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

Show work Problem 1

a) Draw a free body diagram for the skier showing all forces acting on him. Clearly indicate the direction of these forces in your diagram.

\[ F_N \quad f_k \quad W \]

b) (6 pts) The skier starts from rest and travels 50m along the plane when he is found to have a velocity of 12 m/s. Find the acceleration of the skier down the incline.

\[ v^2 = v_0^2 + 2a(x-x_0) \]
\[ 12^2 = 0^2 + 2a(50) \]
\[ a = \frac{144}{100} = 1.44 \text{ m/s}^2 \]

Acceleration: \(1.4 \text{ m/s}^2\)

Show work problem 2

a) (10 pts) How far in advance (horizontal distance) must the package be released, so as to ensure it will reach the climbers?
First, find time of flight for the package

\[ y = y_0 + v_{0y} t + \frac{1}{2} a t^2 \]

\[ -200 = 0 + 0 + \left( \frac{1}{2} \right)(-9.8) t^2 \]

\[ t = 6.39 \text{ sec} \]

Horizontal distance \( d = v_{0x} t = 40 \times 6.39 = 255.5 \text{ m} \)

Distance: 256 m

b) (7 pts) When the package reaches its target (the climbers), locate the position of the aircraft with respect to the climbers. Explain.

Package and aircraft have the same horizontal velocity. Therefore the package will be exactly below the aircraft. When the package lands, the aircraft will be directly above the climbers.

Location: directly above the climbers.

c) (8 pts) If the pilot had decided to release a single larger package of mass 200 kg (made up of two 100 kg packages), how far in advance (horizontal distance) must the package be now released to reach the climbers?

Same distance as in a). Time to fall and reach ground is independent of mass.

Distance: 256 m