Q-1)

Ans-1) No of students = 15

No of Questions = 8

P(No student has to answer more than one question)

Since order in which students are selected does not matter so we can say the expected out come will be $^{15}P_8 = \frac{15!}{(15-8)!}$

And our sample space would be 15^8 as each question can be asked by any of 15 students

So, our probability is given by

$$\frac{\frac{15!}{7!}}{15^8} = 0.10124$$

Ques2)

Ans-2)

The numbers which will meet our criteria will be three digit, four digit and five digit.

No of three digits meeting criteria $5 \cdot 4 \cdot 5 = 100$

No of four digits meeting criteria $= 5 \cdot 4 \cdot 7 \cdot 5 = 700$

No of five digits meeting criteria $= 5 \cdot 4 \cdot 7 \cdot 6 \cdot 5$
$= 4200$

Total No of digits meeting criteria :-
$100 + 700 + 4200 = 5000$

Total numbers of integers that are there are $\underline{10^5}$ from 00000 - 99999.

There are 8 numbers generated at random and 5 exactly meet criteria can be given by.

$P(\text{Getting required integer}) = \frac{5000}{10^5}$

$= 0.05$

So, it is a Binomial Distribution.

$P(K=5) = \binom{8}{5}(0.05)^5(0.95)^3$

$= 1.5004 \times 10^{-5}$.

Ques 3)

Ans 3)

Total no of combinations $= 6^3$

P (Two Dice showing 4 or above)

$$\binom{3}{2}\left(\frac{1}{2}\right)\times\left(\frac{1}{2}\right)\times\left(\frac{1}{2}\right) = \frac{3}{8}$$

P (Three dice showing 4 or above)

$$= \binom{3}{3}\left(\frac{1}{2}\right)\times\left(\frac{1}{2}\right)\times\left(\frac{1}{2}\right) = \frac{1}{8}$$

P(Atleast Two dice showing 4 or above) $= \frac{3}{8} + \frac{1}{8} = \frac{4}{8} = \frac{1}{2}$

$P(\text{All showing same number}) = \frac{6}{6^3}$

$= \frac{1}{36}$

$P(A \cap B) = P(\text{At least 2 showing 4 or more and all three are same})$

$P(A \cap B) = P(\text{All } 4) + P(\text{All } 5) + P(\text{All } 6)$

$= \frac{3}{6^3} = \frac{3}{216} = \frac{1}{72}$

$P(\text{At least 2 showing 4 or more}) = \frac{1}{2}$ ← 1

$P(\text{All same value 3 dice}) = \frac{1}{36}$ — ②

Product of Equation ① & ②
evaluates to $\frac{1}{72}$

Therefore,

$$P(A \cap B) = P(A) \cdot P(B)$$

Hence, these 2 events
are independent.

Ques-4)

Ans-4) A C S D

Let 'X' be a random variable such that it represents no of cards from same suit.

$$E(X) = \frac{1}{P(X)}$$

$$P(X=5) = \frac{\binom{13}{5}\binom{4}{1}}{\binom{52}{5}}$$

$$E(X) = \frac{\binom{52}{5}}{\binom{13}{5}\binom{4}{1}}$$

Ques-5)

Ans-5)

W → Wining
S → Superstar Plays

$$P(W \mid S) = 0.7$$

$$P(W \mid S^c) = 0.5$$

$$P(S) = 0.75$$

$$P(W\ 4\ \text{of}\ 5 \mid S\ \text{plays}\ 5)$$

$$= \binom{5}{4} (0.7)^4 (0.3)^1$$

$$= 5 \times 0.2401 \times 0.3$$

$$= 0.36015$$

$$P(\text{W 4 of 5} \mid \text{S not plays 5 games})$$

$$= \binom{5}{4}(0.5)^4(0.5)^1$$

$$= 5 \times (0.5)^5$$

$$= 0.15625$$

$$P(\underset{\text{plays 5}}{S} \mid \underset{\text{4 of 5 games}}{W}) = \frac{P(W|S)P(S)}{P(W)}$$

$$= \frac{P(W|S)P(S)}{P(W|S)P(S) + P(W|S^c) \cdot P(S^c)}$$

$$= \frac{0.36015 \times 0.75}{0.36015 \times 0.75 + 0.15625 \times 0.25}$$

$$= 0.874$$