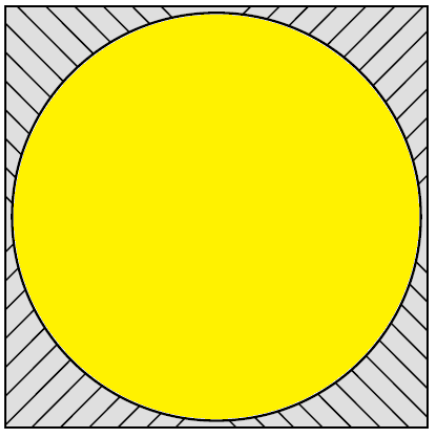
MATHEMATICS
WORKSHEET_110725
CHAPTER 14 PROBABILITY (ANSWERS)

SUBJECT: MATHEMATICS STANDARD **MAX. MARKS : 40**
CLASS : X **DURATION : 1½ hrs**

General Instructions:
(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A
Questions 1 to 10 carry 1 mark each.

1. There is a square board of side '2a' units circumscribing a yellow circle. Jayadev is asked to keep a dot on the above said board. The probability that he keeps the dot on the shaded region is:
(a) $\pi/4$ (b) $(4-\pi)/4$ (c) $(\pi-4)/4$ (d) $4/\pi$



Ans. (b) $(4-\pi)/4$
Area of square = $(2a)^2 = 4a^2$
Area of circle = $\pi r^2 = \pi a^2$
Difference = $4a^2 - \pi a^2 = a^2(4-p)$
Required probability = Favourable outcomes/Sample space
$= a^2(4-p)/4a^2 = (4-\pi)/4$

2. If a card is drawn from a deck of cards, what is the probability of a card drawn to be a red or a black card and what can we say about that event?
(a) 1 and it is a sure event. (b) 0 and it is a sure event.
(c) 1 and it is an impossible event. (d) 0 and it is an impossible event.
Ans. (a) 1 and it is a sure event

3. In an MCQ test, a student guesses the correct answer x out of y times. If the probability that the student guesses the answer to be wrong is 2/3 then what is the relation between x and y
(a) y = 3x (b) x = 3y (c) 3x = 2y (d) 2x = 3y
Ans. (a) y = 3x
According to the given information, P(wrong) = 2/3
The probability of guessing the correct answer is the compliment of the probability of guessing wrong answer.
P(correct) = 1 – P(wrong) = 1 – (2/3)

P(correct) = 1/3
Now, the probability of guessing the correct answer P(correct) is the ratio of the number of correct (guesses) (x) to the total number of guesses (y)
P(correct) = x/y
$\therefore$ x/y = 1/3 $\Rightarrow$ 3x = y $\Rightarrow$ y = 3x

4. If a letter is chosen at random from the letters of English alphabets, then the probability that it is a letter of the word 'MATHEMATICS' is:
(a) 4/13 (b) 9/26 (c) 5/13 (d) 11/26
Ans. (a) 4/13
Total number of letters in English alphabets = 26
Unique letters in the word MATHEMATICS = {M, A, T, H, E, I, C, S}
$\Rightarrow$ Number of unique letters = 8
$\therefore$ Required probability = 8/26 = 4/13

5. Cards numbered 7 to 40 were put in a box. Anish selects a card at random. What is the probability that the selected card is a multiple of 7?
(a) 7/34 (b) 5/34 (c) 6/35 (d) 7/35
Ans. (b) 5/34
Total possible outcomes = 34
Favourable outcomes (Card is a multiple of 7) = 5 (7, 14, 21, 28, 35)
P(card being a multiple of 7) = Favourable outcomes/Total possible outcomes
= 5/34

6. A bowl contains 3 red and 2 blue marbles.
Roohi wants to pick a red marble. Which of the following changes could she make so that the probability of picking a red marble is greater than it was before?
(i) Adding a red marble
(ii) Removing a blue marble
(iii) Adding 1 red and 1 blue marble
(a) Only (i) (b) Only (i) and (ii) (c) Only (i) and (iii) (d) All of the above
Ans. (b) Only (i) and (ii)
Given, a bowl contains 3 red marbles and 2 blue marbles
Total number of outcomes = 5
P(picking a red marble) = 3/5
(i) On adding a red marble, Red marbles = 4
Blue marbles = 2
P(picking a red marble) = 4/6
(ii) On removing a blue marble, Red marbles = 3
Blue marbles = 1
P(picking a red marble) = 3/4
(iii) On adding 1 red marble and 1 blue marble, Red marbles = 4
Blue marbles = 3
P(picking a red marble) = 4/7
Thus, on adding a red marble and removing a blue marble, the probability will be greater than it was before.

