

### 3 Test Prep

Complete the following to summarize the important ideas from this chapter.

Q: How can you determine the number of elements in different regions of a Venn diagram?

NEED HELP?

- See Lessons 3.1, 3.2, 3.3, and 3.4

A: • For a set and its complement,  $n(A) + n(A') = \underline{n(U)}$  UNIVERSAL SET

• For two disjoint sets,  $n(A \cup B) = \underline{n(A) + n(B)}$  and  $n(A \cap B) = \underline{0}$ .

• For two non-disjoint sets, the principle of inclusion and exclusion states  
 $n(A \cup B) = \underline{n(A) + n(B) - n(A \cap B)}$

or  $n(A \cup B) = n(A \setminus B) + \underline{n(B \setminus A)} + n(A \cap B)$ .

• For three non-disjoint sets, the principle of inclusion and exclusion states

$n(A \cup B \cup C) = n(A) + \underline{n(B)} + \underline{n(C)} - n(A \cap B) - \underline{n(A \cap C)}$   
 $- \underline{n(B \cap C)} + n(A \cap B \cap C)$ .

Q: When is a conditional statement false?

NEED HELP?

- See Lesson 3.5

A: A conditional statement is false when the hypothesis is true and the conclusion is false. Otherwise, the conditional statement is true.

Q: How do you write the converse, inverse, and contrapositive of a conditional statement  $p \Rightarrow q$ ?

NEED HELP?

- See Lessons 3.5 and 3.6

A1: • Write the converse by flipping the hypothesis and conclusion of the conditional statement.

• For the inverse, negating the hypothesis and conclusion of the conditional.

• For the contrapositive, flip and negate the hypothesis and conclusion of the conditional.

A2: converse:  $q \Rightarrow p$  inverse:  $\neg p \Rightarrow \neg q$  contrapositive:  $\neg q \Rightarrow \neg p$

# 3 Chapter Test

## MULTIPLE CHOICE

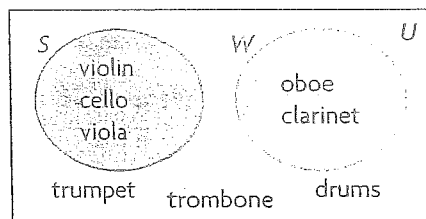
$$n(X) + n(X') = n(U)$$

$$21 + 400 = 421$$

1. Determine  $n(U)$ , the universal set, given  $n(X) = 21$  and  $n(X') = 400$ .

- A. 421      B. 389      C. 21      D. 401

2. Which choice describes the Venn diagram and the sets best?



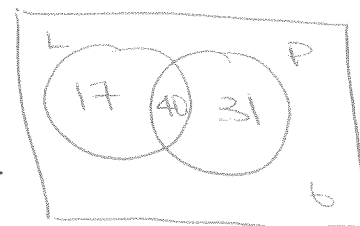
- A.  $U = \{\text{instruments in orchestra}\}$ ,  $S = \{\text{strings}\}$ ,  
 $W = \{\text{woodwinds}\}$ ;  $S = U'$
- B.  $U = \{\text{strings}\}$ ,  $S = \{\text{brass}\}$ ,  $U' = \{\text{percussion}\}$ ;  $W = S'$
- C.  $U = \{\text{instruments in orchestra}\}$ ,  $S = \{\text{strings}\}$ ,  
 $W = \{\text{woodwinds}\}$ ;  $S \subset U$ ,  $W \subset U$ ,  $S$  and  $W$  are disjoint.
- D.  $U = \{\text{instruments in orchestra}\}$ ,  $S = \{\text{woodwinds}\}$ ;  $S$  and  $U$  are disjoint.

3. Marcel asked some students if they like liquorice or popcorn.

- 17 students like liquorice only.
- 40 students like both types of food.
- 31 students like popcorn only.
- 6 students like neither type of food.

Determine how many students Marcel asked.

- A. 98       B. 94      C. 66      D. 17



$$17 + 40 + 31 + 6 = 94$$

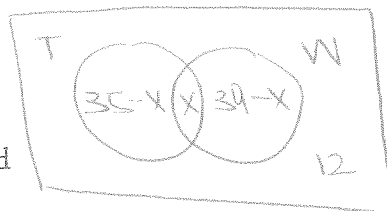
4. In each case, a conditional statement is given. In which case are the correct converse, inverse, and contrapositive also given?

- A. conditional statement: If  $x < 10$  and  $y < 10$ , then  $x \cdot y < 100$ .  
 converse: If  $x \cdot y < 100$ , then  $x < 10$  and  $y < 10$ .  
 inverse: If  $x \geq 10$  and  $y \geq 10$ , then  $x \cdot y \geq 100$ .  
 contrapositive: If  $x \cdot y \geq 100$ , then  $x \geq 10$  and  $y \geq 10$ .
- B. conditional statement: If I am a teacher, then I go to school.  
~~X~~converse: If I am not a teacher, then I do not go to school.  
 inverse: If I go to school, then I am a teacher.  
 contrapositive: If I do not go to school, then I am not a teacher.
- C. conditional statement: If you work at a job, then you will get paid.  
~~X~~converse: If you do not get paid, then you do not work at a job.  
 inverse: If you work at a job, then you will not get paid.  
 contrapositive: If you get paid, then you work at a job.
- D. conditional statement: If the world is flat, then I will wear blue.  
~~X~~converse: If I do not wear blue, then the world is not flat.  
 inverse: If I wear blue, then the world is flat.  
 contrapositive: If I do not wear blue, the world is not flat.

