

Instructions:

You must show ALL your work in ALL questions. You will be graded on your methods, not just your answers. Use only the space provided for each question. Any usage of calculators is prohibited during the exam.

You will have EXACTLY 50 minutes for the exam, which consists of problems numbered 1 – 9. Request a new copy of the exam if any of the problems are missing or hard to read.

1) Fill in the blanks:

- a) (4 points) The two special cases of the any-order property are:
the _____ property and the _____ property.
 - b) (4 points) In the division problem $20 \div 4 = 5$,
the number 20 is called the _____, the number 5 is called the _____.
 - c) (3 points) The three interpretations of subtraction are:
_____.
 - d) (2 points) The number “Two hundred thirty one” in Egyptian numerals is _____.
 - e) (1 point) Multiplication of whole numbers is defined as _____.
 - f) (1 point) Division is defined from multiplication using the concept of _____.
 - g) (1 point) The most useful model for teaching the commutative property in multiplication is:
_____.
 - h) (1 point) When $18 \div 6$ is presented as finding the size of each of the 6 equal segments that add up to a segment of size 18, one is using the _____ interpretation of division.
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2) (1 point each) State the name of the arithmetic property or thinking strategy being used:

- a) $723 + 0 = 723$ _____
 - b) $(70 + 14) \div 7 = (70 \div 7) + (14 \div 7)$ _____
 - c) $19 + 26 = 20 + 25$ _____
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3) (3 points each) Show (clearly but briefly) how to compute the following using Mental Math. Write down the intermediate steps, and state the properties/techniques used.

a) $28 + 19 + 1272 =$

b) $25 \times 98 =$

c) $132 \div 12 =$

d) $280 \div 5 =$

e) $220 - 191 =$

4) (5 points each) Illustrate the following calculations using chip diagrams:

a) $247 + 135 =$

b) $302 - 171 =$

5) (5 points) Using 2 or 3 sentences or bullet points, clearly and completely explain why $7 \div 0$ is undefined.

6) (5 points) Illustrate the equality $4 \times 3 = 3 \times 4$:

Draw a diagram -with labels indicating both sides of the equality are visible- that shows that the equality is not coincidental .

7) (10 points each) Give **Teacher Solutions with Diagrams** for the following word problems. Remember such a solution includes clear diagrams with complete labels, question marks marking unknowns, brief computations using units, answer statements.

a) There were 826 people at a play. 97 of them were kids. How many were adults?

b) There are 31 children in a classroom. 13 of them are girls. How many more boys than girls are there?

c) Laura had \$82. She bought 5 books at \$14 each. How much money does she have left?

8) (6 points) Make up a first grade word problem using measurement division for $53 \div 4$. Illustrate your problem by using an appropriate bar diagram.

9) a) (1 point) In the decimal system, “place value” refers to the fact that

a) (4 points) Write down the steps of the place value process in their full form.

b) (2 points) Using 2-digit numbers, give an example of an addition which does not use *step (ii)*.

c) (2 points) Using 2-digit numbers, give an example of an addition which uses *step (ii)*.
