Math 112 - Review Problems
Spring 2018

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, and it certainly does not cover everything we've done in class. Please refer to the skills checklist for topics included on the final. It is also a good idea to review old tests and quizzes.

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?

11. Let $X = \{0, 1\}$ and $Y = \{1, a, b\}$.

   (a) Determine the difference $X - Y$.
   (b) Determine the difference $Y - X$.

12. Identify each as a conjunction, disjunction, conditional, or biconditional.

   (a) Either he gets married, or he loses his inheritance.
   (b) Oscar and Marcus like playing golf.
   (c) All fish have scales.
   (d) I'm going to eat pizza if and only if my car starts.

13. Explain why the sentence "This statement is false" is not a statement.

14. Let p = "The dog has blue eyes" and let q = "The dog is a husky." Write each statement in words.

   (a) $q \longrightarrow \sim p$
   (b) $\sim (q \wedge p)$
   (c) $q \longrightarrow (p \vee q)$

15. Construct the truth table for $(\sim q \wedge p) \longrightarrow \sim p$.

16. Consider the following conditional statement:

   If today is Tuesday, then tacos are on sale.

   (a) State the inverse.
   (b) State the contrapositive.
   (c) State the converse.
   (d) Of the three, which is equivalent to the original statement?

   Inverse   Contrapositive   Converse

17. Use truth tables to show that the statement $p \longrightarrow q$ is logically equivalent to $\sim p \vee q$.

18. Use DeMorgan's Laws to write a logically equivalent statement.

    (a) $\sim(p \vee q)$

    (b) $\sim(q \wedge r)$

19. $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?

20. 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.

21. 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?

22. 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?

23. 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?

24. 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?

25. 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.

26. Give an example of a probability that might be assigned to

    (a) an impossible event

    (b) a certain event

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(c) an event that is very unlikely, but not impossible

(d) an event that is 3 times more likely than an event with probability 0.2

27. A fair six-sided die is rolled.

   (a) What is the sample space?

   (b) What is the event of rolling an even? Write the event in roster notation.

   (c) What is the probability of rolling a 1?

   (d) What is the probability of rolling a 2 or 4?

28. A letter is selected at random from the word *MISSISSIPPI*. What is the theoretical probability of selecting the letter P or M?

29. 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 | | O   O   O   O   X   X |

   (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?

30. 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 took the test preparation class or passed the test?