DAY 1 NOTES: Section 1.1 Make a Conjecture by Observing Patterns and Identifying Properties

CONJECTURE:

INDUCTIVE REASONING:

Concepts: #14

EXAMPLE #1: The math class consists of 20 boys and 10 girls. Can a conjecture be made about the composition of the school? Can you make more than one conjecture?

EXAMPLE #2: Can you make a conjecture as to what the following item was used for?

This is a
It was r
and usi

MATH EXAMPLES:

EXAMPLE #3: Number Patterns

Make a conjecture about the product of two odd integers

1 x 3 = 3 x 7 = 5 x 11 = 9 x 13 =

EXAMPLE #4: Geometry

Consider the following pattern of equilateral triangles. My conjecture is that the 20th figure will have 400 triangles.

Figure: 1 2 3

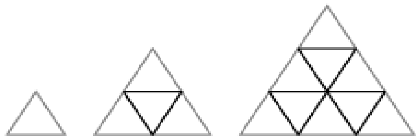

Figure	1	2	3				
Number of triangles							

EXAMPLE #5: Make a conjecture about the shape that is created by joining the midpoints of adjacent sides in **any** quadrilateral.

DO SOME BACKGROUND WORK FIRST:

Write out your conjecture and your argument

EXAMPLE #6: Make a conjecture about consecutive perfect squares.

?: **QUESTION**: Have we PROVEN any of the conjectures we made today?

REMEMBER:

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Assignment #1: CONCEPT 14
FA: P12 #1-3, 5-9, 11,
MLA: P12 #4, 12, 13, 14,
ULA: P12 #20, 22

DAY 2 NOTES: Sec. 1.2 & 1.3 Exploring the Validity of Conjectures & Using Reasoning to Find a Counter Example to a Conjecture

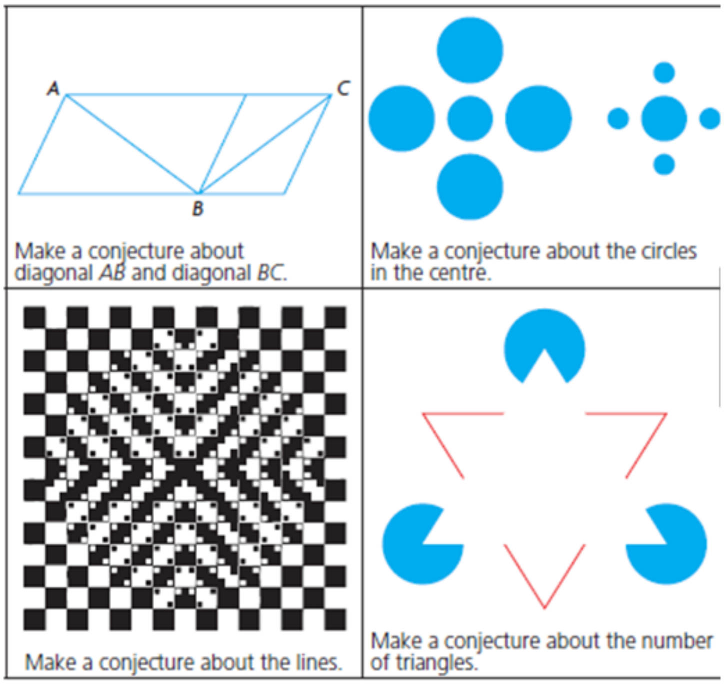
Concepts: #15

INVESTIGATION

Your brain can be deceived!!!!!

Do <u>two</u> of the following optical illusions.

How can you check the validity of your conjectures?



Make a conjecture about diagonal AB and diagonal BC.

Make a conjecture about the circles in the centre.

Make a conjecture about the lines.

Make a conjecture about the number of triangles.

In Summary

Key Idea

Some conjectures initially seem to be valid, but are shown not to be valid after more evidence is gathered.

Need To Know

* The best we can say about a conjecture reached through inductive reasoning is that there is evidence either to support or deny it.
* A conjecture may be revised, based on new evidence.

COUNTEREXAMPLE:

EXAMPLE #1:

CONJECTURE #1: The difference between consecutive perfect square numbers is always an odd number

CONJECTURE #2: The difference between consecutive perfect squares is always a prim number

HOW CAN THESE CONJECTURES BE TESTED?

EXAMPLE #2: Matt thinks that the following pattern will continue. Search for a counterexample to see if he is wrong.

$$1 \bullet 8 + 1 = 9$$
$$12 \bullet 8 + 2 = 98$$
$$123 \bullet 8 + 3 = 987$$
$$1234 \bullet 8 + 4 = 9876$$

?: **QUESTION**: If you can't find a counter example can you be certain that one doesn't exist???

Assignment #2: CONCEPT 15
FA: P17 #1-3 & P22 #1-5, 8-10, 12, 14, 15, 14-17
MLA: P22 #6, 7, 11, 13, 16, 17
ULA: P22 #18-22

DAY 3 NOTES: Section 1.4 Proving Conjectures Using Deductive Reasoning

Concepts: #16a

Let's review what we know already:

INDUCTIVE REASONING: is a type of reasoning in which we arrive at a conclusion, generalization or educated guess based on experience, observation, or patterns.

