

Math 112 - Review Problems

Spring 2019

This review packet may help you prepare for our comprehensive final exam. Warning! The packet does not cover everything that may be included on the final exam. Please refer to the skills checklist.

1. Let X be the set of letters of the word *RACECAR*. Write X in roster notation.
2. Explain why the set of all pretty flowers is not well defined.
3. Let $A = \{0, 2, 4, 6, 8\}$ and $B = \{0, 3, 5, 8\}$, and consider A and B as subsets of the universal set $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$. Determine each of the following.

- (a) $n(A)$
- (b) A'
- (c) $A \cup B$
- (d) $(A \cap B)'$
- (e) $A' \cup B'$
- (f) $A \cap \emptyset$
- (g) $A - B$

4. Write the set P in roster notation.

$$P = \{x \mid x \in \mathbb{N} \text{ and } -2 \leq x < 4\}$$

5. Shade the region of a Venn diagram corresponding to each set.

- (a) $(A' \cap B) \cup C$
- (b) $(A \cap B) \cap C'$

6. List all subsets of $\{1, 2, 3\}$.
7. The set B is defined below using set-builder notation.

$$B = \{x \mid x \in \mathbb{N} \text{ and } x < 5\}$$

- (a) What is the cardinality of B ?
 - (b) Give an example of a set that is equivalent to B , but not equal to B .
8. Suppose U is the set of all U.S. states, and X is the set of states with two-word names. In a sentence, describe the elements of X' .
 9. If the set A has 8 elements, how many subsets does it have?
 10. 184 children were asked to name the fruits they often eat. The following results were obtained:

- 91 said bananas
- 97 said apples
- 69 said grapes
- 42 said bananas and apples
- 21 said bananas and grapes
- 35 said apples and grapes
- 12 said bananas, apples, and grapes

Organize this data in a three-set Venn diagram. How many children surveyed named none of these three fruits?

- Identify each as a conjunction, disjunction, conditional, or biconditional.
 - Either he gets married, or he loses his inheritance.
 - Oscar and Marcus like playing golf.
 - All fish have scales.
 - I'm going to eat pizza if and only if my car starts.
- Explain why the sentence "This statement is false" is not a statement.
- Let p = "The dog has blue eyes" and let q = "The dog is a husky." Write each statement in words.
 - $q \longrightarrow \sim p$
 - $\sim (q \wedge p)$
 - $q \longrightarrow (p \vee q)$
- Construct the truth table for $(\sim q \wedge p) \longrightarrow \sim p$.
- Consider the following conditional statement:

If today is Tuesday, then tacos are on sale.

- State the inverse.
- State the contrapositive.
- State the converse.
- Of the three, which is equivalent to the original statement?

Inverse

Contrapositive

Converse

- Use truth tables to show that the statement $p \longrightarrow q$ is logically equivalent to $\sim p \vee q$.
- Use DeMorgan's Laws to write a logically equivalent statement.
 - $\sim (p \vee q)$
 - $\sim (q \wedge r)$

18. Construct the truth table for $(\sim q \wedge p) \longrightarrow \sim p$.
19. By using truth tables, determine whether each statement is a tautology, a self-contradiction, or neither.
- (a) $(p \vee q) \rightarrow q$
 - (b) $(p \wedge q) \wedge \sim q$
 - (c) $p \rightarrow (p \wedge q)$
20. \$1925 is deposited into an account earning 2.75% simple interest. The account is closed after 13.25 years.
- (a) How much interest does the account earn?
 - (b) What is the total value of the account when it is closed?
21. Julie deposited \$7250 into an account earning simple interest. After 12 years, she closed the account and had \$10730. What was the simple interest rate? Write your result as a percent.
22. A couple decides to set aside \$5,000 in a savings account for a second honeymoon. Interest is compounded quarterly at 7.35%.
- (a) How much money is in the account after 15 years?
 - (b) How much money was made in interest?
23. Suppose you open an annuity with quarterly payments of \$600 at 8% compounded quarterly for 20 years.
- (a) Find the future value of the annuity.
 - (b) How much interest will you earn?
24. Suppose you begin depositing monthly payments into an account earning 7.25% compounded monthly. Your goal is to accumulate \$12,500 in 6 years. What should your monthly payments be?
25. Stephanie has learned that she can get a certain new car by agreeing to make monthly payments of \$312 for five years. After reading the fine print, she realized that these monthly payments include a finance charge of 7.99% compounded monthly. How much would the car cost Stephanie if she paid all at once in cash?
26. A house sells for \$182,350 and a 10% down payment is made. A mortgage is secured for 30 years at 4.125% compounded monthly.
- (a) What amount is financed?
 - (b) What is the monthly payment?
 - (c) When the loan is paid off in 30 years, what will be the total interest paid?
 - (d) Compute the first 3 rows of the amortization schedule. Include the interest, amount paid to principal, and the outstanding balance.

27. Which of the following are probability experiments? Circle all that apply.
- (a) A card is selected from a shuffled deck.
 - (b) A cup of water is placed into the freezer.
 - (c) A match is selected at random from a box of matches.
 - (d) A match is lit by striking the box of matches.
 - (e) A coin is flipped.
 - (f) A student answers a true/false question by guessing.
28. Consider the experiment of rolling an 8-sided die.
- (a) What is a sample space for this experiment?
 - (b) Give an example of an event. Describe it in words.
 - (c) Determine the theoretical probability of the event you described above.
29. Give an example of a probability that might be assigned to
- (a) an impossible event
 - (b) a certain event
 - (c) an event that is very unlikely, but not impossible
 - (d) an event that is 5 times more likely than an event with probability 0.1
30. Four letters are selected from the word *MISSISSIPPI* without replacement. What is the probability of spelling *SIMP* (in order)?
31. Suppose A and B are events with $P(A') = 0.30$, $P(B) = 0.54$, and $P(A \cup B) = 0.88$. Find $P(A)$ and $P(A \cap B)$.
32. In 50 observations, 38 drivers did not stop at a certain stop sign. Based on these observations, what is the probability that a driver will stop?
33. A letter is selected at random from the first box and placed into the second box. Then a letter is selected at random from the second box.

F	F	O	O	X
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O	O	O	O	X	X
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- (a) Sketch the complete tree diagram for this experiment. **Include the probabilities of each path.**
 - (b) What is the probability of selecting at least one X?
 - (c) What is the probability of selecting F from the first box or O from the second box?
34. In studying the effectiveness of a test preparation course, the following data were collected.

	Passed Test	Failed Test
Took Test-Prep Class	137	43
Did not take Test-Prep Class	213	105

A person from this sample is selected at random.

- (a) What is the probability that the person passed the test?
- (b) What is the probability that the person took the test preparation class and passed the test?
- (c) What is the probability that the person passed the test given that he/she took the test preparation class?
- (d) What is the probability that the person took the test preparation class given that he/she failed the test?

35. In a study of students' homework habits, a professor collected the following data.

	Did homework	Did not do homework
Received A or B	97	32
Received C, D, or F	41	78

A student from this study is selected at random.

- (a) What is the probability that the student did homework or received A or B?
- (b) What are the odds against the student doing homework?

36. What are the odds against rolling a 6 on one roll of a fair six-sided die?

37. A woman draws a letter at random from the word MISSISSIPPI. If she draws the letter S, she wins \$1. If she draws I, she wins \$2. If she draws P, she wins \$7. And if she draws M, she wins \$15. What is the expected value for this game?