

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

- direct
- contraposition
- contradiction (De Morgan's)

Theoretical Components

STEP 1:

Readings:

<https://shorturl.at/qr129>

Read examples: Classwork/RESOURCES

It is vital that you watch the following videos to get an insight into Logic and Truth tables before attempting the exercises.

Logic Truth tables:

- <https://goo.gl/NZkJmA>
- <https://goo.gl/5vhLv9>
- <https://goo.gl/hxup4d>
-

Direct Proof:

- <http://goo.gl/TEu4C6>
- <https://goo.gl/RvndtG>

Proof by Contradiction:

- <https://goo.gl/GyJdY4>
- <https://goo.gl/Cnn2BJ>

Proof by Case:

- <https://goo.gl/NLHE3Z>

Practical Components

STEP 2:

Attempt all the questions:

- Check Google Classroom
- Exercises on Direct Proof:
<http://goo.gl/TEu4C6>

Investigation

STEP 4:

A: Prove that $\sqrt{5}$ is irrational.

B: Given that for positive real numbers x and y ,

$$\sqrt{xy} \leq \frac{x+y}{2}$$

Show that:

i)

$$\sqrt{xy} \leq \sqrt{\frac{x^2+y^2}{2}}, \quad \forall x, y \in \mathbb{R}^+$$

ii)

$$\sqrt{abc} \leq \frac{a^2+b^2+2c}{4}, \quad \forall a, b, c \in \mathbb{R}^+$$

(20 marks – see the rubric for mark breakdown)

STEP 3:

Additional Reading: <https://shorturl.at/psAJZ>

Optional!

Q/F/O

(Quiz/Forum/Other)