 2 kg, 3 kg, and 4 kg are situated at the corners of a square and moving at speed 3 m/s, 4 m/s, 1 m/s and 2 m/s respectively. Each particle maintains a direction towards the particle at the next comer symmetrically. The speed of the com at this instant is

(a) 3 m/s (b) 5 m/s
(c) 6 m/s (d) zero

Q 3. The velocity of center of mass of the system as shown in the figure :-



(a) $\left(\frac{2-2\sqrt{3}}{3}\right)\hat{\imath} - \left(\frac{1}{3}\right)\hat{\jmath}$

(b) $\left(\frac{2+2\sqrt{3}}{3}\right)\hat{\imath} - \left(\frac{2}{3}\right)\hat{\jmath}$

(c) $4\,\hat{\imath}$

(d) none of these

Q 4. Two particles of mass 1kg and 2kg are moving along the same line with speeds 2m/s and 4m/s respectively. Calculate the speed of the center of mass of the system if both the particles are moving in the same direction

(a) 10 m/s (b) 3 m/s

(c) $\frac{10}{3}$ m/s (d) $\frac{3}{10}$ m/s

Q 5. Two bodies of masses 2 kg and 1 kg are moving along the same line with speeds 2m/s and 5m/s respectively. What is the speed of the center of mass of the system if the two bodies are moving in opposite directions?

(a) 3 m/s (b) 1 m/s

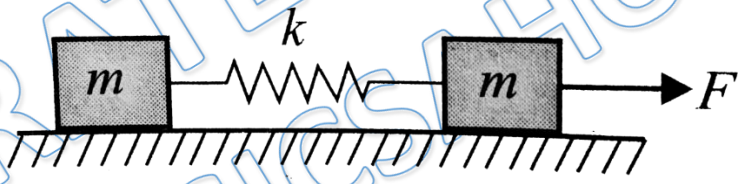
(c) $\frac{2}{3}$ m/s (d) $\frac{1}{3}$ m/s

Q 6. Two particles of masses 2 kg and 4 kg are approaching each other with acceleration `1 m/$s^2$` and `2 m/$s^2$`, respectively, on a smooth horizontal surface. Find the magnitude of acceleration of center of mass of the system

(a) 1 m/s^2 (b) 2 m/s^2

(c) 3 m/s^2 (d) 4 m/s^2

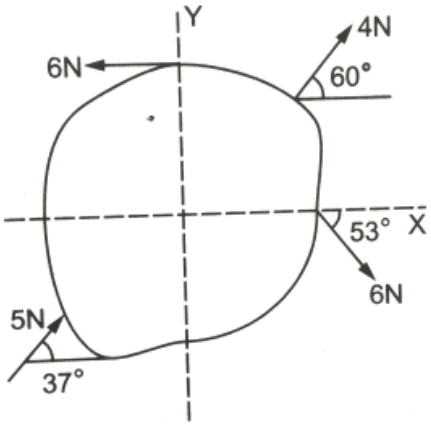
Q 7. Initially system is in rest and an external force F is applied on mass m. Then the displacement of the center of mass of system at time t is :



(a) $\frac{Ft^2}{2m}$ (b) $\frac{Ft^2}{3m}$

(c) $\frac{Ft^2}{4m}$ (d) $\frac{Ft^2}{m}$

Q 8. A body of mass 2.5 kg is subjected other forces shown in figure. Find the acceleration (approx.) of the Centre of mass



(a) 2.1 m/s^2 (b) 3.5 m/s^2
(c) 0.7 m/s^2 (d) 1.5 m/s^2

Q 9. Two bodies of mass 3kg and 4kg are suspended at the ends of massless string passing over a frictionless pulley. The acceleration of the center of mass of system is (g = 9.8 m/s^2)

(a) $\frac{g}{7}$ downward (b) $\frac{g}{49}$ downward
(c) $\frac{g}{14}$ downward (d) $\frac{g}{14}$ upward

Q 10. In a system of particles 8 kg mass is subjected to a force of 16 N along +ve x−axis and another 8 kg mass is subjected to a force of 8 N along +ve y−axis. The magnitude of acceleration of center of mass and the angle made by it with x−axis are given respectively by

(a) $\frac{\sqrt{5}}{2}\ m/s^2, \theta = 45^0$ (b) $3\sqrt{5}\ m/s^2, \theta = \tan^{-1}\left(\frac{2}{3}\right)$
(c) $\frac{\sqrt{5}}{2}\ m/s^2, \theta = \tan^{-1}\left(\frac{1}{2}\right)$ (d) $1\ m/s^2, \theta = \tan^{-1}(\sqrt{3})$

Q 11. Two bodies of masses 5kg and 3kg are moving towards each other with 2m/s and 4m/s respectively. Then velocity of center of mass is

(a) 0.25 m/s towards 3 kg (b) 0.5 m/s towards 5 kg
(c) 0.25 m/s towards 5 kg (d) 0.5 m/s towards 3 kg

Q 12. Two identical particles move towards each other with velocity 2v and v respectively. The speed of center of mass is

(a) v (b) $\frac{v}{3}$
(c) $\frac{v}{2}$ (d) zero

Answer Key

Q.1 d	**Q.2 d**	**Q.3 b**	**Q.4 c**	**Q.5 d**
Q.6 a	**Q.7 c**	**Q.8 d**	**Q.9 b**	**Q.10 c**
Q.11 c	**Q.12 c**			