I want to reiterate how impressed I am with the effectiveness of this project to emphasize several key ideas of discrete mathematics, including proof by induction and various counting techniques, but even more in the way it pushed students to connect differing representations (verbal, pictorial, and symbolic) of relationships and different areas of mathematics (e.g. Calculus with discrete topics). I was very explicit in stating these goals to my students and was pleased that many (but certainly not all) were receptive!

Directions for Project – Phase 1 (assigned 2-17)

·Read pages 1-8, stopping at the end of the paragraph that begins at the bottom of page 7 and ends on page 8.

·Do exercises 1-8, 10-13. However, you may omit any proofs that require mathematical induction since we have not yet covered this topic.

Initial due date: March 3, a draft of solutions to these problems is due at that time.

Directions for Project – Phase 2

·Finish reading part 1 of the project, which ends midway down page 10.

·Do exercises 14-18. Hints and suggestions:

·For #14, simply interpret Fermat's first, second and third claims.

·For #18, by "general claim" the authors of the project mean the generalization that you developed in the second half of #13.

Initial due date: April 14 a draft of solutions to these problems is due at that time.

Directions for Project – Phase 3

·Read the project starting mid-way down page 10 through the end of the project on page 27. You may choose to skip reading the material presented in Pascal's Conclusion that starts on page 16 and ends midway down page 17

·Do exercises 21-23, 25, 29, and 31. Here's more details, hints and suggestions on these problems:

·For #25, determine the general formula for the coefficient of the nk-1 term (the first square box). You do NOT need to prove by induction that these formulas take on the given form for all n.

·For #29, at the very least, write out the sum of the tenth powers of the first thousand whole numbers using Bernoulli's approach. Use Derive to simplify it and verify the answer given at the top of page 25. If you can, verify this result by hand!

·For #31, it is not all that difficult to find the general formula for the coefficient of the (k-3)rd-power term. Write all these down and find a common denominator of 360. Then consider each by factoring out the Bernoulli number present. The general formula will be based somehow on the value of k. You should also try to find the general formula for the coefficient of the (k-5)th-power term. Proceed as before by writing all these down and finding a common denominator. Consider each again by factoring out the Bernoulli number present. Finally, make a conjecture about the general formula for coefficient of the [k-(2j+1)]st-term.

Initial due date for Phase 3: Wednesday May 5

Final Project Write-up and Rubric

Your final project assignment is to polish a portion of what you have done this semester into a document that is both mathematically correct and reasonably presentable. You may choose to complete one of two options:

Option a) Turn in complete answers and explanations for Exercises 1-13 inclusive. Note this now includes the mathematical induction proofs required in Exercises 1 and 9.

Option b) Turn in complete answers and explanations for Exercises 14-18, 21-23, 25, 29,and 31.

Assessment and Grading:

Total project points = 120

The rough draft for each of the three phases is worth 15 points for a total of 45 points. The remaining 75 points will come from grading what you turn in for option (a) or (b) described above. I will use the following rubric to grade each exercise. I will scale the total received on the 0, 1, or 2 scale up to arrive at a total score out of 75 possible.

Points per exercise

0

1

2

Description

More than one error/instance of lack of detail in either or both mathematical calculations and explanation

One significant error in mathematical calculations or substantive details lacking in explanation

Minor errors, minimal incompleteness

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