

1(a)	$D - 350 = 900 \times 0.25$
	$D = 575 \text{ N}$
1(b)	$P = 575 \times 15$
	$P = 8625 \text{ W or } 8.625 \text{ kW}$
5	Attempt at resolving parallel or perpendicular to the plane to form an equation
	$8mg \cos \theta + mg \sin \theta = F$
	$R = mg \cos \theta + 8mg \sin \theta$
	Use of $F = 0.5R$ to get an equation in θ [m and g]
	$8mg \cos \theta + mg \sin \theta = 0.5(mg \cos \theta + 8mg \sin \theta)$
	$\Rightarrow \tan \theta = 2.5$
	$\theta = 68.2$

8(a)	$T \cos 15 = 0.5 \times 1.2$
	$T = 0.621 \text{ N}$
8(b)	Attempt to resolve vertically for A to form an equation
	$6 \sin 20 + R_A = 2g + T \sin 15$
	Attempt at N2L for A
	$6 \cos 20 - T \cos 15 - F = 2 \times 1.2$
	Use of $F = \mu R$ to get an equation in μ only
	$\mu = 0.146$

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Attempt at Newton's second law at least once

$$450000 + 240000g \times 0.04 - 120000 - T = 240000a$$

$$\left[\begin{array}{l} 450000 + 96000 - 120000 - T = 240000a \\ 426000 - T = 240000a \end{array} \right]$$

$$T + 36000g \times 0.04 - 15000 = 36000a$$

$$\left[\begin{array}{l} T + 14400 - 15000 = 36000a \\ T - 600 = 36000a \end{array} \right]$$

$$450000 + (240000 + 36000)g \times 0.04 - 120000 - 15000 = (240000 + 36000)a$$

$$\left[\begin{array}{l} 450000 + 110400 - 120000 - 15000 = 276000a \\ 425400 = 276000a \end{array} \right]$$

Solving for a or T , from equation(s) with the correct number of relevant termsAcceleration = 1.54ms^{-2} and Tension = 56100 N

5	For resolving in any direction to form an equation
	$R = 5g \cos 10 - 20 \sin 35 \quad [= 37.76885892]$
	$20 \cos 35 + 5g \sin 10 - F = 5a \quad [25.06544977 - F = 5a]$
	For use of $F = 0.4R$ to get an equation in a only
	$v^2 = 2^2 + 2 \times (\text{their } 1.99) \times 3$
	Speed = 3.99 ms^{-1}

5	Alternative for Q5 using energy
	For resolving perpendicular to the plane to form an equation for normal reaction
	$R = 5g \cos 10 - 20 \sin 35 \quad [= 37.76885892]$
	$20 \cos 35 \times 3 + 5g \sin 10 \times 3 + \frac{1}{2} \times 5 \times 2^2 - F \times 3 = \frac{1}{2} \times 5 \times v^2$ $[49.1491... + 26.0472... + 10 - 3F = 2.5v^2]$
	For use of $F = 0.4R$ to get an equation in v only
	Speed = 3.99 ms^{-1}

1	$R = 12g \cos 20$
	$T - F - 12g \sin 20 = 12 \times 2$
	$T - 0.4 \times 12g \cos 20 - 12g \sin 20 = 12 \times 2$ $[T - 45.1052... - 41.0424... = 24]$
	Tension = 110 N [110.147...]

6(a)	Use of Newton's second law for P or Q or system
	$0.6g \sin 30 - T = 0.6a$ $T - 0.3g \times 0.4 = 0.3a$ $0.6g \sin 30 - 0.3g \times 0.4 = (0.3 + 0.6)a$
	For attempt to solve for T or a
	$a = 2 \text{ ms}^{-2}$ $T = 1.8 \text{ N}$
6(b)	PE change for $P = \pm 0.3g \times 2 \times 0.4 [= \pm 2.4]$ PE change for $Q = \pm 0.6g \times 2 \sin 30 [= \pm 6]$
	$\text{KE change} = \frac{1}{2} \times (0.3 + 0.6)v^2$
	$\frac{1}{2} \times 0.9v^2 = 0.6g \times 2 \sin 30 - 0.3g \times 2 \times 0.4 - 1.8$
	Speed = 2 ms^{-1}
	Special Case for use of N2L
	$0.6g \sin 30 - 0.3g \sin 9 - 0.9 = 0.9a \rightarrow a = 1$
	$v^2 = 0^2 + 2 \times 1 \times 2 \rightarrow v = 2$