

Logic has many parallels with sets. Watch for the parallels. Counting uses sets, logic, and visualization; you need to understand the question being asked: be careful and THINK before you try to answer.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Decide whether or not the following is a statement.

- 1) July 4 was a Monday.
A) Statement
B) Not a statement
- 2) This test is too hard.
A) Not a statement
B) Statement
- 3) Do you like this color?
A) Statement
B) Not a statement
- 4) One inch is 2.54 meters.
A) Not a statement
B) Statement

Decide whether the statement is compound.

- 5) Computers are very helpful to people.
A) Compound
B) Not compound
- 6) Today is not Monday.
A) Compound
B) Not compound
- 7) I'll go to Mexico or Costa Rica for my next vacation.
A) Not compound
B) Compound
- 8) She was singing a Simon and Garfunkel song.
A) Not compound
B) Compound
- 9) The sign read "Not for sale".
A) Compound
B) Not compound

Write a negation for the statement.

- 10) She earns more than me.
A) She does not earn less than me.
B) She does not earn more than me.
C) She earns less than me.
D) She earns the same as me.
- 11) Not all people like football.
A) Some people like football.
B) Some people do not like football.
C) All people do not like football.
D) All people like football.
- 12) Some athletes are musicians.
A) Some athletes are not musicians.
B) All athletes are musicians.
C) Not all athletes are musicians.
D) No athlete is a musician.

- 13) Some people don't like walking.
 A) Some people like walking. B) Some people don't like driving.
 C) Nobody likes walking. D) Everyone likes walking.

Convert the symbolic compound statement into words.

- 14) p represents the statement "Her name is Lisa."
 q represents the statement "She lives in Chicago."
 Translate the following compound statement into words:

$$\sim p$$

- A) She does not live in Chicago. B) Her name is not Lisa.
 C) Her name is Teresa. D) It is true her name is Lisa.

- 15) p represents the statement "Her name is Lisa."
 q represents the statement "She lives in Chicago."
 Translate the following compound statement into words:

$$p \wedge q$$

- A) Her name is Lisa or she lives in Chicago.
 B) Her name is Lisa and she lives in Chicago.
 C) Her name is Lisa and she doesn't live in Chicago.
 D) If her name is Lisa, she lives in Chicago.

- 16) p represents the statement : "Students are happy."
 q represents the statement: "Teachers are happy."
 Translate the following compound statement into words:

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

- A) Students are not happy or teachers are not happy.
 B) It is not the case that students are happy or teachers are not happy.
 C) Students are not happy and teachers are not happy.
 D) It is not the case that students are happy and teachers are not happy.

**Let p represent the statement, "Jim plays football", and let q represent the statement "Michael plays basketball".
 Convert the compound statement into symbols.**

- 17) Jim does not play football and Michael does not play basketball.
 A) $\sim(p \wedge q)$ B) $\sim p \wedge \sim q$ C) $\sim p \wedge q$ D) $\sim p \vee \sim q$

- 18) Neither Jim plays football nor Michael plays basketball.
 A) $\sim(p \wedge q)$ B) $\sim p \vee \sim q$ C) $\sim p \wedge q$ D) $\sim(p \vee q)$

- 19) Jim does not play football and Michael plays basketball.
 A) $p \wedge q$ B) $\sim p \wedge q$ C) $\sim(p \wedge q)$ D) $\sim p \vee q$

- 20) It is not the case that Jim does not play football and Michael does not play basketball.
 A) $\sim p \wedge \sim q$ B) $\sim(p \vee q)$ C) $\sim(\sim p \wedge \sim q)$ D) $\sim(\sim p \vee \sim q)$

29) $\sim s \vee (\sim p \vee s)$

A) $\frac{s \quad p \quad \sim s \vee (\sim p \vee s)}{\quad \quad \quad}$

T T F
T F F
F T T
F F T

C) $\frac{s \quad p \quad \sim s \vee (\sim p \vee s)}{\quad \quad \quad}$

T T F
T F T
F T T
F F T

B) $\frac{s \quad p \quad \sim s \vee (\sim p \vee s)}{\quad \quad \quad}$

T T T
T F F
F T T
F F T

D) $\frac{s \quad p \quad \sim s \vee (\sim p \vee s)}{\quad \quad \quad}$

T T T
T F T
F T T
F F T

30) $t \vee (t \wedge \sim t)$

A) $\frac{t \quad t \vee (t \wedge \sim t)}{\quad \quad \quad}$

T T
F F

B) $\frac{t \quad t \vee (t \wedge \sim t)}{\quad \quad \quad}$

T T
F T

C) $\frac{t \quad t \vee (t \wedge \sim t)}{\quad \quad \quad}$

T F
F F

D) $\frac{t \quad t \vee (t \wedge \sim t)}{\quad \quad \quad}$

T F
F T

Use De Morgan's laws to write the negation of the statement. Same Demorgan we met in sets.

