A-Level Applied Mathematics

Grade Grabber 3

Applied Mathematics Revision

Question 1

A non-uniform log, AB, of mass 140 kg and length 6 m rests on a support at its midpoint, C. A mass of 40 kg placed at a point D, which is 1 m from B, causes the log to be in equilibrium.



(i) Find the magnitude of the reaction force at *C*.

[2 marks]

(**ii**) Find the distance of the log's centre of mass from *A*.

[3 marks]

Question 2

	Α	Α΄	
В		0.4	
В′	0.1		0.4

(**a**) Complete the following contingency table,

[2 marks]

(**b**) Using the values given in the contingency table, calculate, (**i**) p(A) (**ii**) $p(A \cup B)$

[1, 2 marks]

$(\mathbf{iii}) p(A \mid B)$	(iv)	p(A B')
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[2, 2 marks]

(c)	Are events A and B statistically independent?
	Justify your answer.

[2 marks]

Question 3

(ii)

(iii)

Joe and Chris are tiling the bathroom. They have decided on a random pattern of white and green tiles with about five times as many white as green. To achieve this, before Chris lays each tile, Joe rolls a die. If it shows a six, green is chosen, otherwise white.

Given that the top row has twenty tiles in all, calculate the probability that, (i) exactly four tiles are green

less than four tiles are green

more than four tiles are green

[2 marks]

[2 marks]

[1 mark]

(iv) What is the probability that exactly four tiles are green and that those four tiles are all adjacent ?

[3 marks]

Question 4

An aeroplane is ascending in a straight line over flat grasslands. It's speed is 175 m/s and the angle of elevation is 14° An aid package is released from the aeroplane and travels a horizontal distance of 2.38 km before hitting the ground.

(i) How long after being released, will the package hit the ground ?

[2 marks]

(ii) What was the height of the aeroplane above the ground at the moment the package was released ?

[2 marks]

(iii) With what speed did the package hit the ground ?

[2 marks]

(iv) State two modelling assumptions made in answering the question.

[2 marks]

Question 5

A poorly designed NUCLEAR POWER STATION has ten electrical circuits in its control system, each with a $\frac{1}{15}$ independent probability of failing when the power station is started up. If none of the ten circuits fail, the station will function safely. If one fails it has a 10% probability of EXPLODING but if more than one fails it has a 50% probability of EXPLODING.

(i) Using a tree diagram, or otherwise, calculate the probability of the station EXPLODING when it is started up.

[8 marks]

The safety mechanism consists of two elements; a RED ALERT which sounds if one or more of the electric circuits fail, and a PINK EMERGENCY BUTTON which switches all control to the back-up circuits.

If these back-up circuits are used, the probability of the station EXPLODING is 20%. The station is started up and the RED ALERT sounds.

(ii) Should the operator press the PINK EMERGENCY BUTTON ?

[4 marks]