

## MATH 1135 REVIEW II

1. A student wants to calculate  $256 - 34$  by first calculating  $260 - 34$ . What must the student do next to finish the calculation? Explain what to do using a number line or strip diagram, and write appropriate equations to express the arithmetic.

2. A coach is timing all the swimmers on a team with the same stopwatch, just recording their start and finish times. One swimmer starts when the watch reads 03:53:42, meaning 42 seconds past 3:53. The swimmer finishes at 04:08:15.

The coach wants to use arithmetic to figure out how long the swimmer was swimming. Use an expanded form and the concepts of borrowing or carrying among the hours, minutes, and seconds to perform the arithmetic while explaining it.

3. A farmer arranges eggs in boxes and cartons. Each carton holds 12 eggs, and each box holds 12 cartons. For safer storage, he always packs the eggs in the largest groupings that he can, but only *full* boxes and cartons.

Now one day the farmer has 22 boxes, 10 cartons, and 4 single eggs. He sells 4 boxes, 11 cartons, and 8 single eggs. He wants to use subtraction to figure out how many boxes, cartons, and single eggs he has left.

Use an expanded form for these eggs, and the concept of borrowing (regrouping) among the boxes, cartons and single eggs to explain what he has left.

4.

- (a) Use the meaning of fractions and the meaning of addition to explain why we use a common denominator when adding fractions.
- (b) Use the meaning of fractions and the meaning of addition to explain why we add numerators when adding two fractions that have common denominators.
- (c) Apply your explanations above (possibly with a math drawing) to explain why

$$\frac{3}{4} + \frac{2}{7} = \frac{29}{28}.$$

5. Draw a simple strip diagram for the quantity

$$13 - 6 = ?$$

and explain how this strip diagram relates to an addition problem with an unknown summand.

6. For each of the story problems below, draw a simple strip diagram which relates the known and unknown quantities in the story, then write an arithmetic problem whose answer gives the answer to the story problem.

- (a) Todd starts with some berries in a basket. After adding 22 more berries, he has 50 berries total. How many berries did Todd start with?
- (b) Hugh has 53 berries, which is 14 more than what Ron has. How many berries does Ron have?
- (c) April has 38 berries, and Anna has 12 more than April. How many berries does Anna have?
- (d) Katie eats 14 berries. After eating some more, she finds that she has eaten 30 berries total. How many additional berries did she eat?
- (e) Arianna drank  $\frac{3}{5}$  cup of water and Robert drank  $\frac{1}{3}$  cup of water. How much more water did Arianna drink than Robert?
- (f) Evie ate  $\frac{2}{3}$  cup of fruit. After eating more for lunch, she had eaten  $1\frac{1}{2}$  cups all together. How much fruit did she eat for lunch?

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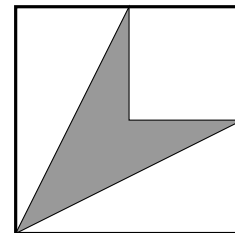
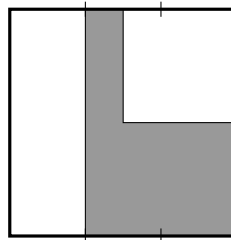
(g) Iris put  $1\frac{1}{2}$  pounds of sand and dirt in a bucket. If the sand in the bucket weighs  $\frac{5}{6}$  pound, then how much does the dirt in the bucket weigh?

7. Explain the conceptual difference between the expressions “ $1 - 3$ ” and “ $1 + (-3)$ ”. Draw a chip diagram to illustrate the relevant concepts and demonstrate that the resulting amounts are equal.

8. Explain the conceptual difference between the expressions “ $-(2+3)$ ” and “ $(-2) + (-3)$ ”. Use a number line or other drawing to support your explanation.

9. Use fraction addition and subtraction to explain how much of each box is shaded gray. (Assume that lengths which appear to be equal really are equal.)

*Hint: Begin by identifying the size of the white areas.*



10. The meaning of multiplication.

(a) Explain the meaning of multiplication as in the expression

$$A \times B.$$

(b) Give an example to demonstrate that multiplication is commutative. Explain your example in terms of the meaning of multiplication.

(c) Give an example to demonstrate that multiplication is associative. Explain your example in terms of the meaning of multiplication.

11. Explain why multiplication by four in base-four is so easy, and why multiplication by ten in base ten is similarly easy.

12. Use one of the interpretations of multiplication to illustrate the equation

$$4 \times 22 = 4 \times 20 + 4 \times 2.$$

Explain how this is related to the distributive property of multiplication.

13. Use multiplication and addition to answer the following questions. Be sure to *explain* your answers carefully using the meaning of addition and of multiplication.

(a) The fruit bowl has 4 times as many green apples as it does red apples, and there are 3 red apples in the bowl. And there are twice as many oranges as there are apples. How many oranges are in the bowl?

(b) A sandwich shoppe makes sandwiches with bread, meat, and cheese. The bread options are white, wheat, and rye. The cheese options are swiss, cheddar, and provolone, and the meat options are turkey and ham. How many different types of sandwiches can the shoppe make with these ingredients? (Each sandwich has one type of bread, one cheese, and one meat).

14. Explain why the partial products algorithm works for  $15 \times 13$ : First show the steps in the algorithm, and then explain how those steps correspond to areas on a  $15 \times 13$  grid.

15. Use multiplication in base four to multiply the numbers  $A0B$  and  $CB$ . You may use either the partial products or the standard algorithm.

