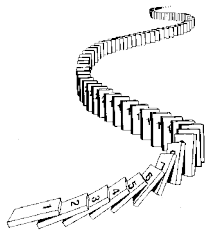


Goals



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

- Mathematical Induction

Theoretical Components

STEP 1:

Read examples:

- ABOUT/RESOURCES/2020 S1/WK05/Reading
- <http://goo.gl/9GoSW4>
- <https://goo.gl/1E2bSe>
- <http://goo.gl/WoS6j7>
- <http://goo.gl/ngez5G>

Proof by Induction:

- <https://goo.gl/4EqNNp>
- <https://goo.gl/GUirvl>

- P** practice! "Look at proofs in lecture notes and textbooks to get a good idea of how proofs should be written."
- R** read your proofs aloud - if it doesn't make sense to someone listening, then you haven't written enough".
- O** rganise your work! "Students often struggle to present their work in a logical order - the classic example is starting from the conclusion and deducing the premise".
- O** btain more examples! "Construct own examples on which you can run proofs (this is only a tool for better understanding and does not replace the proofs)".
- F** eedback. "Consider it carefully - understanding how you could have phrased the argument better will improve future work".

Practical Components

STEP 2:

Attempt all the questions:

ABOUT/RESOURCES/2020 S1/ WK05/

Investigation

A: Show that

$$\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \dots + \frac{1}{n \times (n+1)} = \frac{n}{n+1} \quad \forall n \in \mathbb{Z}^+$$

B: Prove the following by mathematical induction:

i) $2^{3n+1} + 5$ is always a multiple of 7.

ii) $n^3 + 2n$ is divisible by 3, $\forall n \in \mathbb{Z}$

Show clear working to get full marks.

"Understand every line that you write, and do not make bogus claims."

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.