

**PYP 001**  
**Quiz # 3 (A)**

**Name:** \_\_\_\_\_

**ID :** \_\_\_\_\_

1. A box of mass 20 Kg is pushed on a horizontal frictionless floor with a constant acceleration. In the first 10 seconds, the change in the velocity of the box was 5 m/s. What is the magnitude of the pushing force?

Solution:

$$F = ma$$

$$a = \frac{\Delta v}{t} = \frac{5}{10} = 0.5 \text{ m/s}^2 \Rightarrow F = 20 \times 0.5 = 10 \text{ N}$$

2. A skydiver of mass 70 Kg reaches his terminal speed after 10 seconds from jumping from a small plane. What is the magnitude of the air resistance when the skydiver reaches the terminal velocity?

Solution:

At the terminal speed, the acceleration is zero, so  $R=mg=700 \text{ N}$

3. A cannon of mass 300 Kg fires a ball of mass 2 Kg. The ball is accelerated with 5 m/s<sup>2</sup>. What is the acceleration of the cannon?

Solution:

The force on the ball is equal to the force on the cannon;

$$F_{ball} = F_{cannon} \Rightarrow m_{ball} \times a_{ball} = m_{cannon} \times a_{cannon}$$

$$a_{cannon} = \frac{m_{ball} \times a_{ball}}{m_{cannon}} = \frac{2 \times 5}{300} = 0.033 \text{ m/s}^2$$

4. A book is on a table. Think of two forces that represent action-reaction pair. Explain why you selected these two forces.

Solution:

One possible pair: the force by which the table pushes on the book upward (normal force), and the force of the book pushing on the table downward

Another pair: gravity pulls on the book downward, and the book pulls on the earth upwards.

**PYP 001**  
**Quiz # 3 (B)**

**Name:** \_\_\_\_\_

**ID :** \_\_\_\_\_

1. A cannon of mass 500 Kg fires a ball of mass 5 Kg. The ball has acceleration of 3 m/s<sup>2</sup>. What is the acceleration of the cannon?

Solution:

The force on the ball is equal to the force on the cannon;

$$F_{ball} = F_{cannon} \Rightarrow m_{ball} \times a_{ball} = m_{cannon} \times a_{cannon}$$

$$a_{cannon} = \frac{m_{ball} \times a_{ball}}{m_{cannon}} = \frac{5 \times 3}{500} = 0.03 \text{ m/s}^2$$

2. A book is on a table. Think of two forces that represent action-reaction pair. Explain why you selected these two forces.

Solution:

One possible pair: the force by which the table pushes on the book upward (normal force) , and the force of the book pushing on the table downward

Another pair: gravity pulls on the book downward, and the book pulls on the earth upwards.

3. A box of mass 70 Kg is initially at rest on a horizontal frictionless floor. It is then pushed by a force of 30 N. What is the velocity of the box after 3 seconds.

Solution:

$$F = ma \Rightarrow a = \frac{F}{m} = \frac{3}{7} \text{ m/s}^2$$

$$a = \frac{\Delta v}{t} \Rightarrow v_2 - v_1 = a \times t \Rightarrow v_2 = v_1 + a \times t = \frac{9}{7}$$

4. A skydiver of mass 90 Kg reaches his terminal speed after 20 seconds from jumping from a small plane. What is the magnitude of the air resistance when the skydiver reaches the terminal velocity?

Solution:

At the terminal speed, the acceleration is zero, so  $R=mg=900 \text{ N}$