41. (3) Initial mass = 1500; Mass after 50 seconds is = 1500-50x10= 1000 kg; Ma = $V\frac{dm}{dt}$

$1000\times a = 5\times10^3\times10,\ a = 50$

42. (2) Initial velocity = $\frac{2}{2} = 1m/s$; Final velocity = $\frac{-2}{2} = -1m/s$

$\vec{P}_i = 0.4N-s; \vec{P_f} = -0.4N-s$

$\vec{J} = \vec{P_f} - \vec{P}_i = -0.4-0.4 = -0.8N-s\ \vec{J}$ = impulse

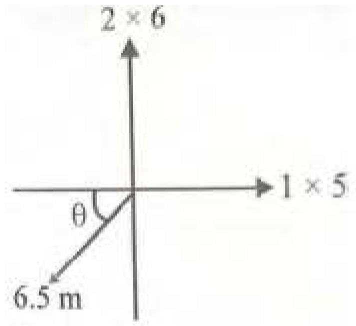
$|\vec{J}| = 0.8N-s$

43. (3) Area under the force time graph is impulse, and impulse is change in momentum

Area of graph = change in momentum $\Rightarrow \frac{1}{2}TF_0 = 2mu \Rightarrow F_0 = \frac{4mu}{T}$

44. (2) Resolve momentum 6.5m along x and y axes and equate.

$\therefore 6.5m\cos\theta = 5\times1$ and $6.5m\sin\theta = 6\times2 \Rightarrow (6.5m) = (5)\hat{i} + (12)\hat{j}$



$\Rightarrow 6.5m = 13 \Rightarrow m = 2kg$ $\therefore$ Total mass = 1 + 2 + 2 = 5kg

45. (3) $u_y = 40m/s, F_y = -5N, m = 5kg$

So, $a_y = \frac{F_y}{m} = -\frac{5}{5} = -1m/s^2\ (As\ v = u + at)\ \therefore v_y = 40 - 1\times t = 0 \Rightarrow t = 40\sec$.

46. (2) $u = 100\ m/s,\ v = 0,\ s = 0.06\ m$

Retardation $= a = \frac{u^2}{2s} = \frac{(100)^2}{2\times0.06} = \frac{1\times10^6}{12}$ $\therefore$ Force $= ma = \frac{5\times10^{-3}\times1\times10^6}{12} = \frac{5000}{12} = 417\ N$

47. (3) Thrust $F = u\left(\frac{dm}{dt}\right) = 5\times10^4\times40 = 2\times10^6\ N$

48. (2) Force exerted by the ball

$\Rightarrow F = m\left(\frac{dv}{dt}\right) = 0.15\times\frac{20}{0.1} = 30\ N$

49. (2) Velocity between $t = 0$ and $t = 2\sec$

$\Rightarrow v_i = \frac{dx}{dt} = \frac{4}{2} = 2\ m/s$

Velocity at $t = 2\sec$, $v_f = 0$

Impulse = Change in momentum $= m(v_f - v_i) = 0.1(0-2) = -0.2\ kg\ m\ sec^{-1}$

50. (2) Area under F-t graph = Impulse = ΔP