

## Forces Practice

### Section 1: $F_g$

- 1) Calculate the force of gravity on a 25 kg mass at the surface of the earth.
- 2) A 75 kg mass is on the surface of Mars when an astronaut lifts it with a spring scale. The scale has a reading of 259 N. What is the gravitational field strength on Mars?
- 3) How much force must a horizontal surface exert to hold up a 2.0 kg book and what is the name of that force?

### Section 2: $F_{net}$

- 1) A cat is dragged at a constant velocity of 3.0 m/s across sandpaper. What is the total force on the cat?
- 2) A 1200 kg car is pushed by three students from rest to 5.0 m/s, 30 m along a level surface. What was the unbalanced force used on the car?
- 3) Assuming the force of friction on the car in problem 2 was 100 N how much combined force did the students have to exert?
- 4) What is the acceleration of a 5.0 kg mass when pulled with 10 N [E] and 12 N [N]?
- 5) What is the net force of a mass when pulled with a force of 10 N at  $30^\circ$  S of W and 12 N at  $40^\circ$  W of N.

### Section 3: $F_f$ and $F_n$ (level surfaces)

- 1) A 10 kg mass is pulled along a level surface using a force of 25 N. What is the coefficient of friction?
- 2) A force of 7.5 N is used to pull a rubber friction block across a table at constant speed. If the coefficient of friction is 0.35 what is the mass of the block?
- 3) What shape is a graph of  $F_f$  vs.  $F_n$  and what is the slope?

### Section 4: $F_e$

- 1) Calculate the extension of a spring whose spring constant is 20 N/m when a 0.50 kg mass is hung on it.
- 2) What is the spring constant of a desk if a force of 784 N compresses it from height 1.00 m to 0.92 m?

### Section 5: Forces on ramps

- 1) What is the normal force and force down the ramp on a 5.0 kg mass resting on a  $40^\circ$  slope?
- 2) What is the acceleration of a 3.0 kg mass on a  $30^\circ$  frictionless slope?
- 3) What is the normal force on the mass in #2 above?
- 4) What is the force of friction on the mass in #3 above if  $m = 0.2$ ?
- 5) What would be the acceleration of the mass in #4 above given  $m = 0.2$ ???

\*\* tough question!

Answers:

- |   |   |              |
|---|---|--------------|
| 1) 245 N                                  | 1) 0 N  | 1) 0.26      |
| 1) 0.245 m                                | 1) $F_n = 37.5\text{N}$ $F_{\text{down}} = 31.5\text{ N}$ |              |
| 2) 3.45 $\text{m/s}^2$                    | 2) 500 N  | 2) 2.19 kg   |
| 2) 9800 N/m                               | 2) 4.9 $\text{m/s}^2$                                     |              |
| 3) 19.6 N, $F_n$                          | 3) 600 N  | 3) linear, m |
| 3) 25.5 N                                 |   |              |
| 4) 3.12 $\text{m/s}^2$ at $50^\circ$ NofE | 4) 5.09 N   |              |
| 5) 16.9 N at $14^\circ$ NofW              | 5) 3.20 $\text{m/s}^2$                                    |              |