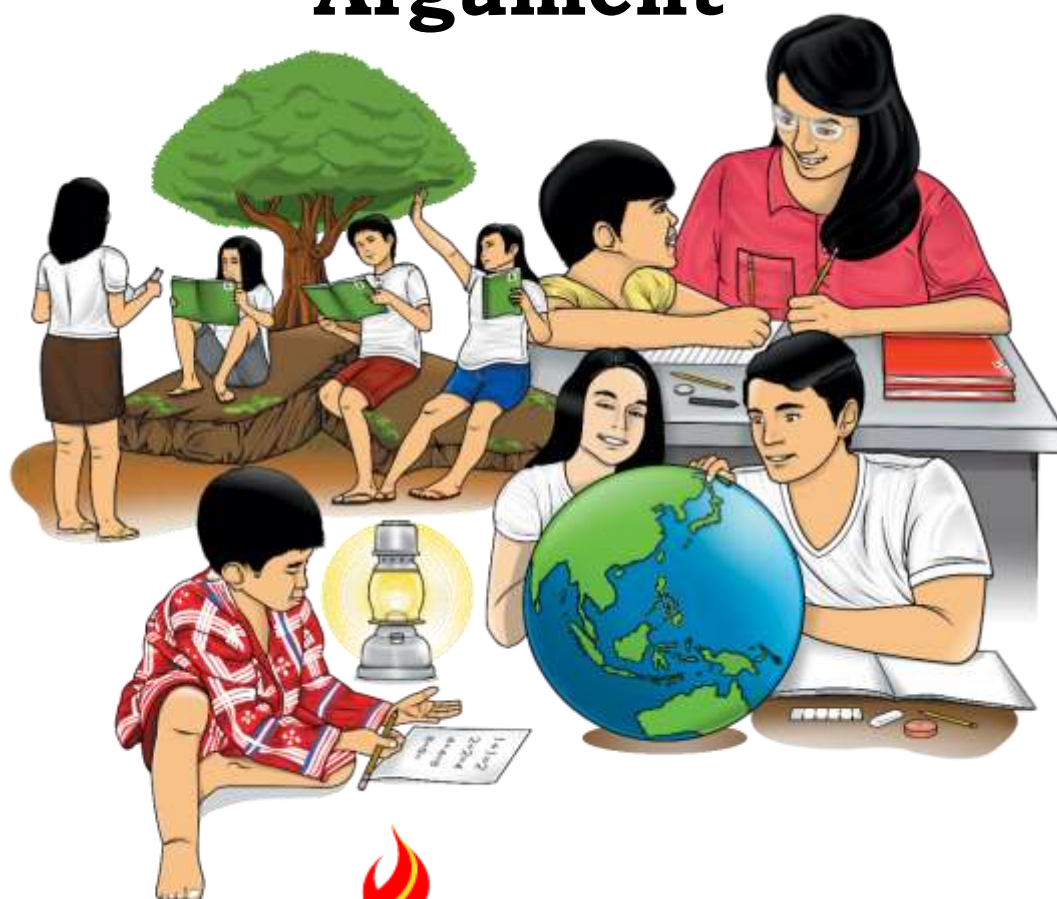


Mathematics

Quarter 2 – Module 13:

“Using Inductive or Deductive Reasoning in an Argument”



Mathematics – Grade 8
Alternative Delivery Mode
Quarter 2 – Module 13: Using Inductive or Deductive Reasoning in an Argument
First Edition, 2020

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.



What I Need to Know

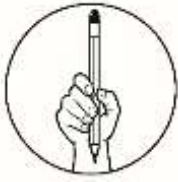
This module was designed and written for you to answer the activity you've missed while you are away from school. It is here to help you familiarize with the types of reasoning in an argument. The scope of this module permits it to be used in many different learning situations. The language used recognizes your diversity and diverse vocabulary level. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

This module contains:

Lesson 1- Using Inductive or Deductive Reasoning in an Argument

After going through this module, you are expected to:

1. define inductive and deductive reasoning.
2. differentiate inductive and deductive reasoning; and
3. apply inductive and deductive reasoning in an argument.

