

Math Elem Ed Final Exam

Do the problems in order in your bluebook. Show your work.

1. Explain why a ratio of integers must have a repeating or terminating decimal and then express $\frac{2}{7}$ as a repeating decimal. (Work it out by hand.)
2. Explain how a numberline model with a car handles $8 - 2$ and $6 - (-3)$.
3. Explain why the commutative law of multiplication holds using areas of rectangles.
4. Explain why we study the arithmetic of other bases in this class. Then show how to add $244_5 + 34_5$ working only in base 5.
5. Use patterns to show how to compute $12 + (-2)$.
6. What is a prime number. Show how to use the Sieve of Eratosthenes to find all primes less than 35.
7. Consider what you get if you take a rectangular piece of paper and glue two opposite sides together with a twist. What is that object called. Describe at least two interesting and perhaps surprising properties it has.
8. Use similar triangles to estimate how tall a tree is if it casts a 7 foot long shadow the same time a 6 foot tall person casts a shadow 2 feet long. Draw the triangles that are similar.
9. Without using decimals, find a model that students can appreciate that can be used to explain how to compare which is larger, $\frac{1}{4}$ or $\frac{1}{6}$.
10. Find the l.c.m. of 18 and 12. Show it using lists of multiples.
11. Working modulo 12, compute $7 + 9 + 4 + 7 + 11$. What common object can be used to understand these problems? Historically, ancient people ended up using base 12 for time (and 60 which is five 12's). It is believed that counting with a certain part of the hand led to this. Explain.
12. Give a model that explains why $\frac{1}{2}$ equals $\frac{3}{6}$.