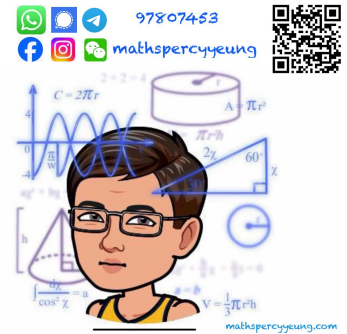


# Chapter 7 Introduction to Probability

## Multiple Choice Section

1. When a fair dice is tossed, find the probability of getting the number 5 or 6.

- A. 2
- B.  $\frac{1}{2}$
- C.  $\frac{1}{3}$
- D.  $\frac{1}{6}$



2. In tossing a fair dice, find the probability of getting a number greater than 5.

- A.  $\frac{1}{6}$
- B.  $\frac{1}{3}$
- C.  $\frac{1}{2}$
- D.  $\frac{5}{6}$

3. A bag contains 12 cards which are marked with numbers from 1 to 12. If a card is drawn at random, what is the probability of getting a multiple of 12?

- A.  $\frac{1}{2}$
- B.  $\frac{1}{6}$
- C.  $\frac{1}{12}$
- D. 0

4. A number is chosen at random from 1 to 1 000. Find the probability of getting a multiple of 10.

- A.  $\frac{1}{10}$

B.  $\frac{1}{50}$

C.  $\frac{1}{100}$

D.  $\frac{1}{500}$

5. A letter is chosen at random from the sentence "MATHEMATICS IS THE BEST". What is the probability of getting a letter I?

A.  $\frac{1}{5}$

B.  $\frac{1}{10}$

C.  $\frac{3}{20}$

D.  $\frac{1}{20}$

6. Mary tossed a fair coin for 21 times. The numbers of tails and heads gotten were 7 and 14 respectively. Find the probability that Mary will get a tail in the next toss.

A.  $\frac{1}{6}$

B.  $\frac{1}{4}$

C.  $\frac{1}{3}$

D.  $\frac{1}{2}$

7. A card is drawn at random from a pack of 52 playing cards (without Jokers). What is the probability of getting a card which is neither a 6 nor a heart?

A.  $\frac{2}{13}$

B.  $\frac{8}{13}$

C.  $\frac{9}{13}$

D.  $\frac{5}{26}$

8. In the English Club of a school, the ratio of the numbers of boys to girls is 1 : 6. If a student is chosen at random, find the probability that the student is a girl.

A.  $\frac{6}{7}$

B.  $\frac{1}{6}$

C.  $\frac{1}{5}$

D. It cannot be found.

9. A bag contains 6 white balls and 5 black balls. If a black ball is drawn without replacement and then a white ball is drawn without replacement, what is the probability of getting a white ball at random in the third draw?

A.  $\frac{4}{9}$

B.  $\frac{5}{9}$

C.  $\frac{5}{11}$

D.  $\frac{6}{11}$

10. Which of the following cannot be the probability of an event?

I. 1

II. 0

III. -1

IV.  $\frac{2}{37}$

V.  $\frac{1}{\sqrt{19}}$

VI. 3

A. III only

B. III and VI only

C. IV, V and VI only

D. I, II, III, IV, V and VI

11. A bag contains 6 red balls (R), 5 black balls (B), 7 green balls (G) and 8 white balls (W). If a ball is drawn at random, find the probability that the ball drawn is red or black.

- A.  $\frac{5}{26}$
- B.  $\frac{7}{26}$
- C.  $\frac{11}{26}$
- D.  $\frac{13}{26}$

12. There are some drinks in a refrigerator, 10 of them are chrysanthemum tea (C). If a drink is taken at random, the probability of taking a chrysanthemum tea is  $\frac{5}{11}$ . What is the total number of drinks in the refrigerator?

