

## PRACTICE EXERCISES

1. Suppose  $p$  is the statement 'You eat carrots' and  $q$  is the statement 'You have good eyesight.' Select the correct statement corresponding to the symbols  $\sim(p \rightarrow q)$ .
- You don't eat carrots or you have good eyesight.
  - If you don't eat carrots then you have good eyesight.
  - It is not the case that if you eat carrots then you have good eyesight.
  - It is not the case that either you eat carrots or you have good eyesight.

2. Suppose  $p$  is the statement 'I pass my math course' and  $q$  is the statement 'I will change my major to nuclear physics.' Select the correct statement corresponding to the symbols  $\sim p \rightarrow q$ .
- It is not the case that if I pass my math course then I will change my major to nuclear physics.
  - It is not the case that either I pass my math course or I will change my major to nuclear physics.
  - I don't pass my math course and I will change my major to nuclear physics.
  - None of these.

3. Suppose  $p$  is the statement 'You get a speeding ticket' and  $q$  is the statement 'Your insurance rate goes up.' Select the correct symbolization for the statement 'If your insurance rate doesn't go up then you don't get a speeding ticket'.
- $\sim p \rightarrow \sim q$
  - $\sim q \wedge \sim p$
  - $\sim q \rightarrow \sim p$
  - None of these

4. Suppose  $p$  is true,  $q$  is false,  $s$  is true. Find the truth value of  $(\sim s \wedge p) \rightarrow (\sim q \rightarrow s)$
5. Suppose  $p$  is true,  $q$  is true,  $s$  is false. Find the truth value of  $\sim[(s \rightarrow \sim p) \rightarrow (\sim q \rightarrow s)]$
6. Suppose  $p$  is false,  $q$  is true,  $r$  is true,  $s$  is false. Find the truth value of  $(\sim p \wedge q) \rightarrow (r \rightarrow s)$
7. Suppose  $p$  is false,  $q$  is true,  $s$  is true. Find the truth value of  $(\sim p \vee q) \rightarrow (q \vee s)$
8. Suppose  $p$  is false,  $q$  is true,  $r$  is true,  $s$  is true. Find the truth value of  $(p \rightarrow q) \vee (r \vee \sim s)$
9. Suppose  $p$  is false,  $q$  is true,  $s$  is false. Find the truth value of  $\sim[(s \rightarrow \sim p) \vee (\sim q \rightarrow \sim s)]$

### 10-18: Make a truth table for the given statement.

10.  $(\sim p \vee \sim q) \rightarrow \sim(\sim p \vee r)$
11.  $(p \wedge q) \rightarrow (\sim p \rightarrow q)$
12.  $\sim[(\sim p \vee \sim q) \rightarrow p]$
13.  $(p \wedge q) \rightarrow (p \rightarrow q)$
14.  $(\sim p \vee q) \rightarrow \sim q$
15.  $(p \vee q) \rightarrow \sim r$
16.  $\sim[(\sim p \wedge \sim q) \rightarrow q]$
17.  $(\sim p \wedge \sim q) \rightarrow r$
18.  $\sim[(\sim p \wedge q) \rightarrow p]$

### 19-23: Decide whether the given statement is true or false.

19. True or false:  $(p \wedge q) \rightarrow (\sim p \rightarrow q)$  is a tautology. *Hint: refer to the answer to #11 above.*
20. True or false:  $\sim p \rightarrow q \equiv (\sim p \wedge \sim q) \rightarrow q$  *Hint: refer to the answers to #11 and #16 above.*
21. True or false:  $(\sim p \wedge \sim q) \rightarrow r$  is a tautology. *Hint: refer to the answer to #17 above.*
22. True or false:  $(\sim p \vee q) \rightarrow \sim q \equiv \sim[(\sim p \vee \sim q) \rightarrow p]$  *Hint: refer to the answers to #14 and #12 above.*
23. True or false:  $(\sim p \vee q) \rightarrow \sim q$  is a tautology. *Hint: refer to the answer to #14 above.*