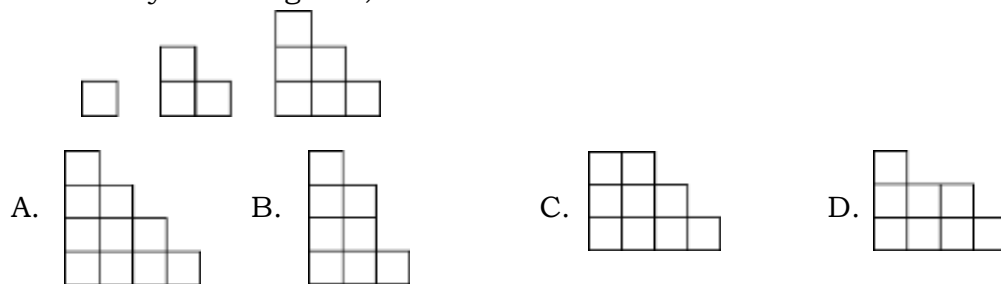


What I Know

Pre – Assessment

Directions: Choose the letter of the correct answer and write it on a separate sheet of paper.

1. Look carefully at the figures, what is next?



2. It is a form of reasoning that uses specific examples to arrive at a general rule, generalizations, or conclusion.
- A. Analogy
B. Arguments
C. Deductive
D. Inductive
3. What is the next term in the sequence 6, 12, 18, 24, ...?
- A. 28
B. 30
C. 32
D. 34
4. What is the next term in the sequence 2, 3, 5, 7, 11, 13, ...?
- A. 9
B. 15
C. 17
D. 19
5. Which of the following best describes deductive reasoning?
- A. making a conclusion based on logical reasons.
B. making a conclusion based on specific examples.
C. making a conclusion based on accepted statements
D. making a conclusion based on personal feelings and emotion.
6. What is the next term in the sequence 1, 4, 9, 16, ...?
- A. 20
B. 25
C. 30
D. 36

7. *All rectangles have congruent diagonals.*
Square is a rectangle.
Therefore, square has congruent diagonals.

The statements above use:

- A. Analogy
 B. Arguments
 C. Deductive
 D. Inductive
8. What comes next in the given sequence of figures below?



9. What type of reasoning draws a conclusion based on collective experiences?
 A. Analogy
 B. Arguments
 C. Deductive
 D. Inductive

10. Which of the following is a valid conclusion to the statements below?

In a parallelogram, any two consecutive angles are supplementary.
In parallelogram ABCD, $\angle A$ and $\angle B$ are consecutive angles.
Therefore, _____

- A. $m\angle A + m\angle B < 90$
 B. $m\angle A + m\angle B = 90$
 C. $m\angle A + m\angle B = 180$
 D. $m\angle A + m\angle B > 180$
11. What number should come next in the sequence: 2, 6, 18, 54, ...?
 A. 108
 B. 148
 C. 162
 D. 216

12. Which of the following best describes inductive reasoning?
 A. making a conclusion based on logical reasons.
 B. making a conclusion based on specific examples.
 C. making a conclusion based on accepted statements
 D. making a conclusion based on personal feelings and emotion.

13. What conclusion can be logically deduced based on the following statements?
"If a student passes an entrance exam, then the student will be accepted into college. Magdalena passed the entrance exam."
 A. Magdalena can choose any course.
 B. Magdalena shall take another exam.
 C. Magdalena will be accepted into college.
 D. Magdalena will not be accepted into college.

14. If $2x + 5 = 17$, then _____.

A. $x = 3$

B. $x = 6$

C. $x = 11$

D. $x = 22$

15. All right angles are congruent angles.

$\angle 1$ and $\angle 2$ are right angles.

Therefore, _____.

A. $\angle 1 \not\cong \angle 2$

B. $\angle 1 \cong \angle 2$

C. $m\angle 1 \neq m\angle 2$

D. $m\angle 2 \neq 90$

Lesson

1

Using Inductive or Deductive Reasoning in an Argument

Reasoning is part and parcel of daily life. There is an involved reasoning in choosing which music to play because we consider the genre, singer, or lyrics. There is also reasoning involved in the way we choose which route to take in going to school, may be because it is the shortest and the fastest route, the most convenient, the safest, or because a friend's house is along the way. In deciding to do certain things, our decision is grounded in reasons.