7. A dice is thrown twice. The probability of getting 4, 5 or 6 in the first throw and 1, 2, 3 or 4 in the second throw is:
(a) 1/3 (b) 2/3 (c) 1/2 (d) 1/4
Ans. (a) 1/3
Total number of outcomes on throwing a dice twice = 36
Here, favourable outcomes = {(4, 1), (4, 2), (4, 3), (4, 4), (5, 1), (5, 2), (5, 3), (5, 4), (6, 1), (6, 2), (6, 3), (6, 4)}
$\therefore$ Number of favourable outcomes = 12

∴ Required probability = 12/36 = 1/3

8. A school has five houses A, B, C, D and E. A class has 23 students, 4 from house A, 8 from house B, 5 from house C, 2 from house D and the rest from house E. A single student is selected at random to be the class monitor. The probability that the selected student is not from houses A, B and C is:
(a) 4/23 (b) 6/23 (c) 8/23 (d) 17/23
Ans. (b) 6/23
Total no. of students = 23
No. of students from houses A, B and C = 4 + 8 + 5 = 17
∴ Remaining no. of students = 23 – 17 = 6
∴ Required probability = No. of students, not from A, B and C / Total no. of students houses
= 6/23

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

9. Assertion (A): The probability that a leap year has 53 Sundays is 2/7.
Reason (R): The probability that a non–leap year has 53 Sundays is 5/7.
Ans. (c) Assertion (A) is true but Reason (R) is false.

10. Assertion (A): The probability of getting a bad egg in a lot of 400 is 0.035. The number of good eggs in the lot is 386.
Reason (R): If the probability of an event is p, the probability of its complementary event will be 1 – p.
Ans. (a) Both (A) and (R) are true and (R) is the correct explanation of (A).

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Cards, marked with numbers 5 to 50, are placed in a box and mixed thoroughly. A card is drawn from the box at random. Find the probability that the number on the taken card is
(*i*) a prime number less than 10. (*ii*) a number which is a perfect square.
Ans. Total no. of cards = 46
Total no. of ways to select a card = 46
(*i*) Prime no. less than 10 in these cards are 5, 7
∴ No. of ways to select a prime no. less than 10 = 2.
∴ Probability that the number on the card is prime = 2/46 = 1/23
(*ii*) No. which is a perfect square, i.e. 9, 16, 25, 36, 49.
No. of ways to select a card with perfect square = 5.
∴ Probability = 5/46

12. The king, queen and jack of diamonds are removed from a pack of 52 cards and then the pack is well shuffled. A card is drawn from the remaining cards. Find the probability of getting a card of (*i*) diamonds, (*ii*) a jack
Ans. Total number of cards in the deck = 52
Number of cards removed = 3 [king, Queen & Jack of diamonds]
Number of cards remaining = 52 – 3 = 49
(*i*) Number of diamonds left = 13 – 3 = 10 [as 3 diamonds have been removed]
∴ Probability of drawing a diamond = 10/49
(*ii*) Number of jacks left = 4 – 1 = 3 [as jack of diamond has been removed]
Probability of drawing a jack = 3/49

13. Two different dice are tossed together. Find the probability
(*i*) that the number on each dice is even
(*ii*) that the sum of numbers appearing on two dice is 5.
Ans. Two different dice are tossed. Therefore, total outcomes are 36.
(*i*) Favourable outcomes for even number on both dice = 9, (2, 2), (2, 4), (2, 6), (4, 2), (4, 4), (4, 6), (6, 2), (6, 4), (6, 6)
∴ Probability of getting even number on both dice = 9/36 = 1/4
(*ii*) Favourable outcomes that the sum of the numbers appearing in two dice is 5 are (1, 4), (2, 3), (3, 2), (4, 1), i.e. 4.
∴ Probability of getting sum of numbers appearing on two dice is 5 = 4/36 = 1/9

