Quiz 4
Name:  
Section:  

This quiz is composed of 1 problem (10 points). Answer all parts.

Problem 1:

A roller coaster ride, is advertised to accelerate with 0.7 g, that is \( a = 0.7 \times 9.81 \text{ m/s}^2 \) (in the direction of the motion of the cart). The cart of the roller coaster, has a mass of \( m = 800 \text{ kg} \) at full capacity and a kinetic friction coefficient of 0.30. (See diagram below.) The track is like an inclined plane with an angle of 45 deg.

a) Calculate the normal force between the cart and the track (3 pts)

\[
N = m g \cos \theta
\]

\[
= (800 \text{ kg})(9.81 \text{ m/s}^2) \cos 45^\circ
\]

\[
= 5549 \text{ N} = 6 \text{ kN}
\]

b) Calculate the net force in the direction of motion (4 pts)

\[
F_{x, \text{net}} = m g \sin \theta - \mu_k N = m g \sin \theta - \mu_k m g \cos \theta
\]

\[
= (800 \text{ kg})(9.81 \text{ m/s}^2) \sin 45^\circ - 0.30(800 \text{ kg})(9.81 \text{ m/s}^2) \cos 45^\circ
\]

\[
= 3885 \text{ N} = 4 \text{ kN}
\]

\( \text{s i g f i g} \)

c) Calculate the acceleration of the Cart expressed in units of g \( (9.81 \text{ m/s}^2) \) (3 pt)

\[
a_x = \frac{F_{x, \text{net}}}{m} = \frac{m g \sin \theta - \mu_k m g \cos \theta}{m}
\]

\[
= (\sin \theta - \mu_k \cos \theta) g = \sin 45^\circ - 0.30 \cos 45^\circ) \times 9.81 \text{ m/s}^2
\]

\[
= 4.9 \text{ m/s}^2
\]

\( \text{2 sig f i g s} \)
Quiz 4
Name: 5
Section: 5

This quiz is composed of 1 problem (10 points). Answer all parts.

Problem 1:

A roller coaster ride is advertised to accelerate with 0.6 g, that is a = 0.6x9.81 ms\(^2\) (in the direction of the motion of the cart). The cart of the roller coaster, has a mass of m = 700 kg at full capacity and a kinetic friction coefficient of 0.57. (See diagram below) The track is like an inclined plane with an angle of 45 deg.

a) Calculate the normal force between the cart and the track (3 pts)

\[ N = m \cdot g = m \cdot g \cdot \cos \theta \]

\[ N = (700 \text{ kg})(9.81 \text{ m/s}^2) \cos 45^\circ \]

\[ N = 5 \text{kN} \]

b) Calculate the net force in the direction of motion (4 pts)

\[ F_{\text{net}} = m \cdot a = m \cdot g \cdot \sin \theta - \mu_k \cdot m \cdot g \cdot \cos \theta \]

\[ F_{\text{net}} = (700 \text{ kg})(9.81 \text{ m/s}^2) \sin 45^\circ - 0.57 (700 \text{ kg})(9.81 \text{ m/s}^2) \cos 45^\circ \]

\[ F_{\text{net}} = 2 \text{kN} \]

c) Calculate the acceleration of the Cart expressed in units of g (9.81 m/s\(^2\)) (3 pts)

\[ a_x = \frac{F_{\text{net}}}{m} = \frac{m \cdot g \cdot \sin \theta - \mu_k \cdot m \cdot g \cdot \cos \theta}{m} \]

\[ a_x = (\sin \theta - \mu_k \cdot \cos \theta)g = (\sin 45^\circ - 0.57 \cdot \cos 45^\circ)g \]

\[ a_x = 0.30g \]

2 sig figs