Drawing a conclusion from events, experiences and logical reasons are also part of scientific methods among scientist and mathematicians in order to formulate general view and greater knowledge. In this module, you will be taught how to make a sound and logical conclusion from specific or general reasons.



What's In

Activating Prior Knowledge

Directions: Rewrite each statement into if – then form, then identify the hypothesis by underlining it once and the conclusion twice.

1. Adjacent sides of a rectangle are perpendicular.
2. A pentagon is a polygon with five sides.
3. Two points determine a line.
4. Filipinos are from the Philippines.
5. A quadrilateral has four sides.

Guide Questions:

1. How did you arrive at your answers?
2. Were you able to rewrite each statement correctly into its if-then form? Justify your answer.
3. Were you able to correctly identify the hypothesis and conclusion? Justify your answer.



What's New

In the previous modules, you have learned about identifying the hypothesis and conclusion of conditional statements, the inverse, converse and contrapositive of an if-then statements, the validity of conditional statements based on truth value. Learning these concepts are important for you to understand how to deduce a conclusion based on logical reason.

Activity 1: Why Oh Why?

Directions: Fill in the blanks with what is asked. Write your answer on separate sheet of paper.

1. What comes next in the sequence of figures below?



2. You wake up in the morning and realize that the sun rises in the east. You also notice that at school the sun rises in the east. You remembered that when you had your vacation, the sun did rise in the east. Based on these observations, you conclude that the sun _____.

3.

2 x 10=	20
4 x 10=	40
6 x 10=	60
8 x 10=	80
10x 10=	100
12 x 10=	_____

Activity 2: Fill-Me-In

Directions: Complete the table by filling in the conclusion. Item 1 is done for you.
Write your answer on separate sheet of paper.

Statement	Conclusion
1. Supplementary angles are two angles whose sum is 180° . $\angle A$ and $\angle B$ are supplementary angles.	The sum of $\angle A$ and $\angle B$ is 180° .
2. Even numbers are divisible by 2. 12 is an even number.	
3. A quadrilateral is a polygon of four sides. A trapezoid is a quadrilateral.	
4. An angle is acute if its measure is between 0° and 90° . Angle B is acute	
5. Collinear points are points that lie on the same line. Points X , Y , and Z are collinear.	

Guide Questions:

1. Were you able to draw the correct conclusion in each activity?
2. How did you come up with your answers in Activity 1?
3. How did you come up with your conclusion in Activity 2?



What is It

In activity 1, you were able to give an answer or draw a conclusion based on specific examples or events. This kind of logical reasoning is called **inductive reasoning**. While in activity 2, you were given general truth or facts which you utilized in making conclusion on specific situations or examples. This kind of logical reasoning is called **deductive reasoning**. This section will provide you an in-depth discussion about inductive and deductive reasoning.

Definition:

Inductive reasoning gathers specific information, usually through observation and measurement, formulate conjecture/s, then draw generalization or conclusion based on the carefully gathered information.

Example:

1. In the sequence, 10, 20, 30, ..., the next term is 40.
2. John, a math challenger is good in mathematics. Joan, Josh, and Bea who are also math challengers are good in mathematics. Therefore, all math challengers are good in mathematics.
3. The chair in the living room is red. The chair in the dining room is red. Therefore, the color of the chairs in the house is red.

Inductive reasoning allows you to make a general rule from specific examples. Like in example 1, you are given a sequence with first three terms are 10, 20 and 30. From these specific examples, you may then generalize that the sequence is a sequence of numbers that are divisible by or multiple of 10. Hence, you conclude that the next term is 40.

In example 2, you are given specific names of math challengers, Jim, Jane, Josh and Bea who are good in mathematics. From these specific examples, you can then generalize that all math challengers are good in mathematics. Similarly, in example number 3, you generalize that all chairs in the house are red as you observed that the chairs in the living and dining rooms are red.

Note however that necessary precaution should be done before making a generalization or conclusion. For example, you may observe that a carabao is black and another carabao is black then you immediately conclude that all carabaos are black. This conclusion is wrong, because not all carabaos are black. Although most of the carabaos are black, there are some that are not. Hence, we have to be careful in making conclusion specially in using the word "All". In inductive reasoning, a single case that is not true will invalidate the general conclusion. Thus, analysis and investigation of different cases are important.