- A. 12
- B. 17
- C. 22
- D. 34

13. There are 10 cups of vanilla ice-cream (V) and  $x$  cups of chocolate ice-cream (C) in a refrigerator. If a cup of ice-cream is drawn at random, the probability of getting vanilla ice-cream is  $\frac{2}{7}$ , find the value of  $x$ .

- A. 15
- B. 25
- C. 35
- D. 45

14. Two fair dice are tossed. What is the probability of getting two 7?

- A. 0
- B.  $\frac{1}{36}$
- C.  $\frac{1}{12}$
- D.  $\frac{1}{4}$

15. A dice was tossed many times and the results are recorded as follows:

|                  |     |     |     |     |     |     |
|------------------|-----|-----|-----|-----|-----|-----|
| <b>Number</b>    | 1   | 2   | 3   | 4   | 5   | 6   |
| <b>Frequency</b> | 185 | 187 | 266 | 165 | 200 | 197 |

What is the experimental probability of getting a 5?

- A.  $\frac{1}{6}$
- B.  $\frac{1}{7}$
- C.  $\frac{7}{200}$
- D.  $\frac{200}{1999}$

16. A dice was tossed many times and the results are recorded as follows:

|                  |    |    |    |    |     |    |
|------------------|----|----|----|----|-----|----|
| <b>Number</b>    | 1  | 2  | 3  | 4  | 5   | 6  |
| <b>Frequency</b> | 80 | 91 | 79 | 67 | 101 | 82 |

What is the experimental probability of getting a number less than 2?

- A.  $\frac{21}{25}$
- B.  $\frac{4}{25}$
- C.  $\frac{41}{250}$
- D.  $\frac{91}{500}$

17. Two dice were tossed many times. The sums of the two numbers obtained are recorded as follows:

|                  |    |    |    |    |    |    |    |    |    |    |    |
|------------------|----|----|----|----|----|----|----|----|----|----|----|
| <b>Sum</b>       | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 |
| <b>Frequency</b> | 28 | 34 | 45 | 14 | 20 | 18 | 10 | 19 | 17 | 20 | 25 |

What is the experimental probability that the sum was 9?

- A.  $\frac{17}{250}$
- B.  $\frac{19}{250}$

C.  $\frac{9}{125}$

D.  $\frac{9}{231}$

18. A basket contains 18 eggs and 3 of them are rotten. Based on the above information, how many rotten eggs do you expect to have among 144 eggs?

- A. 3
- B. 24
- C. 144
- D. It cannot be found.

19. The table below shows the weights of a group of students. If the weight of a student is less than 54.5 kg, the student is underweighted. Find the experimental probability of the under weighted students among the group.

|                           |         |         |         |         |         |         |         |
|---------------------------|---------|---------|---------|---------|---------|---------|---------|
| <b>Weight (kg)</b>        | 40 – 44 | 45 – 49 | 50 – 54 | 55 – 59 | 60 – 64 | 65 – 69 | 70 – 74 |
| <b>Number of students</b> | 17      | 18      | 9       | 5       | 3       | 2       | 1       |

A.  $\frac{7}{65}$

B.  $\frac{1}{5}$

C.  $\frac{4}{5}$

D.  $\frac{49}{55}$

20. A bag contains 36 balls which are yellow, red and white. A ball is drawn from the bag at random with replacement. After many times of drawing, the records are as follows:

|                  |        |      |       |
|------------------|--------|------|-------|
| <b>Colour</b>    | Yellow | Red  | White |
| <b>Frequency</b> | $5x$   | $3x$ | $4x$  |

Estimate the number of yellow balls in the bag.

- A. 15
- B. 30
- C. 45

D. 600

21. Two fair dice are tossed together. Find the probability that the sum is greater than 11.

A. 0

B.  $\frac{1}{36}$

C.  $\frac{1}{18}$

D.  $\frac{1}{12}$

22. Two fair dice are tossed together. Find the probability that the sum is a multiple of 8.

A.  $\frac{1}{36}$

B.  $\frac{5}{36}$

C.  $\frac{1}{6}$

D.  $\frac{1}{4}$

23. Bag *A* contains 6 cards which are marked with numbers from 1 to 6. Bag *B* contains 4 cards which are marked with numbers from 1 to 4. If a card is drawn from each bag at random, find the probability that the sum of the numbers obtained is greater than 8.

