Grade 6 • Curriculum Correlation

Grade 6 2020 Ontario Curriculum and
Grades 4–8 • Open Questions for the Three-Part Lesson

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Grades 4–8 Open Questions for the Three-Part Lesson: *Number Sense and Numeration* [Number]

2020 Ontario Curriculum Expectations	Grades 4–8 Open Questions for the Three-Part Lesson: *Number Sense and Numeration*	Book & Page Number
B. NUMBER		
B1. Number Sense **Overall Expectation:** By the end of Grade 6, students will demonstrate an understanding of numbers and make connections to the way numbers are used in everyday life		
Whole Numbers		
B1.1 read and represent whole numbers up to and including one million, using appropriate tools and strategies, and describe various ways they are used in everyday life	**Q:** Create a number that includes two digits that are 5s and two digits that are 4s. Make sure that one of the 5s is worth 100 times as much as the other 5, and one of the 4s is worth 1000 times as much as the other 4.	Number • Page 114
	Q: When you read a number, you say the words twenty, forty, and thousand, but not the word hundred. What are two or more numbers it could be. What are two or more numbers it could not be.	
	Q: One million can be described as 1000 thousands. What are some other ways to describe one million without saying that it is big?	
	Q: Tell three or more things about the number 3 4 2 2. The numbers in the blanks can be any digit from 0 to 9, and they can be the same or different digits.	
	Q: You can represent the number 110 and the number 231 with the same number of ones as tens. For example, 110 can be represented as 10 tens and 10 ones, and 231 can be represented as 21 tens and 21 ones. What six-digit numbers can you represent with the same number of ten thousands, thousands, hundreds, tens, and ones? For each six-digit number you choose, tell how many ten thousands, thousands, hundreds, tens, and ones there are. What do you notice about the numbers?	Number • Page 115
	Q: Choose a number between 15 and 20. Then, find at least three six-digit numbers with digits that are the sum of the number you chose.	

B1.1 (continued)	**Q:** Look in newspapers, in magazines, or on the Internet to find five or more numbers greater than 10 000, but less than 1 000 000, that are written out in words. What do these numbers represent? How would you write them in standard form?	Number • Page 115
	Q: You read two six-digit numbers that are written in words. Everything is exactly the same when you read them except aould the numbers be? Explain your answer.	Number • Page 116
	Q: How are the numbers 23 140 and 231 400 alike? How are they different?	
	Q: When might it be useful to use expanded notation to describe a number? For example, when might you describe 124 204 as 1 hundred thousand + 2 ten thousands + 4 thousands + 2 hundreds + 4 ones?	
	Q: You add [box] 0 000 to a number. Which digits in the number will change?	
	Q: Do you think there are more ways to represent the number 20 000 or the number 200 000? Why do you think that?	
	Q: What numbers would you place at A and B? Why?	Number • Page 117
	Q: A number is closer to 325 999 than it is to 331 129. What might the number be?	
	Q: What is the least number and the greatest number you would be comfortable estimating as 800 000? Why did you pick these numbers? When might you really use an estimate like that?	
	Q: [box]26 1[2 boxes]and 200[3boxes] are not very much closer together than 398 412 and [2 boxes]41[2 boxes] . What might the missing digits be?	Number • Page 117
	Q: Choose three six-digit numbers that are easy to put in order. Tell why they are easy to put in order.	
	Q: Use the digits 0 to 9 to fill in the blanks. Use each digit only once. Then, order the numbers from least to greatest. Try it with two or more sets of numbers.	Number • Page 118
	Q: Think of at least three numbers that make each of these statements occur. Explain why they occur. a) You end up with the same number when you round to the nearest hundred thousand or the nearest ten thousand. ...	

B1.1 (continued)	**Q:** Find the populations of six cities. The cities should not all be on the same continent. The population size of each city should be greater than 100 000 people, but less than 1 000 000 people. At least two of the cities' populations should be between 10 000 and 20 000 apart in size. At least two of the cities' populations should be less than 10 000 apart in size. Explain your choices.	Number • Page 118
	Q: Why might you round one number up to the nearest hundred thousand, but round another number down to the nearest hundred?	Number • Page 119
	Q: The population of a city was greater than 6 3 185. It increased by 32 417. What do you know for sure about the new population? What are you less sure of?	
	Q: A big number with a lot of 9s in it is less than a big number with a lot of 1s in it. How is that possible?	
	Q: Describe two big numbers that are easy to compare. Tell why it's easy to compare them.	
	Q: You want to decompose 1 000 000 into equal-sized groups. What group size do you think would make that easy?	Number • Page 120
	Q: Is 1 000 000 of something always a lot?	
	Q: Which do you think is easier: finding out how many 1000s make 1 000 000 or finding out how many 3s make 400? Why?	
	Q: Why is it easy to figure out how many hundreds are in an amount if you know how many ten thousands there are in that amount?	Number • Page 122

B1.2 read and represent integers, using a variety of tools and strategies, including horizontal and vertical number lines	**Q:** When might you see the number −2 other than in math class?	Number • Page 170
	Q: What do the integers –8 and –20 have in common?	
	Q: Represent –8 in three or more ways. For each representation, describe one thing it tells about –8 and one thing that it doesn't make clear about –8.	Number • Page 171
	Q: Do you think negative integers are more like counting numbers or more like fractions?	Number • Page 172
	Q: Could an integer and its opposite be 25 apart? Explain.	
	Q: Why do you think –4 is an even integer?	

