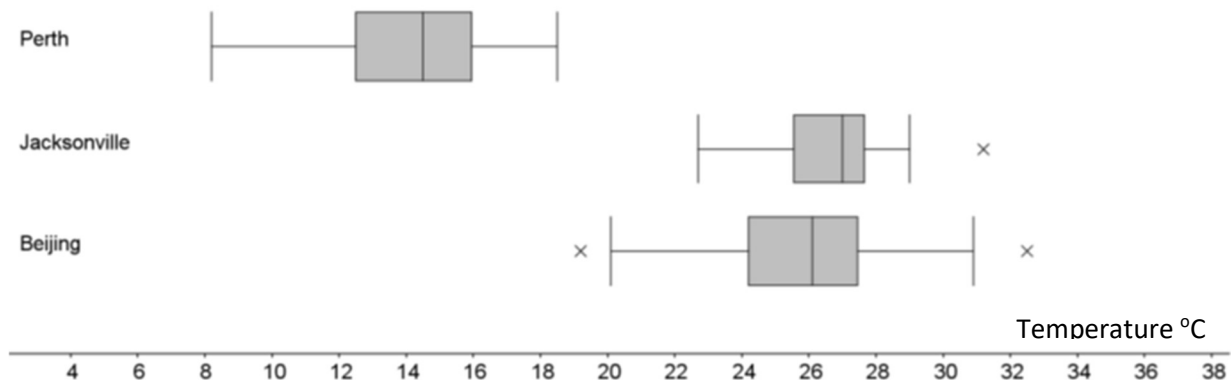# Mechanics 16 – Friction

Please **complete** this homework by _____. Start it early. If you can't do a question you will then have time to ask your teacher for help or go to a drop in session.

Section 1 – Review of previous topics. Please <u>complete</u> all questions.

1. Daily mean air temperature (°C) for Beijing, Perth and Jacksonville June and July 2015


Compare the distributions of mean air temperature at the three locations shown above. You must use numerical values in your comparisons.

2. A mass of 10kg is placed on a smooth plane at an angle of 30° to the horizontal. A force of 40N is applied to the mass up the plane.
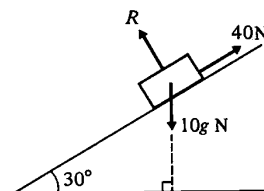
a) Calculate the normal reaction R.
b) Calculate the acceleration of the mass, stating whether this is up or down the plane.

3. The diagram opposite shows a particle in equilibrium under the forces shown. Find the unknown forces.
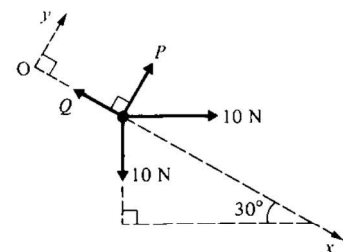
4. A body moves along a straight line uniformly increasing its velocity from 2 m/s to 18 m/s in a time interval of 10 s. Find the acceleration of the body during this time and the distance travelled.

Section 2 – Consolidation of this week's topic.
Please complete all questions.

1. Each of the following diagrams shows a body of mass 10 kg initially at rest on a rough horizontal plane. The coefficient of friction between the body and the plane is $^1/_7$. In each case, R is the normal reaction and F the frictional force exerted on the body, by the plane. Any other forces applied to the body are as shown. In each case,
i) Find the magnitude of F and state whether the body will remain at rest or will accelerate along the plane.
ii) Calculate the acceleration of the body.

a)
b)
c)
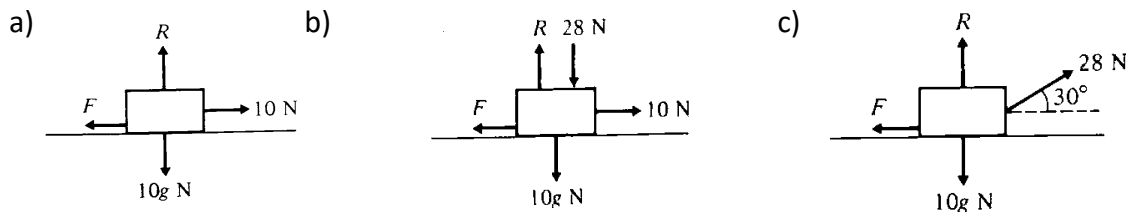
(13)

2. In each of the following situations, the forces shown cause the body of mass 5 kg to accelerate along the rough horizontal plane. The direction and magnitude of each acceleration is as indicated; R is the normal reaction and F the frictional force exerted on the body by the plane.
For each case, find the coefficient of friction between the body and the plane.

a)
b)
c)
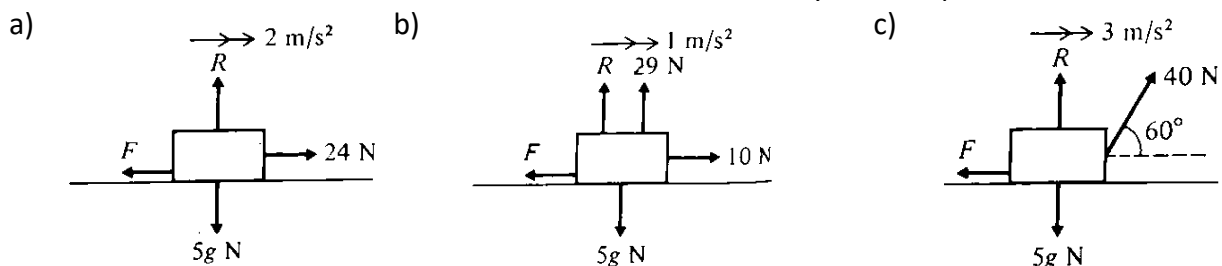
(16)

3. Each of the following diagrams shows a body of mass 10 kg released from rest on a rough inclined plane where $\mu = ¼$. R is the normal reaction and F the frictional force exerted on the body by the plane. In each case, find the magnitude of F and state whether the body will remain at rest or will begin to slip down the plane.

a)
b)
c)
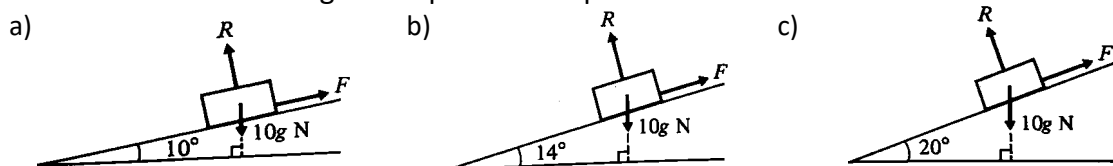
(12)

4. A box of mass 6 kg is placed on a rough plane which is inclined at 45° to the horizontal. The coefficient of friction between the box and the plane is 0.5. Find the force parallel to the plane that must be applied to the box so that the box is just prevented from sliding down the plane. **(8)**

5. A body of mass 3 kg is released from rest on a rough surface which is inclined at $\sin^{-1}(^3/_5)$ to the horizontal. If, after 2.5 seconds, the body has acquired a velocity of 4.9 m/s down the surface, find the coefficient of friction between the body and the surface. **(11)**

Total marks 60