

Practice Exam 1, Math 266
Spring 2003

As potential problems for Exam 1, these problems should be regarded as supplementing the exercises (oral and written) in the text and the problems of Homeworks 1 - 5. The response to every word problem should be an explanation of how to solve it with special attention given to how you decide which arithmetic operations to use.

All numbers are written in base ten numerals except where stated otherwise.

1. You have 60 minutes to do the 12 problems on an exam. If you spend an equal amount of time on each problem, how many minutes can you spend on each problem? Is this a partitive or measurement division problem?
2. Explain why a one-to-one correspondence from a set B to the set $A = \{1, 2, 3, 4\}$ amounts to counting the elements of B .
3. Give the definition of $2 + 4$. Illustrate $2 + 4$ on the number line.
4. Which one of the following problems illustrates comparative subtraction and which illustrates take-away subtraction.
 - (a) David is 6 and his sister Ella is 4. David is how many years older than Ella?
 - (b) Leah has 6 dolls and gives 4 of them to Ragna. How many dolls does Leah have left?
5. What is the definition of $3 \cdot 4$. Use an array to illustrate $3 \cdot 4$.
6. Morris needs to drive from St. Louis to Kansas City and back. It is 238 miles from St. Louis to Kansas City. His truck uses 17 gallons of diesel fuel per mile. How many gallons of diesel fuel does he need for the trip? Same problem, with the question changed to: If diesel fuel costs \$1.90 per gallon, how much does he pay for diesel fuel for the trip?
7. Use the array model of multiplication to illustrate the meaning of the division algorithm for $14 \div 4$, that is, to illustrate $14 = 4 \cdot q + r$, where q is the quotient and r is the remainder.
8. Find the base five numeral of eighty-nine. Illustrate what you've done by describing the process of starting with eighty-nine pennies, changing as many as possible of these

into nickels and then changing as many nickels as possible into quarters. How is your base five numeral related to the number of quarters, nickles and pennies you end up with?

9. Explain how to use the scratch addition algorithm to compute the sum $88 + 65 + 39$.
10. Carry out, with margin notes, the subtraction algorithm for $94 - 56$.
11. Compute $46 \cdot 35$ in columns with margin notes. Show the partial products in a way that illustrates how the algorithm works.
12. Use the subtraction associative properties

$$(4) \quad (a + b) - c = a + (b - c)$$

$$(6) \quad a - (b + c) = (a - b) - c$$

to give a general proof of

$$(30 + 8) - (20 + 6) = (30 - 20) + (8 - 6)$$

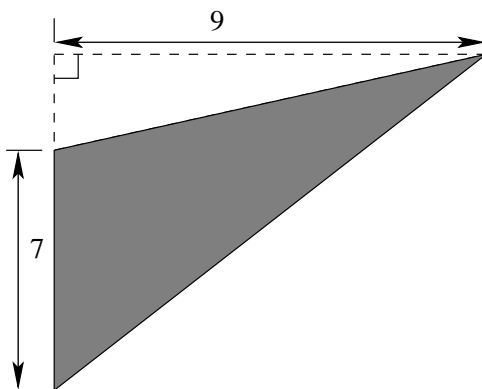
If you are more comfortable with letters, prove that

$$(a + b) - (c + d) = (a - c) + (b - d)$$

under the assumption that $a > c$ and $b > d$.

13. Use money (ten and one dollar bills) and the partitive model of division to explain the standard division algorithm for $86 \div 3$.
14. Ralph leaves his house at noon and walks at 4 mph. After he has gone 2 miles, his dog leaves the house and takes out after him at 14 mph. At what time will the dog catch up to Ralph?
15. Compute $582 \div 18$ with margin notes. An explanation of each step in terms of the partitive model is **not** required here, but you should explain how you estimate the quotient at each step.
16. Describe mental math calculation paths for finding (justifications not required) $58 - 27$ and $19 \cdot 21$.
17. Roll 2 dice, one red and one green. How many outcomes have a 1 on the red die? How many outcomes have a 1 on the green die? How many outcomes have a 1 on at least one of the dice?

18. Caitlin mixed 3 quarts of syrup with 12 quarts of water to make soft drinks. She then poured the whole mixture into 5 equal sized jugs, filling all five of them. How many quarts of soft drink are in each jug? Explain how you decide which arithmetic operations to use and show the calculations.
19. Joshua has three times as many baseball cards as Nicholas. Anthony has 30 more baseball cards than Nicholas. They have 400 baseball cards altogether. How many baseball cards does Joshua have? Note: Use no algebra. Use line segments, or rectangles, to illustrate the number of baseball cards held by each boy. Argue from this what arithmetic operations are required.
20. Find the area of the shaded triangle.



21. There are 4738 students in the college and 2256 of them are men. How many more women than men are there?