

1. Suppose a silly 70-kg person were to drop down from a height of 1.4 m onto the ground and stop stiffly within a distance of only 0.60 cm. The average force his body feels is how many times his own weight?
 - A) 15
 - B) 24
 - C) 2.3×10^3
 - D) 6.1×10^2
 - E) 2.3×10^2

2. A man riding in an elevator has an apparent weight (scale reading) greater than his actual weight. Which one of the following statements could be true?
 - A) The elevator moves upward with constant speed.
 - B) The elevator moves downward with constant speed.
 - C) The elevator moves upward with decreasing speed.
 - D) The elevator moves downward with decreasing speed.
 - E) The elevator moves downward with increasing speed.

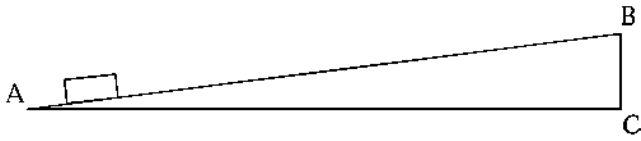
3. A horse harnessed to a wagon refuses to pull, citing Newton's third law, which states that for every force there is an equal but opposite reaction force. The horse, incorrect in its reasoning, *can* pull the wagon because
 - A) after it gives a jerk and the wagon is moving, its pulling force will be greater than the reaction to this force.
 - B) the law applies only to static cases.
 - C) the wagon cannot possibly pull back with a force equal in magnitude to the pulling force.
 - D) the action and reaction forces are acting on different bodies.
 - E) after friction is overcome, the reaction force is less than the pulling force.

4. A block with a mass of 10 kg is at rest on a horizontal surface. The coefficient of static friction between the block and the surface is 0.30, and the coefficient of kinetic friction is 0.25. A horizontal force of 20 N acts on the block. The magnitude of the frictional force on the block is
 - A) 10 N
 - B) 20 N
 - C) 0.10 kN
 - D) 30 N
 - E) 3.0 N

5. A ball of mass 2.0 kg is acted on by two forces, $\vec{F}_1 = 3.0N\hat{i} + 4.0N\hat{j}$ and $\vec{F}_2 = -5.0N\hat{i} + 6.0N\hat{j}$. The magnitude of the acceleration is
- A) 2.5 m/s²
 - B) 3.9 m/s²
 - C) 4.6 m/s²
 - D) 5.1 m/s²
 - E) 5.8 m/s²
6. A mass m is traveling at an initial speed $v_0 = 25.0$ m/s. It is brought to rest in a distance of 62.5 m by a force of 15.0 N. The mass is
- A) 37.5 kg
 - B) 3.00 kg
 - C) 1.50 kg
 - D) 6.00 kg
 - E) 3.75 kg
7. The work expended to accelerate a car from 0 to 30 m/s
- A) is more than that required to accelerate it from 30 m/s to 60 m/s.
 - B) is equal to that required to accelerate it from 30 m/s to 60 m/s.
 - C) is less than that required to accelerate it from 30 m/s to 60 m/s.
 - D) can be any of the preceding, depending on the time taken.
 - E) is described by none of these statements.
8. The angle between the vector $\vec{A} = \hat{i} + 2\hat{j} + 3\hat{k}$ and the y axis is approximately
- A) 58°
 - B) 75°
 - C) 17°
 - D) 26°
 - E) 37°
9. A motor is lifting a mass of 35.0 kg at a constant speed of 6.00 m/s. If friction is neglected, the power developed by the motor to do this lifting is
- A) 740 W
 - B) 1.5×10^3 W
 - C) 2.1×10^3 W
 - D) 59 W
 - E) 43 W

10. Susana ascends a mountain via a short, steep trail. Sean ascends the same mountain via a long, gentle trail. Which of the following statements is true?
- A) Susana gains more gravitational potential energy than Sean.
 - B) Susana gains less gravitational potential energy than Sean.
 - C) Susana gains the same gravitational potential energy as Sean.
 - D) To compare energies, we must know the height of the mountain.
 - E) To compare energies, we must know the lengths of the two trails.

11.



The object in the figure has a mass of 3.45 kg and is pulled up a slope AB, which is 36 m long; the height BC is 3.00 m. There is no friction and the acceleration is constant. The speed v_1 at A is 3.5 m/s whereas the speed v_2 at B is 5.5 m/s.

A) The kinetic energy of the object at A is:

B) The kinetic energy of the object at B is:

C) The change in potential energy of the object as it moves from A to B is:

D) The time elapsed as the object moves from A to B is:

E) The average power developed by the motor pulling the object is:

Answer Key

1. E $F(.006m)=mg(1.4m) \quad F/mg=1.4/.006=2.3 \cdot 10^2$
2. D *must accelerate up*
3. D *Newton's third*
4. B $f_{sM}=\mu_s mg=.3(10kg)(9.81m/s^2)=29.4N \rightarrow f_s=20N$
5. D $\mathbf{F}=\mathbf{F}_1+\mathbf{F}_2=-2\mathbf{i}+10\mathbf{j} \quad F=\sqrt{(2^2+10^2)}=10.2N \quad a=10.2N/2kg=5.1m/s^2$
6. B $\frac{1}{2} \cdot m(25)^2=15(62.5) \quad m=3kg$
7. C $W_1=\frac{1}{2} \cdot m(30)^2=450m \quad W_2=\frac{1}{2} \cdot m[(60)^2-(30)^2]=1350m$
8. A $\mathbf{A} \cdot \mathbf{j}=2=(A)(1)\cos\theta=\sqrt{(1^2+2^2+3^2)} \cos\theta \quad \theta=57.7^\circ$
9. C $35kg(9.81m/s^2)(6m/s)=2060W$
10. C *depends only on height*
11. A. $\frac{1}{2} \cdot 3.45kg(3.5m/s)^2=21.1J$
B. $\frac{1}{2} \cdot 3.45kg(5.5m/s)^2=52.2J$
C. $3.45kg(9.81m/s^2)(3m)=101.5J$
D. $v_{av}=(3.5+5.5)/2=4.5m/s \quad t=36m/4.5m/s=8sec$
E. $(52.2-21.1+101.5)J/8s=16.6W$