

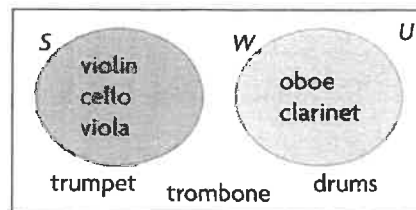
3 Chapter Test

MULTIPLE CHOICE

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
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.
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.
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.
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.

_____ passengers need transfers and are going to work.

_____ passengers need transfers, but are not going to work.

_____ passengers are going to work, but do not need transfers.

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

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.

_____ students are interested in computer science only.

_____ students are interested in finance only.

_____ students are interested in computer science and finance.

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 _____ members on the team.

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

Name: _____

Date: _____

WRITTEN RESPONSE

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.
- 87 like the windows.
- 105 like the headlights.
- 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.

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.”

Lesson 3.5, page 76

- $p = \text{"I am reading"}; q = \text{"I am studying"}$
 - false; e.g., I might be reading for pleasure, not studying.
 - If I am studying, then I am reading; false; e.g., I might be studying music by practising.
- $p = \text{"a number ends in 0"}; q = \text{"a number is divisible by 5"}$
 - true
 - If it is fall, then the deciduous trees are changing colour; true
- true
 - "If an integer is divisible by 3, then it is divisible by 9"; false; e.g., 15 is divisible by 3 but not by 9.
- e.g., If a polygon is a square, then it has four equal sides.
 - e.g., If a polygon has four equal sides, then it is a square.
 - true; false
 - no; e.g., The conditional statement is true but the converse is not.
- A. 6. B.
- false; e.g., I could pass with less than 75%.

Lesson 3.6, page 80

- $5x + 37 \neq 59$
 - The flowers are not red.
 - Spring does not follow winter.
- e.g., no; "I will not do that chore tomorrow."
- Converse: If C is the same distance from every point on a circle then C is at the centre of a circle.
Inverse: If C is not at the centre of a circle, then C is not the same distance from every point on the circle.
Contrapositive: If C is not the same distance from every point on a circle, then C is not at the centre of a circle.
 - Converse: If $3y$ is divisible by 3, then y is a whole number.
Inverse: If y is not a whole number, then $3y$ is not divisible by 3.
Contrapositive: If $3y$ is not divisible by 3, then y is not a whole number.
- e.g., If a polygon is a hexagon, then it has six sides.
Inverse: e.g., If a polygon does not have six sides, then it is not a hexagon.
- Yes
 - no; -7 is also a possible value for x .
 - yes; $7^2 = 49$
 - yes; If $x^2 \neq 49$, then $x \neq 7$.
 - no; e.g., If $x \neq 7$, then it is still possible that $x^2 = 49$.
- i) True.
 - If you are in the Northwest Territories, then you are in Yellowknife. False. You might be in another community.
 - If you are not in Yellowknife, then you are not in the Northwest Territories. False. You might be in another community.
 - If you are not in the Northwest Territories, then you are not in Yellowknife. True.
 - i) True.
 - If a cat is female, then it has had kittens. False. A female cat might not have had kittens.
 - If a cat has not had kittens, then it is not female. False. A female cat might not have had kittens.
 - If a cat is not female, it has not had kittens. True.
- i) True.
 - If Oleg has a racquet in his hand, then he is playing badminton. False. He might be playing squash or tennis.
 - If Oleg is not playing badminton, then he does not have a racquet in his hand. False. He might be playing squash with a racquet.
 - If Oleg does not have a racquet in his hand, then he is not playing badminton. True.
 - i) False. Point $(0, 6)$ is on many graphs, such as $y = 2x + 6$.
 - If the equation of a graph is $y = 3x^2 + 6$, then point $(0, 6)$ is on the graph. True.

- If point $(0, 6)$ is not on a graph, then the equation of the graph is not $y = 3x^2 + 6$. True.
 - If the equation is not $y = 3x^2 + 6$, then point $(0, 6)$ is not on the graph. False. Point $(0, 6)$ is on graphs with different equations, such as $y = 2x + 6$.
- D.
 - e.g., The inverse is false, because its truth is always the same as that of the converse. The contrapositive is true because its truth is always the same as that of the conditional statement.

Chapter 3 Test Prep, page 84

- Q1:**
- For a set and its complement, $n(A) + n(A') = n(U)$.
 - For two disjoint sets, $n(A \cup B) = n(A) + n(B)$ and $n(A \cap B) = 0$
 - For two non-disjoint sets, the Principle of Inclusion and Exclusion states $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ or $n(A \cup B) = n(A \setminus B) + n(B \setminus A) + n(A \cap B)$
 - For three non-disjoint sets, the Principle of Inclusion and Exclusion states $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C)$
- Q2:** A conditional statement is false when the hypothesis is true and the conclusion is false. Otherwise, the conditional statement is true.
- Q3: A1:**
- Write the converse by exchanging the hypothesis and conclusion of the conditional statement.
 - For the inverse, negate the hypothesis and conclusion of the conditional.
 - For the contrapositive, exchange and negate the hypothesis and conclusion of the conditional.
- A2:** Converse: $q \rightarrow p$ inverse: $\neg p \Rightarrow \neg q$ contrapositive: $\neg q \Rightarrow \neg p$

Chapter 3 Test, page 85

- A. 2. C. 3. B. 4. A.
- 22 passengers; 13 passengers; 17 passengers
- 277
- 125 students; 136 students; 58 students
- e.g., "Egypt," "Jordan," "Pyramids," "Petra"; by combining two or more of these terms, Lynn can search for the intersection of web pages related to these terms. For example, "Egypt" and "Petra" are more likely to give useful information than either of these terms on its own, or without the "and."
- 7 members
- 14 people
- 12 customers
- e.g., If $y + 6 \geq 3$, then $y \geq -3$. This is in the form $p \Rightarrow q$, where the hypothesis, p , is $y + 6 \geq 3$ and the conclusion, q , is $y \geq -3$. The inverse is $q \Rightarrow p$. Inverse: If $y \geq -3$, then $y + 6 \geq 3$. The converse is $\neg p \Rightarrow \neg q$. Converse: If $y + 6 < 3$, then $y < -3$. The contrapositive is $\neg q \Rightarrow \neg p$. Contrapositive: If $y < -3$, then $y + 6 < 3$. All of these statements are true. The conditional statement is biconditional, so $y + 6 \geq 3$ if and only if $y \geq -3$.

Chapter 4

Getting Started, page 88

- ii)
 - iv)
 - iii)
 - i)
- e.g.,

