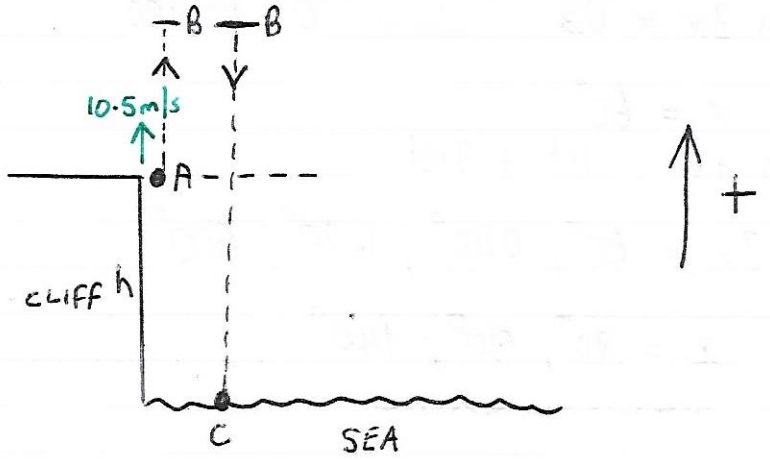
Year 12 Assessment Dec 2020 : Mr Lunt Answers .

1)



a) AB

$u = +10{\cdot}5 \text{ m/s}$
$v = 0$
$a = -9{\cdot}8 \text{ m/s}^2$
$s = s$

$v^2 = u^2 + 2as$
$0^2 = 10{\cdot}5^2 + 2(-9{\cdot}8)s$

(3)

$19{\cdot}6s = 110{\cdot}25$

$s = \dfrac{110{\cdot}25}{19{\cdot}6}$

$s = 5{\cdot}625 \text{ m}$

∴ Height above A reached is $5{\cdot}625$ m

b) AC ↑+

$u = +10{\cdot}5 \text{ m/s}$
$a = -9{\cdot}8 \text{ m/s}^2$
$s = h$
$t = 5 \text{ secs}$

$s = ut + \frac{1}{2}at^2$
$h = 10{\cdot}5(5) + \frac{1}{2}(-9{\cdot}8)5^2$
$h = 52{\cdot}5 - 122{\cdot}5$

(3)

$h = -70\text{m}$
↑
70m below start point

∴ Height of cliff = 70 m

2) a) $\tan 3x = \sqrt{3}$ $\quad 0^\circ$ to 180°

$\alpha = 60^\circ$

tan +ve 1st + 3rd

$3x = 60^\circ, 240^\circ, 420^\circ, 600^\circ$

$x = 20^\circ, 80^\circ, 140^\circ$

b) $4\cos^2\theta - \cos\theta = 2\sin^2\theta$

$\sin^2\theta + \cos^2\theta = 1$
$\sin^2\theta = 1 - \cos^2\theta$

$4\cos^2\theta - \cos\theta = 2(1 - \cos^2\theta)$

$4\cos^2\theta - \cos\theta = 2 - 2\cos^2\theta$

$6\cos^2\theta - \cos\theta - 2 = 0$

$(3\cos\theta - 2)(2\cos\theta + 1) = 0$

either

$3\cos\theta - 2 = 0$

$\cos\theta = 2/3$

$\alpha = 48.2^\circ$

Cos +ve 1st + 4th

$\theta = 48.2^\circ, 311.8^\circ$

or

$2\cos\theta + 1 = 0$

$\cos\theta = -1/2$

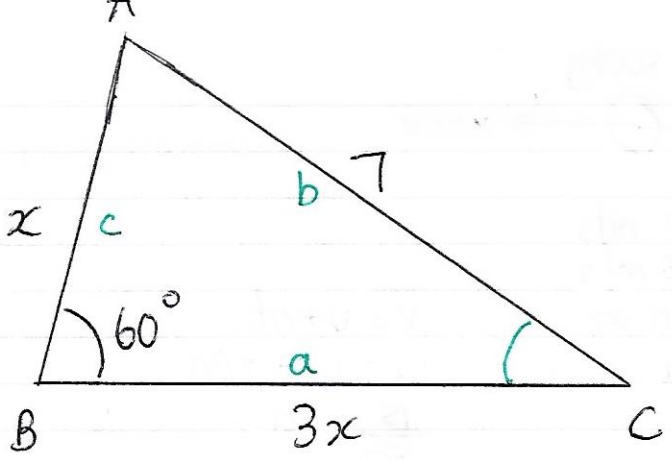
$\alpha = 60^\circ$

Cos -ve 2nd + 3rd

$\theta = 120^\circ, 240^\circ$

$\therefore \theta = 48.2^\circ, 120^\circ, 240^\circ, 311.8^\circ.$

3)