B1.3 compare and order integers, decimal numbers, and fractions, separately and in combination, in various contexts	**Q:** An improper fraction is greater than 4 but less than 5. What could the fraction be? Are there numerators or denominators that are not possible?	Number • Page 124
	Q: What improper fractions do you find easy to model with pattern blocks? Which are less easy? Why?	
	Q: Which fraction or mixed number do you think does not belong with the others?	
	Q: One improper fraction is much less than another. What might the two fractions be? How do you know?	Number • Page 127
	Q: Choose three or more improper fractions that are slightly less than three wholes. What do the fractions have in common? What don't they have in common?	
	Q: Is there one value that you can place in all of the s that makes all of these statements true? Are there other values that would make all of these statements true? Explain.	Number • Page 128
	Q: Choose four improper fractions to place on the number line. Place one fraction in each of the coloured sections. Tell how you know your fractions belong where you put them.	
	Q: Choose three or more improper fractions, and model them. Add 2 to each numerator and 1 to each denominator. Model these fractions. Is the second fraction greater than, less than, or the same size as the original one? Does the size depend on the fraction you start with?	
	Q: Suppose the numerator of a fraction is 10 more than the denominator. Give an example where each of these statements could be true: a) The fraction is greater than 2. ...	
	Q: A fraction is just a little less than 3 ... What might the fraction be? How do you know?	Number • Page 129
	Q: List three mixed numbers between 143 and 391 . How do you know the mixed numbers you listed are in that range?	
	Q: List three improper fractions with different denominators that are easy to put in order. Explain why it is easy to put them in order.	
	Q: Choose a decimal hundredth and a fraction so that it's easy to tell which is greater. Explain your thinking.	Number • Page 158
	Q: Is it possible for .23 to be a lot greater than .894?	
	Q: Suppose 14 > 51 . What could the fractions be? Tell how you know your answers are right.	

B1.3 (continued)	**Q:** Look up statistics from sporting events where the results are decimal numbers. For each event, order the decimal numbers from least to greatest. Which score won — the lowest score or the highest one? Why?	Number • Page 159
	Q: Use the digits from 0 to 9 to create four fractions. Use each digit only once. Make both proper and improper fractions. Then, order the fractions from least to greatest. Repeat, creating different sets of fractions.	
	Q: Use the digits 0 to 9 in the following blanks to make decimal numbers. Use each digit only once. Then, use the digits 0 to 9 in the following blanks to make fractions. Use each digit only once…	
	Q: Do you think it's easier to compare decimals to decimals or fractions to fractions? Why?	Number • Page 160
	Q: When comparing decimals, is it usually sufficient to compare only the whole number parts? Why or why not?	
	Q: What number is 3. 1 less than?	
	Q: If 36 a < b38 , what do you know for sure about the relationship between a and b? Why?	
	Q: What do you know for sure about the fraction that the decimal 0.4 represents?	Number • Page 161
	Q: Two fractions represent decimals that are 0.04 apart. What might the fractions be? Could they have different denominators? Explain how you know.	
	Q: Name two negative integers to make this sentence true. Explain how you know it's true.	Number • Page 170
	Q: An integer is a lot less than 8. What might the integer be? What makes it a lot less?	
	Q: List five integers that meet these requirements: • Two of the integers are little closer together than two of the other integers. ...	Number • Page 171
	Q: On a number line, there are four negative integers, A, B, C, and D. A and B are twice as far apart as B and C. B and C are three times as far apart as C and D. Give three or more examples of the four integers.	
	Q: Why does it make sense that –5 is less than –2?	Number • Page 172

Fractions, Decimals, and Percents		
B1.4 read, represent, compare, and order decimal numbers up to thousandths, in various contexts	**Q:** Which fraction do you think does not belong? Why?	Number • Page 127
	Q: Create a number of the form . , where one of the digits is worth exactly 1000 times as much as another of the digits.	Number • Page 133
	Q: How are the numbers 0.405 and 0.45 alike? How are they different?	
	Q: Put the digits 0 to 9 in the blanks to order the numbers from least to greatest. Use each digit only once. Think of at least three possibilities.	Number • Page 134
	Q: Create a number line, and mark where each of these decimals would appear on the line. Explain why you put them there.	
	Q: Choose a number, of the form 0. that meets the following requirements: a) greater than 0.41 ...	Number • Page 135
	Q: When is it useful to use decimal thousandths?	Number • Page 136
	Q: How are the two 5s in 0.505 different?	
	Q: Do you think it is more helpful to read 1.203 as 1 and 203 thousandths or as one and two-tenths and three-thousandths? What other ways might you read 1.203?	
B1.5 round decimal numbers, both terminating and repeating, to the nearest tenth, hundredth, or whole number, as applicable, in various contexts	There are no Grade 6 Open Questions that align with this expectation.	
B1.6 describe relationships and show equivalences among fractions and decimal numbers up to thousandths, using appropriate tools and drawings, in various contexts	**Q:** It is easy to write the decimal 1. As a fraction. What might the decimal and the fraction be?	Number • Page 133
	Q: Choose six of the following fractions. Which fractions can you write as decimal thousandths? Represent them that way. Which ones can't you write as decimal thousandths? Why not?	Number • Page 135
	Q: Choose three fractions you can show as decimal thousandths. Explain why the decimals and fractions are equal.	Number • Page 136

