# eXPLORE

Mother Teresa said, “If you judge people, you have no time to love them.”

Decide whether this statement means the same as the following statement: “If you don’t judge people, you have time to love them.”

# INVESTIGATE THE MATH

Puneet’s math teacher said: “If a polygon is a triangle, then it has three sides.” Puneet’s geography teacher said: “If you live in Saskatoon, then you live in Saskatchewan.” She wonders what other statements she can write using this information. *What other variations can Puneet write, and are they true?*

1. Begin with the math teacher’s statement. Is it true? Explain.
2. Write the converse of the math teacher’s statement. Is it true? Explain.
3. Write the inverse of the math teacher’s statement. Is it true? Explain.
4. Write the contrapositive of the math teacher’s statement. Is it true? Explain.
5. Repeat parts A to D using the geography teacher’s statement.
6. If you are given a conditional statement that you know is true, can you predict whether:
	1. The converse is true?
	2. The inverse is true?
	3. The contrapositive is true?
7. Test your conjectures from part F using this true statement: “If a quadrilateral is a rectangle, then it is a parallelogram.”

# eXAMPLE 1

Consider the conditional statement: “If this month is January, then next month is February.” Verify the statement, or disprove it with a counterexample.

Verify the inverse, or disprove it with a counterexample.

Verify the contrapositive, or disprove it with a counterexample.

# PRACTICE1

Write the negation of each statement.

1. $5x+37=59$
2. The flowers are red.
3. Spring follows winter.

# PRACTICE 2

Johannes was asked to negate this sentence: *I will do that chore tomorrow.*

He wrote: “I will do that chore today.” Do you agree that this is the correct negation? Explain.

# PRACTICE 3

Write the converse, inverse, and contrapositive of each statement.

1. If *C* is at the centre of a circle, then *C* is the same distance from every point on the circle.
2. If *y* is a whole number, then 3*y* is divisible by 3.

# PRACTICE 4

Consider this statement: “If a polygon has six sides, then it is a hexagon.”

1. Write the converse and the inverse.
2. Are the converse and inverse both true?

# PRACTICE 5

Zi claims that this statement is true:

$$If x^{2}=49, then x=7$$

1. Do you agree or disagree with Zi? Explain.
2. Is the converse true? Explain.
3. Is the inverse true? Explain.
4. Is the contrapositive true? Explain.

# PRACTICE 6

Do the following for each conditional statement:

1. Determine if it is true.
2. Write the converse and determine if it is true.
3. Write the inverse and determine if it is true.
4. Write the contrapositive and determine if it is true.

If any statement is false, provide a counterexample.

1. If you are in Yellowknife, then you are in the Northwest Territories (NT).
2. If a cat has had kittens, then it is a female.
3. If Oleg is playing badminton, then he has a racquet in his hand.
4. If the point (0,6) is on a graph, then the equation of the graph is $y=3x^{2}+6$

# PRACTICE 7

In each case, a conditional statement is given. In which case are the correct inverse and contrapositive also given?

1. Conditional statement: $If x+3<-1 then x<-4$

Inverse: $If x<-4, then x+3<-1  $

Contrapositive $If x≻4, then x+3≻1$

1. Conditional: If I am a teacher, then I go to school.

Inverse: If I am not a teacher, then I do not go to school.

Contrapositive: If I am a teacher, then I go to school.

1. Conditional: $If 3x^{2}+1=19, then x is not an integer.$

Inverse: $If x is an integer, then 3x^{2}+1\ne 19 $

Contrapositive: If $3x^{2}+1=19$ then x is an integer.

1. Conditional: $If the bus is late, then I will miss my class.$

Inverse: $If the bus is not late, then I will not miss my class.$

Contrapositive:$If I miss my class, then the bus was late.$