School of Information Technology

Module	:	Business Statistics
Topic	:	Normal Probability Distribution

Learning Outcomes:

By the end of this lesson, you should be able to

1. Identify characteristics of a Normal distribution by using its characteristics such as the mean, standard deviation, median and mode.
2. Calculate probabilities, the mean and standard deviation of the Normal distribution using the conversion formula and the Z table.
3. Solve real-life business problems by applying concepts of the Normal distribution.

Topic: Normal Probability Distribution

QUESTION 1

Let Z be a standard normal random variable. Use the normal table provided to find:

(a) $P(Z < 2.11)$ (b) $P(Z > 1.02)$ (c) $P(-0.35 < Z < 2.11)$

QUESTION 2

Given that $X \sim N(3,4)$, use the normal table provided to find:

(a) $P(X < 1)$ (b) $P(X > 0.5)$ (c) $P(1 \leq X < 4)$

QUESTION 3

(a) Let Z be a standard normal random variable. Find m such that $P(Z < m) = 0.9082$

(b) Given that $X \sim N(3,4)$. Find m such that $P(X \leq m) = 0.6217$

QUESTION 4

Union negotiators are asking for a pay raise of $1.45 per hour. Past union increases have averaged $1.00 per hour with a standard deviation of $0.30 per hour. Assume that similar conditions prevail now, what is the probability that their increase will be less than $1.45? Assume that wage increases can be described by a normal distribution.

QUESTION 5

The brain weight of a certain population of 18-year olds follow a normal distribution with mean 1380g and standard deviation 80g. Suppose an 18-year old is chosen at random, find the probability that the person's brain weight is:

(a) less than 1300g,

(b) more than 1400g,

(c) between 1320 and 1420g.

QUESTION 6

The IQs of NYP students are normally distributed with variance 400 and unknown mean. Find the mean if it is known that 2.5% of the NYP students have IQ exceeding 150.

QUESTION 7

A recent survey on a group of adults shows that the average daily calories intake of an adult is normally distributed with mean 1380 calories and standard deviation 320 calories.

(a) Find the probability that an adult chosen at random from this group consumes less than 1000 calories per day.

(b) What should be the recommended daily caloric intake if 90% of the group has average daily calories below this recommended daily intake?

(c) If 12,000 adults participated in the survey, find the expected number of people, to the nearest integer, to consume more than 1200 calories per day

QUESTION 8

A company manufactures and distributes car wheels. The weights of the wheels are normally distributed such that 4.36% are under 30 kg and 6.3% are over 60 kg. Calculate the mean and standard deviation of the distribution.

SUPPLEMENTARY QUESTIONS

QUESTION 9

Assume that the weekly expenditure of a family for food is normally distributed with a mean of $150 and a standard deviation of $25.

What is the probability of a family with weekly expenditure for food:

(a) less than $125?
(b) greater than $200?
(c) between $100 and $200?

(d) Suppose 3,000 families were surveyed. Estimate the number of families with weekly expenditure for food greater than $200.

Answers:

Q1 (a) 0.9826 (b) 0.1539 (c) 0.6194

Q2 (a) 0.1587 (b) 0.8944 (c) 0.5328

Q3 (a) 1.33 (b) 3.62

Q4 0.9332

Q5 (a) 0.1587 (b) 0.4013 (c) 0.4649

Q6 110.8

Q7 (a) 0.1170 (b) 1789.6 (c) 8548

Q8 mean = 45.8, standard deviation = 9.26

Q9 (a) 0.1587 (b) 0.0228 (c) 0.9544 (d) 68