WORKSHEET NO : 7

Q1] A die is thrown 1402 times. The frequencies for the outcomes 1, 2, 3, 4, 5 and 6 are given in the following table:

Outcome	1	2	3	4	5	6
Frequency	400	300	157	180	175	190

Find the probability of getting 6 as outcome:

a) 0.34
b) 0.135
c) 0.45
d) 0.78

ANS

Number of times outcome is 6 = 190

Probability of the outcome 6

= Number of times outcome is 6 / Total number of times the die is thrown

= 190/1402

= 0.1355206847360913

the probability of getting 6 as outcome:0.135

So the Answer is b) 0.135

Q2 A telephone directory page has 400 telephone numbers. The frequency distribution of their unit place digit (for example, in the number 25827689, the unit place digit is 9 is given in table below:
First row refers to the digits
Second row to their frequencies.

0	1	2	3	4	5	6	7	8	9
44	52	44	44	40	20	28	56	32	40

What will be the probability of getting a digit with unit place digit odd number that is 1, 3,5,7,9?
a) 0.67
b) 0.60
c) 0.45
d) 0.53
ANS

the probability of getting a digit with unit place digit odd number that is 1, 3,5,7,9

= 52 + 44 + 20 + 56 + 40

=212

Total phone no of phone directory =400 numbers

So the probability of getting a digit with unit place digit odd number that is 1, 3,5,7,9

= 212/400

= 0.53

So the Answer is d) 0.53

Q3 A tyre manufacturing company which keeps a record of the distance covered before a tyre needed to be replaced. The table below shows the results of 1100 cases.

Distance (Miles)	<4000	4000-9000	9001-14000	>14000
Frequency	20	260	375	445

If we buy a new tyre of this company, what is the probability that the tyre will last more than 9000 miles?

a) 0.67
b) 0.459
c) 0.745
d) 0.73

ANS

Probability that it will last more than 9000km=

= Frequency / Number of cases

= (375 + 445) / 1100

= 820 / 1100

= 0.7454545454545455

the probability that the tyre will last more than 9000 miles is 0.745

So the Answer is C) 0.745

Q4Please refer to the case and table given in the question No. 3 and determine what is the probability that if we buy a new tyre then it will last in the interval [4000-14000] miles?

a) 0.56

b) 0.577

c) 0.745

d) 0.73

ANS

the probability that if we buy a new tyre then it will last in the interval [4000-14000] miles =

= Frequency / Number of cases

= (260 + 375) / 1100

= 635 / 1100

= 0.5772727272727273

the probability that if we buy a new tyre then it will last in the interval [4000-14000] miles is 0.577

So the Answer is b) 0.577

Q5 We have a box containing cards numbered from 0 to 9. We draw a card randomly from the box. If it is told to you that the card drawn is greater than 4 what is the probability that the card is odd?

a) 0.5

b) 0.8

c) 0.6

d) 0.7

ANS

we know that the card drawn is greater than 4, then there are only five possible outcomes: 5, 6, 7, 8, or 9.

Out of these five outcomes, three are odd (5, 7, and 9) and two are even (6 and 8).

Therefore, the probability that the card drawn is odd, given that it is greater than 4

= Total How many Odd Numbers / Total Possible Outcomes

= 3 / 5

= 0.6

So the Answer is c) 0.6

Q6 We have a box containing cards numbered from 1 to 8. We draw a card randomly from the box. If it is told to you that the card drawn is less than 4 what is the probability that the card is even?

a) 0.33
b) 0.40
c) 0.56
d) 0.89

ANS

we know that the card drawn is less than 4, then there are only three possible outcomes: 1, 2, or 3.

Out of these three outcomes, one is even (2) and two are odd (1 and 3).

