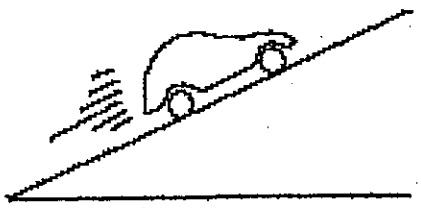
32. The word "normal," as it applies to forces, means

a. usual.
b. mean.
c. average.
d. perpendicular.
e. straight up, in the direction opposite to the force of gravity.

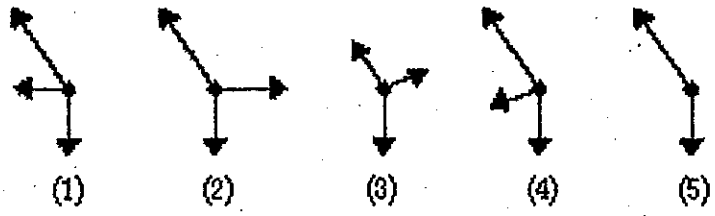
33. A particle has a mass of 6.0×10^{-6} kg and a velocity of 800 m/s along the x axis when a force of 14.4×10^{-5} N along the y axis acts on the particle at right angles to its velocity. The acceleration of the particle is

a. 24 m/s^2 along the x axis.
b. zero.
c. impossible to determine; forces never act at right angles to velocities.
d. 24 m/s^2 along the y axis.
e. tangential.

34.



Which of the following free-body diagrams represents the car going uphill at a constant speed?



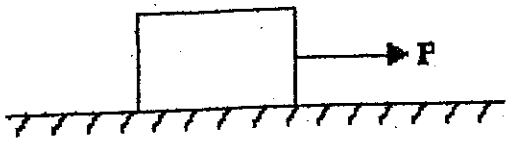
a. 1 b. 2 c. 3 d. 4 e. 5

35. Two groups of five men each are engaged in a tug-of-war, each man pulling with a force of 900 N. If the rope does not move, the tension in it is

a. 18 kN b. 9.0 kN c. 44 kN d. 4.5 kN e. 0.46 kN

36. A 100-kg block is pushed up a 30° incline that is 10 m long. If the coefficient of friction between the block and the incline is 0.1, the constant force parallel to the incline that is required to move the block from rest at the bottom of the incline to the top in 3 s is approximately

a. 0.49 kN b. 0.085 kN c. 0.22 kN d. 0.80 kN e. 0.58 kN

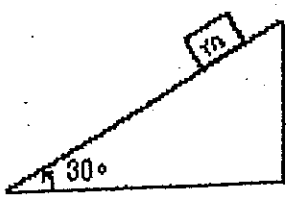
37. 

A 50-kg block rests on a horizontal surface as shown. The coefficient of static friction $\mu_s = 0.50$. The coefficient of kinetic friction $\mu_k = 0.35$. A force P of 250 N is applied as shown.

a. The block remains at rest.
b. The block moves and continues to move at constant velocity.
c. The block accelerates to the right.
d. The block does not move until **P** is increased to greater than 490 N.
e. No conclusions can be drawn concerning the movement of the block from the information given.

38. A block is placed on a plane whose angle of inclination is 30°. The coefficients of static and kinetic friction for the block on the inclined plane are both 0.2. The block

a. remains stationary on the inclined plane.
b. accelerates down the inclined plane.
c. travels down the inclined plane at constant velocity.
d. travels up the inclined plane at constant velocity.
e. accelerates up the inclined plane.

39. 

A block of mass m is at rest on an inclined plane that makes an angle of 30° with the horizontal, as shown in the figure. Which of the following statements about the force of static friction is true?

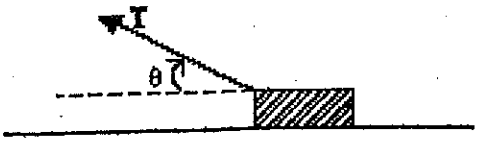
a. $f_s > mg$
b. $f_s > mg \cos 30°$
c. $f_s = mg \cos 30°$
d. $f_s = mg \sin 30°$
e. None of these statements is true.

40. A 10-kg block is at rest on a level surface, where the coefficient of static friction is 0.6 and that for kinetic friction is 0.4. A 50-N horizontal force is applied. The frictional force on the block is

a. 20 N b. 50 N c. 40 N d. 60 N e. 10 N

41. An object with a mass of 5.5 kg is allowed to slide from rest down an inclined plane. The plane makes an angle of 30° with the horizontal and is 72 m long. The coefficient of friction between the plane and the object is 0.35. The speed of the object at the bottom of the plane is

a. 5.3 m/s b. 15 m/s c. 24 m/s d. 17 m/s e. 11 m/s

42. 

