Unit 3: Logic and Reasoning Lesson 3.2

Coach's Corner – III

1. Explain whether each of the following conclusions was drawn from inductive or deductive reasoning.

   a. The inflation rate was about 2% last year, so it will be about 2% next year.

   b. Bobby is a hockey player so he plays in the National Hockey League.

   c. All prime numbers larger than 2 must be odd because an even number will have 2 as a factor.

   d. The next number in the sequence 2, 5, 11, 23, 47, 95 is 191.

2. Consider the following statements. Decide if the conclusion is valid in each case. Explain.

   a. Jessie is Sammy's only sister. Sammy's sister is afraid of heights. Sammy is afraid of heights.

b. Water freezes at 0° Celsius. Tammy sees a thermometer that reads 0° Celsius. The puddles in Tammy's yard will have ice.

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c. Symptoms of the flu include aches and fever. Julie has a fever and her body aches. Julie has the flu.

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d. Tara lives in Grassy Lake. Grassy Lake is in Alberta. Tara lives in Alberta.

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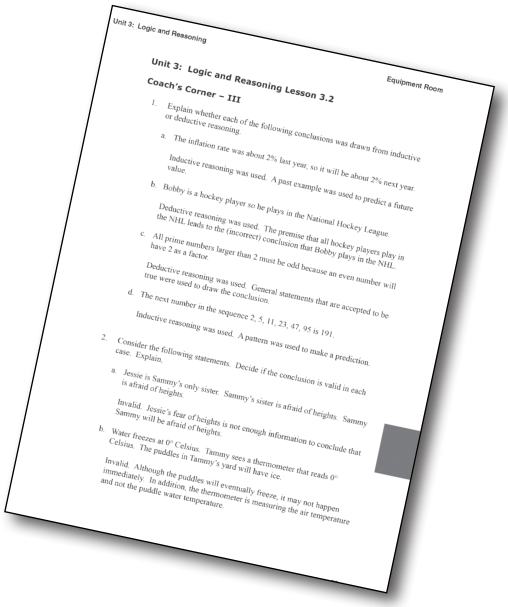
Please go to *Equipment Room* to check your solutions before returning to *Lesson 3.2*.

After you have assessed your work, reflect on your understanding of the concepts addressed in the *Coach's Corner* exercises in the table provided.

Question Number	Got it!	Almost there…	Need to retry or ask for help.
1			
2			


Unit 3: Logic and Reasoning Equipment Room

Unit 3: Logic and Reasoning Lesson 3.2

Coach's Corner – III

1. Explain whether each of the following conclusions was drawn from inductive or deductive reasoning.
   a. The inflation rate was about 2% last year, so it will be about 2% next year.
      Inductive reasoning was used. A past example was used to predict a future value.
   b. Bobby is a hockey player so he plays in the National Hockey League.
      Deductive reasoning was used. The premise that all hockey players play in the NHL leads to the (incorrect) conclusion that Bobby plays in the NHL.
   c. All prime numbers larger than 2 must be odd because an even number will have 2 as a factor.
      Deductive reasoning was used. General statements that are accepted to be true were used to draw the conclusion.
   d. The next number in the sequence 2, 5, 11, 23, 47, 95 is 191.
      Inductive reasoning was used. A pattern was used to make a prediction.
2. Consider the following statements. Decide if the conclusion is valid in each case. Explain.
   a. Jessie is Sammy's only sister. Sammy's sister is afraid of heights. Sammy is afraid of heights.
      Invalid. Jessie's fear of heights is not enough information to conclude that Sammy will be afraid of heights.
   b. Water freezes at 0° Celsius. Tammy sees a thermometer that reads 0° Celsius. The puddles in Tammy's yard will have ice.
      Invalid. Although the puddles will eventually freeze, it may not happen immediately. In addition, the thermometer is measuring the air temperature and not the puddle water temperature.

Unit 3: Logic and Reasoning Lesson 3.2

Coach's Corner – IV

1. Explain why the sum of the lengths of two sides of a triangle must always be greater than the length of the third side.

2. Arlan was told that the following relationship can be used to determine the sum of the first n Natural Numbers: $1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$. Arlan wants to prove that this relationship is always true.

   a. Check that the equation works for two different values of n.

b. Why might Arlan find this relationship difficult to prove?

c. Arlan noticed that if he reversed the order of the values and added the terms he would always get the same value. So, for example, if $n = 50$, he could write

Forward	1	2	3	4	…	48	49	50
Reversed	50	49	48	47	…	3	2	1
Sum	51	51	51	51	…	51	51	51

How many 51s would there be if Arlan wrote out the entire table for 1 to 50?

How does this example correspond to the expression $\frac{n(n+1)}{2}$?

d. Using a pattern similar to Arlan's, prove that $1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$. It may help to expand $1 + 2 + 3 + \ldots + n$ to $1 + 2 + 3 + \ldots + (n-2) + (n-1) + n$.

3. A list of multiples of 5 is shown.

   5, 10, 15, 20, 25, 30, 35, 40, 45

   a. Conjecture a divisibility rule for 5. (In other words, how can you tell if a number is divisible by 5 by looking at it?)