Therefore, the probability that the card drawn is even, given that it is less than 4

= Total How many even numbers / Total Possible outcomes

= 1 / 3

= 0.3333333333333333

So the answer is a) 0.33

Q7 A die is thrown twice and the sum of the numbers appearing is observed to be 7. What is the conditional probability that the number 6 has appeared at least on one of the die?

a) 0.45
b) 0.37
c) 0.33
d) 0.89

ANS

Let A be the set that the sum of the numbers appearing on top be 7

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

Let B be the set that the number 6 has appeared at least once.

B = (1,6) (2,6) (3,6) (4,6) (5,6) (6,6) (6,1) (6,2) (6,3) (6,4) (6,5)

a set that contains elements that are common in both sets A and B.

A intersection B = (1,6) (6,1)

probability that the number 6 has appeared at least on one of the die

P(B / A) = Number of A intersection B / Total Number of A

= 2 / 6

= 1 / 3

= 0.3333333333333333

So the Answer is c) 0.33

Q8 Consider the experiment of tossing a coin. If the coin shows tail, toss it again but if it shows head, then throw a die. Find the conditional probability of the event that ‘the die shows a number greater than 4’ given that ‘there is at least one Head’.

a) 0.1
b) 0.22
c) 0.38
d) 0.45

ANS

The sample space of experiment may be described as

S=(H,H),(H,T),(H,1),(H,2)(H,3)(H,4)(H,5)(H,6)

where (H,H) denotes that both the tosses result into head and (H,i) denote the first toss result into a head and the number 'i' appeared on the die for i=1,2,3,4,5,6.

Thus, the probabilities assigned to 8 elementary events are

1/4 , 1/4 , 1/12 , 1/12 , 1/12 , 1/12 , 1/12 , 1/12

Let F be the event that 'there is atleast one head' and E be the event 'the die shows a number greater than 4'. Then,

F=(H,T),(H,1),(H,2),(H,3),(H,4),(H,5),(H,6)

E=(H,5),(H,6) and E∩F=(H,5),(H,6)

Now, P(F)=P((H,T))+P((H,1))+P((H,2))+P((H,3))+P((H,4))+P((H,5))+P((H,6))

= 1/4 + 1/12 + 1/12 + 1/12 + 1/12 + 1/12 + 1/12

and P(E∩F)=P({(T,5)})+P({(T,6)})

= 1/12 + 1/12

= 1/6

Hence, P(E|F) = P(E∩F) / P(F)

= (1/6) / (3/ 4)

= 2/9

= 0.2222222222222222

So the Answer is b) 0.22

Q9 There are three persons Evan, Ross and Michelle. These people lined up randomly for a picture. What is the probability of Ross being at one of the ends of the line?

a) 0.66

b) 0.45

c) 0.23

d) 0.56

ANS

There are three possible positions for Ross in the line: at the beginning, in the middle, or at the end. Since there are no restrictions on the positions of the other two people, the probability of Ross being at one of the ends of the line is equal to the probability of Ross being at the beginning or at the end of the line.

The probability of Ross being at the beginning of the line = 1/3

Similarly, the probability of Ross being at the end of the line = 1/3.

Therefore, the probability of Ross being at one of the ends of the line is:

P(Ross at one of the ends) = P(Ross at the beginning) + P(Ross at the end)

= (1/3) + (1/3)

= 2/3

= 0.6666666666666667

So the Answer is a) 0.66

Q10 Let us make an assumption that each born child is equally likely to be a boy or a girl. Now suppose, if a family has two children, what is the conditional probability that both are girls given that at least one of them is a girl?
a) 0.33
b) 0.45
c) 0.56
d) 0.26
ANS

There are four equally likely possibilities when a family has two children:

1] The first child is a boy and the second child is a boy (BB)

2] The first child is a boy and the second child is a girl (BG)

3] The first child is a girl and the second child is a boy (GB)

4] The first child is a girl and the second child is a girl (GG)

Since each child is equally likely to be a boy or a girl, the above four possibilities are also equally likely.

