A-Level Applied Mathematics

Grade Grabber 2

Applied Mathematics Revision

Question 1

A 7 kg and 4 kg mass are suspended by a rope either side of a fixed pulley as shown. The system is released from rest.



(i) In order that the simplification $T_1 = T_2$ be made, what assumption must be made about the system ?

[1 mark]

(ii) In order that the simplification $a_1 = a_2$ be made, what assumption must be made about the system ?

[1 mark]

(iii) In order that the acceleration of the subsequent motion be constant, what assumption must be made about the system ?

[1 mark]

(iv) With the system in motion, what is the tension in the rope, and the acceleration of the 7 kg mass ?

[4 marks]

(v) Miranda is worried about the effect of air resistance.Explain why this worry is without foundation.

[1 mark]

Question 2

Packets of *Love and Hate* contain six sweets, chosen at random from the factory's production line, which manufactures red and black sweets in the ratio 2:1

(**a**) For any particular packet of *Love and Hate*, calculate the probability that,

(i)	all six sweets are red	
		[2 marks]
(ii)	at least four of the sweets are red,	
		[2 marks]
(iii)	less than half the sweets are red	

[2 marks]

[1 mark]

A grommet on the production line explodes spectacularly and has to be replaced. Afterwards the production manager is not convinced that the ratio of red to black is still 2:1 and so decides to address her concern by taking 100 sweets at random from the production line. She counts the number of black in the sample.

- (**b**) Assuming the ratio is still 2:1 state the distribution that the number of black sweets should follow.
- (c) She counts 23 black sweets.
 Using a Normal distribution as an approximation, what would be the conclusion, at the 5% level about the 2:1 ratio ?

[5 marks]

Question 3



A particle with mass 4 kg is held at rest on a rough sloping plane. The angle between the line of greatest slope of the plane and the horizontal is 25° When released, the particle moves down the plane with an acceleration of 1.2 m/s^2

(i) Find the coefficient of friction, μ , between the particle and the plane. Give your answer correct to two decimal places.

[6 marks]

(ii) The plane is then adjusted so that the angle between its line of greatest slope and the horizontal is θ°.
 When the particle is released, it remains in equilibrium.
 Find the range of possible values of θ.

Question 4

In a certain team, penalty shots are taken by one of three players *A*, *B* or *C*. For each player the probability of scoring a goal with a penalty shot is constant. The probabilities are,

$$p(A) = \frac{1}{3}$$
 $p(B) = \frac{1}{2}$ $p(C) = \frac{1}{4}$

During one match *A* takes three penalty shots. Find the probability that,

(**i**) A scores three goals

(**ii**) A scores at least one goal

[2 marks]

[1 mark]

[1 mark]

During a second match each player takes one penalty shot. Find the probability that,

(iii) no goal is scored

(iv) exactly one goal is scored

[2 marks]

(v) Given that exactly one goal is scored from a penalty in the second match, find the probability that it was scored by C

[3 marks]