Test 2 Sample Questions

Let p, q, r, and s represent the following statements:

p: One plays hard.
q: One is a guitar player.
r: The commute to work is not long.
s: It is not true that the car is working.

Express the following statement symbolically.

1) The commute to work is long. 1) _____

A) s B) ~s C) ~r D) r

Express the quantified statement in an equivalent way, that is, in a way that has exactly the same meaning.

2) All mathematicians are humans. 2) _____

A) Some humans are not mathematicians.
B) All humans are not mathematicians.
C) There are no mathematicians that are not humans.
D) At least one mathematician is a human.

Provide an appropriate response.

3) In symbolic logic, we use _____ to represent statements. 3) _____

A) lowercase letters B) numbers
C) operation symbols D) uppercase letters

Form the negation of the statement.

4) Today is June 19 4) _____

A) Yesterday was not June 17. B) It is not true that today is June 20.
C) Today is not June 19. D) Today is not June 20.

Determine whether the sentence is a statement.

5) Do you like this color? 5) _____

A) statement B) not a statement

6) No professional basketball player has ever gone on to become a news announcer. 6) _____

A) statement B) not a statement

Express the symbolic statement ~p in words.

7) p: The refrigerator is not working. 7) _____

A) The oven is working.
B) It is not true that the refrigerator is working.
C) The refrigerator is almost working.
D) The refrigerator is working.

Write the negation of the quantified statement. (The negation should begin with "all," "some," or "no.")

8) All athletes are famous. 8) _____

A) Some athletes are famous. B) Some athletes are not famous.
C) All athletes are not famous. D) All athletes are somewhat famous.

9) Some drinks are not liquids. 9) _____

A) All liquids are drinks. B) All drinks are liquids.
C) All drinks are not liquids. D) No drinks are liquids.

Given that p and q each represents a simple statement, write the indicated compound statement in its symbolic form.

10) p: He works out. 10) _____
q: He builds up his strength.
He works out or he does not build up his strength.
A) $p \vee \sim q$ B) $p \vee q$ C) $p \rightarrow \sim q$ D) $p \wedge \sim q$

11) p: The outside humidity is high. 11) _____
q: The basement dehumidifier is running.
r: The basement is getting moldy.

If the outside humidity is high, then the basement dehumidifier is running or the basement is not getting moldy.
A) $p \rightarrow (q \wedge \sim r)$ B) $p \rightarrow (q \vee \sim r)$ C) $p \leftrightarrow (q \vee \sim r)$ D) $p \rightarrow (q \vee r)$

12) p: This is a brontosaurus. 12) _____
q: This is a dinosaur.
If this is a brontosaurus, then this is a dinosaur.
A) $p \leftarrow q$ B) $p \vee q$ C) $p \rightarrow q$ D) $p \wedge q$

Given that p and q each represents a simple statement, write the indicated symbolic statement in words.

13) p: The car has been repaired. 13) _____
q: The kids are home.
r: We will visit Aunt Tillie.
$r \leftrightarrow (p \wedge q)$
A) If the car has been repaired, then we will visit Aunt Tillie if the kids are home.
B) We will visit Aunt Tillie if and only if the car has been repaired and the kids are home.
C) If the car has been repaired and the kids are home, then we will visit Aunt Tillie.
D) We will visit Aunt Tillie if and only if the car has been repaired or the kids are home.

14) p: The refrigerator is working. 14) _____
q: The milk is warm.
$\sim p \wedge q$
A) The refrigerator is working and the milk is warm.
B) The refrigerator is not working if and only if the milk is warm.
C) If the milk is warm, then the refrigerator is not working.
D) The refrigerator is not working and the milk is warm.

15) p: The air freshener is working. 15) _____
q: The basement is smelly.
$p \rightarrow \sim q$
A) If the air freshener is working then the basement is not smelly.
B) Either the air freshener is working or the basement is smelly.
C) If the air freshener is not working then the basement is smelly.
D) The air freshener is working if and only if the basement is not smelly.

Write the compound statement in symbolic form. Let letters assigned to the simple statements represent English sentences that are not negated. Use the dominance of connectives to show grouping symbols (parentheses) in symbolic statements.