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

Date: \_\_\_\_\_

NUMERICAL RESPONSE



5. There are 64 passengers on a morning bus. Of these passengers, 35 need transfers and 39 are going to work. There are 12 passengers who do not need transfers and are not on their way to work.

22 passengers need transfers and are going to work.  
 $35 - 22 = 13$  passengers need transfers, but are not going to work.  
 $39 - 22 = 17$  passengers are going to work, but do not need transfers.

$$35 - x + x + 39 - x + 12 = 64$$

$$86 - x = 64$$

$$\begin{array}{r} 86 \\ -86 \\ \hline -x = -22 \\ x = 22 \end{array}$$

6. The number of elements in the universal set,  $n(U)$ , given  $n(X) = 58$  and  $n(X') = 219$ , is  $58 + 219 = 277$ .

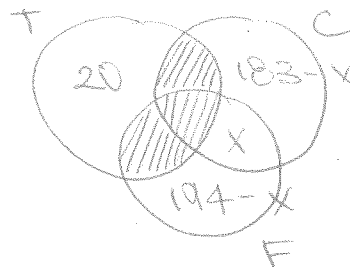
7. At a university, 339 first-year students need to think about which option to take in their second year.

- 20 students are interested in teaching only.
- 183 students are interested in computer science.
- 194 students are interested in finance.

$183 - 58 = 125$  students are interested in computer science only.

$194 - 58 = 136$  students are interested in finance only.

58 students are interested in computer science and finance.

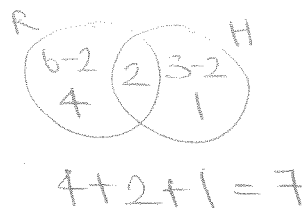


$$20 + 183 - x + x + 194 - x = 339$$

$$\begin{array}{r} 397 \\ -317 \\ \hline -x = -58 \\ x = 58 \end{array}$$

8. Lyn is taking a tour of Egypt and Jordan next winter to visit the many historic sites, including the pyramids and the stone city of Petra. Give four words or phrases that Lyn might use to search for information on the Internet. Use set theory to explain how quotation marks and the word "and" could help her refine her search.

9. The school athletic team consists of 6 runners and 3 high jumpers. Two team members are high jumpers and runners. There are 7 members on the team.



$$4 + 2 + 1 = 7$$

10. The local beauty salon has a total staff of 8 manicurists and 9 hairdressers. Three of these are manicurists and hairdressers. There are 14 people on staff.



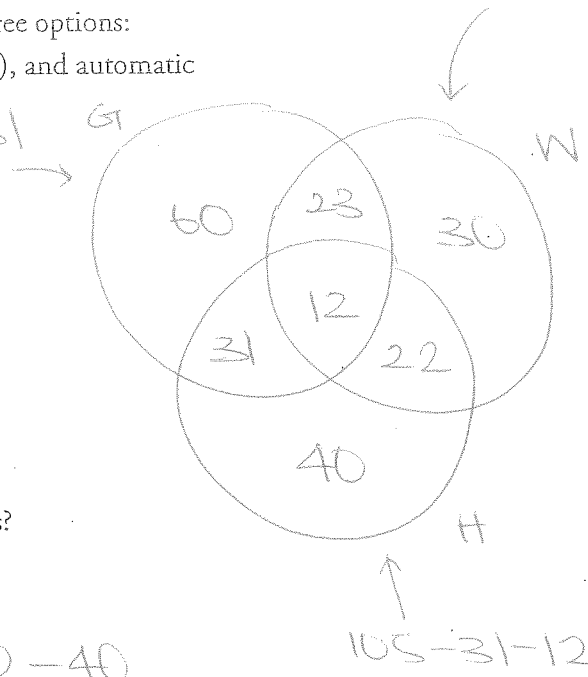
$$5 + 3 + 6 = 14$$

WRITTEN RESPONSE

87-23-12-22

11. A car dealer conducted a survey of 230 customers about three options: Global Positioning System (GPS) ( $G$ ), power windows ( $W$ ), and automatic headlights ( $H$ ).

- 126 like the GPS.  $n(G)$
- 87 like the windows.  $n(W)$
- 105 like the headlights.  $n(H)$
- 23 like the GPS and windows, but not the headlights.
- 22 like the windows and headlights, but not the GPS.
- 31 like the headlights and GPS, but not the windows.
- 12 like all three options.



How many customers did not like any of the three options?  
Explain your answer.

$$230 - 60 - 23 - 30 - 31 - 12 - 22 - 40 = 12$$

12. Give an example of a conditional statement. Then provide its inverse, converse, and contrapositive. Briefly explain how you formed these statements. If any of them are false, then give a counterexample if possible. If your statement is biconditional, state it with the phrase "if and only if."

conditional: If hypothesis then conclusion

converse: If conclusion then hypothesis

inverse: If not hypothesis then not conclusion

contrapositive: If not conclusion then not hypothesis.

Biconditional: Hypothesis if and only if conclusion