31) A day late and a dollar short.

- A) Not a day late and a dollar short.
C) Not a day late and not a dollar short.

- B) A day late or not a dollar short.
D) Not a day late or not a dollar short.

32) Denim is out and linen is in.

- A) Denim is not out and linen is out.
C) Denim is in and linen is out.

- B) Denim and linen are in.
D) Denim is not out or linen is not in.

33) It is Saturday and it is not raining.

- A) It is not Saturday and it is raining.
C) It is Saturday and it is raining.

- B) It is not Saturday or it is not raining.
D) It is not Saturday or it is raining.

Rewrite the statement using the if...then connective. Rearrange the wording or words as necessary.

34) Cats chase mice.

- A) If it is a cat, then it chases mice.
C) If cats chase, then they chase mice.

- B) Cats chase mice.
D) If a cat is chasing it, then it is a mouse.

35) All chocolate is good.

- A) Chocolate is good.
C) If it isn't chocolate, then it isn't good.

- B) If it's good, then it's got to be chocolate.
D) If it's chocolate, then it's good.

36) I'll leave when he arrives.

- A) I'll leave when he arrives.
C) If I will leave, then he'll arrive.

- B) If I leave, then he will leave.
D) If he arrives, then I'll leave.

37) No turkeys like Thanksgiving.

- A) If it is not a turkey, then it likes Thanksgiving.
B) If it is not Thanksgiving, then no turkeys like it.
C) If it is a turkey, then it doesn't like Thanksgiving.
D) If it is Thanksgiving, then turkeys like it.

Construct a truth table for the statement.

38) $q \rightarrow p$

A)

q	p	$q \rightarrow \sim p$
T	T	F
T	F	F
F	T	T
F	F	T

B)

q	p	$q \rightarrow \sim p$
T	T	T
T	F	F
F	T	T
F	F	F

C)

q	p	$q \rightarrow \sim p$
T	T	T
T	F	F
F	T	T
F	F	T

D)

q	p	$q \rightarrow \sim p$
T	T	T
T	F	T
F	T	F
F	F	F

39) $r \rightarrow \sim q$

A)

r	q	$r \rightarrow \sim q$
T	T	F
T	F	F
F	T	T
F	F	T

B)

r	q	$r \rightarrow \sim q$
T	T	T
T	F	T
F	T	F
F	F	F

C)

r	q	$r \rightarrow \sim q$
T	T	F
T	F	T
F	T	T
F	F	T

D)

r	q	$r \rightarrow \sim q$
T	T	T
T	F	F
F	T	T
F	F	T

Write the compound statement in symbols.

Let r = "The food is good."

p = "I eat too much."

q = "I'll exercise."

40) If I eat too much, then I'll exercise.

A) $r \rightarrow p$

B) $p \vee q$

C) $q \rightarrow p$

D) $p \rightarrow q$

41) If the food is good, then I eat too much.

A) $p \rightarrow q$

B) $r \rightarrow p$

C) $r \wedge p$

D) $p \rightarrow r$

42) If the food is good and I eat too much, then I'll exercise.

A) $r \rightarrow (p \wedge q)$

B) $r \wedge (p \rightarrow q)$

C) $p \rightarrow (r \wedge q)$

D) $(r \wedge p) \rightarrow q$

Write the negation of the conditional. Use the fact that the negation of $p \rightarrow q$ is $p \wedge \sim q$.

43) If you give your jacket to the doorman, he will give you a dirty look.

A) You do not give your jacket to the doorman and he will not give you a dirty look.

B) You do not give your jacket to the doorman and he will give you a dirty look.

C) If you give your jacket to the doorman he will not give you a dirty look.

D) You give your jacket to the doorman and he will not give you a dirty look.

44) If you can't take the heat, stay out of the kitchen.

A) You can take the heat and do not stay out of the kitchen.

B) You can't take the heat and do not stay out of the kitchen.

C) You can take the heat and stay out of the kitchen.