The conclusion, generalization, or education guess which is arrived at by inductive reasoning is called a **CONJECTURE.** Conjectures may or may not be true.

EXAMPLE #1: Consider the following.

$2^2 + 1 = 5$ (prime number)
$4^2 + 1 = 17$ (prime number)
$6^2 + 1 = 37$ (prime number)
$10^2 + 1 = 101$ (prime number)
$20^2 + 1 = 401$ (prime number)
$36^2 + 1 = 1297$ (prime number)

a) Write a conclusion based on the above information:

b) The answer in part a) is a __________________ based on _________________________________

A **COUNTEREXAMPLE** is an example which shows that a conjecture is false.

c) Provide a counterexample to show the conjecture in example 1 is false.

DEDUCTIVE REASONING:
The logical process of using true statements to arrive at a conclusion.

Mathematical **PROOFS** are examples of deductive reasoning. A PROOF is a mathematical argument showing that a statement is valid in all cases, or that no counterexample exists.

We will be doing some forms of mathematical proof in this unit. A few things that might be helpful to know about some of the algebra we will be encountering.

Let n = a particular number.

If I wanted to talk about a version of the number n that was an even number, what could I call it algebraically? Why?

If I wanted to talk about a version of the number n that was odd, what could I call it algebraically? Why

If I wanted to talk about the next consecutive number after n, what could I call it algebraically?

EXAMPLE #2: Jon discovered a pattern when adding integers

$1 + 2 + 3 + 4 + 5 = 15$
$(-15) + (-14) + (-13) + (-12) + (-11) = -65$
$(-3) + (-2) + (-1) + (0) + 1 = -5$

Jon's Claim: Whenever you add five consecutive integers, the sum is always 5 times the median of the numbers.

Prove his conjecture is true:

EXAMPLE #3: Prove that the product of an even integer and an odd integer is always even.

EXAMPLE #4: Prove that the difference between consecutive perfect squares is always an odd number.

EXAMPLE #5: Prove that any three digit number is divisible by five when the last digit in the number is divisible by five.

EXAMPLE #5: Use a VENN Diagram to prove the following: All dogs are mammals. All mammals are vertebrates. Shaggy is a dog. What can be deduced about shaggy?

Assignment #3: CONCEPT 16a
FA: P31 #1, 2, 4, 5, 7, 8, 10, 11, 13, 14
MLA: P31 #3, 6, 15, 16,
ULA: P31 #17, 18, 19, 20

DAY 4 NOTES: Sec. 1.5 Proofs that are Not Valid

Concepts: #16b

EXAMPLE #1:

Athletes do not complete in both the summer and winter Olympics. Hayley Wickenheiser has represented Canada 4 times at the Winter Olympics. Therefore she has not participated in the Summer Olympics.

as

An Invalid Proof:
Can contain an error in reasoning or an invalid assumption

Premise:
A statement that is assumed to be true

EXAMPLE #2:

Mike claims he can prove that 3 = 4. Here is his proof:

Suppose $a + b = c$

This can be written as $4a - 3a + 4b - 3b = 4c - 3c$

This can be reorganized into $4a + 4b - 4c = 3a + 3b - 3c$

This can be factored into $4(a + b - c) = 3(a + b - c)$

We can divide both sides by $(a + b - c)$ to get $3 = 4$

Circular Reasoning:
An argument that is incorrect because it makes use of the conclusion to be proven

EXAMPLE #3: Liz claims she has proved that -5 = 5

Her proof: I assumed that $-5 = 5$
I squared both sides $(-5)^2=(5)^2$
I got a true statement $25 = 25$
That means that my original assumption that -5 = 5 is true

What is the error in her proof?

EXAMPLE #4: Shae is trying to prove the following number trick. Choose any number. Add 3. Double it. Add 4. Divide by 2. Take away the number you started with.

Each time she does the trick she gets 5. Her proof does not. What is the error in her following proof?

Choose any number → n
Add 3 → $n + 3$
Double it → $2n + 6$
Add 4 → $2n + 10$
Divide by 2 → $2n + 5$
Take away the number you started with → $2n + 5 – n = n + 5$

Assignment #4: CONCEPT 16b
FA: P42 #1-3, 5, 6, 7
MLA: P42 #4,
ULA: P42 #9, 10

VIDEOS THAT MAY SUPPORT YOUR LEARNING

Section 1.1:

https://goo.gl/aU7d35
https://goo.gl/CnbX6g

Section 1.2:

https://goo.gl/KYU3SW
https://goo.gl/pjQtYk

Section 1.3:

https://goo.gl/TunpZZ
https://goo.gl/XvPU8j

Section 1.4:

https://goo.gl/egSd5o
https://goo.gl/cTC3Zy

Section 1.5:

https://goo.gl/7V3sBC
https://goo.gl/wct7s3