

Physics
Chapter 6 and 7 Review Guide

1. Define the impulse-momentum theorem and give an example of how it is used in the real world.

↑ time ↓ Force Airbag

2. Name and define the 2 types of collisions and tell what happens to the energy in each.

elastic - bounces off

inelastic - sticks together

3. Define angular force and angular acceleration using a drawing



4. Define torque and list what torque depends on.

Force to Rotate ; Length

5. A 30 kg child is riding a 4.2 kg bike with a velocity of 6.5 m/s to the northwest.

$P = mv$; Momentum = mass x velocity

- a. What is the momentum of the bike?

$$4.2 \cdot 6.5 = \boxed{27.3 \text{ kg} \frac{\text{m}}{\text{s}}}$$

- b. What is the momentum of the child?

$$30 \cdot 6.5 = \boxed{195 \text{ kg} \frac{\text{m}}{\text{s}}}$$

- c. What is the total momentum of the child and the bike?

$$(30 + 4.2) 6.5 = \boxed{222.3 \text{ kg} \frac{\text{m}}{\text{s}}}$$

6. A .3 kg football is thrown with a velocity of 12 m/s to the right. A stationary receiver ($V_f = 0$) catches the ball and brings it to a rest in 9 seconds. What is the force exerted on the receiver?

Force (time) = Mass (final velocity) - Mass (initial velocity)

$$= (9) = .3(0) - .3(12) \quad F(9) = -.3(12) \quad F(9) = -3.6 \quad \boxed{F = -.4 \text{ N}}$$

7. A 2500 kg car traveling to the north is slowed down uniformly from an initial velocity of 40 m/s by a 4000 N braking force acting opposite the car's motion. Use the impulse-momentum theorem to answer the following questions:

- a. What is the car's final velocity after 1.3 seconds?

$$5200 = 2500(V_f) - 100,000$$

Force (time) = Mass (final velocity) - Mass (initial velocity) $100,000 + 5200 = 2500(V_f)$

$$1000(1.3) = 2500(V_f) - 2500(40)$$

$$165,200 = 2500(V_f) \quad \boxed{V_f = 42.1 \frac{\text{m}}{\text{s}}}$$

8. A dog sits 3.4 m from the center of a merry-go-round. If the dog undergoes a centripetal acceleration of 2.3 m/s^2 , what is the dog's tangential velocity? What is the angular speed of the merry-go-round?

Centripetal Acceleration = Tangential Velocity² / radius

$$2.3 = \frac{V^2}{3.4}$$

$$2.3 \cdot 3.4 = V^2$$

$$7.82 = V^2$$

$$V = \sqrt{7.82} = \boxed{2.8 \frac{\text{m}}{\text{s}}}$$

9. A girl sits in a tire that is attached to an overhanging tree limb by a rope 3.2 m in length. The girl's father pushes her with a tangential velocity of 4.5 m/s. If the force that maintains her circular motion is 56 N, what is the girl's mass?

Centripetal Force = (mass x Tangential Velocity²) / radius

$$56 = \frac{\text{mass} \cdot 4.5^2}{3.2}$$

$$179.2 = m \cdot 4.5^2 \quad m = \frac{179.2}{4.5^2} \quad \boxed{m = 8.9 \text{ kg}}$$