D) You can take the heat but stay out of the kitchen.

Write the converse, inverse, or contrapositive of the statement as requested.

CONVERSE: Position

INVERSE: Sign,

CONTRAPOSITIVE: Both sign and position.

45) If I pass, I'll party.

Contrapositive

A) I'll party if I pass.

C) If I don't party, I didn't pass.

B) If I party, then I passed.

D) If I don't pass, I won't party.

46) All cats catch birds.

Inverse

A) If it catches birds, it's a cat.

C) If it's not a cat, it doesn't catch birds.

B) If it doesn't catch birds, it's not a cat.

D) Not all cats catch birds.

47) If I were young, I would be happy.

Converse

A) If I were happy, I would be young.

C) If I were young, I would not be happy.

B) If I were not happy, I would not be young.

D) If I were not young, I would not be happy.

48) $\sim q \rightarrow \sim p$

Converse

A) $q \rightarrow p$

B) $\sim(q \rightarrow p)$

C) $\sim p \rightarrow \sim q$

D) $p \rightarrow q$

49) $q \rightarrow \sim p$

Inverse

A) $p \rightarrow \sim q$

B) $\sim p \rightarrow q$

C) $\sim q \rightarrow p$

D) $q \rightarrow p$

Using the 36 possibilities found in the product table for rolling two dice, list and count the outcomes for which the sum (for both dice) is the following.

50) Equal to 8

A) (2,6), (3,5), (4,4), (4,4), (5,3), (6,2); 6

C) (2,6), (3,5); 2

B) (2,6), (3,5), (4,4), (5,3), (6,2); 5

D) (2,6), (3,5), (4,4); 3

51) Multiple of 5

A) (1,4), (4,1), (2,3), (3,2); 4

C) None

B) (1,5), (2,5), (3,5), (4,5), (5,5), (6,5); 6

D) (1,4), (4,1), (2,3), (3,2), (4,6), (6,4), (5,5); 7

52) Between 7 and 10

A) (2,6), (6,2), (3,6), (6,3), (5,3), (3,5), (4,4), (4,5), (5,4), (3,4), (4,3), (6,4), (4,6), (5,5); 14

B) (2,6), (6,2), (6,3), (3,6), (5,3), (3,5), (4,4), (4,5), (5,4); 9

C) (2,6), (3,6), (5,3), (4,4), (4,5); 5

D) (2,6), (6,2), (6,3), (3,6), (5,3), (3,5), (4,5); 8

53) Less than 3

A) (1,1), (1,2); 2

C) (1,1), (1,2), (2,1), (2,2); 4

B) (1,1), (1,2), (2,1); 3

D) (1,1); 1

54) Greater than 10

- A) (4,6), (6,4), (5,6), (6,5), (5,5); 5
C) (6,5), (5,6), (6,6); 3

- B) (6,6); 1
D) (6,5), (6,6); 2

55) Multiple of 11

- A) (5,6); 1

B) None

- C) (1,1); 1

- D) (5,6), (6,5); 2

Given a group of students: $G = \{\text{Allen, Brenda, Chad, Dorothy, Eric}\}$ or $G = \{A, B, C, D, E\}$, list and count the different ways of choosing the following officers or representatives for student congress. Assume that no one can hold more than one office.

56) Three representatives, if two must be male and one must be female

- A) ABC, CDE; 2

- B) ACB, ACD, AEB, AED; 4

- C) ACB, ACD, AEB, AED, CEB, CED, DEC, BEC, DEA, BEA, DCA, BCA; 12

- D) ACB, ACD, AEB, AED, CEB, CED; 6

57) Three representatives, if two must be female and one must be male

- A) BDA, BDC; 2

- B) BDA, BDC, BDE, BAD, BCD, BED; 6

- C) BDA, BDC, BDE, DBA, DBC; 5

- D) BDA, BDC, BDE; 3

58) A president, a secretary, and a treasurer, if the president must be a woman and the other two must be men

- A) BAC, BAE, DAC, DAE; 4

- B) BAC, BAE, BCE, DAC, DAE, DCE; 6

- C) ABD, CBD, EBD; 3

- D) BAC, BAE, BCE, DAC, DAE, DCE, BCA, BEA, BEC, DCA, DEA, DEC; 12

Solve the problem.

59) A sports shop sells tennis rackets in 3 different weights, 3 types of string, and 4 grip sizes. How many different rackets could they sell?

