PRACTICE EXERCISES

1. Suppose p is the statement 'You need a credit card' and q is the statement 'I have a nickel.'
Select the correct statement corresponding to the symbols $\sim(p \vee q)$.
A. You don't need a credit card and I have a nickel.
B. It is not the case that either you need a credit card or I have a nickel.
C. You don't need a credit card or I have a nickel.
D. None of these.

2. Suppose p is the statement 'There are 1,000 meters in one kilometer' and q is the statement 'You will give me a cake.' Select the correct symbolization for the statement 'There are 1,000 meters in one kilometer or you will not give me a cake'.
A. $\sim(p \wedge q)$ B. $p \wedge \sim q$ C. $p \vee \sim q$ D. None of these

3. Suppose p is the statement 'There are 1,000 meters in one kilometer' and q is the statement 'You will order a burrito.' Select the correct symbolization for the statement 'There are not 1,000 meters in one kilometer and you won't order a burrito'.
A. $\sim p \wedge \sim q$ B. $\sim(p \wedge q)$ C. $\sim p \vee \sim q$ D. None of these

4. Suppose p is the statement 'I play softball' and q is the statement 'The moon is 250,000 miles from Earth.' Select the correct statement corresponding to the symbols $\sim p \wedge q$.
A. I don't play softball and the moon is 250,000 miles from Earth.
B. It is not the case that either I play softball or the moon is 250,000 miles from Earth.
C. I don't play softball or the moon is 250,000 miles from Earth.
D. It is not the case that both I play softball and the moon is 250,000 miles from Earth.

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

12-17: Make a truth table for the given expression.

12. $(\sim p \wedge q) \vee (p \wedge \sim q)$ **13.** $(p \wedge \sim q) \vee r$ **14.** $\sim[(p \wedge \sim q) \vee \sim p]$

15. $(p \vee q) \wedge \sim(\sim q \wedge r)$ **16.** $(\sim p \wedge q) \vee (\sim p \vee q)$ **17.** $\sim[(p \vee q) \wedge \sim q]$

18 – 21: In each case, decide whether the statement is true or false.

18. True or false: $(\sim p \wedge q) \vee (\sim p \vee q) \equiv \sim[(p \vee q) \wedge \sim q]$

Hint: refer to the answers to #16 and #17 above.

19. True or false: $(\sim p \wedge q) \vee (p \wedge \sim q)$ is a tautology. *Hint: refer to the answer to #12 above.*

20. True or false: $(\sim p \wedge q) \vee (\sim p \vee q) \equiv (\sim p \vee q)$ *Hint: refer to the answer to #16 above.*

21. True or false: $(p \vee q) \wedge \sim(\sim q \wedge r) \equiv (p \wedge \sim q) \vee r$

Hint: refer to the answers to #15 and #13 above

22. Select the statement that is the **negation** of “All summer days are muggy.”

A. All muggy days are summer. B. Some summer days are muggy.

C. Some summer days are not muggy. D. No summer days are muggy.

23. Select the statement that is the **negation** of “Some weasels are cuddly.”

A. No weasels are cuddly. B. All weasels are cuddly.

C. Some weasels are not cuddly. D. All cuttlefish are weasely.

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

“Coach Spurrier is charming and Coach Spurrier is modest.”

A. Coach Spurrier is not charming and Coach Spurrier is not modest.

B. Coach Spurrier is not charming or Coach Spurrier is not modest.

C. Coach Spurrier is not charming and Coach Spurrier is modest.

D. Let’s get serious for a minute.

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

“The speed limit is 55 and granny is driving 35.”

A. The speed limit is not 55 or granny is not driving 35.

B. The speed limit is not 55 and granny is not driving 35

C. The speed limit is not 55 or granny is driving 35.

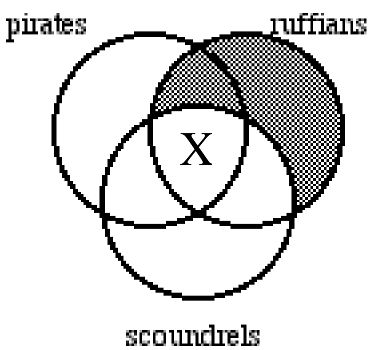
D. The speed limit is not 55 and granny is driving 35.

