2

~~Part B.~~

Question 2

Solution:

Sum of 2 has 1 way 1, 1

Sum of 3 has 2 ways 1, 2 and 2, 1

Sum of 4 has 3 ways 1, 3; 2, 2; 3, 1

5 has 4 ways

6 has 5 ways.

8 has 5 ways

9 has 4 ways

10 has 3 ways

11 has 2 ways

12 has 1 way.

Those are 15/36 for each side with a sum of 30/36

That leaves a $6/36 = 1/6$

probability for sum of 7.

Q5

The probability function for binomial random variable is

$$b(x,n,p) = \binom{n}{x} p^x (1-p)^{n-x}$$

This is the probabity having x successes in a series of n independent

$$E(x) = \sum_{x=0}^{n} x \binom{n}{x} p^x (1-p)^{n-x}$$

$$\sum_{x=0}^{n} x \frac{n!}{x!(n-x)!} p^x (1-p)^{n-x}$$

$$\sum_{x=1}^{n} \frac{n!}{(x-1)!(n-x)} p^x (1-p)^{n-x}$$

Since $x = 0$

Let $y = x-1$

$m = n-1$

Subbing $x = y+1$ and $n = m+1$

into the last sum

$$E(x) = \sum_{y=0}^{m} \frac{(m+1)!}{y!(m-y)} p^{y+1}(1-p)^{m-y}$$

$$= (m+1)p \sum_{y=0}^{m} \frac{m!}{y!(m-y)} p^{y}(1-p)^{m-y}$$

$$= np \sum_{y=0}^{m} \frac{m!}{y!(m-y)!} p^{y}(1-p)^{m-y}$$

The binomial theorm says that:

$$(a+b)^{m} = \sum_{y=0}^{m} \frac{m!}{y!(m-y)} a^{y} b^{m}-y$$

Setting $a=p$ $b=1-p$

$$\sum_{y=0}^{m} \frac{m!}{y!(m-y)} p^{y}(1-p)^{m-y} = \sum_{y=0}^{m} \frac{m!}{y!(m-y)}$$

$$a^{y} b^{m} = (a+b)^{m} = (p+1-p)^{m} = 1$$

so that

$$E(x) = np$$

Smilarly, but the time using $y = x-2$

$m = n-2$

$$E(x(x-1)) = \sum_{x=0}^{n} x(x-1)\binom{n}{x} p^x (1-p)^{n-x}$$

$$= \sum_{x=0}^{n} x(x-1)\frac{n!}{x!(n-x)!} p^x (1-p)^{n-x}$$

$$= \sum_{x=2}^{n} \frac{n!}{(x-2)!(n-x)} p^x (1-p)^{n-x}$$

$$= n(n-1)p^2 \sum_{x=2}^{n} \frac{(n-2)!}{(x-2)!(n-x)} p^{x-2}(1-p)^{n-x}$$

$$= n(n-1)p^2 \sum_{y=0}^{m} \frac{m!}{y!(m-y)} p^y (1-p)^{m-y}$$

$$= n(n-1)p^2 (p+(1-p))^m$$

$$= n(n-1)p^2$$

$$= n(n-1)p^2 (p+(1-p))^m$$

$$= n(n-1)p^2$$

So $E(x^2) - E(x)^2 = E(x(x-1)) + E(x) - E(x)^2 = n(n-1)p^2 + np - (np)^2 = np(1-p)$

Date:

Q4

Since the c_i's form a partition of the sample space we can apply the law of total probability for $A \cap B$

$$P(A \cap B) = \sum_{i=1}^{M} P(A \cap B / C_i)\, P(C_i)$$

$$P(A \cap B) = \sum_{i=1}^{M} P(A/C_i)\, P(B/C_i)\, P(C_i)$$

(A and B are conditionally independant)

$$P(A \cap B) = \sum_{i=1}^{M} P(A|C_i)\, P(B)(C_i)$$

= B is independent of all c_i's)

$$P(A \cap B) = P(B) \sum_{i=1}^{M} P(A|C_i)\, P(C_i)$$

$P(A \cap B)$, $P(B)P(A)$

(law of total probability)

Hence A and B are independent

①

Question 1

Solution:-

Let A be the event that the sum is 7

Let B the sum is odd

So,

A : (1,6), (2,5), (3,4), (4,3), (5,2), (6,1)

B : (1,2), (1,4), (1,6), (2,1), (2,3), (2,5) ... (6,1), (6,3), (6,5) and

$A \cap B$: (1,6), (2,5), (3,4), (4,3), (5,2), (6,1)

Now, there are 36 outcomes in all in tossing 2 fair dice, Hence

$P(A) = 6/36 = 1/6$ $P(B) = 18/36 = 1/2$

and $P(A \cap B) = 6/36 = 1/6$ so, $P(A/B)$

$= P(A \cap B) / P(B) = 1/3$

Q6

Date:

Bi-nomial Distribution.

A binomial distribution can be through of as simply the probability of a success or failure outcome in an experiment or survey that is repeated multiple times.

$$P(X=x)\ f(x) = {}^{n}C_{x}\, p^{x} q^{n-x}$$

Bi-nomial frequency Distribution.

If the binomial probability distribution is multiplied by N, the number of experiment or sets, the resulting distribution is known as

$$N\binom{n}{x} p^{x} q^{n-x}.$$

MWTFS Date: ....

M :- UMAIR

ID :- 5902

Electrical Department.

PROBABILITY :-

Abdul Wahab Paper

Date:

Q7

coefficient of variation

For Data Set A :-

$CV = 6/4 \times 100$

$CV = 3/45 \times 100$

$CV = 6.7$

For Data Set B :-

$CV = 11/60 \times 100$

$CV = 18.3$

For Data Set C

$CV = 5/50 \times 100$

$CV = 100$.

For Dat $CV = 15/5 \times 100$

$CV = 60$

3

Date:

Question # 3

$$\sum_{x=3}^{6} \binom{8}{x}\left(\frac{2}{3}\right)^{x}\left(\frac{1}{3}\right)^{8-x}$$

$$\binom{8}{3}\left(\frac{2}{3}\right)^{3}\left(\frac{1}{3}\right)^{5} + \binom{8}{4}\left(\frac{2}{3}\right)^{4}\left(\frac{1}{3}\right)$$

$$+ \binom{8}{5}\left(\frac{2}{3}\right)^{5}\left(\frac{1}{3}\right) + \binom{8}{6}\left(\frac{2}{3}\right)^{6}\left(\frac{1}{3}\right)^{2}$$

$$= \frac{8}{3^8}\left[56+140+224+224\right]$$

$$= \frac{8 \times 644}{6561} = \frac{5152}{6561} = 0.7852$$