# Physics 20 Equivalency *Readiness Check*

These questions have been created to help you to assess your readiness for this test. You do not need to report the results of this test.   It is for your use ONLY.

* If you score less than 50% on this test, we recommend you email upgrading@nait.ca for advisement.

1. If the vectors in the diagram to the right are added together, what is the angle at which the resultant vector is directed?   Express your answer using standard angles and map coordinates (NEWS).


125 N $\vec{F}_1$

30.0º

220 N

$\vec{F}_2$
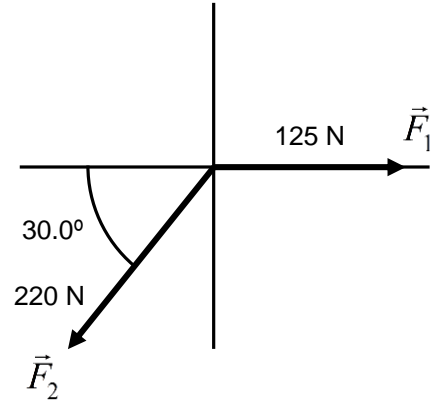
2. A car starts from rest and reaches a speed of 100 km/h in 7.25 s. Find the acceleration in m/s^2.

3. A box of mass 120 kg is being pulled across a floor by a cable that makes an angle of 33.0º with the horizontal.   The tension in the cable is 600 N. The coefficient of friction between the floor and the box is 0.350. Determine the magnitude of the net force acting on the crate.


600 N

33.0º
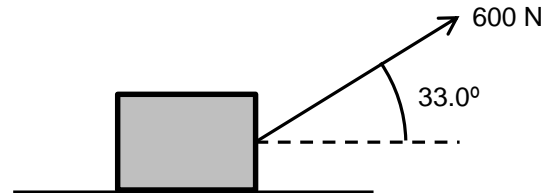
4. A 25.0 kg rock falls from rest from a height of 15.0 m. Assuming free fall and using the conservation of energy, find the speed of the rock in km/h when it is at a height of 5.00 m above the ground.

5. A wave is travelling at a speed of 1.60 km/s. If the wavelength of the wave is 1.75 m, what is the period of the wave?

6. A train blowing its whistle passes a car which is stopped at the side of the road. The frequency of the whistle is 660 Hz. If the train is moving away from the car at a speed of 14.0 m/s, what is the frequency of the whistle as perceived by the car's occupants? The speed of sound is 330 m/s.

7. A mass is attached to a spring and is initially located at point B and is at rest. The spring is stretched so that the mass is now at point C and released. The mass undergoes simple harmonic motion between points A and C. At which points (A, B, C) is the velocity and the acceleration of the mass the greatest?
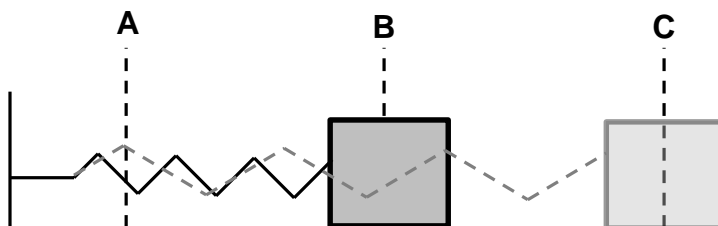
8. The mass of the Earth is 5.97 x 10^{+24} kg, the radius of the Earth is 6,380 km, and the Universal Gravitational Constant is 6.67 x 10^{-11} Nm^2/kg^2. What would be the acceleration due to gravity experienced by an object located at an altitude of 4.00 x 10^{+2} km above the Earth?

9. The free body diagram for a block on a inclined plane is presented to the right. Describe the motion of the block based on the free body diagram.

normal force

kinetic frictional force
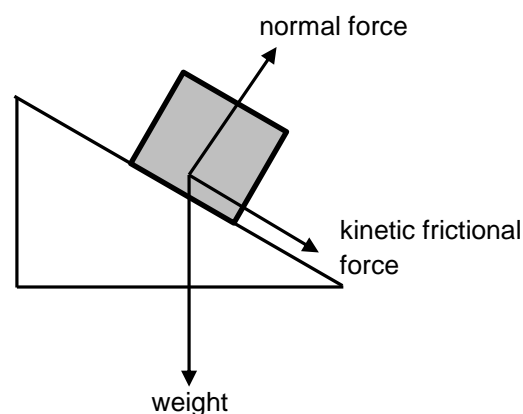
weight

10. A baseball is thrown horizontally from a height of 1.70 m with an initial speed of 35.0 m/s. If the ball is allowed to hit the ground, how far horizontally from the pitcher does it land?

ANSWERS:

1. 239^0, 59^0 S of W
2. 3.83 m/s^2
3. 206 N
4. 15.9 km/h
5. 1.09 ms
6. 633 Hz
7. The velocity of the mass is greatest at points B; the acceleration of the mass is greatest at points A and C.
8. 8.66 m/s^2
9. Moving up the plane.
10. 20.6 m