14. Find the probability that a leap year should have exactly 52 tuesday.
Ans. Number of days in a leap year = 366, Number of weeks = 52
∴ Number of tuesdays in 52 weeks = 52
Number of days left after 52 weeks = 366 – 52 × 7 = 2.
Now, exactly 52 tuesday mean there should not be a tuesday in the remaining 2 days
Possible outcome of remaing two days
(Monday, Tuesday), (Tuesday, Wednesday), (Wednesday, Thursday), (Thursday, Friday), (Friday, Saturday), (Saturday, Sunday) or (Sunday, Monday)
Total possible outcome = 7
Probability of not getting a Tuesday = 5/7
∴ Probability of getting exactly 52 Tuesday = 5/7

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. A bag contains 12 balls out of which x are white.
(*i*) If one ball is drawn at random, what is the probability that it will be a white ball?
(*ii*) If 6 more white balls are put in the bag, the probability of drawing a white ball will be double than that in (*i*). Find *x.*
Ans. $n(S) = 12$

(*i*) Let A be the event of drawing a white ball $n(A) = x$, $P(A) = \frac{x}{12}$

(*ii*) Number of white balls = $x + 6$
Total number of balls = 12 + 6 = 18.
Let B be the event of drawing a white ball

∴ $n(B) = x + 6$, $P(B) = \frac{x+6}{18}$

According to the question, P(B) = 2P(A)

$\Rightarrow \frac{x+6}{18} = 2 \times \frac{x}{12}$

$\Rightarrow 6x + 36 = 18x$

$\Rightarrow 12x = 36 \Rightarrow x = 3$

16. One card is drawn from a well shuffled deck of 52 cards. Find the probability of getting
(i) a face card or a black card
(ii) neither an ace nor a king
(iii) a jack and a black card
Ans. Total number of playing cards = 52
(*i*) Favourable cases for a face card or a black card are 32 (12 + 26 – 6)
∴ Probability of drawing a king or a jack = 32/52 = 8/13
(*ii*) Favourable cases for neither ace nor king card are 44 (52 cards – 4 aces – 4 king)

∴ Probability of drawing a non-ace = 44/52 = 11/13
(*iii*) Favourable cases for jack and black card are 2
∴ Probability of drawing a red card = 2/52 = 1/26

17. Two different dice are thrown together. Find the probability that the numbers obtained:
(a) have a sum less than 7
(b) have a product less than 16
(c) is a doublet of odd numbers.
Ans. The outcomes when two dice are thrown together, are:
(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6),
(2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6),
(3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6),
(4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6),
(5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6),
(6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6),
∴ Total number of outcomes = 36
(a) Favourable outcomes are (1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (2, 1), (2, 2), (2, 3), (2, 4), (3, 1), (3, 2), (3, 3), (4, 1), (4, 2) and (5, 1).
∴ Number of favourable outcomes = 15
∴ Required probability = 15/36 = 5/12
(b) Favourable outcomes are (1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (4, 1), (4, 2), (4, 3), (5, 1), (5, 2), (5, 3), (6, 1) and (6, 2).
∴ Number of favourable outcomes = 25
∴ Required probability = 25/36
(c) Favourable outcomes are (1, 1), (3, 3) and (5, 5)
∴ Number of favourable outcomes = 3
∴ Required probability = 3/36 = 1/12

SECTION – D

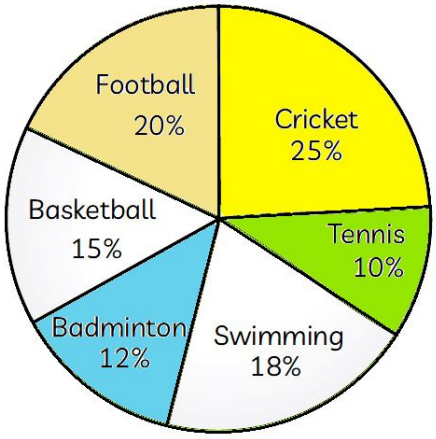
Questions 18 carry 5 marks.