Another type of logical reasoning is deductive reasoning which allows you to make a specific conclusion based on a general truth or fact.

Definition:

Deductive reasoning uses acceptable facts, proven theorem as proof to draw a specific case or situation.

Examples:

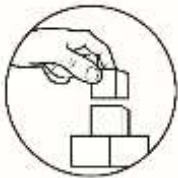
1. Sally does not drink soft drinks. Then, it follows that she does not drink Cola.
2. All numbers ending in 0 or 5 are divisible by 5. Number 35 ends with 5. Therefore, it must be divisible by 5.

3. Right angles measure 90° . $\angle A$ is a right angle. Therefore, $\angle A$ measures 90° .
4. All mathematics challenge contestants are good in mathematics. Jim, Jane and Jelian are math challenge contestants. Therefore, Jim, Jane and Jelian are good in mathematics.

Deductive reasoning starts from a general statement or fact to conclude into specific example or claim. For instance, in example 1, you are given that Sally does not drink soft drinks. Since a cola is a specific example of a soft drink, then it follows that Sally does not drink cola.

Similarly, in example 2, it is a fact that all numbers ending with 0 or 5 are divisible by 5. Since 35 is a number ending with 5, you then conclude that number 35 must be divisible by 5. In number 3, you are given with a general statement that right angles measure 90 degrees. Knowing that $\angle A$ is a right angle. Then the conclusion is $\angle A$ measures 90 degrees.

Example 4 provides a general statement that all mathematics challengers are good in math since Jim Jane and Jelian are mathematics challenge contestants. Then you can specifically conclude that, Jim, Jane and Jelian are good in mathematics.



What's More

Activity 1: Complete Me!

Directions: Draw a conclusion from each given situation and identify the kind of reasoning used. Write your answer on a separate sheet of paper.

1. Complementary angles are two angles whose sum is 90° . $\angle A$ and $\angle B$ are complementary. Therefore, _____.
2. In the sequence 3, 6, 9, 12, The next number is _____.
3. All rectangles have congruent diagonals. Square is a rectangle. Therefore, _____.
4. 2, 4, 6, 8,... The sum of the first 5 even numbers is _____.
5. A pentagon is a polygon with five sides. Polygon ABCDE is a regular pentagon. Therefore _____.

Activity 2: Let's Do this!

Directions: Identify the type of reasoning used in each of the following situations.

Write **IR** if the statement is inductive reasoning and **DR** if it is deductive reasoning. Write your answer on a separate sheet of paper.

1. Today, Sam notices that the city alarm sounds at 9:00 P.M. The next day of the same time, she notices that the city alarm sound again. She remembers that the city alarm did sound at the same time the other day. She then concludes that the city alarm sounds every 9:00 P.M.
2. No foreigner can be elected senator in our country. Peter is a foreigner. Therefore, Peter cannot be elected senator in our country.
3. Grade 11 students at Javier NHS conducted an experiment on tomatoes by applying Ferrous Sulfate. After three weeks, they observed the number of tomatoes produced increased. They concluded that the use of Ferrous Sulfate as organic fertilizer can increase the production of tomatoes.
4. A student who gets a perfect score in mathematics 10 will be given extra credits. Ann got a perfect score in mathematics 10. Thus, Ann will be given extra credit.
5. All the residents of Barangay Guinhalinan are exempted from paying taxes. The parents of Melanie reside in Barangay Guinhalinan. Therefore, Melanie's parents are exempted from paying taxes.

Activity 3: Let's Conclude

A. Directions: Supply the conclusion for the given hypothesis. Item 1 is done for you.

Write your answer on separate sheet of paper.

1. If $\angle A \cong \angle B$, then $m\angle A = m\angle B$.
2. If $AB = CD$, then _____.
3. If $m\angle A + m\angle B = 90^\circ$, then _____.
4. If $\angle A$ and $\angle B$ form a linear pair, then _____.
5. If $\angle B$ and $\angle C$ are complementary angles, then _____.

B. Directions: Fill in the blanks with a valid conclusions and corresponding reason in each given. Item 1 is done as an example. Write your answer in a separate sheet of paper.

