

Dynamics Review

Name: _____

Date: _____

Part A

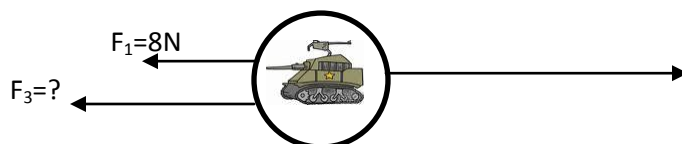
1. What is a force? What are the four fundamental forces (use your notes)? Rank the four forces in order of increasing strength. Which of the forces is the weakest?
2. What is Newton's 1st Law? Explain it and give at least 2 examples. How does inertia relate to the mass of an object?
3. What three variables does Newton's 2nd Law relate? What is the formula used for Newton's 2nd Law?
4. What is Newton's 3rd Law? Give at least 2 examples of Newton's 3rd Law.
5. What is the unit of force?
6. Define the term "net force" or "unbalanced force."
7. What happens if the forces acting on an object are balanced? What happens if the forces acting on an object are unbalanced?
8. What is the acceleration of gravity on Earth? Do all objects accelerate at the same rate? Explain. What factor affects the rate at which objects fall?
9. What is the difference between mass and weight?
10. How is the weight of an object calculated?
11. Explain the concept behind a crumple zone. Explain what is necessary to reduce the acceleration of objects during collisions.
12. Explain the concept of terminal velocity. Explain how terminal velocity is reached and why. Also state the three variables that affect the terminal velocity.
13. What does friction tend to do to the motion of an object?
14. What is the normal force?
15. What two factors does the value of the frictional force depend on? What is the formula?

Part B

A 3 kg mini-tank has the following forces acting on it. Determine the Net/Unbalanced/Sum of the forces acting on this mini-tank. Also determine the acceleration of the tank.



A mini-tank (4 kg) is accelerating to right with an acceleration of 1.5 m/s/s . What is the value of the unknown force, F_3 ?



Part C

A 800 kg, super-charged car is moving along a road at 15 m/s. The driver of the car is late for an important physics meeting and presses the gas pedal to the floor causing the car to accelerate to a speed of 34 m/s in just 3.4 s. If the average air resistance is 300 N and the coefficient of friction between the tires and the road is 0.34.

- Calculate the force of the engine on the car during the acceleration phase.
- After the car reaches a speed of 34 m/s the driver relaxes on the gas pedal so that the car maintains a constant speed. Calculate the force of the engine on the car during this constant speed phase.
- The driver decides to coast to a stop by taking his foot of the gas completely. In what distance would the car come to a rest [hint: what is the only force acting on the car?].



Part D

Matrix the Monkey (10 kg) is in an elevator. He is standing on a scale and looks down to see that his weight is 150 N. Is the elevator moving at a constant speed, accelerating upward or accelerating downward. Explain. If it is accelerating determine the acceleration of the elevator.



Part E

Matrix the Monkey is riding on his skateboard (combined mass of 10kg) to his friend's birthday party. He is carrying two Helium balloons each with a buoyant force of 4 N each. Wind resistance was minimal at 4 N. The coefficient of friction between the wheels and the ground was found to be 0.2. Internal friction from the bearings in the wheels was determined to be 0.5 N. Matrix the monkey is accelerating at a constant rate increasing his speed by 4.2 m/s in a time of 3.6 seconds by pushing himself forward. Calculate the forward force necessary for this acceleration.

