Data Management

MDM4U

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Contents

Chapter 5

Probability Distribution

§5.1 Probability Distributions

Definitions for Probability Distributions

Definition 5.1.1 (Random Variable) *A variable whose values are numerical outcomes of a random phenomenon, such as a probability experiment.*

Definition 5.1.2 (Discrete random variable) *A random variable that hs a FINITE number of possible values in a given interval. Examples include number of books, shoe sizes , and report card marks*

Definition 5.1.3 (Continuous variable) *A random variable that can have an INFINITE number of possible values in a given interval. Examples include height, time, distance and money*

Definition 5.1.4 (Probability Distribution) *The use of it illustrate the PROBABILITY of all possible outcomes of an experiment. The illustration may be in the form of a table of values, a graph, or an equation*

Definition 5.1.5 *The probability that a discrete random variable X have a particular value x is expressed as $P(X = x)$ or $P(x)$*

Definition 5.1.6 *The expected value, $E(x)$ of a random variable X is the predicted MEAN of all possible outcomes of a probability experiment. If X is discrete, then*

$$E(x) = \Sigma x_i P(x_i)$$

and

$$\sigma = \sqrt{\Sigma(x - E(x))^2 P(x)}$$

§5.2 Uniform Distributions

Different Distributions

Distributions of data can be classified by considering the general shape of its graph. This picture is a table of distributions which is copied from the teacher's note

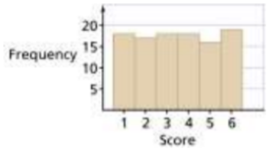
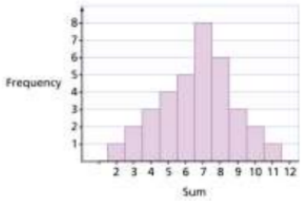
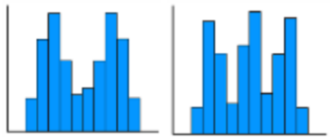
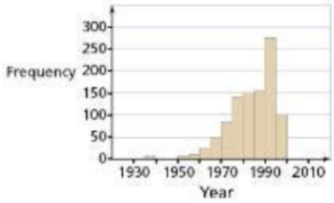
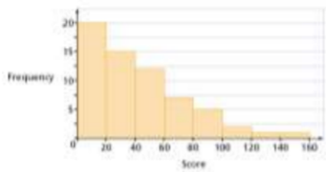
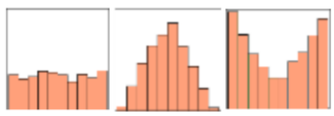
Distribution Type	Description	Example(s)
Uniform	height of EACH bar in the distribution histogram is roughly equal	
Mound-shaped	an interval with the HIGHEST frequency, frequencies of other intervals decrease as you move along either side	
Multimodal	Bimodal distributions has two PEAKS and trimodal distributions has three peaks	
Left-skewed (Negatively skewed)	mean is skewed to the LEFT hence the distribution is asymmetrical with a left-direction (i.e. a "left-tail" exists)	
Right-skewed (Positively skewed)	mean is skewed to the RIGHT hence the distribution is asymmetrical with a right-direction (i.e. a "right-tail" exists)	
Symmetric	shows mirror SYMMETRY about the centre of the distribution	

Figure 5.1: Thanks to **Mr Tang**

Characteristics of Uniform Distribution

If an distribution is considered Uniform, it will have following characteristics:

1. Each outcome is EQUALLY likely in any single trial of experiment

2. If X is discrete and n is the number of possible outcomes in the probability experiment, then

$$P(X = x) = P(x) = \frac{1}{n}$$
$$E(x) = \frac{\Sigma x_i}{n}$$
$$\sigma = \sqrt{\frac{1}{n}\sum(x - E(x))^2}$$

3. If X is continous with values in range from a to b, then the expected value $E(x)$ will be $\frac{a+b}{2}$

Example 4 *I want to discuss*

Proof. $\square$