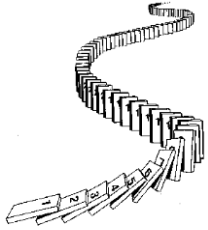


Goals



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/2021 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/2021 S1/ WK05/

Investigation

A: Show that

$$\left(1 - \frac{1}{2}\right)\left(1 - \frac{1}{3}\right)\left(1 - \frac{1}{4}\right)\left(1 - \frac{1}{5}\right)\cdots\left(1 - \frac{1}{n+1}\right) = \frac{1}{n+1}, \forall n \in \mathbb{Z}^+$$

B: Use the principle of mathematical induction to prove that

$$\frac{2^n - (-1)^n}{3}$$

is an odd number for all $n \in \mathbb{Z}^+$.

[Hint: An odd number has form $2m+1$ where m is an integer.]

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.