

This is a Practice Test with 50 items, 2 points each.  
The Actual Test will have 33 items, 3 points each

MATH M118: Finite Mathematics Test #1: Logic and Sets **FORM 1** Seat \_\_\_\_\_

Name: \_\_\_\_\_ ID: \_\_\_\_\_

Directions:

- Bring your picture ID to the test.
- Be sure to use a number 2 pencil.
- Put your name and full (9 digit) student identification number in the blanks above.
- Put your last and first name on the scantron sheet.
- Put your full (9 digit) student identification number on the scantron sheet.
- Put the form number (located on the top line of this test booklet) on the scantron sheet.
- There is only one best response for each question.
- There is no penalty for guessing.
- Turn the test booklet and scantron sheet in when completed.

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Determine which of the following sentences are statements.

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|---|---------------|---------------------|
| 1. The youngest student passed the exam.          | [A] Statement | [B] Not a Statement |
| 2. $2y + 7 = 11$                                  | [A] Statement | [B] Not a Statement |
| 3. If the forecast is correct, then it will rain. | [A] Statement | [B] Not a Statement |
| 4. Go away from me.                               | [A] Statement | [B] Not a Statement |
| 5. John is strong.                                | [A] Statement | [B] Not a Statement |
| 6. $3 + 4 = 12$                                   | [A] Statement | [B] Not a Statement |

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Let  $p$  denote the statement "Jack committed a crime", and  $q$  denote the statement "Jack is 21 years old."

7. Which of the following denotes the statement "Jack committed a crime and he is not 21 years old."

- [A]  $p \wedge q$     [B]  $p \vee q$     [C]  $p \wedge \sim q$     [D]  $p \vee \sim q$     [E]  $\sim(p \vee q)$

8. Which of the following denotes the statement "Jack committed a crime or he is 21 years old."

- [A]  $p \wedge q$     [B]  $p \vee q$     [C]  $p \wedge \sim q$     [D]  $p \vee \sim q$     [E]  $\sim(p \vee q)$

9. Which of the following denotes the statement "Jack didn't commit a crime and he is not 21 years old."

- [A]  $p \wedge q$     [B]  $p \vee q$     [C]  $p \wedge \sim q$     [D]  $p \vee \sim q$     [E]  $\sim(p \vee q)$

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Given the following truth table:

p	q	*	@	#
T	T	T	F	F
T	F	T	F	T
F	T	T	T	F
F	F	F	F	F

10. Which of the following statements could replace \*?

- [A]  $\sim p \wedge q$     [B]  $(p \vee q) \wedge \sim q$     [C]  $(p \wedge q) \vee \sim p$     [D]  $p \vee q$     [E] None of these.

11. Which of the following statements could replace @?

- [A]  $\sim p \wedge q$     [B]  $(p \vee q) \wedge \sim q$     [C]  $(p \wedge q) \vee \sim p$     [D]  $p \vee q$     [E] None of these.

12. Which of the following statements could replace #?

- [A]  $\sim p \wedge q$     [B]  $(p \vee q) \wedge \sim q$     [C]  $(p \wedge q) \vee \sim p$     [D]  $p \vee q$     [E] None of these.

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Construct a truth table for the following statement  $\sim(p \wedge \sim q)$ . Each blank contains a number which corresponds to the question number. Answer each question either [A] for true or [B] for false.

p	q	$\sim q$	$p \wedge \sim q$	$\sim(p \wedge \sim q)$
T	T	_____	_____	13. _____
T	F	_____	_____	14. _____
F	T	_____	_____	15. _____
F	F	_____	_____	16. _____

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 Let p be the statement "The sun is a star" and q be the statement "The moon is a planet." Determine the truth values of the following based on the truth or falsehood of p and q. [Hint, the moon is not one of the nine planets.]

17.  $\sim(p \wedge q)$             [A] True      [B] False  
 18.  $\sim(p \vee \sim q)$             [A] True      [B] False  
 19.  $(p \wedge \sim q) \vee \sim p$         [A] True      [B] False

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 20. Are the following two statements logically equivalent?  $\sim p \vee \sim q$  and  $\sim(p \wedge q)$

[A] Yes      [B] No (You may want to construct a truth table below to help answer this.)

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 Complete the following truth table. Each blank contains a number which corresponds to the question number. Answer each question either [A] for true or [B] for false.

p	q	$p \textcircled{R} q$	$p \ll q$	$(p \dot{\cup} q) \textcircled{R} p$
T	T	21. _____	25. _____	29. _____
T	F	22. _____	26. _____	30. _____
F	T	23. _____	27. _____	31. _____
F	F	24. _____	28. _____	32. _____

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 Test the validity of the following argument.

If it is warm, Brenda will go to the park or go shopping.  
 It is warm and Brenda goes shopping.  
 Therefore, she does not go to the park.

