BIG IDEAS FOR NUMBERS AND OPERATIONS – DRAFT SAMPLE QUESTIONS – GRADES 4-6 Fractions, Decimals and Percents			
Big Ideas, Ontario Curriculum, Mathematics, Gr. 1-8	**Big Ideas, Marian Small**	**Big Ideas, Fractions, Decimals, Percents Cathy Fosnot**	**Sample problem solving questions for Junior**
OVERALL EXPECTATIONS • Compare numbers • Order numbers • Magnitude • Flexible strategies • Proportional reasoning SPECIFIC EXPECTATIONS • Quantity relationships • Counting • Operational Sense • Proportional reasoning **Mathematical Processes** PROBLEM SOLVING STRATEGIES • Using models, pictures or diagrams • Looking for a pattern • Guessing and checking • Making an organized list • Making a table or chart • Solving a simpler problem • Working backwards • Using logical reasoning COMMUNICATION STRATEGIES • • REASONING AND PROVING • • REFLECTING • • SELECTING TOOLS AND COMPUTIONAL STRATEGIES • • CONNECTING • • REPRESENTING •	• Fractions can represent parts of wholes, parts of sets, parts of measures, division, or ratios. A fraction is not as meaningful without knowing what the whole is. • You have to know what the whole is to say what the part represents. • Renaming fractions is often the key to comparing them or computing with them. Every fraction can be renamed in an infinite number of ways. • Operations with fractions have the same meaning as operations with whole numbers, even though the algorithms are different. • There are multiple models and/or procedures for computing with fractions, just as with whole numbers. • A decimal is an alternative representation of a fraction, but one that allows for calculations that are consistent with whole number calculations. • Using decimals extends the place value system to represent parts of a whole, as well as mixed numbers. • A decimal can be read and interpreted in different ways; sometimes one representation is more useful than another in explaining a computation. • Decimals can be renamed as other decimals or fractions. • Algorithms for computing with decimals are derived directly from algorithms for computing with whole numbers.	• Fractions express relationships – the size or amount of the whole matters • Fractions may represent division with a quotient less than one • With unit fractions, the greater the denominator, the smaller the piece is • Pieces don't have to be congruent to be equivalent • To compare fractions, the whole must be the same • With decimal equivalences the numbers in different place-value positions are related by powers of ten • If numerators are common only denominators matter when comparing • Multiplication is connected to fractions (e.g. ¾ = 3 x 1/4) • For equivalence, the ratio must be kept constant • Multiplication and division by ten make the whole shift to the right and to the left in a decimal representation • Equivalence is preserved when equivalent parts are combined • To add or subtract fractions a common whole is needed • If the whole is shifted one can work with decimals using whole-number arithmetic • Fractions can be thought of as operators • Fractions may represent a rate • Multiplication and division of rational numbers are relations on relations • Accumulated increase of a constant rate is the rate times the time • Constant rate can be determined if the accumulated rate and time are known • The properties that hold for whole number operations also hold for rational numbers	• ONAP problem for your grade level, or Guide to Effective Instruction • Marilyn Burns fraction games • You add two fractions and the sum is 9/10. What could the fractions be? • Why is 0 a special number? Why is 1 a special number? • Place these fractions (_____) on the number 1 to number 4 line. • Jeff says the pictures show that 2/3 is greater that ¾. Do you agree with Jeff? Explain your thinking (Small, Making Math Meaningful to Canadian Students, p. 258 for diagram) • Fosnot kit for fractions, decimals and percents: The Field Trip problem • How do you know that 2/10 is less than 2/5? • Elisa thinks that 6/9 is more than 2/3 since 6 and 9 are more than 2 and 3. What do you think? Explain why? • Would you rather have 0.25 or 0.8 of a tomato? Why? • Kerri's time for her first race is 9.26 seconds and for her second race it's 9.5 seconds. Kerri says her time for the second race is better because 5 is less than 26. Do you agree? Explain. • How many ways can you show or tell the answer for, "What is half of 24?" • A turkey weighs 9.75 kilograms. It takes about 20 minutes to cook 500 grams. How many minutes does it take to cook the whole turkey? • After the party, Jooly saw 5 sandwiches left on the tray. Jooly says they ate 2/3 of all the sandwiches. How many sandwiches were there at the beginning of the party? • Choose two fractions that have different denominators. Tell how to compare them. How else? • Asma bought 300 cm of fabric to make a scarves. She uses 75 cm to make a scarf. What fraction of the material has she used? What other numbers could you use to show your answer? • Nina shared 327 candy worms among 4 friends. Could she have shared them equally? • Have students play a concentration game where they use a deck of turned-over cards, some with decimals and some with fractions. Their job is to make matches by turning over two cards. They turn them back over if they do not match (1/10, 1/5, ¼, ½, ¾, 7/10, 1/100, 1/50, 1/25, 3/5, 9/10 and the decimals 0.1, 0.2, 0.25, 0.5, 0.75, 0.7, 0.01, 0.02, 0.04, 0.6, 0.8, 0.9) • Provide decks of cards to students with each of the numbers 0.1, 0.2,…, 0.9 on a card. Ask students to choose three cards to add to various values, for example, the sum of 1.2

Marian Small, "Good Questions. Great Ways to Differentiate Mathematics Instruction" and "Making Math Meaningful to Canadian Students, K-8

The Ontario Curriculum, Grades 1-8, Mathematics, Revised 2005

Sample Questions also adapted from: Activities to Undo Math Misconceptions, PreK-Grade 2 by Honi Bamberger and Christine Oberdorf, available from Heinemann

And Eworkshop Tasks that Provide Opportunities for Mathematical Communication

ONAP for grades 4,5 and 6 Number Sense and Numeration section is another source for problems (includes rubrics and exemplars)