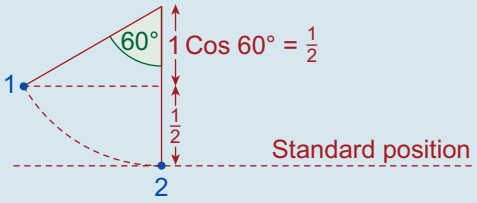
Q. 3.



$$\frac{1}{2}M(0) + Mg\left(\frac{1}{2}\right) = \frac{1}{2}Mv^2 + Mg(0)$$

$$\Rightarrow v^2 = g$$

$$\Rightarrow v = \sqrt{g} = 3.13 \text{ m/s}$$

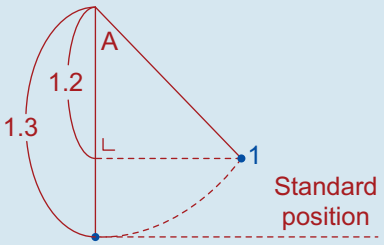
Q. 4. $\frac{1}{2}mu^2 + mgh_1 = \frac{1}{2}mv^2 + mgh_2$

$$\frac{1}{2}(0.4)(7)^2 + (0.4)g(1) = \frac{1}{2}(0.4)(0)^2 + (0.4)g(h)$$

$$\Rightarrow 13.72 = 3.92h$$

$$\Rightarrow h = 3.5 \text{ m}$$

Q. 5.



$$\frac{1}{2}M(0) + Mg(0.1) = \frac{1}{2}Mv^2 + Mg(0)$$

$$\Rightarrow v^2 = 0.2g$$

$$\Rightarrow v = \sqrt{0.2g}$$

$$= \sqrt{\frac{g}{5}}$$

Q. 6. (i) $\frac{1}{2}mu^2 + mgh_1 = \frac{1}{2}mv^2 + mgh_2$

$$\Rightarrow \frac{1}{2}m(14)^2 + mg(0.5) = \frac{1}{2}m(0)^2 + mgh$$

… divide by m

$$\Rightarrow 102.9 = 9.8h$$

$$\Rightarrow h = 10.5 \text{ m}$$

(ii) $\frac{1}{2}mu^2 + mgh_1 = \frac{1}{2}mv^2 + mgh_2$

$$\Rightarrow \frac{1}{2}m(0)^2 + mg(10.5) = \frac{1}{2}mv^2 + mg(0)$$

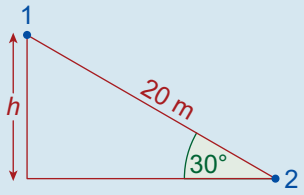
…divide by m

$$\Rightarrow 102.9 = \frac{v^2}{2}$$

$$\Rightarrow v^2 = 205.8$$

$$\Rightarrow v = 14.35 \text{ m/s}$$

Q. 7. Since no force, apart from the gravitational force, does work on the sleigh.



$$h = 20 \sin 30°$$

$$= 20\left(\frac{1}{2}\right)$$

$$= 10 \text{ m}$$

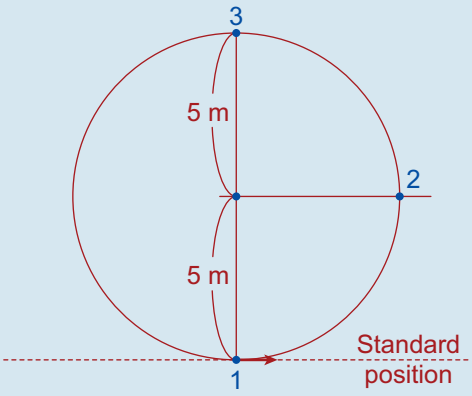
$$\frac{1}{2}M(0)^2 + Mg(10) = \frac{1}{2}Mv^2 + Mg(0)$$

$$\Rightarrow v^2 = 20g$$

$$= 196$$

$$\Rightarrow v = 14 \text{ m/s}$$

Q. 8.



(i) From position 1 to position 2

$$\frac{1}{2}M(14)^2 + Mg(0) = \frac{1}{2}Mv^2 + Mg(5)$$

$$\Rightarrow 98 = \frac{1}{2}v^2 + 49$$

$$\Rightarrow v^2 = 98$$

$$\Rightarrow v = \sqrt{98}$$

$$= 7\sqrt{2} \text{ m/s}$$

(ii) From position 1 to position 3

$$\frac{1}{2}M(14)^2 + Mg(0) = \frac{1}{2}Mv^2 + Mg(10)$$

$$\Rightarrow 98 = \frac{1}{2}v^2 + 98$$

$$\Rightarrow v = 0 \text{ It will just reach (3)}$$