Praktis 8
Probability Distribution

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Praktis Formatif

8.1 Random Variable

1. State the random variable for each of the following situations.
   (a) In an in vitro fertilization (IVF) procedure, mature ova are successfully collected from Puan Amy's ovaries to be fertilized by her husband's sperms.
   (b) The nurse takes the body temperature of the dengue fever patient every hour.
   (c) The daily attendance of the students in school must be recorded before 9 a.m.

2. Identify whether the random variable in each of the following situations is a discrete random variable or a continuous random variable. Write all the possible outcomes in set notations.
   (a) The time allocated to answer 10 questions of an online quiz is 1 hour. X is the random variable that represents the average time taken by all the students to answer the questions. It is known that the minimum time taken is 40 minutes.
   (b) Five letters are chosen randomly from the word POSTMAN. X is the random variable that represents the number of consonants chosen.

3. For each of the following situations,
   (a) list all the possible outcomes for the random variable X in a set notation,
   (b) draw a tree diagram that represents all the possible outcomes,
   (c) determine the probability distribution for X.
      i. In a piano test the students are required to listen and state the 4 basic notes played by the teacher. X is the random variable that represents the correct answers.
      ii. A piece of coin is tossed twice. X is the random variable that represents the number of heads obtained.
      iii. Two fair dice are thrown simultaneously twice. X is the random variable that represents the number of getting 4 as the difference in value between the numbers on the surface of each dice.

4. 3 camping lamps are chosen randomly from a bpx containing 12 damping lamps and checked. It is known that 30% of camping lamps contained in a box are defective. X is the random variable that represents the number of defective camping lamps chosen.
   (a) Build a table of probability distribution for random variable X.
   (b) Draw a graph of probability distribution for X.

5. X is the number of baby girls in a twin's pregnancy. List all the possible outcomes for X and determine whether it is a discrete or a continuous random variable. Give your reasons.

6. The following diagram shows the graph of probability distribution of random variable X.
   (a) State the type of random variable X.
   (b) Write all the outcomes for X in the set notation.
   (c) Find teh value of m.

7. Is the distribution in each of the following situations a binomial distribution? Explain.
   (a) There are 2 red balls and 4 black balls in a box. A ball is randomly draw from the box, the colour is recorded and returned before the next ball is drawn, This process is repeated 4 times.
   (b) There are 2 red balls and 4 black balls in a box. Two balls are draw simultaneously from the box.
   (c) A supermarket holds a lucky draw activity for the customers. The following diagram shows the wheel of dream used to decide the lucky draw prizes to be won. Rahman has spent more than RM300 and is entitled to spin the wheel 3 times.

8. During the Movement Control Order (MCO), it is found that the attendance of students of a school for all the online lessons is 85%. If 10 students are chosen at random from the school, find the probability that
   (a) all students attended all the online lessons,
   (b) at least 8 students attended all the online lessons.

9. In a survey, it is found that 5% of the residents do not own a car. If 8 residents are chosen, find the probability that
   (a) 2 residents do not own a car,
   (b) more than 2 residents own at least a car.

10. The probability to win a gram is 0.6.
    (a) If 5 games are played by Aiman, find the probability that he wins at least 2 games.
    (b) If m games are played, the probability to win 1 game is 5 times the probability to lose in all games. Find the value of m.

11. The probability of one who puts on the face mask properly being tested positive with COVID-19 is p. 10 people are randomly chosen to carry out the COVID-19 swab test. It is found that the probability of nobody being tested positive with the COVID-19 virus is 0.9044, find
    (a) the value of p,
    (b) the probability that 2 people who put on the mask properly being tested positive with the COVID-10 virus.

12. Solve each of the following situations.

(a) The probability of children who take the eyesight test and found the be short-sighted is $\frac{4}{5}$. If 500 children took the eyesight test in a particular week, find the expected number of children who are short-sighted. Hence, find the variance and the standard deviation.

(b) There are 20 questions in a test. Every question has four choices of answers and there is only one correct answer. Billy chooses the answers randomly. Calculate the mean and the standard deviation of his score.