A block of mass m is pulled in the direction shown in the figure across a rough surface at a constant velocity. The magnitude of the frictional force is

a. $\mu_k mg$ b. $\mu_k T \cos\theta$ c. $\mu_k(T - mg)$

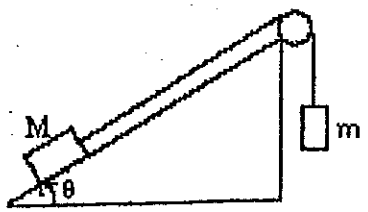
d. $\mu_k T \sin\theta$ e. $\mu_k(mg - T \sin\theta)$

43. An object is accelerating down a plane that is inclined at an angle of 27.5° above the horizontal. The acceleration is 3.65 m/s^2. The coefficient of friction μ_k between the plane and the object is

a. $\mu_k = 0.52$ b. $\mu_k = 0.10$ c. $\mu_k = 0.20$ d. $\mu_k = 0.30$ e. $\mu_k = 0.40$

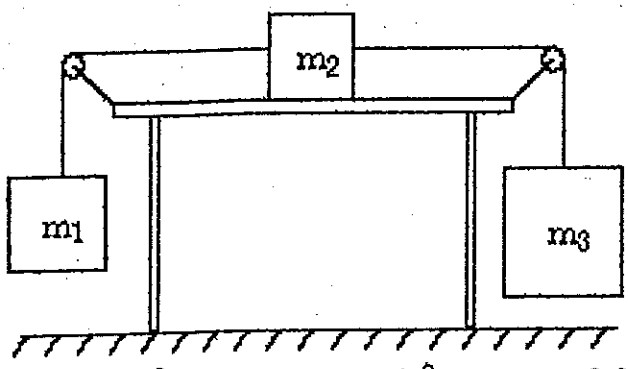
44. A mass M = 5.6 kg on a horizontal table is pulled by a horizontal string that passes over a frictionless pulley to a free-hanging mass m = 3.4 kg. The coefficient of friction between M and the table is 0.28. The acceleration of M is

a. 3.7 m/s^2 b. 2.0 m/s^2 c. 2.2 m/s^2 d. 0.20 m/s^2 e. 0.49 m/s^2

45. 

An object with a mass M = 250 g is at rest on a plane that makes an angle θ = 30° above the horizontal. The coefficient of kinetic friction between M and the plane is $\mu_k = 0.100$. Mass M is attached by a string to another mass m = 200 g, which hangs freely. When mass m has fallen 30.0 cm, its speed is

a. 83 cm/s b. 48 cm/s c. 160 cm/s d. 59 cm/s e. 72 cm/s

46. 

a. 1.9 m/s^2 b. 2.4 m/s^2 c. 3.0 m/s^2 d. zero e. 13 m/s^2

47. A horizontal force **F** is used to push an object of mass m up an inclined plane. The angle between the plane and the horizontal is θ. The normal reaction force of the plane acting on the mass m is

a. $mg \cos\theta + F \cos\theta$
b. $mg \cos\theta$
c. $mg \cos\theta + F \sin\theta$
d. $mg \cos\theta - F \cos\theta$
e. impossible to determine because the coefficient of friction is not given.

48. The net force acting on an object is zero. You can therefore definitely conclude that the object is

a. at rest.
b. moving in a straight line at constant speed.
c. moving in a circle at constant speed.
d. undergoing acceleration.
e. either at rest or moving in a straight line at constant speed.

49. A horizontal force **F** acts on a mass m that lies on a horizontal surface. The acceleration of m is **a**. The coefficient of kinetic friction μ_k between mass m and the surface can be calculated from

a. $\mu_k = a/g$ b. $\mu_k = (F/mg) - (a/g)$ c. $\mu_k = (F/mg) + (a/g)$
d. $\mu_k = 0$ e. none of these.

50. A block of mass m_b rests on a horizontal surface and is accelerated by means of a horizontal cord that passes over a frictionless peg to a hanging weight of mass m_w. The coefficient of kinetic friction between the block and the horizontal surface is μ and the tension in the cord is T. The acceleration of the block is given by

a. $(T - m_w g)/(m_w + m_b)$ b. $T/(\mu m_b g + m_b)$ c. $(T - \mu m_b)/m_b$
d. $(m_w g - T)/m_w$ e. $T/m_b - \mu m_b g$