Chapter 5 test (Decimals: Rational and Irrational Numbers)
(AC #/# symbol: for example 137/7 refers to the Activity Book, 10th edition, page 137, problem # 7).

Decimals – Two models

1. Modeling decimals:
   a. Represent a given decimal by Decimal Squares and/or Base 10 pieces.
      Examples: Represent .273 using Decimal Squares (shade the appropriate area). Given a flat = 1, represent 3.75 (draw base –10 pieces. Etc...)
   b. Write down and read a decimal represented by a shaded area on Decimal Squares.
      Example: See the book 138/2

   c. Explain how to use models and the place-value table to write decimals.
      Example: Given a long = 1, explain how to write down (using numbers as well as words) the decimal represented by 1 flat and 2 small squares.
   d. Write each place value using a (1) decimal, (2) decimal fraction, (3) fraction with a power of 10 and (4) negative power of ten.
      Example: What is the place value of the digit 5 in 23.345 242?
      $$\text{(answ.: } 0.001 \ \text{ or } \ \frac{1}{1000} \ \text{ or } \ \frac{1}{10^3} \ \text{ or } 10^{-3} \text{)}$$
   e. Write a given decimal in the expanded form and explain or justify your expansion by a model.
      Example: Write 4.76 in the expanded form and then draw it using base-10 pieces to explain the expansion.
2. Comparison of decimals:
   a. Show and explain why two decimals such as .7 and .700 are equal.
      Examples: See the book 140/4
   b. Compare two or order more decimals using phrases such as „is greater than", „less than", „is the greatest", „is the smallest", „is equal to"... Use both models (Decimal Squares and Base-10 pieces) to explain or justify the answer.
      Examples: See the book 143-4/7,8
3. Approximation and estimation:
   a. Use models to approximate fractions with a decimal.
      Example: Use tenths, then hundredths and then thousandths squares to approximate 1/8. Clearly explain each digit you write. Do the same for 1/9 (you should get 3 decimals with a certain pattern). What is the pattern? How do we write the decimal corresponding to 1/9? See also the book for 1/3 and 1/6 on pages 144-5 .
   b. Apply the rules for rounding off whole numbers to decimals.
      Example: Round off 25.458 to the nearest tenth and explain the source of one common error with such rounding. How to round off 0.996 to the nearest hundredth?

Decimals – Operations

1. Addition of decimals using Base 10 pieces and Decimal Squares.
   Examples: see the book 149/1.
2. Subtraction of decimals: Take away and Missing Addend/Comparison approach and their demonstration using Base 10 pieces and Decimal Squares.
   Examples: see the book 152/3
3. Multiplication of decimals: Repeated addition and Area approach and their demonstration using models. Two different problems: 0.3 x 2 and 0.3 x 0.2 and their explanations. Using „multiplication grid" or base 10 pieces to multiply decimals greater than 1.
   Examples: see the book pages 153-156
4. Explain why multiplication by 10 leaves all digits unchanged and only „moves" the decimal point.

5. Calculate mentally and explain the result: 0.4 x 0.03, 0.004 x 0.03, 400 x 0.003, … etc.
6. Division of decimals: Sharing (partitioning) and Measurement (repeated subtraction) approach and their demonstration using models. Two different problems: 1.2 ÷ 3 and 1.2 ÷ .4 and their explanation.
   Examples: See the book pages 157,158/8,9,10.
7. Explain why a division by a (positive) decimal smaller than 1 (such as 250 ÷ 0.5) yields a number greater than original number (250). 158/10d
8. Explain why division by 10 leaves all digits unchanged and only „moves" the decimal point. (157/9)
9. Calculate mentally and explain the result: 0.36 ÷ 0.9, 360 ÷ 0.09, 0.036 ÷900 , … etc.

Percent

1. Introduce percent using base 10 pieces. (Explain how we use base-10 pieces to represent and calculate percent.)
   Example: see the book 165-6/1-3
2. Solve for „part" and explain the solution using base 10 pieces. (Find 20% of 150)
   Example: see the book 166/4
3. Solve for „percent" and explain the solution using base 10 pieces. (?? % of 150 is 30)
   Example: see the book 167/5
4. Solve for „whole" and explain the solution using base 10 pieces. (20% of ?? is 30)
   Example: see the book 167/6
5. Convert certain % values into fractions and vice versa (such as 50%, 75%, 20%, 25%, 10%, 40%, 60%, 80%, into fractions 1/2, 3/4, 1/5 etc.) Pages 169-171

Decimals and Rational Numbers. Ratios.

1. Give a few examples of rational, as well as irrational numbers. You do not have to memorize the definition – the emphasis is on understanding, e.g. make sure you are able to describe in your own words what we mean by rational or irrational numbers.
   Example: Write 5 rational numbers. Explain why your numbers are rational. Give examples of 5 irrational numbers (not in their decimal form!).
2. Given a decimal, decide if it represents a rational number or an irrational one.
   Examples: Are the following numbers rational? 0.9994; 123.2346565656565...(repeating). What can you tell about π and its decimal expansion?
3. Convert any fraction into a decimal. When is the resulting decimal finite (terminating) and infinite (repeating or periodic)?
   Example: Which of the following fractions can be represented as a terminating decimal? Which of them yields a periodic decimal? You should be able to convert the first 3 fractions without using the calculator or pencil and paper division algorithm. 17/1000; 4/20; 2/25; 1/9 .
4. Convert a decimal into a fraction (if it is a rational number of course). This includes converting terminating as well as periodic decimals into a fraction.
   Examples: Convert the following decimals into fractions: .1234; 172.45; 2.3333... (periodic); 1.25252525...(periodic)
5. Convert 0.99999...(repeating 9) into a fraction and discuss the result.
6. Create ratios to make comparisons.
   Example: Out of 28 students in a class, there are 7 boys. Find the ratio of the number of girls to the number of boys. Formulate it using words „there is/are x girls for every boy".
7. Calculate quantities if a ratio is given.
   Example: Three shareholders agreed to share the profit of their business in the ratio 1:2:3. This month's profit was $120. How much each of them got? Explain.
8. Solve proportions with (one) unknown.
   If 15 gallons of gasoline costs $37.5 , how much will you pay for 2 gallons?