B2. Operations **Overall Expectation:** By the end of Grade 6, students will: use knowledge of numbers and operations to solve mathematical problems encountered in everyday life		
Properties and Relationships		
B2.1 use the properties of operations, and the relationships between operations, to solve problems involving whole numbers, decimal numbers, fractions, ratios, rates, and whole number percents, including those requiring multiple steps or multiple operations	**Q.** Create four different expressions, each involving at least three operations, which might be calculated differently if the person calculating did not know the rules for order of operations. Indicate which value is actually correct and why.	Number • Page 143
	Q. Choose a two-digit number that does not end in zero. Explain how you would use mental math to multiply it by 6.	Number • Page 144
	Q. Do you think we would need rules for the order of operations if all the math we did were based on story problems?	
	Q. Why might it be less obvious what 3 + 4 _ is than what 3 _ is?	

Math Facts		
B2.2 understand the divisibility rules and use them to determine whether numbers are divisible by 2, 3, 4, 5, 6, 8, 9, and 10	There are no Grade 6 Open Questions that align with this expectation.	

Mental Math		
B2.3 use mental math strategies to calculate percents of whole numbers, including 1%, 5%, 10%, 15%, 25%, and 50%, and explain the strategies used	**Q:** It is easy to figure out 25% of a number that is not 100. What might the number be? How would you calculate 25% of it?	Number • Page 133
	Q: Choose a number. The number you choose is: • about 10% of number A ... Why do your observations make sense?	Number • Page 134
	Q: How is multiplying 0.01 X 34 similar to multiplying 0.34 X 100?	Number • Page 153
	Q: Do you think it is easier to multiply by 0.1 or divide by 10 to calculate one-tenth of 384?	
	Q: You multiply a whole number by 0.1, and there is a 4 in the tenths place. If you multiply that same number by 0.01, there is a 7 in the ones place. What might the number be? Why are there so many options?	
	Q: What is a good estimate for 42% of 85? Explain how you estimated it.	Number • Page 191
	Q: Is 10% a lot? Explain why or why not.	
	Q: What are some options you have to figure out what 40% of 520 is?	Number • Page 193
	Q: Suppose you know that the number x is 50% of the number y. How would you calculate what x is 20% of?	
	Q: What picture would you draw to help you figure out 30% of 80?	
	Q: If you know 20% of a number, what other percents of it are easy to figure out? How would you figure the other percents out?	

Addition and Subtraction		
B2.4 represent and solve problems involving the addition and subtraction of whole numbers and decimal numbers, using estimation and algorithms	**Q:** You subtract two whole numbers and estimate the difference to be 420. What might the numbers be?	Number • Page 142
	Q: Create an addition problem and a subtraction problem that you can solve using mental math. Both problems should use one four-digit number and one two-digit number. Tell why mental math is reasonable for each problem.	Number • Page 143
	Q: Two nearby towns decide to join together to become a single town to save administrative costs. The total population of the two towns is about 8000, but the larger town's population is about 500 more than the smaller town's population. What might the exact population of the two original towns be? Think of at least three possibilities. Describe your strategy for at least one choice.	
	Q: Create a question involving the addition and subtraction of four-digit numbers that might look difficult, but is really pretty easy. Explain why it's easy.	Number • Page 144
	Q: You add two decimal numbers and show the sum using 1 thousand block, 5 hundred blocks, 9 ten blocks, and 7 one blocks. What two decimals might you be adding?	Number • Page 148
	Q: You add a decimal thousandth to a decimal hundredth, and the answer is 1.182. What might the numbers be?	
	Q: The answer is 4.135. What might the question be?	
	Q: How would you estimate 4.23 + 5.12 ? Does it matter what numbers are in the blanks?	
	Q: You add two decimal thousandths and subtract a third one. The result is a bit less than 2. What could the numbers be?	
	Q: Fill in the blanks with digits 0 to 9, using each digit once, to make both equations true.	Number • Page 149
	Q: The sum of two decimals is 1.632 greater than the difference. What might the two decimals be? If there are lots of possibilities, give several examples. If not, tell why there are not many possibilities. Describe how you solved the problem.	
	Q: Two problems are solved by subtracting 1.305 from another decimal. What real-life problems might these be? Solve them.	Number • Page 149