33. The argument above is \_\_\_\_\_. [A] Valid [B] Not Valid

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34. Given the sets  $A = \{1, 2, 3\}$  and  $B = \{e, u\}$ , which of the following symbols should be placed in the blank to make it a true statement?  $(e, 2) \_ A \times B$

- [a]  $\in$
- [b]  $\notin$
- [c]  $\subset$
- [d]  $\varnothing$
- [e]  $=$

35. If  $A$  and  $B$  are subsets of  $U$  and  $x \in (A \cap B)'$  which of the following is always true?

- [a]  $x \in A \cap B$
- [b]  $x \in A^c$
- [c]  $x \in B^c$
- [d]  $x \in A^c \cup B^c$

36. Let  $A = \{1, 2, 3, 4\}$  and  $B = \{1, 2, 3\}$ , which of the following is equal to  $n(A \times B)$  ?

- [a] 3
- [b] 4
- [c] 12
- [d] 64
- [e] 81

37. How many subsets can be constructed from a set containing 6 elements?

- [a] 0
- [b] 6
- [c] 12
- [d] 36
- [e] 64

38. At Garfield High, 11 students take Algebra but not French, 21 students take French but not Algebra and 46 students take at least one of these two subjects. How many students take both French and Algebra?

- [a] 0
- [b] 14
- [c] 21
- [d] 32

[e] 78

39. Let  $A = \{1, 2, 3\}$ ,  $B = \{3, 4, 5\}$ , and  $C = \{4, 5, 6\}$  be subsets of  $U = \{1, 2, 3, 4, 5, 6, 7\}$ . Find  $A \cap (B \cup C)$ .

- [a]  $\{ \}$
- [b]  $\{1, 2, 3\}$
- [c]  $\{3\}$
- [d]  $\{1, 2\}$
- [e]  $\{1, 2, 3, 4, 5, 6, 7\}$

40. A set  $U$  is partitioned into three subsets  $A$ ,  $B$ , and  $C$ . The number of elements in  $A$  is three times that of  $C$ , and the number in  $C$  is twice the number in  $B$ . If  $n(U) = 45$ , find  $n(B)$ .

- [a] 1
- [b] 5
- [c] 10
- [d] 30
- [e] None of the above.

41. A random sample of 100 students were surveyed about their preferences for types of music to be played on the student radio station. The choices to select from were rock, blues, and country. The results of the survey are listed below.

72 like rock	22 like rock and the blues	12 like all three
40 like blues	20 like rock and country	
37 like country	27 like country and the blues	

How many students surveyed like only one of the three types of music?

- [a] 0
- [b] 12
- [c] 49
- [d] 47
- [e] 149

42. Let  $A$  and  $B$  be subsets of  $U$ ,  $n(U) = 50$ ,  $n(A \cap B) = 10$ , and  $n(B - A) = n(A - B) = 15$ . Find:  $n(A \cup B)$

- [a] 10
- [b] 15
- [c] 20
- [d] 30
- [e] 40

43. Let  $A$  and  $B$  be subsets of  $U$ ,  $n(U) = 50$ ,  $n(A \cap B) = 10$ , and  $n(B - A) = n(A - B) = 15$ .  
Find:  $n(A \cup B)$
- [a] 10  
[b] 15  
[c] 20  
[d] 30  
[e] 40
44. An urn contains 3 red and 5 white balls. Four balls are selected without replacement. Find all the elements of  $R = \{x \mid x \text{ is the number of red balls in the four selected from the urn}\}$
- [a]  $R = \{0\}$   
[b]  $R = \{0, 1\}$   
[c]  $R = \{0, 1, 2\}$   
[d]  $R = \{0, 1, 2, 3\}$   
[e]  $R = \{0, 1, 2, 3, 4\}$
45. Let  $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$ ,  $A = \{1, 2, 3, 4\}$ ,  $B = \{3, 4, 5, 6\}$ , and  $C = \{5, 6, 7, 8\}$ ,  
find  $(A \cap B) \cup (B \cap C)$
- [a]  $\{ \}$   
[b]  $\{5, 6, 7, 8\}$   
[c]  $\{1, 2, 3, 4\}$   
[d]  $\{3, 4, 5, 6\}$   
[e]  $\{1, 2, 3, 4, 5, 6, 7, 8\}$
46. Given  $U = \{x \mid x \text{ is a car in the school parking lot}\}$ ,  $R = \{x \mid x \text{ is a red car}\}$ ,  $F = \{x \mid x \text{ is a foreign car}\}$ ,  
and  $C = \{x \mid x \text{ is a car owned by a faculty member}\}$ . Which of the following sentences best describe  
the set  $X = C - (R \cap F)$ .
- [a]  $X = \{x \mid x \text{ is a car in the school lot, owned by faculty, but it is neither red nor foreign}\}$   
[b]  $X = \{x \mid x \text{ is a car in the school lot, owned by faculty, but it is not a red foreign car}\}$   
[c]  $X = \{x \mid x \text{ is a car in the school lot, owned by faculty, but it is not red or it is foreign}\}$   
[d]  $X = \{x \mid x \text{ is a car in the school lot, owned by faculty, but it is red and foreign}\}$   
[e]  $X = \{x \mid x \text{ is a car in the school lot, owned by faculty, but it is not red or it is not foreign}\}$
47. Determine if the following statement is true.  $B \cap C \subseteq B \cup C$
- [a] True  
[b] False
48. Determine if the following statement is true.  $U - A = A^c$

- [a] True
- [b] False

49. Determine if the following statement is true.  $(G \cup H)' = G' \cap H'$

- [a] True
- [b] False

50. Determine if the following statement is true.  $E - F = E \cap F'$

- [a] True
- [b] False