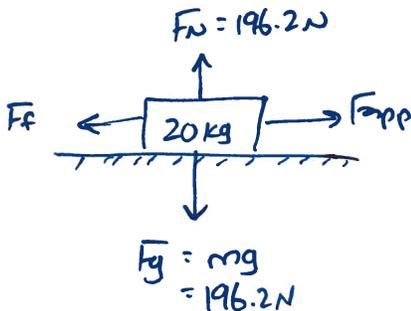First Name:_____   Last Name:_____

L05 – fQ – Friction in 1-Dimension

Use the following information to answer Q1-Q3:

An object of mass 20kg is sitting on a flat, horizontal surface. The coefficient of static friction between the two objects is 0.8, and the coefficient of kinetic friction is 0.5.

Q1: How much force is required to get the object moving? *(1 mark)*

$$F_N = 196.2 N$$

$$F_g = mg = 196.2 N$$

$$F_{f_s} \leq M_s F_N$$
$$\leq (0.8)(196.2 N)$$
$$\leq 156.96 N$$

so $\boxed{F_{app} > 156.96 N}$ is required.

Note that if $F_{app} = 156.96 N$, then friction is maximum at $F_{f_s} = 156.96 N$, and the object won't move

Q2: Once moving, in order to move at a constant speed the object requires a force of *a.bc* x 10^d N to be applied, where *a, b, c,* and *d* are ___, ___, ___, and ___.

*(Record your **four-digit** answer in the Numerical Response boxes below)*

9	8	1	1

$$F_{f_k} = M_k F_N$$
$$= (0.5)(196.2 N)$$
$$= 98.1 N$$

Constant speed means no acceleration, so no net force. So $F_{app} = 98.1 N$
$$\approx 9.81 \times 10^1 N$$

Q3: If the object is subject to a 200N force, then its acceleration will be _____ m/s².

*(Record your **three-digit** answer in the Numerical Response boxes below)*

5	.	1	0

$$\vec{F}_{net} = \vec{F}_{app} + \overleftarrow{F}_{f_k}$$
$$= (200\,N) + (-98.1)$$
$$= 101.9\,N$$

$$a = \frac{F_{net}}{m} = \frac{101.9\,N}{20\,kg} = 5.095\,m/s^2$$

$$a \approx 5.10\,m/s^2$$

MARKING:

Beginning	0.0 – 1.0
Progressing	1.5 – 2.0
Competent	2.5
Exemplary	3.0