B2.4 (continued)	**Q:** You are subtracting two numbers with decimal thousandths. What is the best way to estimate the answer?	Number • Page 150
	Q: How would knowing that 2.14 – 0.859 = 1.281 help you solve other similar decimal subtraction questions?	
	Q: Is subtracting decimal thousandths the same as or different from subtracting decimal hundredths? Explain your answer.	
	Q: You buy three packages of meat with a total mass of 2 kg. One package has a mass of 0.358 kg. What could the other two masses be?	Number • Page 214
B2.5 add and subtract fractions with like and unlike denominators, using appropriate tools, in various contexts	**Q:** How could you use pattern blocks to show the addition of two fractions?	Number • Page 184

Multiplication and Division		
B2.6 represent composite numbers as a product of their prime factors, including through the use of factor trees	**Q:** A number can be divided by a lot of numbers without a remainder. Another number cannot be divided by a lot of numbers without a remainder. What could the numbers be? What can you divide by to have no remainder for each of the numbers?	Number • Page 138
	Q: Name a very large number for which it is easy to tell if it is divisible by a lot of numbers without remainders. Why is it easy?	
	Q: Which number do you think does not belong? 41 14 24 16	
	Q: Using this chart, identify which numbers are prime. What do you notice about all the prime numbers greater than 10? Why does what you noticed about the prime numbers greater than 10 make sense?	Number • Page 139
	Q: A composite number has 12 factors. What might the composite number be? Think of three or more possibilities. Use tiles to show how these factors form the dimensions of rectangles.	
	Q: Find six composite numbers that are consecutive (one after the other) numbers.	
	Q: You are asked whether a number that is greater than 70 is a composite number or a prime number. What would make it easy for you to answer the question?	Number • Page 140
	Q: Why does it make sense that there are more composite numbers than prime numbers?	
	Q: Suppose you know that 60 is a composite number. What other numbers would automatically also be composite?	
	Q: You solve a problem where you divide 442 by 3. What might the problem be? How would you estimate the result?	Number • Page 142
	Q: Do you think everyone will get the same result when calculating 3 + 4 _7?	
	Q: How might you multiply 40 X 32 mentally?	
	Q: You multiply two numbers in your head. The answer is about 400. What numbers might you have multiplied?	

B2.6 (continued)	**Q:** You solve a problem involving the multiplication of a two-digit number by a four-digit number, and the answer is about 100 000. What might the problem be? Explain.	Number • Page 145
	Q: Choose a two-digit number and a four-digit number. Create a problem that involves multiplying these two numbers, and then solve the problem. Create three other problems with different sets of numbers.	Number • Page 146
	Q: Describe two or more good ways to estimate 4930 X 38. Which of your estimates do you think is closer to the exact product? Why?	Number • Page 147
	Q: What number between 100 and 200 do you think might have a lot of factors? Why did you pick that number?	Number • Page 166
	Q: A number is a multiple of 25. Tell as many things as you can about the number.	
	Q: Make a list of as many numbers as you can that have exactly four factors. What do these numbers have in common (besides having four factors)?	Number • Page 167
	Q: Every fourth multiple of one number matches every sixth multiple of another number. What could the numbers be?	
	Q: Make a list of the numbers 1 x 1, 2 x 2, 3 x 3, …20 x 20. Make a list of the factors of each of these numbers. What do the lists of factors have in common?	
	Q: If you chose a number at random, is it more likely to be a factor of more numbers or a multiple of more numbers?	Number • Page 168
	Q: If the factors of number A are all factors of number B, what do you know about the relationship between A and B?	
	Q: Why do you think so few numbers are perfect squares?	
	Q: A number with a ones digit of 8 has 7 as a factor. What could the number be? What are its other factors?	Number • Page 206
	Q: How might you sort the following numbers into two different sets? 4 9 16 26 36 49 59 64 100	

B2.7 represent and solve problems involving the multiplication of three-digit whole numbers by decimal tenths, using algorithms	**Q:** You divide a four-digit number by a two-digit number. What do you know about the product?	Number • Page 145
	Q: What is an example of a situation where you might divide 1200 by 4?	
	Q: Create and solve three problems that would be solved by dividing 3008 by 12. Make the problems seem quite different.	Number • Page 146
	Q: This number line shows a division of a four-digit number by a two-digit number. Choose a value for the jump size and a value for point A, and explain what division it shows. Repeat with a different jump size and a different value for A.	
	Q: Choose a division where you would divide a four-digit number by a two-digit number that would be easy to do. Explain your thinking.	Number • Page 147
	Q: Does it make sense to say that 3000 ÅÄ 15 is halfway between 3000 ÅÄ 10 and 3000 ÅÄ 20? Explain.	
	Q: What model might you use to show what 3 7.2 means?	Number • Page 151
	Q: Suppose a ribbon is a little more than 10 cm long. If you lined up 10 of these ribbons, how long a line would they make?	
	Q: Fill in the blanks with the digits from 0 to 9, using each digit once, to make these equations true.	Number • Page 152
	Q: Choose a reasonable length for a car to be. Use the form . m. Then, imagine that there is a lineup of five identical cars. What would be the distance from the front of the first car to the back of the last car? How short do you think that line might really be? How long might the line be?	
	Q: Describe at least three different situations when you might want to multiply a number like 3200 by 0.01.	
	Q: You multiplied a whole number by a decimal and the result was 24.24. What whole number might you have multiplied by what decimal?	Number • Page 153
	Q: You multiply a decimal by 100, and there is a 6 in the tenths place. What might the decimal be? Why are there so many options?	
	Q: If a yellow hexagon pattern block is worth 5.1, make three or more designs worth 16.15. Explain your answers.	Number • Page 179
	Q: You buy a number of containers of juice. Each container holds 0. L. Choose the number of containers to buy and the values for the missing digits. How many litres of juice will you have? Repeat with two or more sets of numbers.	Number • Page 182