A.  $\frac{1}{6}$

B.  $\frac{1}{8}$

C.  $\frac{1}{24}$

D.  $\frac{1}{36}$

24. A fair coin and a fair dice are tossed together. Find the probability of getting a head and a multiple of 3.

A.  $\frac{1}{3}$

B.  $\frac{1}{4}$

C.  $\frac{1}{6}$

D.  $\frac{1}{12}$

25. Bookcase  $A$  contains 6 Mathematics books ( $M_1, M_2, M_3, M_4, M_5$  and  $M_6$ ) and 4 English books ( $E_1, E_2, E_3$  and  $E_4$ ). Bookcase  $B$  contains 1 Mathematics book ( $M$ ) and 1 English book ( $E$ ). If a book is chosen at random from each bookcase, find the probability that both are Mathematics books.

A.  $\frac{1}{10}$

B.  $\frac{1}{5}$

C.  $\frac{3}{10}$

D.  $\frac{3}{5}$

26. There are 1 pair of red socks ( $R_1$  and  $R_2$ ), 1 pair of yellow socks ( $Y_1$  and  $Y_2$ ) and 1 pair of white socks ( $W_1$  and  $W_2$ ) in the drawer. If two socks are chosen together at random, find the probability that both socks are same in colour.

A.  $\frac{1}{5}$

B.  $\frac{1}{6}$

C.  $\frac{1}{9}$

D.  $\frac{1}{12}$

27. Mrs. Chan has 4 children. Find the probability that the first child is a girl, the second child is a girl, the third child is a girl and the fourth child is a boy.

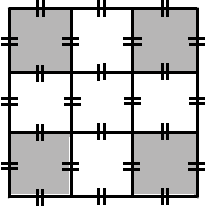
A.  $\frac{1}{2}$

B.  $\frac{1}{4}$



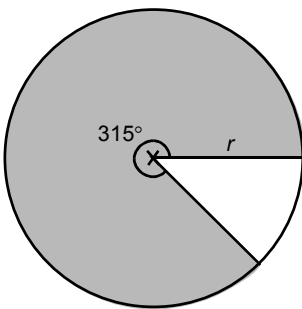
- C.  $\frac{1}{8}$
- D.  $\frac{1}{16}$

28. If a dart, assuming that it will not hit on any boundary lines, randomly hits the following figure at any position, find the probability that the dart hits the shaded region.



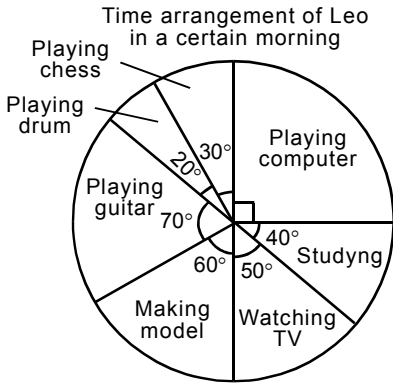
- A.  $\frac{4}{27}$
- B.  $\frac{2}{9}$
- C.  $\frac{1}{3}$
- D.  $\frac{4}{9}$

29. If a dart, assuming that it will not hit on any boundary lines, randomly hits the following figure at any position, find the probability that the dart hits the shaded region.