- A) 36

- B) 10

- C) 24

- D) 27

60) A saleswoman packed 3 jackets and 5 skirts. With one jacket, she could wear all 5 skirts. With another jacket, she could wear 4 skirts. With the third jacket, she could wear only 3 skirts. How many different combinations did she have?

- A) 12

- B) 60

- C) 23

- D) 11

61) A musician plans to perform 5 selections for a concert. If he can choose from 8 different selections, how many ways can he arrange his program?

- A) 40

- B) 56

- C) 6720

- D) 32,768

62) How many different 4-letter radio-station call letters can be made if the first letter must be K or W, repeats are allowed, but the call letters cannot end in an O?

- A) 456,976

- B) 33,800

- C) 16,900

- D) 35,152

63) How many ways can a president, vice-president, and secretary be chosen from a club with 12 members?

- A) 1320

- B) 220

- C) 6

- D) 36

- 64) There are 6 women running in a race. How many different ways could first, second, and third place finishers occur?
A) 216 B) 18 C) 120 D) 20

Evaluate the permutation.

- 65) $8^P 2$
A) 336 B) 1 C) 8 D) 56
- 66) $8^P 0$
A) 0.5 B) 1 C) 40,320 D) 80,640
- 67) $12^P 12$
A) 11 B) 479,001,600 C) 1 D) 0
- 68) Determine the number of permutations of 9 things taken 2 at a time.
A) 504 B) 72 C) 9 D) 1

Evaluate the expression.

- 69) $14^C 8$
A) 3003 B) 1440 C) 60,540,480 D) 2,162,160
- 70) $5^C 0$
A) 120 B) 1 C) 60 D) 30
- 71) $8^C 8$
A) 1 B) 10,080 C) 40,320 D) 0.5
- 72) Determine the number of combinations of 14 things taken 8 at a time.
A) 60,540,480 B) 3003 C) 1440 D) 2,162,160

Solve the problem.

- 73) How many ways can a president, vice-president, secretary, and treasurer be chosen from a club with 9 members? Assume that no member can hold more than one office.
A) 3024 B) 24 C) 36 D) 126
- 74) There are 12 members on a board of directors. If they must form a subcommittee of 4 members, how many different subcommittees are possible?
A) 495 B) 20,736 C) 24 D) 11,880
- 75) There are 8 women running in a race. How many different ways could first, second, and third place finishers occur?
A) 24 B) 512 C) 56 D) 336

- 76) Four married couples have reserved eight seats in a row at the theater, starting at an aisle seat. In how many ways can they arrange themselves if the four men occupy the four seats closest to the aisle?
A) 24 B) 40,320 C) 16 D) 576
- 77) A pool of possible jurors consists of 16 men and 11 women. How many different juries consisting of 5 men and 7 women are possible?
A) 1,352,078 B) 17,383,860 C) 4698 D) 1,441,440
- 78) A poker hand consists of 5 cards dealt from an ordinary deck of 52 playing cards. How many different hands are there consisting of four hearts and one spade?
A) 13 B) 728 C) 9295 D) 715

Answer Key

Testname: M1010 19F CW2

- | | |
|-------|-------|
| 1) B | 50) B |
| 2) A | 51) D |
| 3) B | 52) B |
| 4) B | 53) D |
| 5) B | 54) C |
| 6) A | 55) D |
| 7) B | 56) D |
| 8) A | 57) D |
| 9) B | 58) D |
| 10) B | 59) A |
| 11) D | 60) A |
| 12) D | 61) C |
| 13) D | 62) B |
| 14) B | 63) A |
| 15) B | 64) C |
| 16) B | 65) D |
| 17) B | 66) B |
| 18) D | 67) B |
| 19) B | 68) B |
| 20) C | 69) A |
| 21) A | 70) B |
| 22) A | 71) A |
| 23) B | 72) B |
| 24) B | 73) A |
| 25) A | 74) A |
| 26) B | 75) D |
| 27) A | 76) D |
| 28) B | 77) D |
| 29) D | 78) C |
| 30) A | |
| 31) D | |
| 32) D | |
| 33) D | |
| 34) A | |
| 35) D | |
| 36) D | |
| 37) C | |
| 38) C | |
| 39) C | |
| 40) D | |
| 41) B | |
| 42) D | |
| 43) D | |
| 44) B | |
| 45) C | |
| 46) C | |
| 47) A | |
| 48) C | |
| 49) C | |