Given	Conclusion	Reason
1. If $\angle B$ is a right angle	then $m\angle B = 90$.	<u>If an angle is right angle, then its measure is 90°.</u>
2. If Y is the midpoint of \overline{XZ} ,	then _____.	_____
3. If \overline{BD} bisects $\angle ABC$,	then _____.	_____
4. If $q \perp r$ and $s \perp r$,	then _____.	_____
5. If $\angle 1$ and $\angle 3$ are supplementary and, $\angle 2$ and $\angle 3$ are also supplementary,	then _____.	_____



What I Have Learned

Activity: Answer Me!

Directions: Fill in the blank with the correct word to complete the statement.

_____ (1) _____ gathers specific information, usually through observation and measurement, regarding a conjecture and then proceeds to make a _____ (2) _____ conclusion based on the gathered information.

_____ (3) _____ uses general facts (statements) and applies them to _____ (4) _____ situations.



What I Can Do

Activity: Let's Write!

Directions: Complete the table below by listing some situations on how each type of reasoning is used in different subjects.

Subject	Inductive Reasoning	Deductive Reasoning
Science	Cacti are plants. All plants perform photosynthesis. Therefore, Cacti perform photosynthesis.	All organisms are made of cells. Human is an organism, then human is made of cells.
Mathematics		
English		
Filipino		
T.L.E.		



Assessment

Directions: Choose the letter of the correct answer. Write it on a separate sheet of paper.

- What is the next term in sequence 25, 50, 75, 100?
 - 115
 - 125
 - 135
 - 145
- Which reasoning refers to the gathering of information through observation and measurement, formulating conjecture/s, then drawing generalization or conclusion based on the carefully gathered information?
 - Argument
 - Assumption
 - Deductive
 - Inductive
- The following are deductive reasoning, EXCEPT:
 - If $5x = 25$, then $x = 5$.
 - Since today is Friday, tomorrow will be Saturday.
 - If an isosceles triangle has at least two sides congruent, then an equilateral triangle is also isosceles.
 - Maria earned A's on her first six geometry tests so she concludes that she will always earn A's on geometry tests.
- Which reasoning uses proof, acceptable facts to draw specific case or situation?
 - Analogy
 - Argument
 - Deductive
 - Inductive
- If a number is divisible by 4, then the number is divisible by 2. 12 is divisible by four. Therefore,
 - 4 is divisible by 2.
 - 4 is not divisible by 2.

C. 12 is divisible by 2.

D. 12 is divisible by 4.

6. Which reasoning is used in the statements “Acute angles measure less than 90° . $\angle A$ measures 65° . Therefore, $\angle A$ is an acute angle.”?


- A. Analogy B. Argument C. Deductive D. Inductive

7. All vegetarians do not eat meat. Dario is a vegetarian. What can you conclude about Dario?

- A. Dario is a meat lover.
B. Dario is non-vegetarian.
C. Dario does not eat meat.
D. Dario is neither a vegetarian nor a meat lover.

8. What should replace the question mark?



- A.  B.  C.  D. 

9. What are the next two terms of the sequence?

8 , 3 , -2 , __ , __.

- A. -7, -12 B. -4, -6 C. 4, 6 D. 7, 12

10. Which of the following is an example of inductive reasoning?

- A. All deer are mammals; all mammals have kidneys; therefore, all deer have kidneys.
B. Mich, Krisna and Karen are all graceful. They are dancers. Therefore, all dancers are graceful.
C. Obtuse angles are greater than 90 degrees but less than 180 degrees. An angle is 110 degrees, so it is obtuse.
D. Snakes are reptiles and reptiles are cold blooded. Therefore, snakes are cold blooded.

11. Which process of drawing conclusion is based on sets of observation?

- A. Analogy C. Deduction
B. Argument D. Induction

12. Philippine Eagles have wings. Pag-asa is a Philippine Eagle. Using deductive reasoning, what can you conclude about Pag-asa?

- A. Pag-asa can fly. C. Pag-asa has wings.
B. Pag-asa is a bird. D. Pag-asa is a Philippine Eagle.

