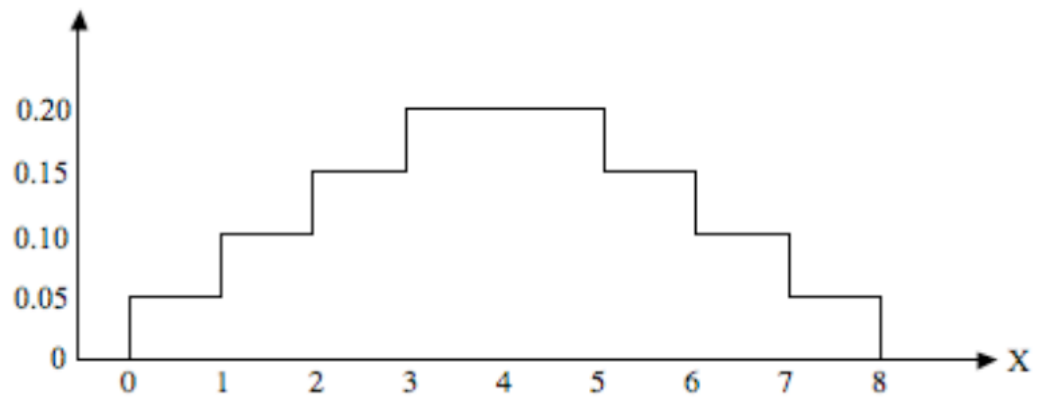


1. A random variable X is described by the density curve shown below:



The probability of $P(3 \leq X \leq 6)$ is equal to:

- (A) 0.55 (B) 0.45 (C) 0.375 (D) 0.40 (E) 0.60

Sample Term Test 2 – B

2. Which of the following statements about a normal distribution is true?

- (A) The mean of a normal distribution must always be greater than zero.
- (B) For a standard normal distribution, $P(Z < z) = P(Z > -z)$ for any value z .
- (C) The height of a normal density curve must always be equal to one.
- (D) All values must fall within three standard deviations of the mean.
- (E) The standard deviation of a normal distribution must always be greater than one.

Sample Term Test 2 – B

3. Weights of apples grown in an orchard are known to follow a normal distribution with mean 160 grams. It is known that approximately 99.7% of apples have weights between 124 and 196 grams. What is the standard deviation of weights of all apples grown in the orchard?

- (A) 9 grams (B) 12 grams (C) 18 grams (D) 24 grams (E) 36 grams

Sample Term Test 2 – B

4. A variable Z has a standard normal distribution. What is the value b such that $P(b \leq Z \leq 0.36) = 0.2470$?

(A) -1.22

(B) -0.68

(C) -0.27

(D) -0.39

(E) -0.55

Sample Term Test 2 – B

5. A variable X follows a normal distribution with mean 10 and standard deviation 5. Another variable Y follows a normal distribution with mean 25 and standard deviation 10. The maximum height of the density curve for X is _____ (i) _____ the maximum height for the density curve for Y , and the area under the density curve for X is _____ (ii) _____ the area under the density curve for Y .
- (A) (i) greater than, (ii) less than
(B) (i) less than, (ii) greater than
(C) (i) equal to, (ii) equal to
(D) (i) greater than, (ii) equal to
(E) (i) less than, (ii) less than

Sample Term Test 2 – B

The next **two** questions (**6** to **7**) refer to the following:

Percentage grades in a large geography class follow a normal distribution with mean 67.5 and standard deviation 12.5.

6. What proportion of students in the class receive percentage grades between 60 and 70?

- (A) 0.2650 (B) 0.2750 (C) 0.2850 (D) 0.2950 (E) 0.3050

Sample Term Test 2 – B

7. The professor decides to assign a grade of A+ to the students with the top 8% of the grades, and a grade of A to the next best 12%. What is the minimum percentage a student needs to earn a grade of A?

(A) 77

(B) 78

(C) 79

(D) 80

(E) 81

Sample Term Test 2 – B

8. The contents of bottles of water follow a normal distribution with mean μ and standard deviation 4 ml. What proportion of bottles have fill volumes within 1 ml of the mean?
- (A) 0.1974
 - (B) 0.5987
 - (C) 0.6826
 - (D) 0.4013
 - (E) unable to calculate without the value of μ

Sample Term Test 2 – B

9. A candy company manufactures hard candies in five different flavours, according to the following probability distribution, where k is some constant:

Flavour	Cherry	Root Beer	Strawberry	Orange	Peppermint
Probability	0.21	k	0.27	k	0.14

If you select a candy at random, what is the probability that it will be fruit-flavoured?

- (A) 0.48 (B) 0.67 (C) 0.68 (D) 0.72 (E) 0.86

Sample Term Test 2 – B

10. Event A has probability of 0.4 to occur and Event B has a probability of 0.5 to occur. Their union (A or B) has a probability of 0.7 to occur. Then:
- (A) A and B are mutually exclusive.
 - (B) A and B are not mutually exclusive.
 - (C) A and B are independent.
 - (D) A and B are dependent.
 - (E) both (B) and (C).

