
Circle the letter corresponding to your answer. Circle only one answer per question. There is no partial credit on this portion of the exam. Answer the long answer questions on the exam itself.

1. T F
2. T F
3. T F
4. T F
5. T F
6. T F
7. T F
8. T F
9. A B C D E
10. A B C D E
11. A B C D E
12. A B C D E
13. A B C D E
14. A B C D E
15. A B C D E
16. A B C D E
17. A B C D
18. A B C D E

True / False (2 points each) Record all answers on the cover page / answer sheet. There is no partial credit for this portion of the exam. Circle T if the statement is always true and circle F if the statement is sometimes false.

1. T F “ $5 < 3$ or $6 < 0$.”

2. T F “ π is irrational and 7 is even.”

3. T F “Some whole numbers are positive numbers.”

4. T F “All rational numbers are real numbers.”

For the following, assume that p is true and q is false.

5. T F $p \rightarrow q$

6. T F $(p \wedge q) \rightarrow (p \vee q)$

7. T F F $\sim q \rightarrow (p \wedge q)$

8. T F $(p \vee q) \rightarrow \sim q$

Multiple Choice (5 points each) Record all answers on the cover page / answer sheet. There is no partial credit for this portion of the exam. Circle the letter corresponding to the best answer.

9. Which of the following is the negation of “All cats are felines”?

- A. Some cats are not felines.
- B. Some cats are felines.
- C. All cats are not felines.
- D. Some cats are dogs.
- E. None of the above.

10. Which of the following is the negation of “Some dogs hate cats”?

- A. All dogs don’t hate cats.
- B. All dogs hate cats.
- C. Some dogs hate cats.
- D. Some dogs don’t hate cats.
- E. None of the above.

11. Which of the following is the negation of “I will order soup and salad”?

- A. I will order a sandwich.
- B. I will not order soup or I will not order salad.
- C. I will not order soup or salad.
- D. I will not order soup and I will not order salad.
- E. None of the above.

12. Which of the following is the negation of “I love television, but I never get to watch it”?

- A. I don't love television and I never get to watch it.
- B. I love television, but I never get to watch it.
- C. I don't love television or I never get to watch it.
- D. I don't love television and I never get to watch it.
- E. None of the above.

13. Which of the following is the negation of “If it does not rain, then Brian plays golf”?

- A. If it rains, then Brian does not play golf.
- B. If it does not rain, then Brian does not play golf.
- C. It rains or Brian plays golf.
- D. It does not rain and Brian does not play golf.
- E. None of the above.

14. Which of the following is the inverse of “If you lead, I will follow”?

- A. If I follow, you will lead.
- B. If I don't follow, you won't lead.
- C. If you don't lead, I won't follow.
- D. If you don't lead, I will follow.
- E. None of the above.

15. Which of the following is a valid conclusion for the following argument:

All men are created equal.

All people who are created equal are women.

- A. All people are men.
- B. All men are women
- C. All people are women.
- D. All women are created equal.
- E. None of the above.

16. The rewards codes on bottles of Coke consists of 12 letters or numbers. If the letter O is not allowed, how many rewards codes are possible?

- A. $36 \cdot 12!$
- B. 36^{11}
- C. ${}_{36}P_{12}$
- D. ${}_{36}C_{12}$
- E. None of the above.

17. License plates in TX consist of 4 non-repeatable letters followed by 2 non-repeatable numbers. How many license plates are possible?

- A. $26^4 \cdot 10^2$
- B. $26 \cdot 25 \cdot 24 \cdot 23 \cdot 10 \cdot 9$
- C. ${}_{26}C_4 \cdot {}_{10}C_2$
- D. ${}_{26}P_4 \cdot {}_{10}P_2$
- E. None of the above.

18. Two dice (a red die and a blue die) are rolled. In how many ways can you roll a sum of 5?
- A. 4
 - B. 5
 - C. 6
 - D. 7
 - E. None of the above.

19. You are dealt 5 cards for a poker hand. How many possible poker hands are there?
- A. ${}_{52}P_5$
 - B. ${}_{52}C_5$
 - C. ${}_{26}P_5$
 - D. ${}_{26}C_5$
 - E. None of the above.

20. Draw two cards from a standard deck of 52 in order and without replacement. In how many ways can you draw one red card and one black card?
- A. $2 \cdot 26 \cdot 26$
 - B. $26 \cdot 26$
 - C. $26 \cdot 25$
 - D. $2 \cdot 26 \cdot 25$
 - E. None of the above.

Long Answer. Answer the following questions. **No work = no credit.**

21. (12 points) Analyze the validity of the following argument using a truth table:

The Steelers will be in the playoffs if and only if Ben leads the league in passing.

Bill coaches the Steelers or Ben leads the league in passing.

Bill does not coach the Steelers.

Therefore, the Steelers will not be in the playoffs.

22. (12 points) You go to a pizza place that has 10 topping options for the pizza. In how many ways could you order a pizza with at most 2 toppings? Give a number as your answer, but remember to show all work.