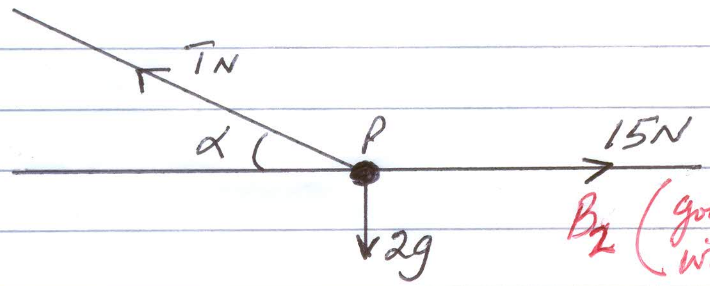
G.H.S SENIOR SIX MATHEMATICS P425/2 ENTRY TEST. FEB. 2013

1.



B_2 (good diagram with all forces).

Resolving at equilibrium;

$$\left.\begin{aligned}(\rightarrow)\quad T\cos\alpha &= 15 \quad ---(i)\\ (\uparrow)\quad T\sin\alpha &= 2g \quad ---(ii)\end{aligned}\right\} \quad B_1 \; B_1$$

$(i)^2 + (ii)^2$;

$$T^2\cos^2\alpha + T^2\sin^2\alpha = 15^2 + (2g)^2 \qquad M_1$$

$$T^2(\cos^2\alpha + \sin^2\alpha) = 225 + (2\times 9.8)^2 \qquad B_1\ (\cos^2\alpha + \sin^2\alpha = 1)$$

$$T^2 = 609.16$$

$$T = \sqrt{609.16}$$

$$T = 24.6812\ N. \qquad A_1 \quad (T = 24.68N).$$

$(ii) \div (i)$;

$$\frac{T\sin\alpha}{T\cos\alpha} = \frac{2g}{15} \qquad M_1$$

$$\tan\alpha = \frac{2\times 9.8}{15} \qquad B_1$$

$$\tan\alpha = 1.306667$$

$$\alpha = \tan^{-1}(1.306667)$$

$$\alpha = 52.57^\circ. \qquad A_1$$

(a) $\alpha = \underline{52.57^\circ \text{ or } 52.6^\circ}$ ✓

(b) $T = \underline{24.6812N}$. ✓

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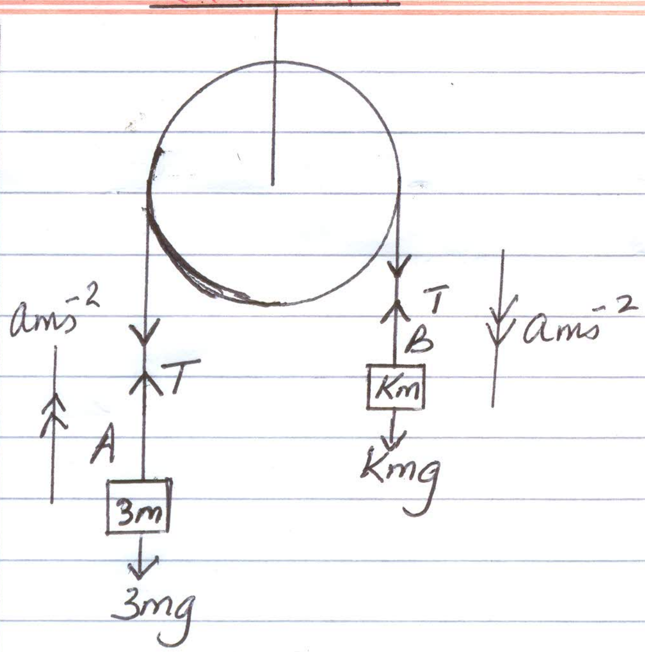
2.



B_1 (Diagram with all forces)

Equations of motion:

$$Kmg - T = Kma \quad ---(i) \qquad B_1$$

$$T - 3mg = 3ma \quad ---(ii) \qquad B_1$$

(i) + (ii)

$$Kmg - 3mg = Kma + 3ma. \qquad M_1$$

but $a = \frac{2}{5}g$

$$(K-3)mg = (K+3)m\left(\tfrac{2}{5}g\right) \qquad B_1 \text{ (Using } a = \tfrac{2}{5}g\text{)}$$

$$K - 3 = (K+3)\tfrac{2}{5}$$

$$5k - 15 = 2k + 6$$

$$5k - 2k = 6 + 15$$

$$3k = 21$$

$$k = 7. \qquad A_1$$

$\therefore$ from (ii)

$$T = 3ma + 3mg.$$

$$= 3m\left(\tfrac{2}{5}g\right) + 3mg \qquad M_1$$

$$= \frac{6mg}{5} + 3mg$$

$$T = \frac{21mg}{5}. \text{ or } 4\tfrac{1}{5}mg \qquad A_1$$

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$\therefore$ $T = \frac{21}{5}mg$ ~~units~~ ✓, $K = 7$ ✓