16) I change the station if and only if it's not true that both I like the song and the DJ is entertaining. 16) _____

A) $(r \leftrightarrow \sim p) \wedge q$ B) $r \leftrightarrow \sim(p \vee q)$ C) $r \leftrightarrow \sim(p \wedge q)$ D) $r \leftrightarrow (\sim p \wedge q)$

Let p, q, and r represent the following simple statements:

p: There is a blizzard outside.

q: We do not have to go to school.

r: We go sledding.

First place parenthesis as needed before and after the most dominant connective and then translate the symbolic statement into English.

17) $\sim p \rightarrow r \vee q$ 17) _____

A) If there is a blizzard outside, then we go sledding or we do not have to go to school.

B) If there is not a blizzard outside, then we go sledding and we do not have to go to school.

C) If there is not a blizzard outside, then we go sledding or we do not have to go to school.

D) If there is a blizzard outside, then we go sledding and we do not have to go to school.

Construct a truth table for the statement.

18) $q \vee (q \wedge \sim q)$ 18) _____

A)

q	$q \vee (q \wedge \sim q)$
T	T
F	T

B)

q	$q \vee (q \wedge \sim q)$
T	F
F	T

C)

q	$q \vee (q \wedge \sim q)$
T	F
F	F

D)

q	$q \vee (q \wedge \sim q)$
T	T
F	F

19) $(s \wedge r) \wedge (\sim r \vee t)$ 19) _____

A)

s	r	t	$(s \wedge r) \wedge (\sim r \vee t)$
T	T	T	F
T	T	F	T
T	F	T	T
T	F	F	F
F	T	T	T
F	T	F	F
F	F	T	F
F	F	F	T

B)

s	r	t	$(s \wedge r) \wedge (\sim r \vee t)$
T	T	T	F
T	T	F	T
T	F	T	T
T	F	F	T
F	T	T	T
F	T	F	F
F	F	T	T
F	F	F	T

C)

s	r	t	$(s \wedge r) \wedge (\sim r \vee t)$
T	T	T	T
T	T	F	F
T	F	T	F
T	F	F	F
F	T	T	F
F	T	F	F
F	F	T	F
F	F	F	F

D)

s	r	t	$(s \wedge r) \wedge (\sim r \vee t)$
T	T	T	T
T	T	F	T
T	F	T	T
T	F	F	T
F	T	T	T
F	T	F	F
F	F	T	T
F	F	F	T

20) $(p \wedge \sim q) \wedge t$ 20) _____

A)

p	q	t	$(p \wedge \sim q) \wedge t$
T	T	T	T
T	T	F	T
T	F	T	T
T	F	F	F
F	T	T	F
F	T	F	T
F	F	T	T
F	F	F	T

B)

p	q	t	$(p \wedge \sim q) \wedge t$
T	T	T	F
T	T	F	F
T	F	T	T
T	F	F	F
F	T	T	F
F	T	F	F
F	F	T	F
F	F	F	F

C)

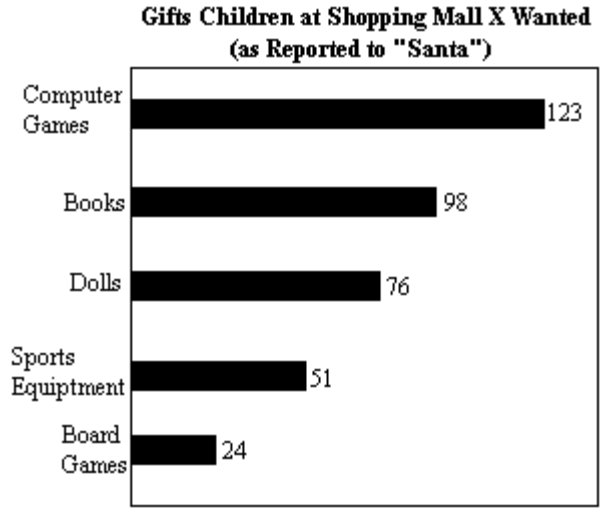
p	q	t	$(p \wedge \sim q) \wedge t$
T	T	T	F
T	T	F	F
T	F	T	F
T	F	F	F
F	T	T	F
F	T	F	T
F	F	T	T
F	F	F	T

D)

p	q	t	$(p \wedge \sim q) \wedge t$
T	T	T	F
T	T	F	F
T	F	T	F
T	F	F	F
F	T	T	F
F	T	F	T
F	F	T	T
F	F	F	F

In a small town shopping mall last December, market researchers recorded the top five gifts that children requested while visiting "Santa." The bar graph below shows the number of children who requested each gift. Use the information given by the graph to determine the truth value of the statement.

