Equation D becomes:

$5g - 5a - 3g = 5a + 5b$

$10a + 5b = 2g$ **Equation F**

Equation E ($\times 5$): $40a - 15b = 0$

Equation F ($\times 3$): $30a + 15b = 6g$ …add

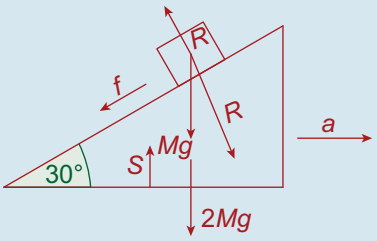
$70a = 6g$

$a = \frac{6g}{70}$

$\Rightarrow a = \frac{3}{35}g$ m/s^2 … acceleration of 8 kg mass

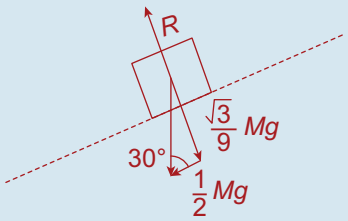
Exercise 5G

Q. 1.

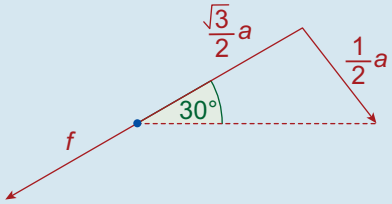


(i) **The Particle:**

Forces



Accelerations



Along the slope : $F = ma$

$\Rightarrow \frac{1}{2}Mg = M(f - \frac{\sqrt{3}}{2a})$

$\Rightarrow g = 2f - \sqrt{3}a$ …. ①

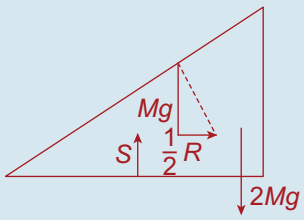
Perpendicular to the slope: $F = ma$

$\Rightarrow \frac{\sqrt{3}}{2}Mg - R = M\left(\frac{1}{2}a\right)$

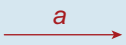
$\Rightarrow \sqrt{3}\,Mg - 2R = Ma$ …. ②

(ii) **The Wedge:**

Forces



Acceleration



$F = ma$

$\Rightarrow \frac{1}{2}R = 2Ma \quad R = 4Ma$ …. ③

Putting this result into equation ② gives:

$\sqrt{3}Mg - 8Ma = Ma$

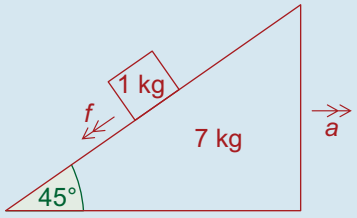
$\Rightarrow a = \frac{\sqrt{3}}{9}g$ m/s^2

Putting this result into equation ① gives:

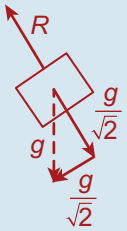
$g = 2f - \sqrt{3}\left(\frac{\sqrt{3}}{9}g\right)$

$\Rightarrow f = \frac{2}{3}g$ m/s^2

Q. 2.



Forces on 1 kg mass



Forces on wedge