

## MECHANICS QUIZ PRACTICE PROBLEMS

Answers are on the back of this page.

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- 1) How many decameters (dam) are in 53.8 kilometers (km)?
- 2) How many hectometers (hm) are in 2120 centimeters (cm)?
- 3) Convert 73 seconds to years.
- 4) Convert 5 km to feet.
- 5) A student rode her bike 5 miles to the store and she traveled at a speed of 7 miles/hour. How long did it take her to get there?
- 6) A student runs 2 miles in 15 minutes. The student slows down and runs another mile in 9 minutes. What is the student's average speed for the entire run?
- 7) A car travels from Central Market to McDonald's. Its speed at Central Market is 30 mph. However, when it arrives at McDonald's, 1.5 minutes later, its speed is 45 mph. What is the car's acceleration? Hint: Make sure you have like units!!
- 8) An 10 gram acorn falls off the roof of a building and hits the ground in 1.5 seconds.
  - a) Neglecting air resistance, how tall is the building?
  - b) Right before it hits the ground, how fast was the acorn falling?
  - c) Neglecting air resistance, with how much force did the acorn hit the ground? Hint: what unit does mass need to be in?
- 9) A boy pushes his younger sister in a wagon. The mass of the girl and the wagon is 15 kg. The applied force by the boy is 12 N while friction and air resistance are 3 N. What is the wagon's acceleration?
- 10) A car with a mass of 1000 kg accelerates at a rate of  $4 \text{ m/s}^2$ . What is the net force acting on the car?
- 11) A 170 pound person travels to Mars where the acceleration due to gravity is  $3.7 \text{ m/s}^2$ .
  - a) What is the person's mass?
  - b) What is the person's weight on Mars, in Newtons?
  - c) What is the person's weight on Mars, in pounds?

## MECHANICS QUIZ REVIEW SHEET

The following items are listed as a guide for what to focus on during your studies. An equations sheet will be provided and is posted online.

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- Be able to convert between metric units. Be able to convert between imperial and metric units.
- Understand and be able to apply Newton's 1<sup>st</sup> Law of Motion.
- What is inertia?
- Be able to apply the Equilibrium Rule to different situations, including free body diagrams (vector diagrams). Be able to determine the net forces (overall forces) of a system using a free body diagram.
- Know the difference and be able to give examples of something in static vs. dynamic equilibrium.
- Be able to interpret graphs of velocity, acceleration, and distance.
- Be able to calculate speed and average speed given a set of data.
- Be able to calculate acceleration without given force or mass.
- How are speed and velocity different from each other? Be able to apply and give examples.
- Be able to apply Newton's 2<sup>nd</sup> Law. Be able to calculate using  $F=ma$ .
- Be able to mathematically determine the instantaneous speed of an accelerating object.
- Be able to mathematically determine the distance an accelerating object has traveled after a given amount of time.
- Be able to relate weight to mass. Be able to calculate weight given mass and acceleration due to gravity.
- Be able to convert between mass, weight and pounds.

Answers: 1) 5380 dam, 2) 0.2120 hm, 3)  $2.315 \times 10^{-6}$  yr, 4) 16404 ft, 5) 0.71 hr, 6) 0.125 miles/min or 7.5 mph, 7) 600 mi/hr<sup>2</sup>, 8a) 11 m, 8b) 14.7 m/s, 8c) 0.098 N, 9)  $0.6 \text{ m/s}^2$ , 10) 4000 N, 11a) 77.3 kg, 11b) 286.01 N, 11c) 64.2 lbs