21) 21) _____



More than 90 children requested computer games and more children requested dolls than sports equipment.

A) True B) False

Construct a truth table for the statement. Then determine if the statement is a tautology.

22) $(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$ 22) _____

A)

p	q	$p \rightarrow q$	$\sim q$	$\sim p$	$\sim q \rightarrow \sim p$	$(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$
T	T	T	F	F	T	F
T	F	F	T	F	F	T
F	T	T	F	T	T	T
F	F	T	T	T	T	T

Is not a tautology.

B)

p	q	$p \rightarrow q$	$\sim q$	$\sim p$	$\sim q \rightarrow \sim p$	$(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$
T	T	T	F	F	T	T
T	F	F	T	F	F	T
F	T	F	F	T	T	F
F	F	T	T	T	T	T

Is not a tautology.

C)

p	q	$p \rightarrow q$	$\sim q$	$\sim p$	$\sim q \rightarrow \sim p$	$(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$
T	T	T	F	F	F	T
T	F	F	T	F	F	T
F	T	F	F	T	T	T
F	F	T	T	F	T	T

Is a tautology.

D)

p	q	$p \rightarrow q$	$\sim q$	$\sim p$	$\sim q \rightarrow \sim p$	$(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$
T	T	T	F	F	T	T
T	F	F	T	F	F	T
F	T	T	F	T	T	T
F	F	T	T	T	T	T

Is a tautology.

23) $(q \rightarrow p) \leftrightarrow (\sim p \vee q)$ 23) _____

A)

p	q	$q \rightarrow p$	$\sim p$	$\sim p \vee q$	$(q \rightarrow p) \leftrightarrow (\sim p \vee q)$	
T	T	T	F	T	T	
T	F	T	F	F	F	Is not a tautology.
F	T	F	T	T	T	
F	F	T	T	T	T	

B)

p	q	$q \rightarrow p$	$\sim p$	$\sim p \vee q$	$(q \rightarrow p) \leftrightarrow (\sim p \vee q)$	
T	T	T	F	T	T	
T	F	T	F	F	F	Is not a tautology.
F	T	F	T	T	F	
F	F	T	T	T	T	

C)

p	q	$q \rightarrow p$	$\sim p$	$\sim p \vee q$	$(q \rightarrow p) \leftrightarrow (\sim p \vee q)$	
T	T	T	F	T	T	
T	F	F	F	F	T	Is a tautology.
F	T	T	T	T	T	
F	F	T	T	T	T	

D)

p	q	$q \rightarrow p$	$\sim p$	$\sim p \vee q$	$(q \rightarrow p) \leftrightarrow (\sim p \vee q)$	
T	T	T	T	T	F	
T	F	T	F	F	F	Is not a tautology.
F	T	F	T	T	F	
F	F	F	T	T	T	

Construct a truth table for the statement.

24) $(q \rightarrow \sim r) \rightarrow (q \wedge \sim r)$ 24) _____

A)

q	r	$(q \rightarrow \sim r) \rightarrow (q \wedge \sim r)$
T	T	T
T	F	T
F	T	F
F	F	T

B)

q	r	$(q \rightarrow \sim r) \rightarrow (q \wedge \sim r)$
T	T	F
T	F	F
F	F	F
F	T	T

C)

q	r	$(q \rightarrow \sim r) \rightarrow (q \wedge \sim r)$
T	T	T
T	F	T
F	T	F
F	F	F

D)

q	r	$(q \rightarrow \sim r) \rightarrow (q \wedge \sim r)$
T	T	F
T	F	T
F	T	T
F	F	T

25) ~(q → ~ p) 25) _____

A)

p	q	~ p	q → ~ p	~(q → ~ p)
T	T	F	F	T
T	F	F	T	F
F	T	T	T	T
F	F	T	T	F

B)

p	q	~ p	q → ~ p	~(q → ~ p)
T	T	F	F	T
T	F	F	F	T
F	T	T	T	F
F	F	T	T	F

C)

p	q	~ p	q → ~ p	~(q → ~ p)
T	T	F	T	F
T	F	F	F	T
F	T	T	F	T
F	F	T	F	T

D)

p	q	~ p	q → ~ p	~(q → ~ p)
T	T	F	F	T
T	F	F	T	F
F	T	T	T	F
F	F	T	T	F

Construct a truth table for the given statement and then determine if the statement is a tautology.