- 24.** Select the statement that is the **negation** of “If you are a fish, then you have cold lips.”
- A. You are a fish and you don’t have cold lips.
  - B. You are a fish or you don’t have cold lips.
  - C. You aren’t a fish or you have cold lips.
  - D. If you aren’t a fish, then you don’t have cold lips.
- 25.** Select the statement that is **logically equivalent** to “Class is cancelled or this is not my lucky day.”
- A. Class is cancelled and this is not my lucky day.
  - B. Class is not cancelled and this is my lucky day.
  - C. Class is not cancelled or this is my lucky day.
  - D. If class is not cancelled then this is not my lucky day.
- 26.** Select the statement that is **logically equivalent** to “If an offer sounds too good to be true, then I’m interested.”
- A. An offer sounds too good to be true or I’m interested.
  - B. An offer doesn’t sound too good to be true, or I’m interested.
  - C. An offer sounds too good to be true and I’m not interested.
  - D. If I’m interested in an offer, then it sounds too good to be true.
- 27.** Select the statement that is the **negation** of “If my computer breaks, then I won’t be able to waste so much paper.”
- A. If my computer doesn’t break then I will be able to waste so much paper.
  - B. My computer breaks and I am able to waste so much paper.
  - C. My computer doesn’t break or I am able to waste so much paper.
  - D. If I am able to waste so much paper, then my computer didn’t break.
- 28.** Select the statement that is **logically equivalent** to “If you want to be on my team, then you like getting bossed around.”
- A. If you don’t like getting bossed around, then you don’t want to be on my team.
  - B. If you don’t want to be on my team, then you don’t like getting bossed around.
  - C. If you like getting bossed around, then you want to be on my team.
  - D. A, B, & C are all correct.
  - E. Stop whining and get to work.
- 29.** Select the statement that is the **negation** of “Some of us don’t have our textbooks.”
- A. None of us have our textbooks.
  - B. Some of us have our textbooks.
  - C. All of us have our textbooks.
  - D. We have this website instead.
- 30.** Select the statement that is **logically equivalent** to “If you have passed MAC4411, then you can’t receive credit for MGF1106.”
- A. You haven’t passed MAC4411 or you can’t receive credit for MGF1106.
  - B. If you can receive credit for MGF1106, then you haven’t passed MAC4411.
  - C. All of those who have passed MAC4411 are ineligible to receive credit for MGF1106.
  - D. A, B and C are all correct.

**31.** Select the statement that is **logically equivalent** to “You can pick your friends or you can pick your nose.”

- A. You can't pick your friends and you can't pick your nose.
- B. You can't pick your friends or you can't pick your nose.
- C. If you can't pick your friends then you can pick your nose.
- D. ...but you can't pick your friend's nose.

**32.** Select the statement that is **logically equivalent** to “If you eat that day-old burrito, you will use lots of hot sauce.”

- A. If you didn't use lots of hot sauce, then you didn't eat that day-old burrito.
- B. If you don't eat that day-old burrito, then you won't use lots of hot sauce.
- C. If you used lots of hot sauce, then you ate that day-old burrito.
- D. A, B, & C are all equivalent to the given statement.

**33.** Select the statement that is the **negation** of

“All bulldogs are sweet and some poodles are mean.”

- A. No bulldogs are sweet and some poodles aren't mean.
- B. No bulldogs are sweet or some poodles aren't mean.
- C. Some bulldogs aren't sweet and no poodles are mean.
- D. Some bulldogs aren't sweet or no poodles are mean.

**34.** Select the statement that is the **negation** of “If some bees fly into your face, then all of your plans for the day are ruined.”

- A. If no bees fly into your face, then all of your plans for the day are ruined.
- B. If some bees fly into your face, then some of your plans for the day aren't ruined.
- C. Some bees fly into your face and some of your plans for the day aren't ruined.
- D. No bees fly into your face and none of your plans for the day are ruined.

**35.** Select the statement that is **logically equivalent** to

“If all of us are OK, then all of them are losers.”

- A. If all of them are losers, then all of us are OK.
- B. Some of us are OK and all of them are losers.
- C. If some of them aren't losers, then some of us aren't OK.
- D. If some of us aren't OK, then some of them aren't losers.

**36.** Select the statement that is **logically equivalent** to

“If I lock my cat in the house, then she beats up the dog.”

- A. I lock my cat in the house and she doesn't beat up the dog.
- B. I don't lock my cat in the house or she beats up the dog.
- C. If I don't lock my cat in the house, then she doesn't beat up the dog.
- D. None of these.

