20

1. Static (Fs) or Kinetic (Fk) Friction?

K Tries to stop an object when it's moving.
K How much force to keep an object sliding.
K Slows down a sliding object.
S How much it takes to start an object sliding.
K Car tires when they "spin out".
both Requires F_N to calculate.
K Calculate with μ_k.
K On a playground slide.
K Sliding friction.
S Car tires normally.
S Is greater.
S Gripping friction
S Calculate with μ_s.

2. More or less friction?

A. M On a rougher surface.
B. M If F_N increases.
C. L If the surface is smoother.
D. L If μ is less.
E. M If the object has more mass.
F. M If you push down on the object.
G. L If you pull up on the object.
H. M If μ increases.

3. An object is moving to the left. Which way does friction act? R

4. A force is pulling on an object to the left. Draw an arrow showing the direction of static friction.

5. If $F_N = 50$ N and $\mu_s = .26$, find the force of static friction.

$F_s = \mu_s F_N = .26 \cdot 50N = 13N$

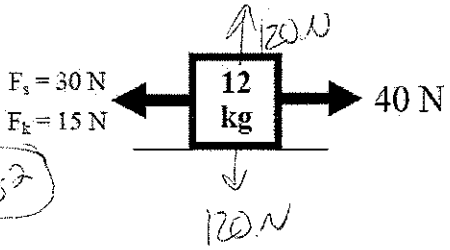
6. If $F_N = 25$ N and $\mu_k = .13$, calculate kinetic friction.

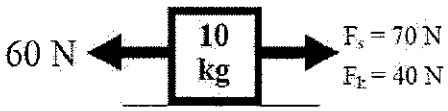
$F_k = \mu_k \cdot F_N = .13 \cdot 25N = 3.25N$

7. A. How much force is necessary to start the 12 kg object moving? 30 N
B. How much force is necessary to keep it moving? 15 N
C. If it starts at rest, will it start sliding? Yes 30 N > 30 N
D. Calculate the acceleration of the object.

$\Sigma F = 40N - 15N = 25N$

$a = \frac{\Sigma F}{m} = \frac{25N}{12kg} = 2.08 m/s^2$



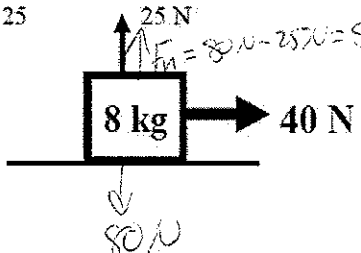


8. A. Does the object start sliding? No
B. If not, how much extra force is necessary? 10 N +
C. If it is moving calculate the acceleration of the object?

$\Sigma F = -60N + 40N = -20N$

$a = \frac{\Sigma F}{m} = \frac{-20N}{10kg} = -2 m/s^2$

$\mu_s = .4$ $\mu_k = .25$



9. A. Calculate the normal force on the object.
B. Calculate both static and kinetic friction.

$F_s = 0.4 \cdot 55N = 22N$

$F_k = 0.25 \cdot 55N = 13.75N$

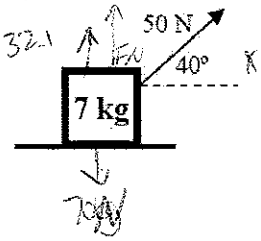
C. Does the object start moving? Yes
D. Calculate the acceleration if it is moving.

$\Sigma F = 40N - 13.75N = 26.25N$

$a = \frac{\Sigma F}{m} = \frac{26.25N}{8kg} = 3.28 m/s^2$

$\mu_s = .6$ $\mu_k = .3$

$Y = 50N \sin 40° = 32.1N$



10. A. Does the 50 N increase or decrease F_N?
B. Resolve the 50 N force into its x and y-components.

$X = 50N \cos 40° = 38.3N$

C. Calculate F_N.

$F_N = 70N - 32.1N = 37.9N$

D. Using F_N, calculate F_s and F_k.

$F_s = .6 \cdot 37.9N = 22.74N$ $F_k = .3 \cdot 37.9N = 11.37N$

E. Will the object slide? Yes, $38.3N > 22.74N$
F. Calculate the acceleration of the object if it does slide.

$\frac{\Sigma F}{m} = \frac{38.3N - 11.37N}{7kg} = 3.85 m/s^2$