26) [(p → ~ q) ∧ q] → ~ p 26) _____

A)

p	q	~ q	p → ~ q	(p → ~ q) ∧ q	~ p	[(p → ~ q) ∧ q] → ~ p
T	T	F	F	F	F	F
T	F	T	T	F	F	F
F	T	F	T	T	T	T
F	F	T	T	F	T	T

Is not a tautology.

B)

p	q	~ q	p → ~ q	(p → ~ q) ∧ q	~ p	[(p → ~ q) ∧ q] → ~ p
T	T	F	T	T	F	T
T	F	T	F	F	F	T
F	T	F	F	F	T	T
F	F	T	F	F	T	T

Is a tautology.

C)

p	q	~ q	p → ~ q	(p → ~ q) ∧ q	~ p	[(p → ~ q) ∧ q] → ~ p
T	T	F	F	F	F	T
T	F	T	T	F	F	T
F	T	F	T	T	T	T
F	F	T	T	F	T	T

Is a tautology.

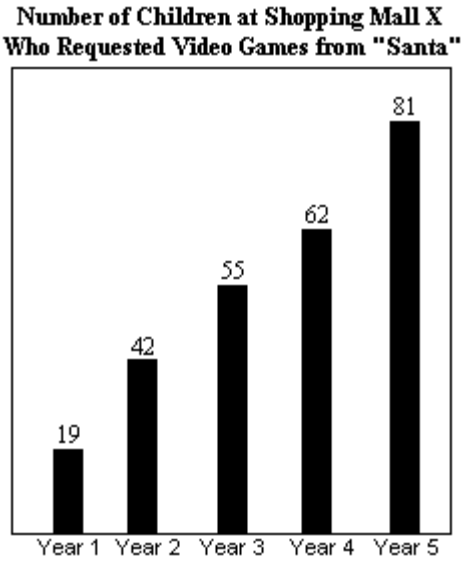
D)

p	q	~ q	p → ~ q	(p → ~ q) ∧ q	~ p	[(p → ~ q) ∧ q] → ~ p
T	T	F	F	F	F	T
T	F	T	T	T	F	T
F	T	F	T	F	T	T
F	F	T	T	F	T	T

Is a tautology.

In a small town shopping mall, market researchers recorded the number of children who requested video games while visiting "Santa." The bar graph below shows the results for five consecutive years. Use the information given by the graph to determine the truth value of the statement.

27) 27) _____



If there was a decrease in the number of children at this mall requesting video games from Year 2 to Year 3, then more than 85 children at this mall requested computer games in Year 5.

A) True B) False

Provide an appropriate response.

28) The biconditional statement $p \leftrightarrow q$ can be written symbolically as _____. 28) _____

A) $(p \rightarrow q) \vee (q \rightarrow p)$ B) $(p \rightarrow q) \wedge (\sim q \rightarrow \sim p)$
C) $(p \rightarrow q) \vee (\sim p \rightarrow \sim q)$ D) $(p \rightarrow q) \wedge (q \rightarrow p)$

29) A conditional statement is false only when the _____, the statement before the $\rightarrow$ connective, is true and the _____, the statement after the $\rightarrow$ connective, is false. 29) _____

A) implication; tautology B) consequent; antecedent
C) tautology; implication D) antecedent; consequent

Use a truth table to determine whether the two statements are equivalent.

30) $p \rightarrow q$ and $\sim q \rightarrow \sim p$ 30) _____

A) Yes B) No

Select the statement that is NOT equivalent to the given statement.

31) It is not true that Giselle and Gerry are both chefs. 31) _____

A) If Giselle is a chef, then Gerry is not a chef.
B) Giselle is not a chef or Gerry is not a chef.
C) If Gerry is a chef, then Giselle is not a chef.
D) Giselle is not a chef and Gerry is not a chef.

Use a truth table to determine whether the two statements are equivalent.

32) $\sim(\sim q)$ and q 32) _____

A) Yes B) No

Write the contrapositive of the statement.

33) If the electricity is out, then I cannot use the computer. 33) _____

A) If I cannot use the computer, then the electricity is out.
B) If the electricity is not out, then I can use the computer.
C) If the electricity is not out, then I cannot use the computer.
D) If I can use the computer, then the electricity is not out.

Write the converse and inverse of the statement.

