

### FREQUENTLY ASKED Questions

#### Study Aid

- See Lesson 3.4, Example 2.

**Q:** How can an understanding of sets help you conduct Internet searches?

**A:** Sets that are created by using the words “and,” “or,” or “not” can help you define your search. If you want the exact wording, use quotation marks around the word or phrase. To further reduce your hits, enter a “-” (minus sign) immediately before any words or phrases you want to avoid.

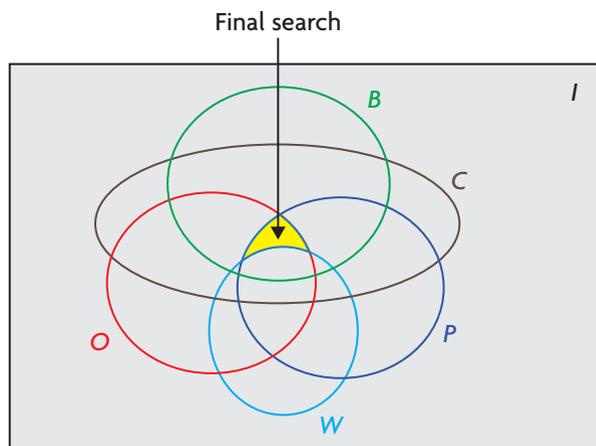
For example, suppose that you want a recipe for chocolate chip cookies like your grandmother used to make. Searching *chocolate chip cookie recipe* nets 938 000 results. Using quotation marks, “*chocolate chip cookie recipe*” gets 172 000 results.

You remember that your grandmother’s recipe contained oatmeal and pecans, so you search “*chocolate chip cookie recipe*” and *oatmeal and pecans*. You get 124 000 results.

You dislike walnuts, so now you search for “*chocolate chip cookie recipe*” and *oatmeal and pecans* –*walnuts*. You get 6270 results.

To further narrow your search, you look for the exact phrase “*brown sugar*”: “*chocolate chip cookie recipe*” and *oatmeal and pecans* –*walnuts* and “*brown sugar*.” Now you have only 4660 recipes to check.

- $I = \{\text{all search results}\}$   
 $C = \{\text{“chocolate chip cookie recipe”}\}$   
 $O = \{\text{with oatmeal}\}$   
 $P = \{\text{with pecan}\}$   
 $W = \{\text{with walnut}\}$   
 $B = \{\text{“brown sugar”}\}$



**Q: How do you form the converse, inverse, and contrapositive of a conditional statement?**

**A:** In the following table,  $p$  represents a hypothesis and  $q$  represents a conclusion.

**Study Aid**

- See Lesson 3.5, Examples 2 and 4; Lesson 3.6.

Type of Statement	Conditional statement	Converse	Inverse	Contrapositive
How to Create Statement	The truth of $p$ implies the truth of $q$ .	Switch $p$ and $q$ .	Negate $p$ and $q$ .	Negate and switch $p$ and $q$ .
Written in Logic Notation	$p \Rightarrow q$	$q \Rightarrow p$	$\neg p \Rightarrow \neg q$	$\neg q \Rightarrow \neg p$
Example	If a bird quacks, then it is a duck.	If a bird is a duck, then it quacks.	If a bird does not quack, then it is not a duck.	If a bird is not a duck, then it does not quack.

**Q: How do you decide whether a conditional statement is true or false?**

**A:** Assume that the hypothesis is true. You then need to determine if the conclusion that follows is true or false. If the conclusion is true, then the conditional statement is true.

If the conclusion is false, then the conditional statement is false.

You can also use this approach to decide if the converse, inverse, or contrapositive statements are true.

Note the following:

- If the hypothesis is false, then the conditional statement is always true.
- If a conditional statement is true, then its contrapositive is true, and vice versa.
- If the converse of a conditional statement is true, then its inverse is true.

**Study Aid**

- See Lesson 3.5, Examples 1 and 2; Lesson 3.6, Examples 1 to 3.
- Try Chapter Review Question 8.

**Q: What is a biconditional statement, and how can you create it?**

**A:** A biconditional statement is a statement in which both the original conditional statement and its converse are always true. Combine both the statement and its converse, using “if and only if.”  
For example: A number is divisible by 2, if and only if it is even.

**Study Aid**

- See Lesson 3.5, Examples 3 to 5; Lesson 3.6, Example 3.
- Try Chapter Review Question 6.

# PRACTISING

## Lesson 3.1

- a) Draw a Venn diagram to show these sets.
  - the universal set  $U = \{\text{natural numbers from 1 to 30 inclusive}\}$
  - $E = \{\text{multiples of 2}\}$
  - $F = \{\text{multiples of 16}\}$
  - $S = \{\text{multiples of 3}\}$
- b) List the disjoint subsets, if there are any.
- c) Is any set a subset of the other sets? Explain.
- d) Define  $S'$ . How is it different from  $E'$ ?
- e) Give an example of an empty set.

## Lesson 3.2

- There are 28 students on the school track and field team.
  - 19 have black hair.
  - 8 have blue eyes.
  - 9 do not have black hair or blue eyes.
- a) How many students have black hair and blue eyes? Explain.
- b) How many students have black hair but not blue eyes?
- c) How many students have blue eyes but not black hair?

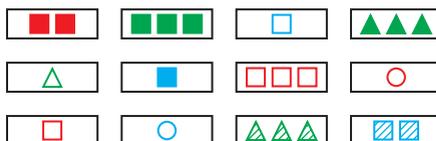
## Lesson 3.3

- Consider these two sets:
    - $A = \{-12, -9, -6, -3, 0, 3, 6, 9, 12\}$
    - $B = \{x \mid -12 \leq x \leq 12, x \in \mathbb{I}\}$
  - a) Determine  $A \cup B$ ,  $n(A \cup B)$ ,  $A \cap B$ , and  $n(A \cap B)$ .
  - b) Draw a Venn diagram to show these two sets.
- Neil asked 40 people at a bookstore if they prefer romance novels or horror novels.
    - 18 people do not like either type.
    - 10 people like romance novels.
    - 13 people like horror novels.

Determine how many people like both romance novels and horror novels.

## Lesson 3.4

- The following 12 cards have three different shapes, colours, and numbers. Create six sets, with three cards in each set. Each set of three cards must have
  - the same number or three different numbers, and
  - the same shape or three different shapes, and
  - the same colour or three different colours.All the cards in each set can be used more than once.



## Lesson 3.5

- Determine whether each statement is biconditional, and explain your reasoning. If the statement is biconditional, write it in biconditional form. If it is not biconditional, give a counterexample.
  - If  $x$  is positive, then  $10x > x$ .
  - If you live in Victoria, then you live on Vancouver Island.
  - If  $xy$  is an odd number, then both  $x$  and  $y$  are odd numbers.
  - If two numbers are even, then their sum is even.
- Serge is considering buying a new car but must borrow \$24 729.56 from the dealership for 60 months, at 2.9% interest.
  - If he buys the car, then what will his monthly payment be?
  - If Serge chose to pay an additional \$100 a month, then how much sooner could he pay off the loan?

## Lesson 3.6

- For each conditional statement below, verify or disprove the statement, its converse, its inverse, and its contrapositive with a counterexample.
  - If a number is positive, then it is not negative.
  - If Monday is a holiday, then it is a long weekend.