A penny dropped from the top of a rollercoaster. The height of the ride is 110m. (neglect air resistance)

A. Find the speed of the penny when it hits the ground.

B. Find the time it takes for the penny to fall to the ground.

A.

The law of conservation of energy:

$$T + U = const$$

$T = \frac{mv^2}{2}$ - kinetic energy, m - mass of the body, v - speed

$U = mgh$ - potential energy, g - gravitational acceleration, h – high

Therefore:

$$mgh + 0 = 0 + \frac{mv^2}{2}$$

$$v = \sqrt{2gh} = \sqrt{2 * 9.8\frac{m}{s^2} * 110\,m} = 46\frac{m}{s}$$

Answer: $46\frac{m}{s}$

B.

Speed for uniformly accelerated motion with initial speed 0 equals:

$$v = g * t$$

Therefore, time of motion equals:

$$t = \frac{v}{g} = \frac{46\frac{m}{s}}{9.8\frac{m}{s^2}} = 4.7\,s$$

Answer: $4.7\,s$