- A.  $\frac{7}{8}$
- B.  $\frac{7\pi}{8}$
- C.  $\frac{7r}{8}$
- D.  $\frac{7r}{4}$

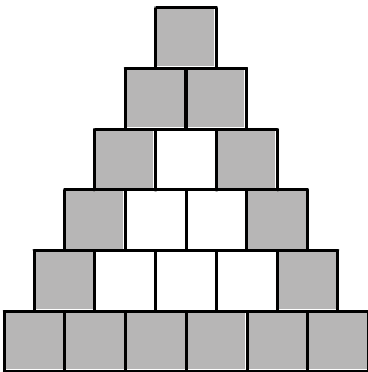
30. The time arrangement of Leo in a certain morning is shown as follows:



If Janet called Leo that morning, find the probability that Leo was playing chess at that moment.

- A.  $\frac{1}{3}$
- B.  $\frac{1}{5}$
- C.  $\frac{1}{6}$
- D.  $\frac{1}{12}$

31. The figure shows a dartboard which is divided into 21 equal squares. 7 marks is scored for hitting the shaded region and 3.5 marks for white region. If a dart, assuming that it will not hit on any boundary lines, hits the dartboard randomly, what is the expected score of each throw?



- A. 3.5 marks
- B. 4 marks
- C. 6 marks
- D. 7 marks

32. There are 3 brands of noodles on the shelf of a supermarket. 40% of them are Brand A noodles, 25% are Brand B noodles and 35% are Brand C noodles. The prices of each pack of Brand A, Brand B and

Brand C noodles are \$3, \$2 and \$4 respectively. If 8 packs of noodles are selected at random from the shelf, find the expected value of the selling price.

- A. \$3.1
- B. \$6.72
- C. \$11.1
- D. \$24.8

## Section A(1)

- A bag contains 2 red balls (R), 5 yellow balls (Y) and 7 black balls (B).
  - How many balls are there in the bag?
  - If a ball is drawn from the bag at random, what is the probability that the ball is
    - yellow?
    - black?
- A card is selected at random from a pack of 52 playing cards (without Jokers). Find the probability of drawing
  - a black card.
  - a King.
  - a black King.
- If a fair dice is tossed, find the probability that the number is
  - 2.
  - odd.
  - less than 7.
  - greater than 7.
- A letter is chosen at random from the word "MATHEMATICS". What is the probability of getting
  - a letter M?
  - a letter I?
  - a letter T or H?
- There are 40 students in F.1A. 15 of them go to school on foot, 20 of them go to school by school bus and 5 of them go to school by bus. If a student is selected at random from F.1A, find the probability that the student goes to school
  - by bus.
  - by school bus.
  - by private car.
- In tossing a fair dice, what is the probability of
  - getting a number less than 4?
  - getting a number greater than 2?
  - not getting the number 2?
- There are 24 members in the volleyball team of a certain school. 8 of them come from F.1, 10 of them come from F.2 and 6 of them come from F.3. If a member of the team is selected at random, find the probability that the member is

- (a) a F.3 student.
- (b) a F.1 or F.2 student.
- (c) a junior form student.

8. A bag contains 20 balls including 5 red balls (R), 8 green balls (G) and 7 yellow balls (Y). If a ball is drawn from the bag at random, what is the probability of

- (a) getting a green ball?
- (b) not getting a red ball?

9. A letter is chosen at random from the word “INTEGRATION”. What is the probability of getting

- (a) a letter T?
- (b) a vowel? [Hint: A, E, I, O and U]

10. A coin was tossed 50 times and the results are recorded as follows:

| <i>Number of heads</i> | <i>Number of tails</i> |
|------------------------|------------------------|
| 26                     | 24                     |

- (a) Find the experimental probability of getting a head.
- (b) Find the experimental probability of getting a tail.

