

Print your name:

Show all of your work. Explain your reasoning. NO CALCULATORS.

1. Your class has a balance scale to weigh objects. The scale has two pans, one for the objects to be weighed, the other to place pre-measured weights on. The pre-measured weights consist of four 1-gram weights, four 5-gram weights, and four 25-gram weights. What is the range of all the possible weights of possible objects that the scale can accurately measure using this collection of weights ? Why ? What numeration system does this activity explore ? Explain all of your reasoning.

2. A survey of 103 students shows that 77 love math, 58 love history, yet 8 do not love either of the two subjects. Draw and use a Venn diagram to describe this situation. Make sure you label all the sub-regions correctly, both in words and numbers. Show and explain all of your steps.

3. If four men working six hours can dig five holes, how long does it take one man to dig one hole ? Explain all of your steps. (Give your answer in hours and minutes.)

4. Use the charged particle model to explain the computation $-3 - (-5)$. Show and explain all the steps, using several different pictures and words for each step.

5. Construct a multiplication table for base five and use it to calculate $214 \div 3$ (both numbers here are in base five). Show and explain all of your steps.

6. Use an area measurement model, with clearly drawn and labeled pictures, to work through the problem: “A city park field covers $2\frac{1}{3}$ acres. Bags of grass seed cover $\frac{1}{2}$ acres each. How many bags and fractions of bags will be needed for the field ?” Explicitly state the mathematical problem being solved here.

7. Find the prime factorizations for 264 and 990 and use them to find their GCD. Do **not** use the Euclidean algorithm. Show and explain all of your steps.

8. Working in base seven, compute the sum of 655 and 1534 using place value cards. Use several figures to show how your calculation progresses. Show and explain all of your steps.

9. You make a purchase totaling \$24.10. The sales tax is 9%. Explain how to use mental math to find the sales tax. Give a two step method that involves no explicit multiplication, but only moving the decimal place and subtraction, yet finds the tax exactly. (Use the “5 Up” rule in your calculation for any tenths of cents.) Show and explain all of your steps.

10. Explain how the car number-line model works for the problems $-10 + (-20)$ and $-10 - 20$. Draw number-lines and be explicit about the difference between the problems. Explain.

11. Use the mail-time model and words such as “big” and “small” to explain what happens to the “ $<$ ” when you multiply the inequality $a < b$ by -1 . You may assume that both a and b are positive, but do not assign any numerical values to either of them. Your explanation should make sense and should show how a model can explain a mathematical result. Be sure to state the mathematical result in terms of both its hypothesis and its conclusion.

12. Express $0.\overline{946}$ as a fraction of integers in simplest form. Show and explain all of your steps.

13. Use an area model to compute $\frac{3}{5} - \frac{1}{2}$. Do not work the problem algebraically. Instead, let your model do all of the work. Show and explain all of your steps.

14. Suppose A and B are positive. If 82% of A equals 41% of B , find the ratio of A to $A + B$. Do not assign any numerical values to either A or B . Show and explain all of your steps.

SCRATCH PAPER below– will not be graded