Blair Physics Name _____
SEMESTER 1 Final Review

It's best to do these problems on a separate sheet of paper

KINEMATICS

Graphing: Using the velocity vs. time graph:

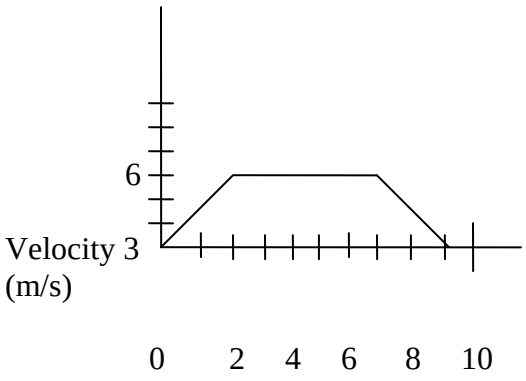
a. Create a corresponding displacement versus time graph and an acceleration – time graph.

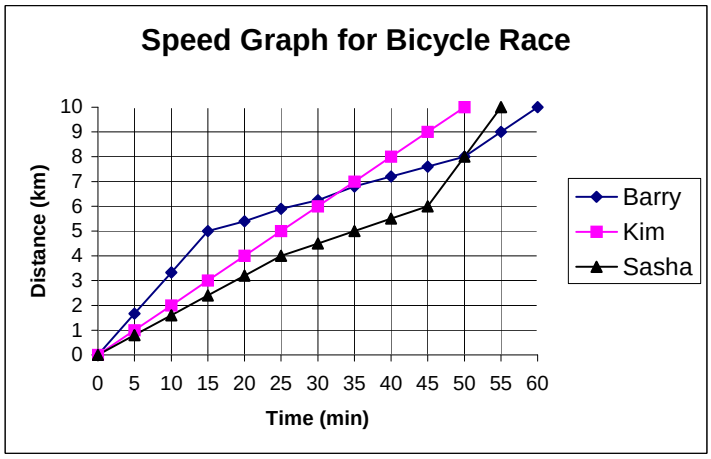
b. Calculate the acceleration of each segment.

Using the distance (position) vs. time graph:

a. Who won the race?

b. What was the winner's average speed?





1. As a projectile rises and then falls back to the ground, what happens to its acceleration?

A. decreases, then increases
B. increases, then decreases
C. increases, only
D. remains the same

2. Object A is dropped from rest on a planet that has acceleration A and it falls for 2 seconds. Object B is dropped from rest on a planet where the acceleration is twice as large and it is allowed to fall for 1 sec. What can be said about the distance each object has traveled?

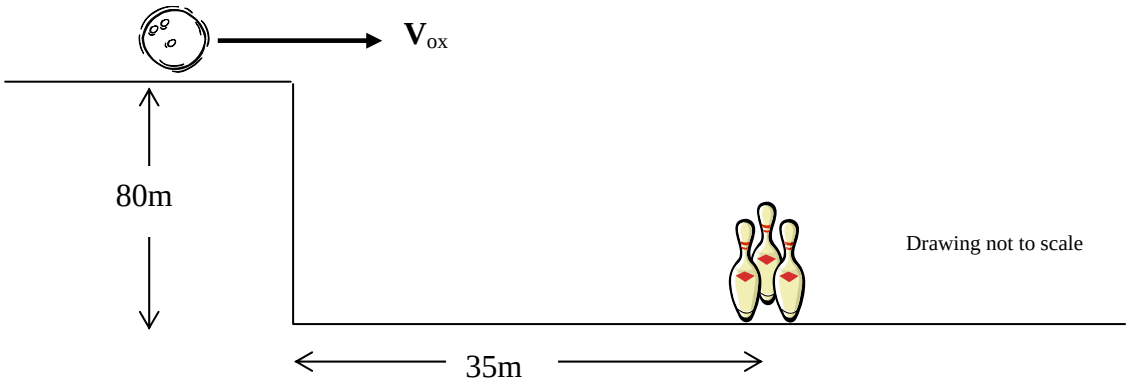
A. B travels one-half as far
B. B travels twice as far
C. B travels 3 times as far
D. B travels 4 times as far

2b. If you dropped one object from 10 m, and another object from 5 m at the *same time*, describe the distance between the two objects the entire trip down to the ground.

3. A man walks **west** on a boat at a speed of 3 m/s. The boat is traveling **south** at 5 m/s. If you were watching the man from above, what velocity would you see him travel at? Draw the resultant vector.

