



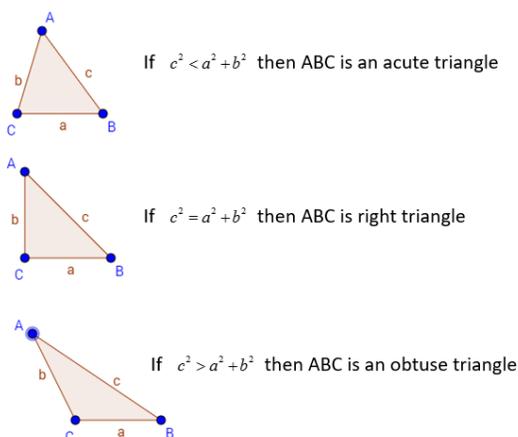
Python Coding Lesson

Lesson Title:	Conditional Statements
Grade Level:	High School
Subject:	Mathematics
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Engagement:

- Students previously have discussed if, then statements in a Geometry context. Students will be given some If, then statements and then be asked to come up with converse, inverse, and contrapositive statements.
- Possible questions:
 - What is a conditional statement?
 - What letter do we typically use in math to represent the if portion of the conditional statement?
 - What letter do we typically use in math to represent the then portion of the conditional statement?
 - What is the converse statement?
 - What is the
- Potential student misconceptions:
 - Students may or may not know what the geometric terms relating conditional statement mean so teacher may have to refresh their memory.
 - Using real world examples for the “if..then” statements so students can make connections to their lives.

Converse of Pythagorean Theorem



Source: <https://www.onlinemathlearning.com/pythagorean-theorem-converse.html>



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Exploration:

- Students will write a Python program that inputs an If, then statement and then outputs the converse, inverse, and contrapositive statement. They will be using geometric theorems they have learned thus far to test out their program (i.e. if a triangle has two congruent sides and base angles that are congruent then it is an isosceles triangle.)
- Possible questions:
 - What is a print statement?
 - What is a variable?
 - If we want to print a variable do we need to have it in parentheses?
 - Is your program going to accept an input as a number (int or float) or a set of words (string)?
 - If the user makes a mistake, will your program allow for it or shut down?
- Potential student misconceptions:
 - Teacher may need to scaffold the exploration activity so that there are guiding steps to help students navigate through the activity.
 - Teacher may need to run the sample program to help students understand the product they are trying to create.

Explanation:

- Students will try to explain what each line of their Python code does and relate it back to the mathematics lesson on conditionals.
- Possible questions:
 - What is a print statement?
 - What is a variable?
 - Is your variable storing a number (int or float) or a
 - If we want to print a variable do we need to have it in parentheses?
 - Is your program going to accept an input as a number (int or float) or a set of words (string)?
 - If the user makes a mistake, will your program allow for it or shut down?
- Potential student misconceptions:
 - Students may have trouble understanding what the program is doing in relation to the computer. They may need the teacher to act out the storing of information into the variable and later retrieval when the print statements are generated.



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Elaboration:

- Students will be asked to modify their code so they could apply it to Triangle Congruence theorems (SAS,SSS, ASA, AAS). Students would try to make a Triangle congruence checker: student inputs their triangle congruence theorem and the program outputs if it is one of the correct four theorems that can be used to prove two triangles are congruent. Students often get the letters in the wrong order when using the theorems.
- Possible questions:
 - What changes can you make to your program so it can be used to check if you have a correct triangle congruence theorem being applied?
 - What is a print statement?
 - What is a variable?
 - Is your variable storing a number (int or float) or a
 - If we want to print a variable do we need to have it in parentheses?
 - Is your program going to accept an input as a number (int or float) or a set of words (string)?
 - If the user makes a mistake, will your program allow for it or shut down?
- Potential student misconceptions:
 - Students may need the teacher to run a sample program so they can see what they are supposed to do and then work backwards to create the code.

Evaluation:

- PA Common Core Math Standards: CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
- Students will take an exit ticket with the following questions:
 - What is a conditional statement?
 - Given the following conditional statement: If two parallel lines are intersected by a transversal then alternate interior angles are congruent. Please give me the converse, inverse, and contrapositive statements.
 - What congruence theorems can you use to prove two triangles are congruent?
 - Create a python program that inputs a value, stores the information in a variable, and displays the text as a print statement.



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Code:

#This program will taken input an if then statement and output the converse, inverse, and contrapositive statement.

s1=input("Please enter your p statement. ")

s2=input("Please enter your q statement. ")

print("Original statement: If "+s1+" then "+ s2+" .")

print("Converse statement: If " + s2 + " then "+s1+".")

print("Inverse statement: If "+ s1 + " is not true " + "then "+s2+" is not true.")

print("Contrapositive statement: If "+ s2+ " is not true "+ " then "+s1+ " is not true. ")

input("Please press enter to exit the program. ")