a) Apply Cosine Rule

$$b^2 = a^2 + c^2 - 2ac\cos B$$

$$7^2 = (3x)^2 + x^2 - 2(3x)(x)\cos 60^\circ$$

$$49 = 9x^2 + x^2 - 6x^2\cos 60^\circ$$

$$49 = 10x^2 - 3x^2$$

$$49 = 7x^2$$

$$7 = x^2$$

$$\therefore \quad x = \sqrt{7}\ \text{cm}.$$

b)

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{3x}{\sin A} = \frac{7}{\sin 60^\circ} = \frac{x}{\sin A\hat{C}B}$$

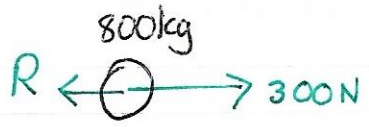
$$\frac{7}{\sin 60^\circ} = \frac{\sqrt{7}}{\sin A\hat{C}B}$$

$$\frac{\sin 60^\circ}{7} = \frac{\sin A\hat{C}B}{\sqrt{7}}$$

$$0.378 = \frac{\sqrt{7}\sin 60^\circ}{7} = \sin A\hat{C}B$$

$$19.1^\circ = A\hat{C}B$$

4)

a) 

$u = 0$ m/s
$v = 15$ m/s
$t = 50$ secs
$a = a$

$v = u + at$
$15 = 0 + 50a$
$\frac{15}{50} = a$
$\frac{3}{10} = a$
$0.3 m/s^2 = a$

b) $RF = ma$
$300 - R = 800(0.3)$
$300 - 240 = R$
$60 N = R$

c) Journey total distance = 500m

Distance when 300N is applied

$s = \frac{(u+v)}{2} t$
$s = \frac{(0+15)}{2} 50$
$s = 375 m$

∴ Distance when brakes applied = 500 − 375
= 125 m.

When braking.

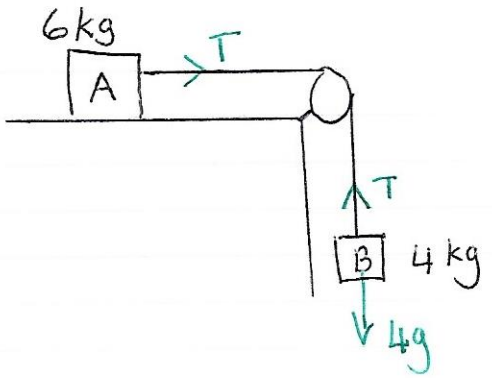
∴ $u = 15$
$v = 0$
$a = a$ ✓
$s = 125$

$v^2 = u^2 + 2as$
$0^2 = 15^2 + 2(125)a$
$0 = 225 + 250a$
$\frac{-225}{250} = a$
$\therefore -0.9 = a$

∴ $RF = ma$ braking force
$R_F = 800(0.9)$
$R_F = 720N$

ie retardation = $0.9 m/s^2$.

(5)



a) $Rf = ma$ whole system

$4g - T + T = 10a$

$4g = 10a$

$\frac{2g}{5}\ m/s^2 = a$

$Rf = ma$ for A

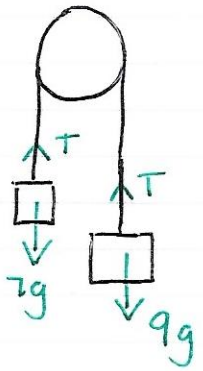
$T = 6\left(\frac{2g}{5}\right)$

$T = \frac{12g}{5}\ N.$

b) Light means weightless string

∴ Tension same along whole string.

6)



a) $Rf = ma$ whole system

$9g - 7g = 16a$

$2g = 16a$

$\frac{g}{8}\ m/s^2 = a \quad = \quad 1.225\ m/s^2$

b) $Rf = ma$ 7 kg mass

$T - 7g = 7\left(\frac{g}{8}\right)$

$T = \frac{7g}{8} + 7g$

$T = \frac{7g}{8} + \frac{56g}{8}$

$T = \frac{63g}{8}\ N \quad = \quad 77.175\ N$