1. An ISU student drives home from Ames to Davenport a distance of 191 miles without stopping. Her average speed is 65 mph. How long did it take her to drive home?
(a) 2.6 hours  (b) 2.7 hours  (c) 2.8 hours  (d) 2.9 hours  (e) 3.0 hours
Hint: Do not convert to S.L. units

2. In the formula $F = Y \left( \frac{\Delta L}{L} \right) A$ that we study later in the course, $F$, $L$ and $A$ represent force, length and area, respectively. What are the dimensions of the constant $Y$ (Young's Modulus)?
(a) $1 / L^2$  (b) $M / (L^2 T)$  (c) $M / (L T^2)$  (d) $M / T^2$
(e) $Y$ is a constant and is therefore dimensionless.
3. A swimmer swims the length of a 100 m pool at a speed of 3.0 m/s but she is only able to swim the return lap at a speed of 2.0 m/s. What is her average speed for the complete trip of 200 m?
(a) 2.2 m/s  (b) 2.3 m/s  (c) 2.4 m/s  (d) 2.5 m/s  (e) 2.6 m/s

4. On the interstate you are traveling at a speed of 30 m/s, 200 m behind a truck traveling at a speed of 25 m/s. How long does it take you to catch up with the truck?
(a) 30 s  (b) 40 s  (c) 50 s  (d) 60 s  (e) 70 s

5. In a lecture demonstration a small metal ball was shot horizontally from a spring gun and simultaneously an identical ball was dropped from the same height. Which statement best describes the result of the demonstration?
(a) The ball that was shot from the gun landed first.
(b) The ball that was dropped landed first.
(c) Both balls landed at about the same time.

6. A student throws a baseball straight up vertically. Which answer below best describes the baseball at the highest point in its trajectory?
(a) a=0, v=0  (b) a down, v=0  (c) a up, v=0  (d) a=0, v down  (e) a down, v up

7. A student standing on the top of a very high cliff leans over the edge and throws a ball straight up at a speed of 20 m/s. Where is the ball 6 s later?
(a) 56 m above the cliff top  (b) 36 m above the cliff top  (c) 21 m above the cliff top  (d) 21 m below the cliff top  (e) 56 m below the cliff top
8. Vectors \( L \), \( M \) and \( N \) are shown in the figure to the left. The sum \( L - M + N \) is best represented by which vector in the figure to the right?

\[
\begin{align*}
L & \quad M \\
\rightarrow & \quad \uparrow \\
N & \quad \rightarrow \\
\end{align*}
\]

\[
\begin{align*}
A & \quad B \\
\rightarrow & \quad \downarrow \\
E & \quad \rightarrow \\
\end{align*}
\]

(a) \( X \) (b) \( Y \) (c) \( Z \) (d) \( W \) (e) \( V \)

9. An airliner wishes to travel straight east from Des Moines to New York. The airliner can travel at a speed of 250 m/s in still air. If the wind is blowing from the north at a speed of 20 m/s, in what direction must the airliner head in order to reach New York?

(a) 3.5° N of E (b) 4.6° N of E (c) 5.2° N of E (d) 4.6° S of E (e) 3.5° S of E

10. A cannon resting on the top of a cliff as shown to the right fires a shell in a horizontal direction with an initial speed of 130 m/s at a target on the plain below. How far is the target from the base of the cliff?

(a) 371 m (b) 455 m (c) 566 m (d) 741 m (e) 896 m
11. A cannon resting on a flat plain fires a shell at an angle of 30.0° with respect to the ground at a speed of 130 m/s as shown to the right. How far from the cannon did the shell land?
(a) 0.89 km (b) 1.05 km (c) 1.27 km (d) 1.49 km (e) 1.63 km

12. A man pulls a 50. kg box along a level surface with a horizontal force as shown to the right. What force must the man exert, starting from rest to move the box a distance of 40. m in one minute? Consider the effects of friction to be negligible.
(a) 1.1 N (b) 2.5 N (c) 3.2 N (d) 4.3 N (e) 5.6 N

13. In problem 12 what is the reaction to the normal force on the box?
(a) The weight of the box.
(b) The weight of the man.
(c) The force exerted by the earth on the box.
(d) The force exerted by the box on the earth.
(e) The force exerted by the man on the box.

14. A 2000. kg car is traveling on a level road at a speed of 10.0 m/s. The coefficient of kinetic friction between car and road is 0.0500. The driver wishes to increase the car’s speed to 20.0 m/s in one minute. What force must the car’s engine supply?
(a) 333 N (b) 596 N (c) 980 N (d) 1.31 kN (e) 1.64 kN
15. You are traveling on your skateboard on a level surface at a speed of 15 m/s. If the coefficient of friction between skateboard and surface is 0.10, how much time elapses before your speed is reduced to 8.0 m/s?
(a) 3.8 s    (b) 4.6 s    (c) 5.9 s    (d) 6.5 s    (e) 7.1 s

16. After the big win against Iowa you are partying and get your car stuck in the mud. Knowing kinetics from physics-111 you tie a rope to the car and a nearby tree as shown in the figure. If you pull on the rope with a force of 200 N (about 45 lb) what is the force exerted on the car?
(a) 1.15 kN    (b) 1.35 kN    (c) 1.52 kN    (d) 1.85 kN    (e) 2.30 kN

17. What force is needed to push a box of weight \( W \) up the inclined plane shown at a constant speed of 2.5 m/s?
(a) \( W \sin \theta \)    (b) \( W \sin \theta + \mu W \cos \theta \)    (c) \( W \cos \theta + \mu W \sin \theta \)
(d) \( W \sin \theta - \mu W \cos \theta \)    (e) greater than \( W \sin \theta + \mu W \cos \theta \)
18. A 2000 kg car is at rest on top of a 200 m long hill. Someone releases the emergency brake and the car rolls to the bottom. The coefficient of friction is 0.15. How fast is the car moving when it reaches the bottom of the hill? Hint: This problem is longer than most.
(a) 21 m/s  (b) 26 m/s  (c) 37 m/s  (d) 45 m/s  (e) 51 m/s