B2.8 represent and solve problems involving the division of three-digit whole numbers by decimal tenths, using appropriate tools, strategies, and algorithms, and expressing remainders as appropriate	There are no Grade 6 Open Questions that align with this expectation.	
B2.9 multiply whole numbers by proper fractions, using appropriate tools and strategies	**Q:** What calculation do you see in this number line?	Number • Page 181
	Q: Choose a denominator that is greater than 2 so that the yellow hexagon block is worth 2/[] . Build a design worth 4. What other blocks could you could use to build the design?	Number • Page 182
	Q: Choose a whole number. Then, choose a fraction to divide the number by so that the quotient is between 5 and 10. What could the division be? Think of three or more possibilities.	
	Q: How would you convince someone that a number divided by ⅓ is the same as twice the number divided by ⅔?	
	Q: What is a division question with the same answer as 10 ÷ ⅖ that you would find easier to solve than 10 ÷ ⅖ ? Why is your division question easier to solve?	Number • Page 183
	Q: Without doing the calculation, what do you think must be true about 5 × 23 ?	Number • Page 184
	Q: You can add two fractions by showing both fractions on the same grid and telling what part of the grid is covered with counters. For example, you could use a 3 × 4 grid to show ⅔ + ¼. You could cover 2 of the 3 rows with blue counters and 1 of the 4 columns with green counters. Then, you could rearrange the counters, one per section, to show that 11 12 of the grid is covered. Choose 4 pairs of fractions with different denominators. Use grids to show the sums. What is important when you choose the grid?	Number • Page 185
	Q: You multiply a whole number by a fraction that is not a whole number, and the result is 15. Tell three or more sets of numbers that you could have multiplied. How did you figure the sets of numbers out?	Number • Page 186

B2.10 divide whole numbers by proper fractions, using appropriate tools and strategies	**Q:** There are as many thirds in 4 as there are another fraction in another whole number. What might the fraction and the whole number be?	Number • Page 181
	Q: You have to measure out 3 cups of flour. How could you measure this amount of flour using only one of these measuring cups: ½ cup, ⅓ cup, and ¼ cup?	
	Q: You have 5 m of string to cut into equal strips of [].[][][]m each. You have to use all the ribbon. How long will the strips be? Repeat with three or more numbers of strips.	Number • Page 182
	Q: What picture would you draw to make sense of what 3 ÷ ⅔ means?	Number • Page 218
B2.11 represent and solve problems involving the division of decimal numbers up to thousandths by whole numbers up to 10, using appropriate tools and strategies	**Q:** A real-life problem involves dividing a decimal by a whole number. What might the problem be?	Number • Page 178
	Q: You divide a decimal with thousandths by 4, and your answer is a little greater than 5. What might your calculation have been?	Number • Page 181
	Q: How are problems that require you to calculate 8 × 1.125 similar to problems that require you to calculate 1.125 ÷ 8? How are they different?	Number • Page 183

B2.12 solve problems involving ratios, including percents and rates, using appropriate tools and strategies	**Q:** Fill in the blanks to make this statement true: is X times as much as X.	Number • Page 87
	Q: Which phrase do you think does not belong? • 1. times as much as 8 ...	
	Q: How can 60 be X times as much as one number, but X times as much as another?	
	Q: Fill in the blanks, using a mixed number, decimal, or fraction in one of the blanks, to make this statement true: The number 20 is times as many as X .	
	Q: Choose a small counting rod, and mark a distance that is four rods long. Record what the distance is. Then, create distances in the following ways. Tell how many of which colour of rod is used. Use only one colour of rod for each amount.	Number • Page 88
	Q: There are 3. Times more people on the bus at the end of the workday than at around 2:00 p.m. What numbers of people do you think might be on the bus at each of these times? Why did you choose these numbers? Are there any numbers of people that could not fit on the bus? Why or why not?	
	Q: Four people have a total of more than $200. Each person has a whole number of dollars. Joel has the least amount of money. Charlie has 1.2 times as much as Joel. Anisa has 1. times as much as Charlie. Lianne has 2⅓ times as much as Anisa. How much might each person have? Show your thinking.	
	Q: A certain whole number is 2⅓ times as much as another whole number and 1.4 times as much as a third whole number. What could the number be? Show your thinking.	
	Q: Simon has read 2⅓ times as many pages as Makayla. Do you think Jane might have read exactly 40 pages? Why or why not?	Number • Page 89
	Q: When do you think it might be more useful to think of 15 as 1. tens instead of thinking of 15 as 5 greater than 10?	
	Q: Can the same whole number be 1⅓ times as much as one number, but 2⅔ times as much as another number? Explain.	
	Q: Suppose one whole number is 3⅓ times as much as another number. What do you know about the two numbers?	
	Q: How might knowing that there are 3600 seconds in an hour help you solve other math problems involving time?	Number • Page 122