4. What are the horizontal and vertical components of a 10 m/s at 40° velocity?

5. How fast would you have to roll a bowling ball off an 80 m cliff to land on a stack of pins 35 m away. Assume the initial velocity of the bowling ball is horizontal.



NEWTON'S LAWS:

1) A TV is pushed across the floor with a force of 60 N at a constant speed of 2 m/s. If I push it harder with a force of 100 N, causing it to increase its speed to 4 m/s in 2 seconds, what is the TV's mass?

2) A 1.5 kg brick is pushed across a floor with a force of 10 N at a constant speed. What is the acceleration of the brick if I increase the push to 20 N? What is the speed of the brick after 2 seconds of the new push if its initial speed was 5 m/s? Draw free-body diagrams of both scenarios.

3) A) What happens to the force of gravitation between 2 objects when the mass of object 1 is doubled and the mass of object 2 becomes half?

   B) What would happen to the force if the masses were held constant and the distance between them is tripled?

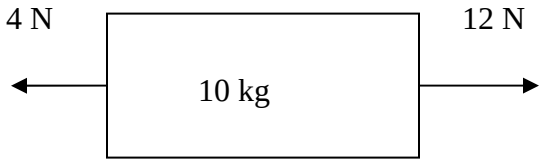
4) Draw a free-body diagram (force diagram) of your ID being spun in a circle.

5) Draw a free-body diagram of a planet orbiting a star.

6) A bat hits a baseball. Which one exerts more force, the ball on the bat, the bat on the ball or another answer? Explain your reasoning behind your answer.

7) Explain the difference between mass and weight. Where do you weight more than on Earth?

8) Two forces of 4 N and 12 N act on a 10-kg object as shown. What's the object's acceleration?



9) An apple sitting on a table experiences a weight force and a normal force. Are those forces a third law action/reaction pair? If not, what are the pairs?

10) Describe the forces acting on a box being carried on a rolling cart. What keeps the box moving forward?

11) What would happen to all the free fall problems in this class if we included air resistance? What factors control air resistance (from Hewitt reading 5.7)?

12) A Hewitt "Think and Explain" Problem: A rocket fired from its launching pad not only picks up speed, but its acceleration also increases significantly as firing continues. Why? (Hint: About 90% of the mass of a newly launched rocket is fuel.)

BCR

Athletes that train for short distance races in the Olympic Games have to maintain the perfect balance in their bodies. They need strong muscles in their legs and even arms. Building a lot of muscles would increase the runners' masses significantly. However, these runners are generally thin. They do not develop their muscles too much and their masses stay low.

How does keeping the balance of strong muscles and light bodies help the runners win?

In your response, be sure to:

- Define Newton's Second Law.
- Apply Newton's Second Law to explain how strong muscles will affect the runners' performance.
- Apply Newton's Second Law to explain how keeping a low body mass will affect the runners' performance.
- Describe how the runners' velocities would change based on their mass.

IMPULSE MOMENTUM

1) A 5 kg cat is stuck up in a tree. She drops down to a trampoline below, hitting it with a speed of 8 m/s and rebounds with a speed of 7.5 m/s. If the impulse lasts for 0.8 seconds, how much force does the trampoline provide to her?

2) Draw a Force vs. Time graph that shows a change in momentum of 8 kg-m/s.

3) Two astronauts floating at rest with respect to their ship in space decide to play catch with a 0.500-kg asteroid. Tim (whose mass is 80 kg) heaves the asteroid at 15.0 m/s toward Gina (whose mass is 50 kg). She catches it and heaves it back at 15.0 m/s. Before Tim catches it a second time, how fast is each person moving, and in what direction?

WORK-ENERGY

1) Describe a situation where work is being done in the English sense of the word but not in the Physics sense.

2) What does work on a falling rock?

   What does work on a sled sliding to rest? How does this work change the sled's kinetic energy?

3) Does pushing a boulder up a ramp require more work or less work than lifting that boulder up to the same height? Why?

   Why would you use a ramp instead of lifting the object?

4) Describe why changing the speed affects an object's kinetic energy more than changing its mass.

EXPERIMENTAL DESIGN

Design an experiment to test whether completing a review sheet improves scores on tests. Include a hypothesis, independent variable, dependent variable, control, constants, and the data you are going to collect. How are you going to ensure accuracy?