Mechanics 15 – Inclined Planes

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 underline complete all questions.

1. A particle travels in a straight line with uniform acceleration. The particle passes through three points A , B and C lying in that order on the line, at times t = 0, t = 2 s and t = 5s respectively. If BC = 30cm and the speed of the particle when at B is 7m/s find the acceleration of the particle and its speed when at A.

2.

x	frequency
0-0.4	18
0.5-0.7	
0.8-1.0	
1.1-1.4	15
1.5-1.8	12

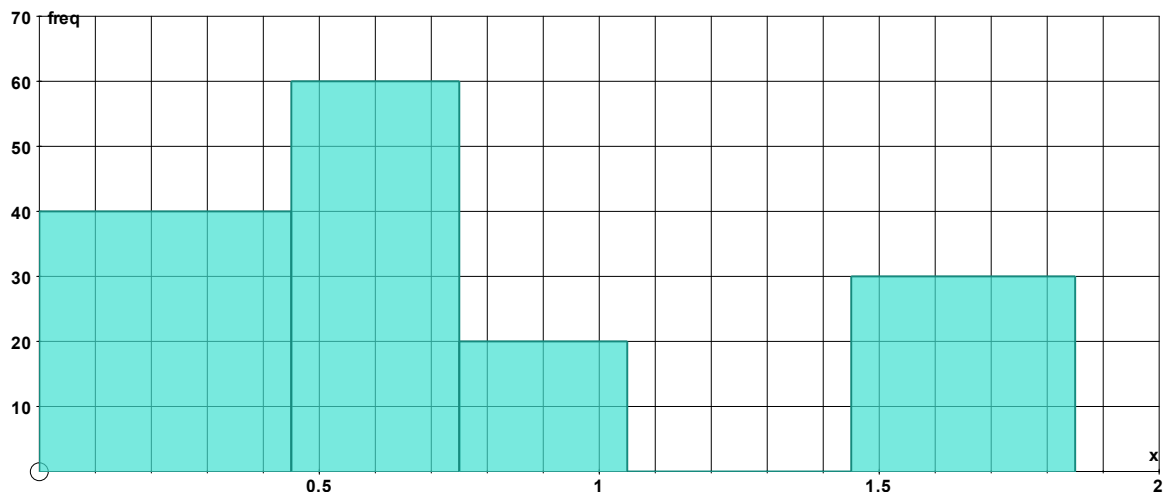A set of continuous data is recorded to one decimal place. The results are summarised in a histogram.
a) Find the missing frequencies in the table.
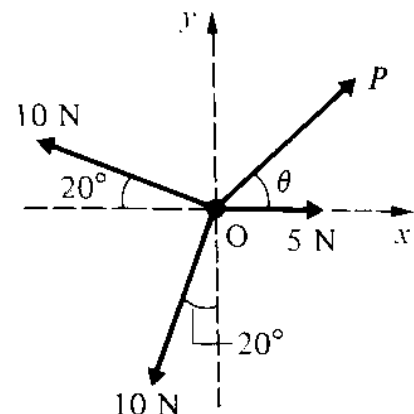b) Calculate the width and height of the missing bar.
c) Estimate the percentage of values that are
i) below 0.6, ii) above 1.2.

3. Find the constant force needed to accelerate a car of mass 600 kg from rest to 25 m/s in 12s if the resistance to motion is 350N.

4. By resolving forces horizontally and vertically find the values of P and θ

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

1. A force of 5N is pulling a particle of mass 8kg down a smooth plane that is inclined at 30° to the horizontal. Given that the force acts parallel to the plane,
a) Draw a force diagram to represent all the forces acting on the particle. **(2)**
b) Work out the normal reaction between the particle and the plane. **(2)**
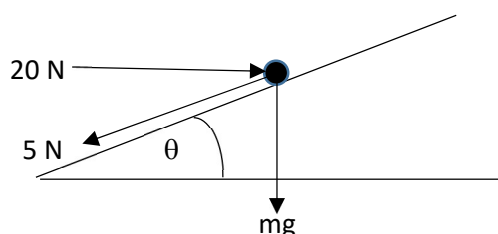c) Find the acceleration of the particle. **(3)**

2. A particle of mass 5kg slides down a rough slope that is inclined at 60° to the horizontal. The force of friction is a constant 30N.
a) Draw a force diagram to represent all the forces acting on the particle. **(2)**
b) Work out the normal reaction between the particle and the plane. **(2)**
c) Find the acceleration of the particle. **(3)**

3. A body of mass 20 kg is released from rest at the top of a rough slope which is inclined at 30° to the horizontal. Six seconds later the body has a velocity of 21 m/s down the slope. Find the resistance to motion experienced by the body. (Assume this resistance to be constant throughout). **(5)**

4. Each of the diagrams below shows a body of mass 10 kg accelerating on an inclined plane in the direction indicated. All of the forces acting are as shown. In each case
(a) Obtain an equation by resolving perpendicular to the direction of motion,
(b) Obtain an equation by applying F = ma parallel to the direction of motion,
(c) Use your equations to (a) and (b) to find the unknown forces, accelerations and angles.
(i)   (ii)   (iii)

(5)   **(6)**   **(8)**
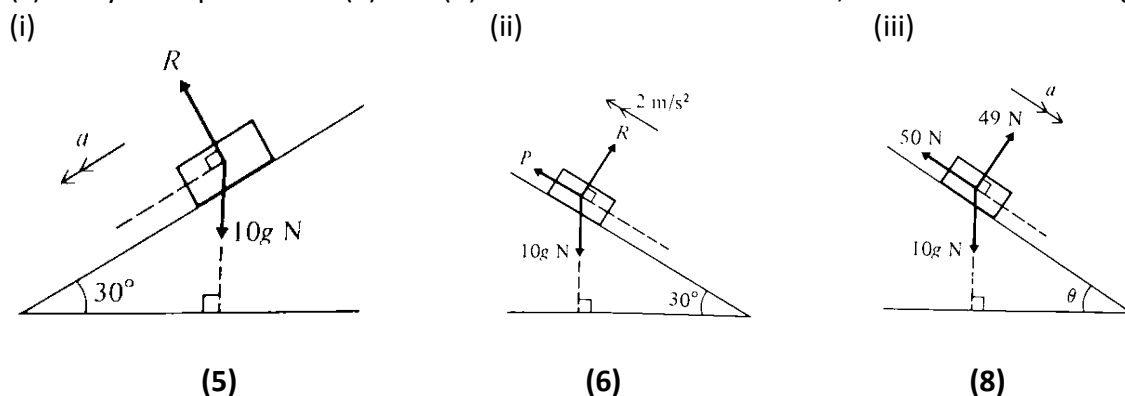
5. A particle of mass m kg is pushed up a rough slope by a horizontal force of 20 N. The particle experiences a constant frictional force of 5 N. Given that tan θ = ¾ and that the acceleration of the particle is 0.4 m/s^2 , show that m = 1.75kg. (2dp)

(12)

Total Marks 50