13. $1 \times 100 = 100$
 $2 \times 100 = 200$
 $3 \times 100 = 300$
 $5 \times 100 = 500$
 $2400 \times 100 = \underline{\hspace{2cm}}$
- A. 2400
 B. 2400
 C. 24 000
 D. 240 000
14. If $\angle A$ is an acute angle, then _____.
- A. the $m\angle A$ is between 0° and 90° .
 B. the $m\angle A$ is between 90° and 180° .
 C. the $m\angle A$ is between 180° and 270° .
 D. the $m\angle A$ is between 270° and 360°
15. If $m\angle 1 + m\angle 2 = 90$, then _____.
- A. $\angle 1$ and $\angle 2$ are right angles.
 B. $\angle 1$ and $\angle 2$ are obtuse angles.
 C. $\angle 1$ and $\angle 2$ are complementary angles.
 D. $\angle 1$ and $\angle 2$ are supplementary angles



Additional Activities

Directions: Write an entry in your activity notebook describing how much you have learned about inductive and deductive reasoning, and how these can be applied to real life situation.


Rubric for the Written Journal

Category	5-Excelent	4-Good	3-Average	2-Needs Improvement
Content	The written journal is completely accurate and logically presented. It includes facts, concepts, and examples involving inductive and deductive	The written journal is generally accurate, and the presentation reflects understanding of inductive and deductive reasoning. Minor inaccuracies do not affect the	The written journal is generally accurate, but the presentation lacks application of inductive and deductive reasoning. The chosen	The written journal contains major inaccuracies and significant errors in some parts. The chosen real-life situation is not timely

Category	5-Excelent	4-Good	3-Average	2-Needs Improvement
	reasoning. The chosen real-life situation is very timely and interesting.	overall results. The chosen real-life situation is timely and interesting.	real-life situation is somehow timely and interesting.	and interesting.
Timeliness	Journal is submitted on or before deadline	Journal is submitted within 1 day.	Journal is submitted 1-2 days after deadline	Journal is submitted 2-3 days after deadline



Answer Key

<p>Assessment</p> <ol style="list-style-type: none"> B D D C C C D D A A B D A A C <p>What's In</p> <ol style="list-style-type: none"> Adjacent sides of a rectangle are perpendicular. A pentagon is a polygon with five sides. Two points determine a line. Philippines are from the Philippines. A quadrilateral has four sides. <p>What's New</p> <p>Activity 1: Why Oh Why?</p>  <ol style="list-style-type: none"> 1. The sun rises in the east 2. The sun rises in the east 3. 120 <p>Activity 2: Fill-Me-In</p> <ol style="list-style-type: none"> 1. The sum of $\angle A$ and $\angle B$ is 180°. 12 is divisible by 2. A trapezoid has four sides. Angle B measures between 0° and 90°. Points X, Y, and Z lie on the same line. 	<p>What's More</p> <p>*Activity 1: Complete Me!</p> <ol style="list-style-type: none"> The sum of $\angle A$ and $\angle B$ is 90°. (Deductive Reasoning) 15 (Inductive Reasoning) Square has congruent diagonals (Deductive Reasoning) 30 (Inductive Reasoning) Polygon $ABCDE$ has five sides. (Deductive Reasoning) <p>*Activity 1: Let's Do this!</p> <ol style="list-style-type: none"> 1. IR 2. DR 3. IR 4. DR 5. DR <p>*Activity 2: Let's Conclude</p> <p>A.</p> <ol style="list-style-type: none"> $m\angle A = m\angle B$ $\overline{AB} \cong \overline{CD}$ $\angle A$ and $\angle B$ are complementary $\angle A$ and $\angle B$ are supplementary $m\angle A + m\angle B = 90^\circ$ <p>B.</p> <ol style="list-style-type: none"> $m\angle B = 90$ If an angle is right angle, then its measure is 90° $\overline{XY} \cong \overline{YZ}$ If point Y is the midpoint of segment \overline{XZ}, then point Y divides segment \overline{XZ} into two congruent parts. $\angle ABD \cong \angle CBD$ Since \overline{BD} is an angle bisector, it divides $\angle ABC$ into two congruent angles. $q \parallel s$ Since q and s are perpendicular to line r, we have two right angles where the intersections occur. Since all right angles are congruent, we have congruent corresponding angles which create parallel lines. If two angles are supplements of the same angle, then the two angles are congruent. 	<p>What I Know</p> <ol style="list-style-type: none"> A D B C C B C B D C C C B B B
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