34) If you drink too much coffee, then you get hyper. 34) _____

A) converse: If you get hyper, then you are drinking too much coffee.
inverse: If you don't drink too much coffee, you don't get hyper.
B) converse: If you don't drink too much coffee, you don't get hyper.
inverse: If you get hyper, then you are drinking too much coffee.
C) converse: If you get hyper, then you are drinking too much coffee.
inverse: If you don't get hyper, then you are drinking too much coffee.
D) converse: If you get hyper, then you are drinking too much coffee.
inverse: If you don't get hyper, then you are not drinking too much coffee.

Use the De Morgan law that states:

$\sim(p \wedge q)$ is equivalent to $\sim p \vee \sim q$

to write an equivalent English statement for the statement.

35) It is not true that condors and rabbits are both birds. 35) _____

A) condors are not birds or rabbits are not birds.
B) condors are birds or rabbits are birds.
C) Neither condors nor rabbits are birds.
D) rabbits are not birds, but condors are.

Use De Morgan's laws to write a negation of the statement.

36) Cats are lazy or dogs aren't friendly. 36) _____

A) Cats are lazy and dogs are friendly.
B) Cats aren't lazy or dogs are friendly.
C) Cats aren't lazy and dogs are friendly.
D) Cats aren't lazy or dogs aren't friendly.

Write the negation of the conditional statement.

37) If there is a disaster, then all doctors are on call. 37) _____

A) There is not a disaster and some doctors are not on call.
B) There is a disaster and some doctors are not on call.
C) If there is a disaster, then some doctors are not on call.
D) There is a disaster and no doctors are on call.

Draw a valid conclusion from the given premises.

38) Students who watch television while doing homework jeopardize their grades. Students with grades in jeopardy get grounded. Being grounded includes being barred from watching television. Therefore.... 38) _____

A) Students who watch TV while doing homework will not be allowed to watch TV.
B) Students who watch TV will be grounded.
C) Students who watch TV will be barred from watching TV.
D) Students who are grounded watch TV while doing homework.

39) It is either day or night. If it is daytime, then the squirrels are scurrying. It is not nighttime. Therefore.... 39) _____

A) Squirrels do not scurry during the day.
B) Squirrels do not scurry at night.
C) The squirrels are not scurrying.
D) The squirrels are scurrying.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

40) Lonni's math professor said to his class, "After the last session, we will go out for a beer or we will have dinner at Chez Louis."
The professor and his class did not go out for a beer.
Therefore.... 40) _____

Write the passage in the form of an argument using the following simple statements:

p: The "diamond" is a fake.
q: Peter will be unhappy for weeks.

The argument's conclusion should be:

The diamond must not have been a fake.

Determine if the argument is valid or invalid.

41) Peter bought a "diamond" from a street vendor. I was sure it was a fake and that it would make Peter miserable for weeks. But I saw him a few days later. He had got the "diamond" appraised and looked quite happy..... 41) _____

A) $p \rightarrow q$
$\sim q$
———
$\therefore p$ The argument is invalid.

B) $p \rightarrow q$
$\sim q$
———
$\therefore \sim p$ The argument is valid.

C) $p \rightarrow q$
$\sim q$
———
$\therefore \sim p$ The argument is invalid.

D) $p \leftrightarrow q$
$\sim q$
———
$\therefore \sim p$ The argument is valid.

Use a truth table to determine whether the symbolic form of the argument is valid or invalid.

42) $p \rightarrow q$ 42) _____

$\sim p$

———

$\therefore \sim q$

A)

p	q	$p \rightarrow q$	$\sim p$	$(p \rightarrow q) \wedge \sim p$	$\sim q$	$[(p \rightarrow q) \wedge \sim p] \rightarrow \sim q$
T	T	T	F	F	F	T
T	F	F	F	F	T	T
F	T	T	T	T	F	F
F	F	T	T	T	T	T

The argument is invalid.

B)

p	q	$p \rightarrow q$	$\sim p$	$(p \rightarrow q) \wedge \sim p$	$\sim q$	$[(p \rightarrow q) \wedge \sim p] \rightarrow \sim q$
T	T	T	F	F	F	T
T	F	F	F	F	T	T
F	T	F	T	F	F	T
F	F	F	T	F	T	T

The argument is valid.

