

## Goals

$$P \Rightarrow Q$$

By the end of this unit, students:

- understand the concepts and techniques in combinatorics, geometry and vectors
- apply reasoning skills and solve problems in combinatorics, geometry and vectors
- communicate their arguments and strategies when solving problems
- construct proofs in a variety of contexts including algebraic and geometric
- interpret mathematical information and ascertain the reasonableness of their solutions to problems.

**This week's focus:**

Nature of Proof

- Counter Examples
- Equivalence
- Use the quantifiers 'for all' and 'there exists'

## Theoretical Components

STEP 1:

Readings:

Mathspace Lessons:

Contradiction: <https://bit.ly/3pAebeO>

Equivalence: <https://bit.ly/3aCBocp>

Counterexample: <https://bit.ly/3ukrdB5>

**It is vital that you read a few examples to get an insight into Logic and Truth tables before attempting the exercises.**

Counter Examples

- <https://goo.gl/FLeMrU>
- <https://goo.gl/cSD8l7>

Equivalence:

- <https://goo.gl/vdE3ye>
- <https://goo.gl/a39vkB>

Use the quantifiers 'for all' and 'there exists'

- <https://goo.gl/qK6Cf7>
- <https://goo.gl/W5GI3Q>

## Practical Components

STEP 2:

Attempt all the questions:

ABOUT/RESOURCES/2021 S1/ WK04/Quantifiers

Answer all the odd numbered questions from

Exercises on Equivalences

## Investigation

**A:**

In a third grade class consisting of six students, 3 boys and 3 girls, where we denote the boys by the set  $B$  and the girls by the set  $G$ , where

$$B = \{\text{Abe, Bob, Carl}\}$$

$$G = \{\text{Ann, Betty, Carol}\}$$

We now define the predicate

$$P(b, g) = \text{boy } b \text{ likes girl } g$$

where  $b \in B$  represents one of the 3 boys

and  $g \in G$  one of the 3 girls.

Explain if this statement holds:

$$\begin{aligned} \forall b \forall g P(b, g) &\rightarrow \exists b \forall g P(b, g) \rightarrow \forall g \exists b P(b, g) \\ &\rightarrow \exists b \exists g P(b, g) \end{aligned}$$

**B:** Show complete proof of the statement below:

If the integer  $n^2$  is a multiple of 3, then  $n$  is a multiple of 3.

20 marks- see the rubric.

Q/F/O

(Quiz/Forum/Other)

Complete this quiz:

<http://goo.gl/zuNrhK>

You may take notes for future reference.