11. In a census carried out by a certain government, 1 000 families were asked about the numbers of members in the families. The results are recorded as follows:

| <i>Number of members</i>  | 1  | 2   | 3   | 4   | 5   | 6  |
|---------------------------|----|-----|-----|-----|-----|----|
| <i>Number of families</i> | 36 | 194 | 262 | 348 | 136 | 24 |

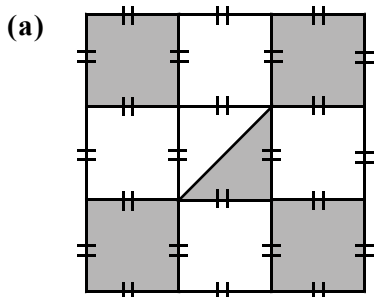
- (a) Find the experimental probability that the number of members in a family is 2.
- (b) Find the experimental probability that the number of members in a family is greater than 4.

12. Two cards are drawn at random from three cards which are marked with numbers 1, 2 and 3 respectively. If the two cards are drawn one by one without replacement, what is the probability that

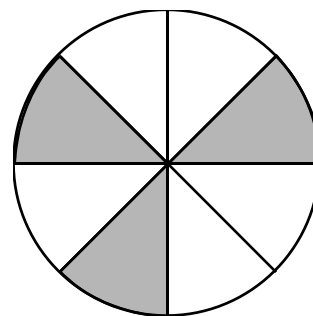
- (a) the sum of the two numbers is odd?
- (b) the sum of the two numbers is even?

13. Two cards are drawn at random from four cards which are marked with numbers 1, 4, 5 and 7 respectively. If the two cards are drawn one by one without replacement and a 2-digit number is formed by these two numbers, what is the probability that the 2-digit number is divisible by 5?
14. A family has three children.
- List out the sample space of the sex of these children by a tree diagram. (B represents a boy and G represents a girl.)
  - Find the probability that the family has one girl.
15. A letter is chosen at random from each of the words "MARY" and "FANNY".
- List out the sample space by a table.
  - Find the probability of getting
    - the same letter.
    - two vowels.

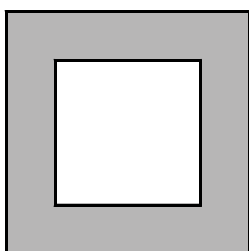
16. If a dart, assuming that it will not hit on any boundary lines, randomly hits each of the following figures at any position, find the probability that the dart hits the shaded region.



(b)



17. The following figure shows a square dartboard. The ratio of the length of a side of the larger square to that of the smaller square is 5 : 3. If a dart, assuming that it will not hit on any boundary lines, hit the dartboard randomly, find the probability that the dart hits the shaded region.



18. In a game of tossing a fair dice, \$4 will be given as a prize if the dice shows an even number and \$2 will be given as a prize if the dice shows an odd number. Find the expected value of the prize of this game.
19. Among 8 000 lucky draw tickets, two tickets will win prizes. One ticket of them will win \$100 000 while another will win \$20 000. If all 8 000 tickets are sold out, find the expected value of the prize of each ticket.

## Section A(2)

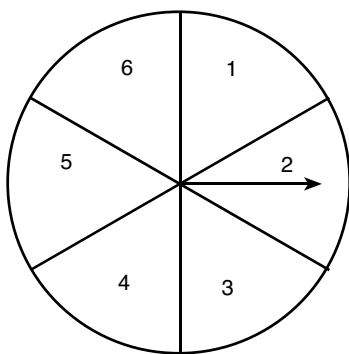
20. Eight cards are marked with A, C, E, F, H, J, N and O respectively. If a card is drawn randomly from them, find the probability of getting
- (a) a vowel.
  - (b) a vowel which appears in the word "CHICKEN".
21. A bag contains 20 black and white balls. If a ball is drawn from the bag at random, the probability of drawing a black ball is  $\frac{3}{5}$ . How many white balls are there in the bag?
22. A bag contains 16 red balls (R) and  $n$  yellow balls (Y). If a ball is drawn at random, the probability of drawing a red ball is  $\frac{4}{7}$ .
- (a) Find the probability of drawing a yellow ball.
  - (b) Find the value of  $n$ .
23. A bag contains some fruity candies and soft candies. The number of fruity candies is 20 more than that of soft candies. If a candy is drawn at random from the bag, the probability of drawing a soft candy is  $\frac{1}{4}$ . How many fruity candies are there in the bag?
24. Six cards are marked with 1, 2, 3, 5, 6 and 9 respectively. A card is drawn randomly from them.
- (a) What is the probability of getting a multiple of 2?

