Name________________________________

[PACKET 2.1: INDUCTIVE REASONING]

To the video!

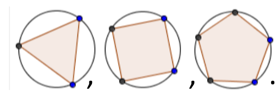
Write your questions here!

______________________________ is reasoning based on patterns you observe. Let's look at some examples.

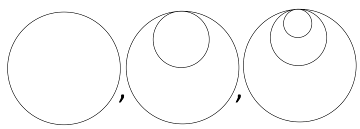
Examples:

Look for a pattern. What are the next two terms in the sequence?

1. 1, 4, 16, 64 ...

2.  ....

You try!

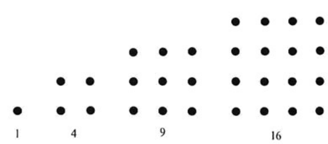
3.  ...

4. 16, 8, 4, 2, 1 ...

Once we are pretty sure we understand a pattern, we can start to make conjectures. ______________________________ are conclusions made using inductive reasoning.

Let try and figure out this next pattern. Can you guess how many would be in the 20th picture?

Example:



. . .

You try!

Try and figure out the 43rd term of the following sequence:

A, E, I, O, U, A, E, ...

Counterexamples

Sadly, not all of your conjectures will be true! All you need to do is find ONE example of when it is not true, and you will know your conjecture is false. A ________________________ is an example that shows that a conjecture is false

Example: Give a counterexample for each of the false conjectures given.

1. If the name of a month starts with the letter J, it is a summer month.

Counterexample:____________________

Write your questions here!

2. *Multiplying a number by 2 makes it bigger.*

Counterexample:____________________

You try!

3. *If you teach Flipped-Mastery Geometry, you are super good-looking.*

Counterexample:____________________

Conditional Statements

______________________________extremely useful in reasoning. A ______________ ______________is a statement that can be written as an "if-then" statement.

Examples:

1. ***If*** you complete the entire packet on your own, ***then*** you will pass the Mastery Check.
2. ***If*** you drink coffee late at night, you will have trouble sleeping.
3. When Sully stays up late, it's to catch Santa Claus.
4. Dolphins are mammals.

You try! Write each statement as a conditional statement.

5. Quadrilaterals have four sides.
6. Parallel lines never intersect.

Each conditional can be broken down into the "if" part, called the ________________, and the "then" part called the ________________. We say that when the hypothesis is true, it implies that the conclusion is also true.

Identify the hypothesis and the conclusion of the conditional.

9. If Sully shoots the ball, then the shot will be an airball.
10. If a triangle is equilateral, then it is also isosceles.

Write your questions here!

Related Conditionals

If we have a conditional statement, there are several related statements we can make:

Negation: The opposite of a statement. Usually said "not p" or ~p

Lets use the following conditional to help illustrate the next examples:

"If I studied really hard, then I earned an A on the test!"

$s \rightarrow a$

Converse: Take a conditional and switch the hypothesis and conclusion.

"If I earned an A on the test, then I studied really hard!"

$a \rightarrow s$

Inverse: Take a conditional and negate both the hypothesis and conclusion.

"If I didn't study really hard, then I didn't earn an A on the test!"

$\sim s \rightarrow \sim a$

Contrapositive: Take a conditional and switch and negate both the hypothesis and conclusion.

"If I didn't earn an A on the test, then I didn't study really hard!"

$\sim a \rightarrow \sim s$

The contrapositive will **ALWAYS have the same truth-value** as the original conditional! The converse and inverse MIGHT have the same truth-value, but it also MIGHT NOT have the same truth-value.

Summary of Related Conditional Statements		
Conditional Statement	$p \rightarrow q$	If p, then q.
Converse	$q \rightarrow p$	If q, then p.
Inverse	$\sim p \rightarrow \sim q$	If not p, then not q.
Contrapositive*	$\sim q \rightarrow \sim p$	If not q, then not p.

* Same truth value as the conditional

If you notice, the inverse is the contrapositive of the converse. Therefore, the inverse and the converse will always have the same truth-value.

Now, summarize your notes here!

Practice 2.1

If the given statement is not in if-then form, rewrite it. Identify the hypothesis and the conclusion. Then write the converse, inverse, and contrapositive.

1. *If a figure is a rectangle, then it has four sides.*

   a. If-Then Conditional statement:____

   b. Hypothesis: ____

   c. Conclusion: ____

   d. Converse: ____

   e. Inverse: ____

   f. Contrapositive: ____

2. *All Europeans live in Germany.*

   a. If-Then Conditional statement:____

   b. Hypothesis: ____

   c. Conclusion: ____

   d. Converse: ____

   e. Inverse: ____

   f. Contrapositive: ____

3. *If $x = -6$, then $|x| = 6$.*

   a. If-Then Conditional statement:____

   b. Hypothesis: ____

   c. Conclusion: ____

   d. Converse: ____

   e. Inverse:____

   f. Contrapositive: ____

Determine the truth-value for the following statements. If a statement if false, give a counter example.