B2.12 (continued)	**Q:** Design a piece of art where there is 5/3 as much green as red, 2 ⅖ times as much blue as green, and 3 times as much yellow as blue.	Number • Page 125
	Q: Show that the same amount might be 2.5 . of one thing, but it could be 3/4 of another thing.	Number • Page 126
	Q: Which expression do you think doesn't belong? Why? 25% of 40 10% of 100 ⅔ of 15 50% of 30	Number • Page 133
	Q: Is it true that knowing 75% of a number also tells you 10% of a number?	Number • Page 136
	Q: You paid a little less than $30 for 25 L of gas. What could the unit price of the gas be?	Number • Page 145
	Q: Create a sentence that includes the following words and numbers: per, 1, can, 30	
	Q: Three cars travelled at these speeds: • Car 1: km in 15 min ... Think of two or more possibilities. Explain your thinking.	Number • Page 146
	Q: Is knowing a unit rate always more useful to know than knowing the same rate in another form? Explain.	Number • Page 147
	Q: How else could you describe a rate of 2 cans of soup for $1.49?	Number • Page 188
	Q: Have you heard the word per used? When? Is that rate a unit rate?	
	Q: Kylie said that she bought a slice of pizza for $1.50. Liam bought 2 slices for $3.25. Who got a better deal? Are you sure?	
	Q: When do people use percents in everyday life other than in sales in stores?	Number • Page 191
	Q: A percent of a certain number is 35. What could the percent and number be?	
	Q: Jayla and Rhea paid the same amount of money for their sweaters, but Jayla got her sweater at a 40% off sale, and Rhea got hers at a 20% off sale. How were the original prices of the sweaters related? Explain.	Number • Page 192
	Q: Investigate how percents are used in a sport you are interested in. Describe as many situations as you can, and tell how percents are used and calculated.	
	Q: Give an example of each situation: a) A big number can represent a small percent of something. ...	Number • Page 193
	Q: You saved _ % on an item, which led to a savings of a little more than $5. What do you think the item might have cost?	Number • Page 224
	Q: You are buying an item, and your goal is to save exactly $47. What could the discount and the original cost be? Think of six or more possibilities, and justify two of them.	Number • Page 225
	Q: If you wanted to save about the same on a $40 item at one store as you would save on a $50 item at another store, how would the percent discounts have to compare?	Number • Page 226
	Q: Make a design with yellow, red, and blue pattern blocks. If the yellow is worth $9, how much should your design be worth?	Number • Page 227

2020 Ontario Curriculum Expectations	Open Questions for the Three-Part Lesson: Measurement • Patterning & Algebra	Book & Page Number
C. ALGEBRA		
C1. Patterns and Relationships **Overall Expectation:** By the end of Grade 6, students will identify, describe, extend, create, and make predictions about a variety of patterns, including those found in real-life contexts		
Patterns		
C1.1 identify and describe repeating, growing, and shrinking patterns, including patterns found in real-life contexts, and specify which growing patterns are linear	There are no Grade 6 Open Questions that align with this expectation.	
C1.2 create and translate repeating, growing, and shrinking patterns using various representations, including tables of values, graphs, and, for linear growing patterns, algebraic expressions and equations	**Q:** Build the first few terms of a geometric pattern that does not grow by the same amount from one term to the next. How would you predict the 20th term?	MPA • Page 106
	Q: A geometric pattern represents the number pattern 3, 6, 12, 24, ... What might the geometric pattern look like?	
	Q: The 20th term of a pattern is 80. What could the pattern rule be?	
	Q: Build a geometric pattern with counters, square tiles, or linking cubes. Represent it as a number pattern that describes the number of items in each term of the pattern.	MPA • Page 107
	Q: The value of the third term in a pattern is 16. What might the first five rows of the table of values look like?	
	Q: Create a growing geometric pattern for a graph that includes the points (4, 11) and (7, 20). What could the pattern, the table of values, and the graph look like?	MPA • Page 108
	Q: The graph of a pattern is not a straight line. Create three possible patterns, and show that their graphs are not straight lines.	MPA • Page 109