- (b) If the first card with a number which is a multiple of 3 is drawn without replacement, what is the probability of getting a multiple of 3 at random in the next draw?

25. Eight coins were tossed 2 400 times together and the results are recorded as follows:

|                        |   |    |     |     |     |     |     |    |    |
|------------------------|---|----|-----|-----|-----|-----|-----|----|----|
| <i>Number of heads</i> | 0 | 1  | 2   | 3   | 4   | 5   | 6   | 7  | 8  |
| <i>Frequency</i>       | 5 | 90 | 255 | 550 | 666 | 520 | 232 | 72 | 10 |

- (a) Find the experimental probability of getting more than 6 heads.  
 (b) Find the experimental probability of getting less than 4 heads.  
 (c) Find the experimental probability of getting 8 tails.
26. The following diagram shows a spinning wheel. They are divided evenly into 6 sectors. The wheel is turned at random and a fair coin is tossed together. Assume that the pointer will not stop on any boundary lines.

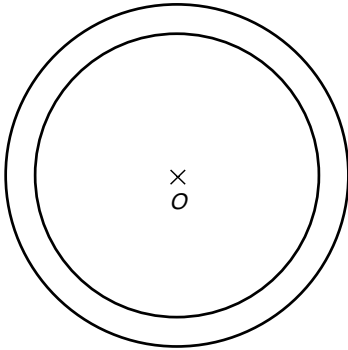


- (a) List all the possible outcomes.  
 (b) Find the probability of getting an odd number and a head.  
 (c) Find the probability of getting a multiple of 2.
27. A fair dice is tossed twice.
- (a) List all the possible outcomes.  
 (b) Find the probability that
- the sum of the two numbers is less than 5.
  - the product of the two numbers is greater than 16.
  - the first number is 3 and the second number is greater than 3.
28. There are 4 drivers ( $D_1, D_2, D_3$  and  $D_4$ ) and 3 police cars ( $T_1, T_2$  and  $T_3$ ) in a police station. A driver and a police car are selected at random.



- (a) Find the probability that driver  $D_2$  drives police car  $T_3$ .
- (b) If police car  $T_3$  breaks down, find the probability that driver  $D_1$  drives police car  $T_2$  or driver  $D_4$  drives police car  $T_1$ .

29. The figure shows a horizontal circular track. 2 marbles are rolling on it and stop at two positions at random. \$3 will be won if the angle created by these 2 marbles and the centre of the track is smaller than or equal to  $10^\circ$ .



- (a) Find the probability of winning \$3.
  - (b) Find the expected value of the prize of this game.
30. Find the expected value of the prize for each of the following cases.
- (a) A player tosses a fair dice. The player is offered the odds of 1 to 4 if the number tossed is 5, otherwise the player loses.
  - (b) A player tosses a fair dice. The player is offered the odds of 1 to 3 if the number tossed is a multiple of 3, otherwise the player loses.

## Section B

31. A bag contains 2 red balls ( $R_1$  and  $R_2$ ) and 3 black balls ( $B_1$ ,  $B_2$  and  $B_3$ ). If two balls are drawn one by one from the bag at random with replacement, find the probability that
- (a) two balls are black.
  - (b) the first ball is red and the second ball is black.
  - (c) the second ball is red.
32. In a survey, 50 people were interviewed. 32 of them had the credit card of Bank  $A$  while 24 of them had the credit card of Bank  $B$ . Each person had at least one credit card of either Bank  $A$  or Bank  $B$ . If a person is selected at random, find the probability that the person had credit cards of both Bank  $A$  and Bank  $B$ .