Take-home assignments

Each assignment is worth 3 points. A neatly formatted page or two is preferable extent of each assignment. If you have any question regarding any of the assignments, please ask.

1. Number Patterns

We have talked about various number patterns – sequences, figural numbers, Pascal's triangle etc. Research other interesting patterns and choose one to describe. Your pattern may relate to the same concepts (for example Pascal's triangle) but the pattern itself must be different from the ones we discussed in class. Make sure to touch at least these points in your narrative:

- Why did you choose this particular pattern?
- *How* does the pattern work?
- *Why* does the pattern work?
- Are there any interesting applications of the pattern?

2. Fractals

Now that you are familiar with fractals, you can explore their use in K-8 mathematics. A good starting point are Fractivities on the Fractal Foundation's website; https://fractalfoundation.org/resources/fractivities/. Research the activities (you may choose a different source) and briefly explain:

- Which activity did you use and why
- What is your intended grade level
- What will the students learn from the activity?
- Briefly outline the lesson. Do not provide a complete lesson plan, just outline:
    - What you and your students will be doing
    - What key questions will you be asking during the activity
    - What will be the output or final product from the activity? (It does not have to be a tangible object)

3. How many grains of sand are there on Earth? Can there be infinitely many of them? Explain why or why not.

Hints to guide your discussion:

- If you think there is a finite number of grains of sand, state what is YOUR best estimation of the number and how you arrived at your answer. Your estimation will probably be very rough so try to provide also a number that you would say is definitely an upper limit and you are sure that there is less grains of sand on Earth than that number. Explain how you arrived at that number.
- If you think there is infinitely many grains of sand, explain why there is no upper limit – no number that you would be sure is greater than the number of all grains of sand on Earth.

4. Write a short essay describing either:
   - The most interesting or surprising discovery you made studying the concept of infinity.
   - The most puzzling or unconceivable "thing" (fact, concept, etc.) regarding infinity that you struggled or are still struggling with.
   - Or both.

400 words minimum.

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5. Choose one paradox (The Barber's Paradox or one of the Zeno's Paradoxes) and explain it in <u>your own words</u>. Your audience is other students of elementary education; make sure that your explanation has enough detail so that it can be understood just by reading it.

The Barber Paradox: (also page 90 in the textbook)
In a village, the barber shaves everyone who does not shave himself, but no one else.
The question that prompts the paradox is this:
Who shaves the barber?

Zeno's paradoxes – see the Wikipedia or other resources.