C1.2 (continued)	**Q:** Choose values for *A* and *B*. Pattern 1: Start at *A* and add *B* to each term to get the next term. Pattern 2: Start at *B* and add *A* to each term to get the next term. Create tables of values and graph both patterns. Compare the graphs. What do you notice? Repeat for two other values of *A* and *B*. What do you notice? Do you think your observations would be the same for any values of *A* and *B*?	MPA • Page 110
	Q: Choose a value and call that value *A*. To get the term value for a particular term in a pattern, multiply the term number by *A* and subtract 3. Create tables of values and graphs for two or more values of *A*. How are the tables and graphs alike? How are they different?	MPA • Page 111
	Q: Choose numbers for the pattern rule below. Include 120 in the pattern. Start at ___ and add ___ to each term value to get the next term value. How would you figure out the value of the 20th term? Which term has a value of 120?	MPA • Page 112
	Q: A growing pattern grows quickly. The points form a straight line on a graph. What might the pattern be?	
	Q: Draw a block-letter shape that has only right angles. Create a pattern by rotating the shape using a 90° clockwise rotation.	MPA • Page 116
	Q: Create a repeating pattern involving both 90° and 180° rotations. Describe your pattern.	
	Q: A repeating shape pattern is created using at least one half turn, at least one 90° clockwise turn, and at least one 90° counter-clockwise turn. Create two or more possible patterns. Predict what the 100th term will look like, and explain why.	MPA • Page 117
	Q: The 7th term of a repeating rotation pattern looks the same as the 35th term. What might the core of the pattern be? Explain.	

C1.3 determine pattern rules and use them to extend patterns, make and justify predictions, and identify missing elements in repeating, growing, and shrinking patterns, and use algebraic representations of the pattern rules to solve for unknown values in linear growing patterns	**Q:** Create a growing geometric pattern for a graph that includes the points (4, 11) and (7, 20). What could the pattern, the table of values, and the graph look like?	MPA • Page 108
	Q: Choose values for *A* and *B*. Pattern 1: Start at *A* and add *B* to each term to get the next term. Pattern 2: Start at *B* and add *A* to each term to get the next term. Create tables of values and graph both patterns. Compare the graphs. What do you notice? Repeat for two other values of *A* and *B*. What do you notice? Do you think your observations would be the same for any values of *A* and *B*?	MPA • Page 110
	Q: Choose a value and call that value *A*. To get the term value for a particular term in a pattern, multiply the term number by *A* and subtract 3. Create tables of values and graphs for two or more values of *A*. How are the tables and graphs alike? How are they different?	MPA • Page 111
	Q: Choose numbers for the pattern rule below. Include 120 in the pattern. Start at ___ and add ___ to each term value to get the next term value. How would you figure out the value of the 20th term? Which term has a value of 120?	MPA • Page 112
	Q: The 30th term of a pattern is 4 × 30 + 6. What could the 20th term be? What would the pattern rule be?	
	Q: Describe a situation where you would prefer the pattern rule had this form: Start at ___ and add ___ to each term to get the next term. Then, describe a situation where you would prefer the pattern rule had this form: To get the value of a term, multiply the term number by ___ and subtract ___.	
	Q: Part of a repeating rotation pattern looks like this. What could the core be?	MPA • Page 116

C1.4 create and describe patterns to illustrate relationships among whole numbers and decimal numbers	**Q:** How are the numbers 45 and 4.5 related? What number operation do you think you might do to get from 45 to 4.5? Why?	MPA • Page 151
	Q: What equation would you put next in this pattern? Why?	
	Q: How are the numbers 8.9 and 890 related? What number operation do you think you might do to get from 8.9 to 890? Why?	Number • Page 107
	Q: You multiply a decimal number with a 7 in it by 100. What do you know for sure about the product?	
	Q: You divide a decimal number by 10, and the result is between 0 and 1. What do you know about the original decimal?	
	Q: Jeff said that to multiply a number by 10, you put a 0 at the end, so 10 X 3.4 = 3.40. What might you say to Jeff about his idea?	Number • Page 109
	Q: The number 4 . is divided by 100. What do you know for sure about the result?	
	Q: Do you agree that it is easier to multiply a decimal by 10 or 100 than by other numbers? Explain.	

C2. Equations and Inequalities **Overall Expectation:** By the end of Grade 6, students will demonstrate an understanding of variables, expressions, equalities, and inequalities, and apply this understanding in various contexts		
Variables and Expressions		
C2.1 add monomials with a degree of 1 that involve whole numbers, using tools	There are no Grade 6 Open Questions that align with this expectation.	
C2.2 evaluate algebraic expressions that involve whole numbers and decimal tenths	**Q:** Choose three numbers. Call them *A*, *B*, and *C*. Write at least four equations that use all three variables. For example, if *A* = 1, *B* = 10, and *C* = 100, one equation could be *A* + *B* + *C* = 111.	MPA • Page 114
	Q: Choose three numbers. Call them *X*, *Y*, and *Z*. Write equations to describe the relationships among them. The equations you write should allow someone to figure out the values you chose, but the values should not be too easy to figure out.	
	Q: Create an equation that involves more constants than variables.	MPA • Page 115
	Q: Create an equation where the variable *A* is an unknown (there is only one solution). Then, create another equation where *A* can vary.	
	Q: The equation *A* = *b* × *h* relates the area of a parallelogram to its base and height. What values are possible for *A*, *b*, and *h*? Are only certain values possible, or are all values possible?	