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   b. Prove your conjecture.

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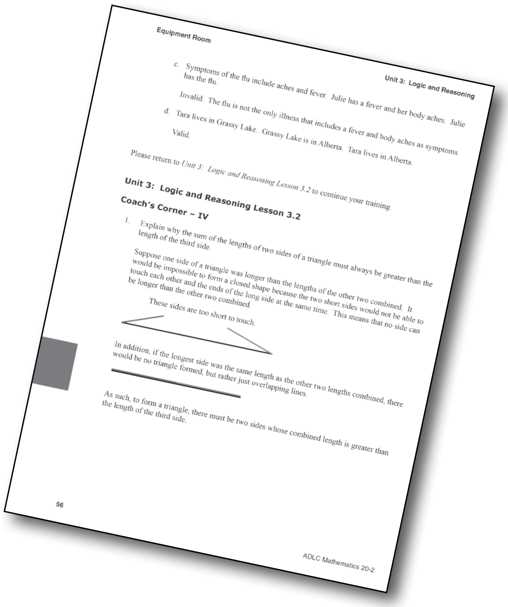
Please go to *Equipment Room* to check your solutions before proceeding to *Game On!*, on the next page of this *Workbook*.



Equipment Room   Unit 3: Logic and Reasoning

c. Symptoms of the flu include aches and fever. Julie has a fever and her body aches. Julie has the flu.

Invalid. The flu is not the only illness that includes a fever and body aches as symptoms.

d. Tara lives in Grassy Lake. Grassy Lake is in Alberta. Tara lives in Alberta.

Valid.

Please return to *Unit 3: Logic and Reasoning Lesson 3.2* to continue your training.

Unit 3: Logic and Reasoning Lesson 3.2

Coach's Corner – IV

1. Explain why the sum of the lengths of two sides of a triangle must always be greater than the length of the third side.

Suppose one side of a triangle was longer than the lengths of the other two combined. It would be impossible to form a closed shape because the two short sides would not be able to touch each other and the ends of the long side at the same time. This means that no side can be longer than the other two combined.

These sides are too short to touch.

In addition, if the longest side was the same length as the other two lengths combined, there would be no triangle formed, but rather just overlapping lines.

As such, to form a triangle, there must be two sides whose combined length is greater than the length of the third side.

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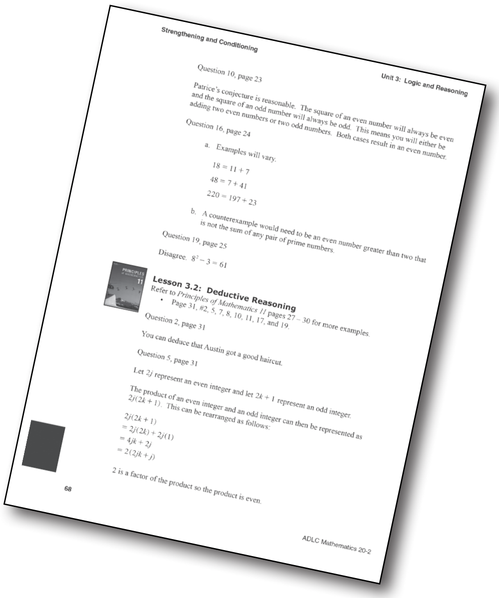
After you have assessed your work, reflect on your understanding of the concepts addressed in the *Coach's Corner* exercises in the table provided.

Question Number	Got it!	Almost there…	Need to retry or ask for help.
1			
2			
3			

Note: Before you complete *Game On!*, you may review your skills and get more practice by completing the following problems in *Principles of Mathematics 11*.

- Page 31, #2, 5, 7, 8, 10, 11, 17, and 19

Check your work in *Strengthening and Conditioning*.



Strengthening and Conditioning   Unit 3: Logic and Reasoning

Question 10, page 23

Patrice's conjecture is reasonable. The square of an even number will always be even and the square of an odd number will always be odd. This means you will either be adding two even numbers or two odd numbers. Both cases result in an even number.

Question 16, page 24

a. Examples will vary.

$18 = 11 + 7$

$48 = 7 + 41$

$220 = 197 + 23$

b. A counterexample would need to be an even number greater than two that is not the sum of any pair of prime numbers.

Question 19, page 25

Disagree. $8^2 - 3 = 61$

Lesson 3.2: Deductive Reasoning

Refer to *Principles of Mathematics 11* pages 27 – 30 for more examples.

- Page 31, #2, 5, 7, 8, 10, 11, 17, and 19

Question 2, page 31

You can deduce that Austin got a good haircut.

Question 5, page 31

Let $2j$ represent an even integer and let $2k + 1$ represent an odd integer.

The product of an even integer and an odd integer can then be represented as $2j(2k + 1)$. This can be rearranged as follows:

$2j(2k + 1)$
$= 2j(2k) + 2j(1)$
$= 4jk + 2j$
$= 2(2jk + j)$

2 is a factor of the product so the product is even.

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