C)

p	q	$p \rightarrow q$	$\sim p$	$(p \rightarrow q) \wedge \sim p$	$\sim q$	$[(p \rightarrow q) \wedge \sim p] \rightarrow \sim q$
T	T	T	F	F	F	T
T	F	F	F	T	T	T
F	T	T	T	T	F	F
F	F	T	T	T	T	T

The argument is invalid.

D)

p	q	$p \rightarrow q$	$\sim p$	$(p \rightarrow q) \wedge \sim p$	$\sim q$	$[(p \rightarrow q) \wedge \sim p] \rightarrow \sim q$
T	T	T	F	T	F	T
T	F	F	F	F	T	T
F	T	F	T	T	F	T
F	F	F	T	T	T	T

The argument is valid.

43) $(p \rightarrow q) \wedge (q \rightarrow r)$ 43) _____

p

$\therefore r$

A) Valid B) Invalid

44) $p \rightarrow \sim q$ 44) _____

$q \rightarrow \sim p$

$\therefore p \vee q$

A) Valid B) Invalid

45) ~ p ∧ q
q ↔ r
———
∴ p ∧ r

45) _____

A)

p	q	r	~ p	~ p ∧ q	q ↔ r	(~ p ∧ q) ∧ (q ↔ r)	p ∧ r	[(~ p ∧ q) ∧ (q ↔ r)] → (p ∧ r)
T	T	T	F	F	T	F	T	T
T	T	F	F	F	F	F	F	T
T	F	T	F	F	F	F	T	T
T	F	F	F	F	T	F	F	T
F	T	T	T	T	T	T	T	T
F	T	F	T	T	F	F	F	T
F	F	T	T	F	F	F	F	T
F	F	F	T	F	T	F	F	T

Symbolic argument is valid.

B)

p	q	r	~ p	~ p ∧ q	q ↔ r	(~ p ∧ q) ∧ (q ↔ r)	p ∧ r	[(~ p ∧ q) ∧ (q ↔ r)] → (p ∧ r)
T	T	T	F	F	T	F	T	T
T	T	F	F	F	F	F	F	T
T	F	T	F	F	F	F	T	T
T	F	F	F	F	T	F	F	T
F	T	T	T	T	T	T	F	F
F	T	F	T	T	F	F	F	T
F	F	T	T	F	F	F	F	T
F	F	F	T	F	T	F	F	T

Symbolic argument is invalid.

C)

p	q	r	~ p	~ p ∧ q	q ↔ r	(~ p ∧ q) ∧ (q ↔ r)	p ∧ r	[(~ p ∧ q) ∧ (q ↔ r)] → (p ∧ r)
T	T	T	F	F	T	F	T	F
T	T	F	F	F	F	F	F	F
T	F	T	F	F	F	F	T	F
T	F	F	F	F	T	F	F	F
F	T	T	T	T	T	T	F	F
F	T	F	T	T	F	F	F	F
F	F	T	T	F	F	F	F	F
F	F	F	T	F	T	F	F	F

Symbolic argument is invalid.

D)

p	q	r	~ p	~ p ∧ q	q ↔ r	(~ p ∧ q) ∧ (q ↔ r)	p ∧ r	[(~ p ∧ q) ∧ (q ↔ r)] → (p ∧ r)
T	T	T	F	F	T	F	T	T
T	T	F	F	F	F	F	F	T
T	F	T	F	F	F	F	T	T
T	F	F	F	F	T	F	F	T
F	T	T	T	T	T	T	T	T
F	T	F	T	T	F	F	F	T
F	F	T	T	F	F	F	F	T
F	F	F	T	F	T	F	F	T

Symbolic argument is valid.

Use an Euler diagram to determine whether the argument is valid or invalid.

46) All insects have six legs. 46) _____
No spiders are insects.
Therefore, no spiders have six legs.
A) valid B) invalid

47) All businessmen wear suits. 47) _____
Aaron wears a suit.
Therefore, Aaron is a businessman.
A) valid B) invalid

48) Eric is older than Camille. 48) _____
Camille is older than Todd.
Therefore, Todd is younger than Eric.
A) valid B) invalid

49) All doctors have studied chemistry. 49) _____
All surgeons are doctors.
Therefore, all surgeons have studied chemistry.
A) valid B) invalid

50) $\sqrt{10}$ is less than 10. 50) _____
5 is less than 10.
Therefore, $\sqrt{10}$ is less than 5.
A) valid B) invalid