

key Level II Physics Pd 2

DYNAMICS

FT DYNAMICS (21 S2)

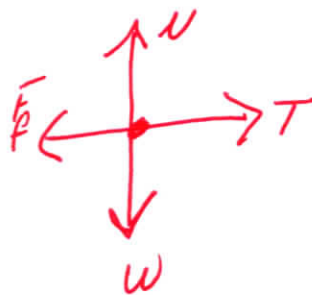
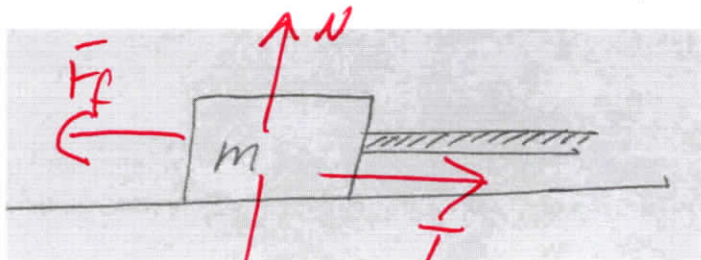
Directions: Solve the following problems. Each is worth 5 points. Your work will be graded, not just the answer. Required with each question (with the exceptions of #1, & #6) is a body diagram, free-body diagram, and sum of force equation(s).

- 1) What is the mass of a 25 kg object?

25kg

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- 2) The box shown below has a mass of 10kg. The box and the floor have a coefficient of friction of 0.4. Determine the force needed to pull the box at a constant speed.



$$\begin{aligned}\Sigma F_y &= N - W = mg \\ N - W &= 0 \\ N &= mg\end{aligned}$$

$$\Sigma F_x = T - F_f = ma$$

$$T - F_f = 0$$

$$T = F_f$$

$$T = \mu N$$

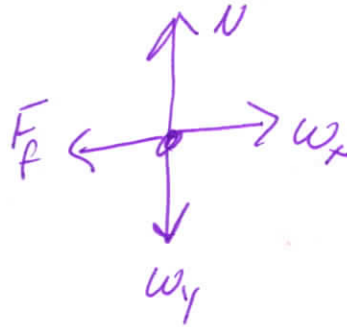
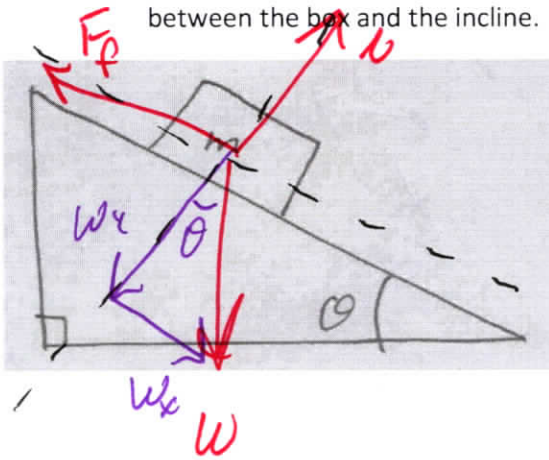
$$T = \mu mg$$

$$T = (0.4)(10\text{kg})(9.8\text{m/s}^2)$$

$$T = 39.2\text{N}$$

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- 3) The box shown below has a mass of 10kg. The angle of the incline is 30 degrees, determine the acceleration of the box down the incline knowing there is a 0.25 coefficient of friction between the box and the incline.



$$\begin{aligned}\Sigma F_y &= N - W_y = ma \\ W - W \cos \theta &= 0 \\ N &= mg \cos \theta\end{aligned}$$

$$\begin{aligned}\Sigma F_x &= W_x - F_p = ma \\ W \sin \theta - \mu N &= ma \\ mg \sin \theta - \mu mg \cos \theta &= ma \\ g \sin \theta - \mu g \cos \theta &= a\end{aligned}$$

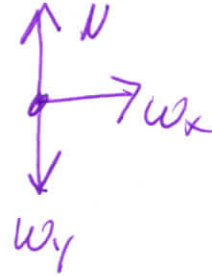
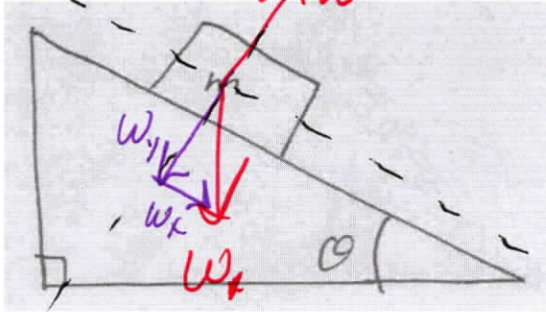
$$g(\sin \theta - \mu \cos \theta) = a$$

$$\left(9.8 \frac{\text{m}}{\text{s}^2}\right) (\sin 30^\circ - (0.25) \cos 30^\circ) = a$$

$$2.78 \frac{\text{m}}{\text{s}^2} = a$$

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- 4) The 10 kg box below is on a frictionless incline. Determine the acceleration when the angle of the incline is 30 degrees.



$$\Sigma F_x = W_x = ma$$

$$W \sin \theta = ma$$

$$mg \sin \theta = ma$$

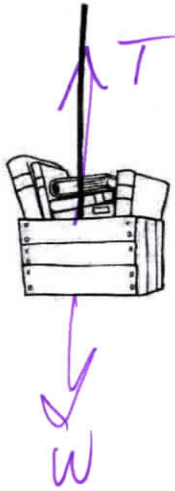
$$g \sin \theta = a$$

$$(9.8 \text{ m/s}^2)(\sin 30^\circ) = a$$

$$\frac{4.9 \text{ m}}{\text{s}^2} = a$$

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- 5) Determine the tension in the string when the 10 kg box is accelerated upward at 2m/s^2 .



$$\Sigma F_y = T - W = ma$$

$$T = ma + W$$

$$T = ma + mg$$

$$T = m(a + g)$$

$$T = (10\text{kg})\left(2\frac{\text{m}}{\text{s}^2} + 9.8\frac{\text{m}}{\text{s}^2}\right)$$

$$T = 118\text{N}$$

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6) What is the weight of a 10kg object?

$$W = mg$$
$$W = (10\text{kg})(9.8\text{m/s}^2)$$
$$W = 98\text{N}$$