4. If an animal is a mammal, it lives on land.

5. If a number is prime, then it is odd.

6. If your first name is Joe, then your last name is Mammah.

7. If the figure is a triangle, then the sum of the interior angles is 180°.

8. If a figure has 4 congruent sides, then that figure is a square.

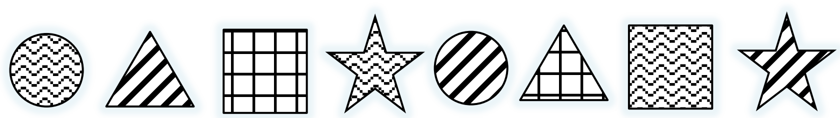
Find a pattern for each sequence. Use the pattern to find the next two terms.

9. 4, 4.5, 4.56, 4.567…

10. 1, -1, 2, -2, 3…

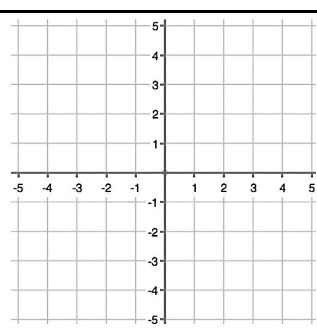
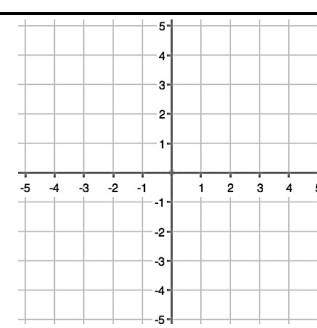
11. J, F, M, A, M, …

Use the sequence and inductive reasoning to make a conjecture:



12. What pattern is in the 15^{th} figure?

13. What is the shape of the 12^{th} figure?

Solve each equation for x!		Multiply!	Factor!
1. $3x - 3 = -6$	2. $4x + 1 = 13x - 13$	3. $x(x - 2)$	4. $4x^3 - 8x^2$
5. Graph the equation: y = -x + 3 		6. Graph the equation: y = 1 	

2.1 Application and Extension

If the given statement is not in if-then form, rewrite it. Identify the hypothesis and the conclusion. Then write the converse, inverse, and contrapositive. Determine the truth-value for all four statements. If a statement if false, give a counter example.

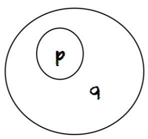
1. *All woodchucks chuck wood.*

   a. If-Then Conditional statement:____

   b. Hypothesis: ____

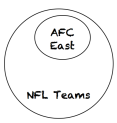
   c. Contrapositive: ____

Sometimes Venn Diagrams can be used to represent conditional statements. p → q can be represented by the Venn Diagram:



Think of this as: "If p happens, then q definitely happens."

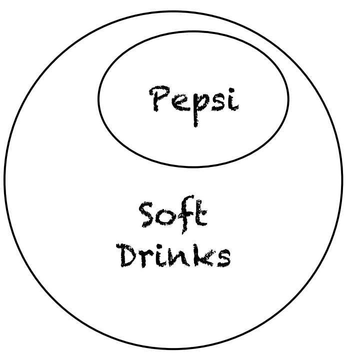
For example,



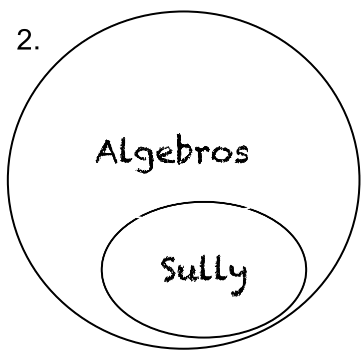
would represent: *"If a team is the AFC East, then it is an NFL team."*

Write a conditional statement that each Venn Diagram illustrates:

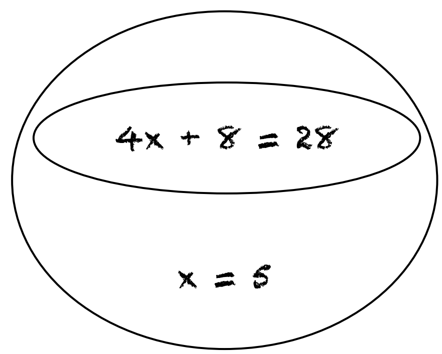
1.



2.



3.



Draw a Venn diagram to represent the following conditional statements. (Rewrite in if-then form if necessary.)

4. *If two figures are congruent, then they have equal areas:*

5. *The Geometry packets Mr. Kelly makes are super long:*