Sample Term Test 2 – B

11. You have two unfair coins. On any given flip, the first coin has a 40% chance of landing on Heads and the second coin has a 25% chance of landing on Heads. If you flip both coins, what is the probability that at least one of them lands on Heads?

(A) 0.10

(B) 0.45

(C) 0.55

(D) 0.65

(E) 0.90

Sample Term Test 2 – B

12. Suppose it is known that 8% of males are colour blind. In a random sample of 20 males, what is the probability that exactly 3 of them are colour blind?

(A) 0.1212

(B) 0.1313

(C) 0.1414

(D) 0.1515

(E) 0.1616

Sample Term Test 2 – B

13. Suppose it is known that 61% of Winnipeg adults read the Winnipeg Free Press, 29% read the Winnipeg Sun and 18% read both newspapers. What is the probability that a randomly selected adult in Winnipeg reads only one of the two papers (but not both)?
Hint: Draw a Venn diagram.

(A) 0.54

(B) 0.50

(C) 0.45

(D) 0.72

(E) 0.47

Sample Term Test 2 – B

The next **two** questions (**14** and **15**) refer to the following:

A hockey player compiles the following facts:

- Her team wins (W) 60% of their games.
- She scores a goal (G) in 30% of her games.
- She gets a penalty (P) in 40% of her games.
- In 38% of her games, her team wins and she scores a goal.
- In 24% of her games, her team wins and she gets a penalty.
- in 15% of her games, she scores a goal and gets a penalty.

14. In any given game, what is the probability that the player scores a goal or gets a penalty?

- (A) 0.85 (B) 0.55 (C) 0.70 (D) 0.65 (E) 0.58

15. Which of the following statements is **true**?

- (A) W and G are independent.
- (B) G and P are mutually exclusive (disjoint).
- (C) W and P are independent.
- (D) W and G are mutually exclusive (disjoint).
- (E) G and P are independent.

Sample Term Test 2 – B

16. Which of the following variables has a binomial distribution?

- (A) You roll five fair dice, each with face values of 1 through 6.
 X = total number of dots facing up on the five dice.
- (B) An airplane carrying 100 passengers has two emergency exits, one at the front of the plane and one at the back. The airplane makes an emergency landing.
 X = number of people who leave the plane through the front exit.
- (C) A paper boy delivers the newspaper to every house on your block.
 X = number of houses that get their newspaper on time tomorrow morning.
- (D) You repeatedly flip two quarters simultaneously until both quarters land on Heads.
 X = number of flips required for both quarters to land on Heads.
- (E) A student randomly guesses the answer to each of the 40 multiple choice questions on this exam.
 X = number of multiple choice questions the student gets correct.

Sample Term Test 2 – B

17. The probability that a certain machine will produce a defective item is $\frac{1}{4}$. If a random sample of six items is taken from the output of this machine, what is the probability that there will be at least five defectives in the sample?

(A) $\frac{1}{4096}$

(B) $\frac{3}{4096}$

(C) $\frac{4}{4096}$

(D) $\frac{18}{4096}$

(E) $\frac{19}{4096}$

Sample Term Test 2 – B

18. A random variable X follows a binomial distribution with parameters n and p . If the mean and the variance of X are 3.6 and 2.52 respectively, then the values of the parameters n and p are, respectively:

- (A) 6 and 0.6.
- (B) 18 and 0.2.
- (C) 24 and 0.15.
- (D) 12 and 0.3.
- (E) 12 and 0.4.

Sample Term Test 2 – B

19. A student driving to university must pass through seven sets of traffic lights. Suppose it is known that each set of traffic lights are red 35% of the time and that all lights function independently. What is the probability that the student will have to stop at two or more sets of lights on her to university?

- (A) 0.6828 (B) 0.2985 (C) 0.4893 (D) 0.7662 (E) 0.5997

Sample Term Test 2 – B

The next **three** questions (**20** to **22**) refer to the following:

We have a small deck of ten cards. Five of the cards are red, three are blue and two are green. We randomly select **four** cards from the deck **with replacement**. That is, after we select a card and record the colour, we put the card back in the deck and thoroughly shuffle them before we select another card.

20. Let X be the number of blue cards that are selected. The distribution of X is:

- (A) binomial with parameters $n = 4$ and $p = 0.1$.
- (B) binomial with parameters $n = 10$ and $p = 0.3$.
- (C) binomial with parameters $n = 10$ and $p = 0.4$.
- (D) binomial with parameters $n = 4$ and $p = 0.3$.
- (E) normal with parameters $\mu = 1.2$ and $\sigma = 0.92$.

Sample Term Test 2 – B

21. Let A be the event that the first selected card is the only red card in our four selections. Which of the following events is mutually exclusive (disjoint) from the event A ?
- (A) Second card selected is blue.
 - (B) No green cards are selected.
 - (C) Third selected card is the only green.
 - (D) Same number of red and blue cards are selected.
 - (E) Same number of blue and green cards are selected.

