> Write your name and/or registration number in the box provided.
> Write your answers in space provided.
> You have 1 hour to complete this exam.

Name:_____ *Reg. No:*_____

Question:	1	2	3	4	Total
Points:	3	4	5	3	15
Score:					

(2 marks)   1. (a) Create the truth tables to check whether/when the following statements are true or false:

     1. $(A \setminus B)^c = (B^c \setminus A^c)$
     2. $(A \cup B) \setminus C \supset (A \setminus C)$

Solution:

A	B	A^c	B^c	$A \setminus B$	$D = (A \setminus B)^c$	$E = B^c \setminus A^c$	$D = E$
1	1	0	0	0	1	0	0
1	0	0	1	1	0	1	0
0	1	1	0	0	1	0	0
0	0	1	1	0	1	0	0

A	B	C	$(A \cup B)$	$D = (A \cup B) \setminus C$	$E = (A \setminus C)$	$D \supset E$
1	1	1	1	0	0	1
1	1	0	1	1	1	1
1	0	1	1	1	0	1
1	0	0	1	1	1	1
0	1	1	1	0	0	1
0	1	0	1	1	0	1
0	0	1	0	0	0	1
0	0	0	0	0	0	1

(1 mark)   (b) Suppose that 30% of the students are from Kerala and 40% of Kerala students are Female. What is the probability that a randomly chosen student will not be a Female student from Kerala.

(b) _____ **0.88** _____

    2. Give the probabilities for each of the following:

(1 mark)　　(a) You see a Maruti car, given that there are twice as many Maruti cars on the road as any other car.

(a) _____ **2/3** _____

(1 mark)　　(b) A randomly chosen number between 1 and 99 is of the form $n!$ for some n.

(b) _____ **—{1,2,6,24}—/99=4/99** _____

(1 mark)　　(c) When two dice are thrown, the probability that the sum of the numbers is 6.

(c) **—{(1,5),(2,4),(4,2),(5,1)}—/36=5/36**

(1 mark)　　(d) When a coin is flipped four times, there are at least two Heads.

(d) $P(X \leq 1) = 1/16 + 4/16 = 5/16$ **so** $P(X \geq 2) = 11/16$

3. Two dice are rolled. If the numbers shown are both even or both odd, then the dice are rolled again, otherwise we stop.

(1 mark)　　(a) Write the formula for the probability that there have been 5 throws when we stop.

(a) _____ $(1/2)^4(1/2) = (1/2)^5$ _____

(1 mark)　　(b) Write the formula for the probability that there have been n throws when we stop.

(b) _____ $(1/2)^{n-1}(1/2) = (1/2)^n$ _____

(1 mark)　　(c) Write the formula for the probability that there are n throws *and* on the n-th throw the sum is 7.

(c) _____ $(1/2)^{n-1}(1/6)$ _____

(1 mark)　　(d) Write the formula for the probability that the sum of the numbers on the last throw is 7.

(d) _____ $\sum_{n=1}^{\infty}(1/2)^{n-1}(1/6)$ _____

(1 mark)　　(e) Calculate the probability that there are at least 5 throws.

(e) $\sum_{n=5}^{\infty}(1/2)^n = (1/2)^5/(1 - (1/2)) = (1/2)^4$

4. In a quiz the number of students with various scores was as per the following table:

Marks	1	2	3	4	5
Number	10	30	100	20	40

Let X denote the random variable indicating the score of a randomly chosen student. Calculate the following:

(1 mark)　　(a) The mathematical expectation $E(X)$.

(a) $(1 \times 10 + 2 \times 30 + 3 \times 100 + 4 \times 20 + 5 \times 40)/200$

(1 mark)   (b) The most likely value of X.

(b) __3 since $P(X = 3) = 1/2$ is highest__

(1 mark)   (c) The largest score s so that $P(X \leq s) < 1/3$.

(c) __2 since $P(X \leq 2) = 1/5 < 1/3$ and $P(X \leq 3) = 13/2$__