E. Counseling for road rage is available at 1 - 900 - calmdown.

26. Select the statement that is the **negation** of "All circus clowns are undignified."
A. All circus clowns are dignified.
B. All cirrus clouds are indistinguishable.
C. Some circus clowns are dignified.
D. No circus clowns are dignified.

27. Select the statement that is the **negation** of "You wear matching socks to the interview or you don't get hired."
A. You don't wear matching socks to the interview or you get hired.
B. You don't wear matching socks to the interview and you get hired.
C. You don't wear matching socks to the interview and you don't get hired.
D. If you don't wear matching socks to the interview, then you don't get hired.

28. Suppose the marked diagram below conveys information about relationships between pirates, ruffians and scoundrels. We use shading to indicate that a region contains no elements. An "X" in a region indicates the existence of at least one element; an "X" on the boundary between two regions indicates that the union of those two regions contains at least one element. If a region is unmarked, then whether that region contains any elements is uncertain. Select the choice that must be true according to the marked diagram.



A. No scoundrels are ruffians and some pirates aren't scoundrels.
B. All ruffians are scoundrels and some scoundrels aren't pirates.
C. No pirates are scoundrels and some ruffians are scoundrels.
D. All ruffians are scoundrels and some pirates are ruffians.
E. None of these is correct.

ANSWERS TO PRACTICE EXERCISES

1. B **2.** C **3.** A **4.** A

5. Suppose p is false, q is false, s is true. Then $(s \vee p) \wedge (q \wedge \sim s)$ is F.

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

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

8. Suppose p is false, s is false, r is true. Then $\sim[(s \wedge p) \vee \sim r]$ is T.

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

10. Suppose p is false, q is true, r is false. Then $(p \vee \sim q) \vee r$ is F.

11. Suppose p is true, q is true, r is true, s is false. Then (~p∨s) ∨ (s∧r) is F.

12. (~p∧q) ∨ (p∧~q)

p	q	~p	~q	~p∧q	p∧~q	(~p∧q)∨(p∧~q)
T	T	F	F	F	F	F
T	F	F	T	F	T	T
F	T	T	F	T	F	T
F	F	T	T	F	F	F

13. (p∧~q) ∨ r

p	q	r	~p	~q	~r	p∧~q	(p∧~q)∨r
T	T	T	F	F	F	F	T
T	T	F	F	F	T	F	F
T	F	T	F	T	F	T	T
T	F	F	F	T	T	T	T
F	T	T	T	F	F	F	T
F	T	F	T	F	T	F	F
F	F	T	T	T	F	F	T
F	F	F	T	T	T	F	F

14. ~[(p∧~q) ∨ ~p]

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

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

p	q	r	~p	~q	~r	p ∨ q	~q ∧ r	~(~q ∧ r)	(p ∨ q) ∧ ~(~q ∧ r)
T	T	T	F	F	F	T	F	T	T
T	T	F	F	F	T	T	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	F	T	T
F	T	F	T	F	T	T	F	T	T
F	F	T	T	T	F	F	T	F	F
F	F	F	T	T	T	F	F	T	F

16. $(\sim p \wedge q) \vee (\sim p \vee q)$

p	q	~p	~q	~p ∧ q	~p ∨ q	(~p ∧ q) ∨ (~p ∨ q)
T	T	F	F	F	T	T
T	F	F	T	F	F	F
F	T	T	F	T	T	T
F	F	T	T	F	T	T

17. $\sim[(p \vee q) \wedge \sim q]$

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

18. True **19.** False **20.** True **21.** False **22.** C **23.** A
24. B **25.** A **26.** C **27.** B **28.** D