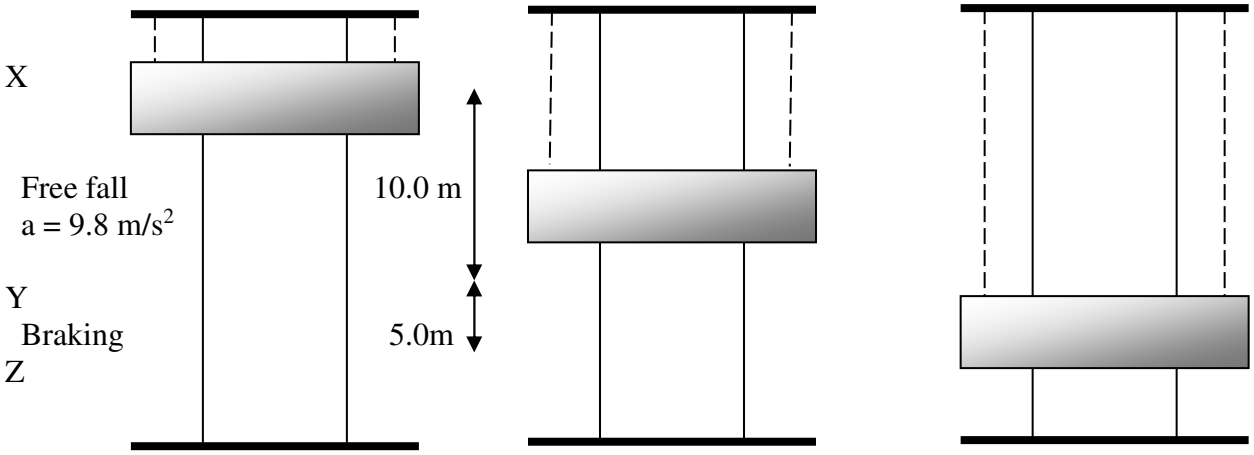
The Coney Island Top Drop

Data: Mass of 10 person carriage = 1150 kg. Include units in your answers.

1. On the diagrams below, draw a vector (when needed) to represent the direction of the net force on a rider in the chair.

a) Stationary at X at the top b) in free fall between X and Y c) braking between Y and Z



2. Now on each of the diagrams draw in a vector for the weight force (when needed), labeled $F_{\text{by Earth on rider}}$

3. Now on each of the diagrams draw in a vector for the reaction force by the chair on the rider (when needed), labeled $F_{\text{by chair on rider.}}$ Consider the size as well as the direction of this force.

4. Energy

(a) How much work is done by the cables to raise the chair and riders from Z to X?

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(b) What is the decrease in Gravitational Potential Energy of the carriage when full (assume your body mass) as it falls from position X to Y?

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(c) What is the Kinetic Energy of the carriage when full at Y?

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(d) Use this to find out how fast the carriage and its occupants are falling at the end of free fall, Y?

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5. Kinematics and Dynamics

(a) Use your answer from 4(d) to calculate how long you are in free fall from stationary at X to the point Y, 10.0 m lower:

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(b) From Y to Z the seat decelerates under braking from the speed calculated in 2(d) to zero. Assume this deceleration is constant, calculate its size:

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(c) How many "*gees*" is this acceleration in 5b that the riders experience? (That is, how many times is this greater than the acceleration due to gravity, 9.8 m/s^2).

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(d) What force does the cushioning have to supply to bring the carriage to rest over this distance?

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(e) You "feel" your weight through the reaction force acting on you, i.e. the force by chair on rider. This is called your apparent weight. Determine your apparent weight at
i) Position X ii) In free fall iii) During deceleration from Y to Z

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