

Math104 Part II Review

You are expected to understand:

1. What is a set? What is an empty set and what is a universal set? How do we use the main set operations in counting? What are the counting formulas?
2. How do we find a sample space and express various events associated with a sample space? What is probability and how do we calculate it? How do we set up a discrete probability distribution and what does it mean?
3. How to compute the probability of the complement of a given event? Under what conditions do we use the addition rule and the multiplication rule to compute the probability of a union or intersection of events?
4. What is conditional probability? What are independent events? How to check if two events are independent? How to compute conditional probabilities?
5. Be able to find the mean, median, mode, variance and standard variation for sample data and for population data. Understand the Chebychev's inequality.
6. What is a random variable? What is the probability distribution of a random variable? Be able to compute the expected value, variance and standard deviation of a random variable that follows a given distribution. Be able to find the odds of an event.
7. What is a binomial distribution? Be able to compute the binomial probabilities. Be able to compute the mean, variance and standard deviation of a binomial probability distribution.
8. Understand the normal distribution. Be able to standardize normal random variables. Use the table for the standard normal distribution to calculate probabilities. Recognize normal distribution problems, and know how to solve them.

Practice Problems

There will be multiple choice problems and word problems that you need to show your work or steps.

A. Multiple choice Problems: See discussion problems, webassign and quizzes.

B. Word problems.

1. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ be the universal set. $A = \{1, 4, 8, 10\}$, $B = \{1, 3, 5, 9\}$, $C = \{2, 4, 6, 8, 10\}$. Find $A \cap B$, $A \cup B$, $(A \cap B) \cup C$, A^c , $(A \cup B)^c$.

2. A leading cosmetics manufacturer advertises its products in three magazines: *Allure*, *Cosmopolitan*, and the *Ladies Home Journal*.

A survey of 500 customers by the manufacturer reveals the following information:

180 learned of its products from *Allure*.

200 learned of its products from *Cosmopolitan*.

192 learned of its products from the *Ladies Home Journal*.

84 learned of its products from *Allure* and *Cosmopolitan*.

52 learned of its products from *Allure* and the *Ladies Home Journal*.

64 learned of its products from *Cosmopolitan* and the *Ladies Home Journal*.

38 learned of its products from all three magazines.

How many of the customers saw the manufacturer's advertisement in

a. At least one magazine?

b. Exactly one magazine?

3. The probability that a person has a checking account is 0.74, a saving account is 0.31, and both accounts is 0.22. Find the probability that a randomly selected person has a checking account or a saving account.

4. Among the 2500 college graduates in a survey, 1300 are male and 1200 are female. Among the male graduates, 1000 got job offers, and 300 did not get any. Among the female graduates, 1000 got job offers and 200 did not get any.

a). Find the probability that a randomly selected college graduate will get job offers.

b). Find the probability that a randomly selected graduate get job offer if the selected student is a male student.

5. An experiment consists of selecting a card at random from a standard 52-card deck. A). Find the probability that the card is an Ace or a spade. B). Find the probability that the card is an ace knowing that it is a heart?

6. A committee has 15 members. How many ways can a chairman and a treasure be selected? If we know that there are 9 men and 6 women in the committee. How many ways can a chairman and a treasure be selected so that the chairman is a man and the treasure is a women?

7. A nationwide survey conducted by the National Cancer Society revealed the following information: Of 10,000 people surveyed, 3,300 were "heavy coffee drinkers" and 160 had cancer of the pancreas. Of those who had cancer of the pancreas, 137 were heavy coffee drinkers. If a person is randomly selected, what is the probability that the person is has cancer of the pancreas? What is the probability that the person has cancer of the pancreas knowing that the person is a heavy coffee drinker? Are the two events "being a heavy coffee drinker" and "having cancer of the pancreas" independent?

8. Customers are asked to make a determination about their satisfaction following a visit to a convenience store. The following table reports how many new and returning customers are either satisfied or unsatisfied.

	Satisfied	Unsatisfied
New	400	200
Returning	500	100

A customer is selected at random. Let N represent the event that the customer is a new customer, R represent the event that the customer is a returning customer, S represent the event that the customer is a satisfied customer, and U represent the event that the customer is an unsatisfied customer.

- A. Find $P(N)$. B. Find $P(S|N)$. C. Find $P(N|S)$.

9. Let A and B be two independent events in a sample space S such that $P(A) = 0.5$, $P(B) = 0.2$, Find $P(A \cap B)$, $P(A \cup B)$ and $P(A|B)$.

10. Given the following data: 2, 5, 3, 7, 9, 9, 14, 15, 3, 9, 13.

- a). Find the mean, median, variance and standard deviation of the data set if the data is collected from a sample.
b). Find the mean, median, variance and standard deviation of the data set if the data is collected from a population.

11. A class of 40 students took a 5-point math quiz. The following frequency distribution describes the scores received on the quiz.

Score	0	1	2	3	4	5
Frequency	1	3	6	15	10	5

- A. Find the probability distribution of X , where X denotes the score received on the quiz.

- B. Find the probability that a randomly selected student got a score more than 3.
C. Find the mean and variance of the probability distribution of X .

12. A local marathon runner estimates that the probability he will win his next race is 0.4.

- A. What are the odds that he will win his next race?
B. What are the odds that he will not win his next race?

13. What should you pay to play a game in which you receive \$5 for drawing an ace from a deck of cards, \$1 for a face-card, and 50¢ for any other card so that the game is fair?

14. Ms. Wiggins purchases a \$10,000 one-year term life insurance policy for \$105. Find the company's expected gain (to the nearest cent) if the probability that

she will live for another year is 0.9915.

15. Market research shows that 27% of college students have at least one major credit card. If 10 students are selected at random, calculate the probability that fewer than 2 of them have at least one major credit card. What about the probability that exactly 5 out of the 10 students have at least one major credit card? Find the mean and standard deviation of this probability distribution.
16. A new drug has been found to be effective in treating 75% of the people afflicted by a certain disease. If the drug is administered to 700 people who have this disease, what are the mean and the standard deviation of the number of people for whom the drug can be expected to be effective? (Round your standard deviation to two decimal places.)
17. IQ's are normally distributed with a mean of 100 and a standard deviation of 10. If a person is selected at random, what is the probability that his/her IQ is between 100 and 115? What is the probability that his/her IQ is higher than 120? What about lower than 100?
18. According to data released by the Chamber of Commerce of a certain city, the weekly wages (in dollars) of female factory workers are normally distributed with a mean of 575 and a standard deviation of 50. Find the probability that a female factory worker selected at random from the city makes a weekly wage of \$475 to \$625.
19. The average grade for an exam is 74, and the standard deviation is 7. If 12% of the class is given As, and the grades are curved to follow a normal distribution, what is the lowest possible A? If D is assigned to a grade of 65 or below. What percent of the class received a D?
20. A probability distribution has a mean of 20 and a standard deviation of 2. Use Chebychev's inequality to estimate the probability that an outcome of the experiment lies between 16 and 24.