Math 112 - Review/Extra Credit

December 6, 2016

This review packet may help you prepare for our comprehensive final exam. It may also help you earn some extra credits points.
If you are interested in earning extra credit, please continue to read. (Otherwise just use this packet for final exam practice problems.) For extra credit, you may earn up to one-third of the points you missed on your lowest test. Before you begin, first check D2L to find your lowest test score. Next, compute

$$\frac{100 - \text{ lowest test score}}{3}.$$

This is how many extra credit points **you may attempt** to earn.
Now choose any problems from below to submit for possible points, but stop choosing when the total possible point value reaches your limit. I will not grade any further problems.
Submit your problems right before you take the final exam on Thursday. DO NOT PUT YOUR SOLUTIONS ON THIS PAPER!

---

1. (0.5 points) Let X be the set of letters of the word *RACECAR*. Write X in roster notation.

2. (0.5 points) Explain why the set of all pretty flowers is not well defined.

3. (2 points) 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. (0.5 points) Write the set P in roster notation.

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

5. (2 points) Shade the region of a Venn diagram corresponding to each set.

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

6. (1 point) List all subsets of $\{1, 2, 3\}$.

7. (1 point) The set B is defined below using set-builder notation.

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

   (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. (1 point) 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. (1 point) If the set A has 8 elements, how many subsets does it have?

10. (2 points) 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. (1 point) Let $X = \{0, 1\}$ and $Y = \{1, a, b\}$.

    (a) Determine the Cartesian product $X \times Y$.

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

12. (2 points) 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. (1 point) Explain why the sentence "This statement is false" is not a statement.

14. (2 points) 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. (2 points) Construct the truth table for $(\sim q \wedge p) \longrightarrow \sim p$.

16. (2 points) 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. (2 points) Use truth tables to show that the statement $p \longrightarrow q$ is logically equivalent to $\sim p \vee q$.

18. (1 point) Use DeMorgan's Laws to write a logically equivalent statement.

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

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

19. (3 points) Consider the following argument in symbolic form.

$$\begin{array}{l} p \vee q \\ \sim p \\ \hline \therefore q \end{array}$$

(a) Use the truth table method to determine the validity of the argument.

(b) Is the argument a common form? If so, use your knowledge of common forms to explain the validity.

20. (2 points) Write the argument in symbolic form. Then use a common-form argument to determine its validity. Explain your reasoning.

Premise 1: If I win the lottery, then I will vacation in Fiji.

Premise 2: If I vacation in Fiji, then I will get malaria.

Conclusion: If I win the lottery, then I will get malaria.

21. (2 points) \$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?

22. (1 point) 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.

23. (2 points) 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?

24. (2 points) 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?

25. (2 points) 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?

26. (2 points) 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?

27. (4 points) 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.

28. (1 point) Five lower case letters of the English alphabet are selected **without replacement** to form a personal identification code. How many different 5-letter codes are possible?

29. (1 point) A scientist is labeling his samples with 7-letter ordered sequences consisting of 3-X's, 3-Y's and 1-Z (YYXZXXY, for example). How many different sequences are possible?

30. (2 points) There are 34 students (20 freshmen and 14 sophomores) in a certain class. A five-person committee is to be formed.

    (a) How many 5-person committees are possible?

    (b) How many of those 5-person committees have exactly 3 freshman and 2 sophomores?

31. (3 points) 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?

32. (2 points) 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?

33. (2 points) 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?

34. (0.5 points) What are the odds against rolling a 6 on one roll of a fair six-sided die?

35. (1 point) A card is drawn at random from a standard 52-card deck of playing cards. Let A be the event the card drawn is black and let B be the event the card drawn is an ace or a jack.

(a) Find $P(A|B)$.

(b) Find $P(B|A)$.

36. (2 points) 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?