Sample Term Test 2 – B

22. What is the probability that the first two selected cards are the same colour?

(A) 0.38

(B) 0.25

(C) 0.29

(D) 0.33

(E) 0.41

Sample Term Test 2 – B

The next **two** questions (**23** and **24**) refer to the following:

The time X taken by a cashier in a grocery store express lane follows a normal distribution with mean 90 seconds and standard deviation 20 seconds.

23. What is the first quartile (Q1) of the distribution of X ?
- (A) 73.8 seconds
 - (B) 85.0 seconds
 - (C) 69.4 seconds
 - (D) 81.2 seconds
 - (E) 76.6 seconds

Sample Term Test 2 – B

24. What is the probability that the average service time for the next three customers is between 80 and 100 seconds? (Assume the next three customers can be considered a simple random sample.)
- (A) 0.6156
 - (B) 0.4893
 - (C) 0.7212
 - (D) 0.5559
 - (E) impossible to calculate with the information given

Sample Term Test 2 – B

25. Weights of oranges sold at a supermarket follow a normal distribution with mean 0.22 pounds and standard deviation 0.04 pounds. If you randomly select four oranges, what is the probability that their total weight is less than 1 pound?

(A) 0.9719

(B) 0.8508

(C) 0.9332

(D) 0.7967

(E) 0.8340

Sample Term Test 2 – B

The next **two** questions (**26** and **27**) refer to the following:

The amount X spent (in \$) by customers in the grocery store express lane follow some right-skewed distribution with mean \$24 and standard deviation \$15.

26. What is the probability that the average amount spent by the next three customers is more than \$20? (Assume the next three customers can be considered a simple random sample.)
- (A) 0.4619
 - (B) 0.6772
 - (C) 0.8186
 - (D) 0.7673
 - (E) impossible to calculate with the information given

Sample Term Test 2 – B

27. What is the probability that the next 40 customers spend less than \$1,000 in total?
(Assume the next 40 customers can be considered a simple random sample).

(A) 0.5199

(B) 0.6064

(C) 0.6628

(D) 0.5784

(E) 0.6331

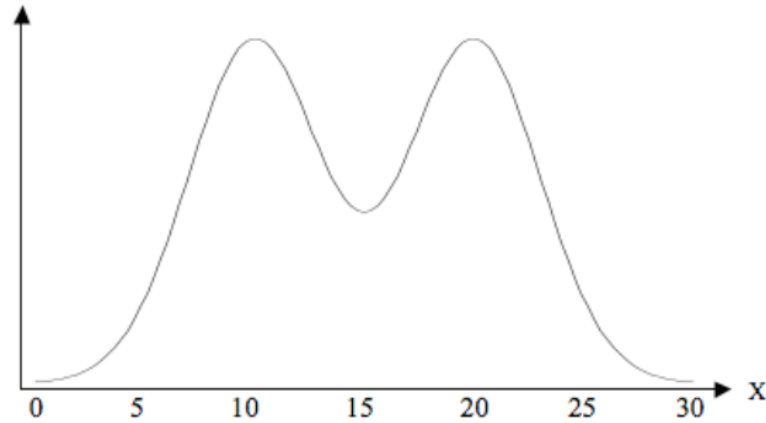
28. The Central Limit Theorem states that:

- (A) when n gets large, the standard deviation of the sample mean \bar{X} gets closer and closer to σ/\sqrt{n} .
- (B) regardless of the population distribution of a random variable X , when n gets large, the sampling distribution of \bar{X} is approximately normal.
- (C) if a random variable X follows a normal distribution, then when n gets large, the sampling distribution of \bar{X} is exactly normal.
- (D) when n gets large, the sample mean \bar{X} gets closer and closer to the population mean μ .
- (E) when n gets large, the sample mean \bar{X} becomes an unbiased estimator of the population mean μ .

Sample Term Test 2 – B

The next **two** questions (29 and 30) refer to the following:

A bimodal probability distribution is one with two distinct peaks. A random variable X follows a bimodal distribution with mean 15 and standard deviation 4, as shown below:



29. Suppose that you take a random sample of 10,000 observations from the population above and make a histogram. You expect the histogram to be:
- (A) approximately normal with mean close to 15 and standard deviation close to 0.0004.
 - (B) bimodal with mean close to 15 and standard deviation close to 0.04.
 - (C) approximately normal with mean close to 15 and standard deviation close to 0.04.
 - (D) bimodal with mean close to 15 and standard deviation close to 4.
 - (E) approximately normal with mean close to 15 and standard deviation close to 4.

Sample Term Test 2 – B

30. Suppose that you take 10,000 random samples of 10,000 observations from the population above and that for each sample, the mean \bar{x} is calculated. A histogram of resulting \bar{x} 's would be:
- (A) approximately normal with mean close to 15 and standard deviation close to 0.0004.
 - (B) bimodal with mean close to 15 and standard deviation close to 0.04.
 - (C) approximately normal with mean close to 15 and standard deviation close to 0.04.
 - (D) bimodal with mean close to 15 and standard deviation close to 4.
 - (E) approximately normal with mean close to 15 and standard deviation close to 4.