

# Exam 1 Solutions

## Multiple Choice Key

1. c
2. c
3. b
4. e
5. d
6. a
7. c
8. c
9. a
10. c

## Worked Problems

1. Use conservation of energy:

$$\frac{1}{2}mv_i^2 + mgy_i = mv_f^2 + mgy_f$$

- Find difference in heights using a bit o' trigonometry:

$$y_i - y_f = (1 \text{ m}) \sin 45^\circ = 0.707 \text{ m}$$

- Solve for  $v_f$ , using  $v_i = 0$

$$v_f = \sqrt{2g(y_i - y_f)} = 3.7 \text{ m/s.}$$

2. In this problem, the picture is in equilibrium, so the total force acting on the picture must be zero. Looking at the y-components of the forces

$$T_1 \sin 25^\circ + T_2 \sin 130^\circ - mg = 0$$

so, solving for  $m$

$$m = \frac{T_1 \sin 25^\circ + T_2 \sin 130^\circ}{g} = 0.68 \text{ kg}.$$