Therefore, the conditional probability that both children are girls given that at least one of them is a girl is:

P(both are girls | at least one is a girl) = P(GG | BG or GB or GG)

= (1/3) / (1/3 + 1/3 + 1/3)

= (1/3) / (1)

= 0.3333333333333333

So the answer is a) 0.33

Q11 Consider the same case as in the question no. 10. It is given that elder child is a boy. What is the conditional probability that both children are boys?
a) 0.33
b) 0.23
c) 0.5
d) 0.76
ANS

the conditional probability that both children are boys given that the elder child is a boy is:

P(both are boys | elder is a boy) = P(BB | BG or BB or GB)

= P(BB) / P(BG or BB or GB)

= 1/3 / (1/3 + 1/3)

= 1/2

= 0.5

So the answer is c) 0.5

Q12 We toss a coin. If we get head, we toss a coin again and if we get tail we throw a die. What is the probability of getting a number greater than 4 on die?
a) 0.166
b) 0.34
c) 0.78
d) 0.34
ANS

The probability of getting a tail on the first coin toss is 1/2,

if we get a tail, the probability of getting a number greater than 4 on the die

= 2/6

= 1/3.

= 0.333333333

Therefore, the probability of getting a number greater than 4 on the die

= P(number > 4) = P(getting tail) * P(number > 4 | getting tail)

= (1/2) * (1/3)

= 1/6

= 0.1666666666666667

So the Answer is a) 0.166

Q13 We toss a coin. If we get head, we toss a coin again and if we get tail we throw a die. What is the probability of getting an odd number on die?
a) 0.345
b) 0.79
c) 0.2
d) 0.25
ANS

The probability of getting a tail on the first coin toss = 1/2

if we get a tail, the probability of getting an odd number on the die

= 3/6

= 1/2

Therefore, the probability of getting an odd number on the die

= P(odd number) = P(getting tail) * P(odd number | getting tail)

= (1/2) * (1/2)

= 1/4

= 0.25

So the answer is d) 0.25

Q14 Suppose we throw two dice together. What is the conditional probability of getting sum of two numbers found on the two die after throwing is less than 4, provided that the two numbers found on the two die are different?

a) 0.3

b) 0.56

c) 0.24

d) 0.06

ANS

When two dice are thrown, there are 36 equally likely outcomes.

Let A be the event that the sum of the two numbers is less than 4

and B be the event that the two numbers are different.

The number of outcomes in which the sum of the two numbers is less than 4 = 0

because the minimum sum that can be obtained on two dice = 2.

If the two numbers are different, then there are 30 outcomes in which the sum of the two numbers is greater than or equal to 4, and the probability of each of these outcomes = 1/36.

Therefore, the probability of getting a sum greater than or equal to 4 given that the two numbers are different is:

$P(A' | B) = P(A' \cap B) / P(B)$

= (30/36) / (30/36 + 0)

= 1

Therefore, the conditional probability of getting a sum of two numbers less than 4 given that the two numbers are different is 0

So the answer is d) 0.06

Q15 A box contains three coins: two regular coins and one fake two-headed coin, you pick a coin at random and toss it. What is the probability that it lands heads up?

a) 1/3
b) 2/3
c) 1/2
d) 3/4

ANS

Let H be the event that the coin lands heads up.

We need to find the probability of H given that we picked a coin at random from the box.

Let R1 be the event that we picked one of the regular coins

R2 be the event that we picked the fake two-headed coin.

Then, by the law of total probability:

$P(H) = P(H \mid R1)P(R1) + P(H \mid R2)P(R2)$

Since the regular coins are fair, $P(H \mid R1) = 1/2$, and $P(R1) = 2/3$

Since the fake two-headed coin always lands heads up, $P(H \mid R2) = 1$, and $P(R2) = 1/3$

Therefore:

$P(H) = (1/2)(2/3) + (1)(1/3)$

$= 2/3$

So the Answer is b) 2/3