18. From a pack of 52 playing cards, Jacks and Kings of red colour and Queens and Aces of black colour are removed. The remaining cards are mixed and a card is drawn at random. Find the probability that the drawn card is:
(a) a black queen.
(b) a card of red colour.
(c) a Jack of black colour.
(d) a face card.
Ans. Number of cards removed = (2 + 2 + 2 + 2) = 8
Total number of remaining cards = (52 – 8) = 44
Now, there are 2 jacks, 2 kings of black colour and 2 queens, 2 aces of red colour left.
(a) Number of black queens = 0
∴ P(getting a black queen) = 0/44 = 0
(b) Number of red cards = 26 – 4 = 22
∴ P(getting a red card) = 22/44 = 1/2
(c) Number of jacks of black colour = 2
∴ P(getting a black jack) = 2/44 = 1/22
(d) We know that jacks, queens and kings are face cards.
∴ Number of remaining face cards = (2 + 2 + 2) = 6
∴ P(getting a face card) = 6/44 = 3/22

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. A school offers several sports to its students such as cricket, football, basketball, tennis, badminton and swimming. Based on past records, the sports teacher prepared a pie chart as shown below showing preference of students towards a particular sport.



(a) Find the probability of favourite sport being either swimming or badminton.
(b) Find the probability of favourite sport being neither football nor cricket.
(c) Find the probability of favourite sport being basketball, tennis or cricket.
Ans. (a) 18% students prefer swimming and 12% prefer badminton. Therefore, percentage of students showing preference for swimming or badminton = 30%.
Hence, probability of favourite sport being either swimming or badminton = 30/100 = 3/10.
(b) The preference for cricket is 25% and for football is 20%. Therefore, preference for either cricket or football is 25% + 20% i.e., 45%.
That means the preference for neither cricket nor football is (100 – 45)% i.e., 55%.
Hence, Probability of favourite sport being neither football nor cricket = 55/100 = 11/20
(c) 15% students prefer basketball, 10% students prefer tennis while 25% students prefer cricket.
Therefore, percentage of students showing preference for basketball, tennis or cricket = 15% + 10% + 25% = 50%
Hence, probability of favourite sport being basketball, tennis or cricket = 50/100 = ½

20. Two friends are travelling in a bus. They were feeling bored, so they started playing a game with a pair of dice that one of them had. Each of them started rolling the pair of dice one by one, stating one condition before rolling. If the person gets the numbers according to the condition stated by him, he wins and get a score.

Based on the above information, answer the following questions.
(i) (a) First friend says, “a doublet”. What is the probability of his winning? (1)
(b) Second friend says, ‘‘sum less than 9’’. What is the probability of his winning? (1)
(ii) (a) First one says, “6 will come up either time.” What is the probability of his winning? (1)
(b) Second one says, “sum is an even number”. What is the probability of his losing? (1)
Ans. (i) (a) Number of doublets are {(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)} i.e., 6.
Total possible events = 36
∴ P(E) = 6/36 = 1/6
(b) Possible cases of sum less than 9 are {(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6) (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6) (3, 1), (3, 2), (3, 3), (3, 4), (3, 5) (4, 1), (4, 2), (4, 3), (4, 4) (5, 1), (5, 2), (5, 3) (6, 1), (6, 2)} i.e., 26.
∴ P(E) = 26/36 = 13/18
(ii) (a) Possible cases when 6 will come up either time are {(1, 6), (2, 6), (3, 6), (4, 6), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)} i.e., 11.

Number of favourable outcomes = 11.
∴ P(E) = 11/36
(b) Possible cases for which sum is an even number are {(1, 1), (1, 3), (1, 5), (2, 2), (2, 4), (2, 6), (3, 1), (3, 3), (3, 5), (4, 2), (4, 4), (4, 6), (5, 1), (5, 3), (5, 5), (6, 2), (6, 4), (6, 6)} i.e., 18.
∴ P(E) = 18/36 = 1/2
Probability of his losing is 1/2