- 37.** Select the statement that is the **negation** of  
“If all things are considered, then I listen to public radio.”
- A. If I don't listen to public radio, then some things aren't considered.
  - B. If all things are considered then I don't listen to public radio.
  - C. Some things aren't considered or I listen to public radio.
  - D. All things are considered and I don't listen to public radio.
- 38.** Select the statement that is **logically equivalent** to “We make a first down or we punt.”
- A. If we don't make a first down, then we punt.
  - B. We punt or we make a first down.
  - C. Both A & B.
  - D. None of these.
- 39.** Select the statement that is the **negation** of “No campaign promises are sincere.”
- A. Some campaign promises are sincere.      B. Some campaign promises are insincere.
  - C. All campaign promises are insincere.      D. All campaign promises are sinister.
- 40.** Select the statement that is logically **equivalent** to "No elephants are forgetful."
- A. If you aren't an elephant, then you are forgetful.
  - B. If you are an elephant, then you aren't forgetful.
  - C. If you aren't forgetful, then you are an elephant.
  - D. All of these.
- 41.** Referring to #28, select the **converse** of the given statement.
- 42.** Referring to #30, select the **contrapositive** of the given statement.
- 43.** Referring to #37, select the **contrapositive** of the given statement.
- 44.** Referring to #35, select the **inverse** of the given statement.
- 45.** Select the statement that is **equivalent** to "No beggars are choosers."
- A. If you aren't a beggar, then you are a chooser.
  - B. All beggars are choosers.
  - C. If one is a beggar, then one isn't a chooser.
  - D. One is a beggar and one isn't a chooser.
- 46.** Referring to #32, select the **inverse** of the given statement.

### ANSWERS TO PRACTICE EXERCISES

1. C 2. D 3. C

4. Suppose p is true, q is false, s is true. Then  $(\sim s \wedge p) \rightarrow (\sim q \rightarrow s)$  is T.

5. Suppose p is true, q is true, s is false. Then  $\sim[(s \rightarrow \sim p) \rightarrow (\sim q \rightarrow s)]$  is F.

6. Suppose p is false, q is true, r is true, s is false. Then  $(\sim p \wedge q) \rightarrow (r \rightarrow s)$  is F.

7. Suppose p is false, q is true, s is true. Then  $(\sim p \vee q) \rightarrow (q \vee s)$  is T.

8. Suppose p is false, q is true, r is true, s is true. Then  $(p \rightarrow q) \vee (r \vee \sim s)$  is T.

9. Suppose p is false, q is true, s is false. Then  $\sim[(s \rightarrow \sim p) \vee (\sim q \rightarrow \sim s)]$  is F.

10.  $(\sim p \vee \sim q) \rightarrow \sim(\sim p \vee r)$

p	q	r	$\sim p$	$\sim q$	$\sim r$	$\sim p \vee \sim q$	$\sim p \vee r$	$\sim(\sim p \vee r)$	$(\sim p \vee \sim q) \rightarrow \sim(\sim p \vee r)$
T	T	T	F	F	F	F	T	F	T
T	T	F	F	F	T	F	F	T	T
T	F	T	F	T	F	T	T	F	F
T	F	F	F	T	T	T	F	T	T
F	T	T	T	F	F	T	T	F	F
F	T	F	T	F	T	T	T	F	F
F	F	T	T	T	F	T	T	F	F
F	F	F	T	T	T	T	T	F	F

11.  $(p \wedge q) \rightarrow (\sim p \rightarrow q)$

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

12.  $\sim[(\sim p \vee \sim q) \rightarrow p]$

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

13.  $(p \wedge q) \rightarrow (p \rightarrow q)$

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

14.  $(\sim p \vee q) \rightarrow \sim q$

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

15.  $(p \vee q) \rightarrow \sim r$

p	q	r	$\sim p$	$\sim q$	$\sim r$	$p \vee q$	$(p \vee q) \rightarrow \sim r$
T	T	T	F	F	F	T	F
T	T	F	F	F	T	T	T
T	F	T	F	T	F	T	F
T	F	F	F	T	T	T	T
F	T	T	T	F	F	T	F
F	T	F	T	F	T	T	T
F	F	T	T	T	F	F	T
F	F	F	T	T	T	F	T

16.  $\sim[(\sim p \wedge \sim q) \rightarrow q]$

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

17.  $(\sim p \wedge \sim q) \rightarrow r$



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

18.  $\sim[(\sim p \wedge q) \rightarrow p]$

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

19. True

20. True

21. False

22. False

23. False

24. A

25. D

26. B

27. B

28. A

29. C

30. D

31. C

32. A

33. D

34. C

35. C

36. B

37. D

38. C

39. A

40. B

41. C

42. B

43. A

44. D

45. C

46. B