Equalities and Inequalities		
C2.3 solve equations that involve multiple terms and whole numbers in various contexts, and verify solutions	**Q:** Zahra wrote $ax - b =$? to figure out which term number in a pattern has a value of ?. Choose values for a and b. Then, choose a high value that is in the pattern. Solve the equation to figure out what x is.	MPA • Page 179
	Q: The numbers in the grid below are all whole numbers. The sum of A and B is 2 more than the sum of A and C. The sum of B and D is 4 more than the sum of A and B. What could the sum of the four numbers be? What could the sum of the four numbers not be? Explain your thinking.	MPA • Page 113
	Q: The sum of a, b, and c is 80, and a, b, and c are all whole numbers. If c is triple a, what other relationships among the variables are you sure of?	
	Q: The solution to an equation involving at least one big number is 32. What could the equation be?	
	Q: Which equation do you think doesn't belong?	
	Q: Create five equations that seem really different and all have a solution of $p = 20$.	MPA • Page 114
	Q: Suppose $3 \times A + 4 \times B = 96$. Determine four possible pairs of values for A and B. Choose two of your pairs. How does the difference in the A values compare to the difference in the B values?	
	Q: You solve an equation involving multiplication and some big numbers, and the solution is $s = 21$. What might the equation be?	MPA • Page 115
	Q: You figure out the missing number in a multiplication equation by dividing. What might the equation be?	
	Q: A and B are whole numbers and $3 \times A = 2 \times B$. What do you know about A? What do you know about B? What might the equation represent?	

C2.4 solve inequalities that involve two operations and whole numbers up to 100, and verify and graph the solutions	There are no Grade 6 Open Questions that align with this expectation.	

C3. Coding **Overall Expectation:** By the end of Grade 6, students will solve problems and create computational representations of mathematical situations using coding concepts and skills		
Coding Skills		
C3.1 solve problems and create computational representations of mathematical situations by writing and executing efficient code, including code that involves conditional statements and other control structures	There are no Grade 6 Open Questions that align with these expectations.	
C3.2 read and alter existing code, including code that involves conditional statements and other control structures, and describe how changes to the code affect the outcomes and the efficiency of the code		

C4. Mathematical Modelling **Overall Expectation**: By the end of Grade 6, students will apply the process of mathematical modelling to represent, analyse, make predictions, and provide insight into real-life situations		
This overall expectation has no specific expectations. Mathematical modelling is an iterative and interconnected process that is applied to various contexts, allowing students to bring in learning from other strands. Students' demonstration of the process of mathematical modelling, as they apply concepts and skills learned in other strands, is assessed and evaluated.	**Q:** About how many packages of 100 sheets of paper do you think you could stack from the floor to the ceiling? Explain your estimate.	MPA • Page 90
	Q: 1 000 000 potatoes might have a mass that is the same as about 5000 people. Think about 1 000 000 bugs, 1 000 000 pennies, 1 000 000 people, or 1 000 000 of anything. How could you describe your 1 000 000 in a different way? Explain your answer.	MPA • Page 121
	Q: How long would it take for at least two of these to happen? Explain. • eating 1 000 000 calories ...	
	Q: About how many trees does it take to have 1 000 000 leaves?	
	Q: 10 000 is the answer to a real-life problem that needs to be solved in more than one step. Think of problems where 10 000 might be the answer. Tell how you know.	MPA • Page 122

2020 Ontario Curriculum Expectations	Grades 4–8 Open Questions for the Three-Part Lesson • *Geometry and Spatial Sense • Data Management and Probability*	G4–8 Book & Page Number
D. DATA		
D1. Data Literacy **Overall Expectation:** By the end of Grade 6, students will manage, analyse, and use data to make convincing arguments and informed decisions, in various contexts drawn from real life		
Data Collection and Organization		
D1.1 describe the difference between discrete and continuous data, and provide examples of each	**Q:** Choose two of the questions below. What are some numbers that you might see in people's answers to these two questions? What are some numbers that you would not see in answers to the questions that you chose?	GSSDP • Page 63
	Q: Choose one description from each of these columns: Collect data that reflects your choices, and display the data on a graph. Tell why you chose the data and type of graph that you did. Then, repeat with a different combination of descriptions. If one of your combinations doesn't work, explain why this is the case, and repeat for a different combination of descriptions.	GSSDP • Page 65
	Q: Reagan collects data about the weather in her community by collecting data in the form of numbers. Wyatt collects data about the weather in his community by collecting data in the form of words. Use data from your own community to show how Reagan and Wyatt might have displayed their data. Then, answer the following questions:	GSSDP • Page 71
	Q: Give an example of data values that are categorical. Then, give an example of data values that are discrete but not categorical.	GSSDP • Page 141

D1.2 collect qualitative data and discrete and continuous quantitative data to answer questions of interest about a population, and organize the sets of data as appropriate, including using intervals	**Q:** Pick a topic. Tell what primary and secondary data might be collected about this topic. Tell how you would collect each type of data.	GSSDP • Page 102
	Q: Create a plan to collect data that will help you decide on the following: A. a movie for your family to watch B. a movie for your class to watch C. a movie for your school to watch	GSSDP • Page 110
	Q: You overhear someone say, “That isn’t a good way to collect data for that population.” Why might this person have said this? How would you help the person collecting the data to modify what he or she is doing?	GSSDP • Page 111
	Q: Conduct a survey or experiment in which the results are better suited for a histogram than a bar graph. Using a digital device, display your data on a histogram, and justify why a histogram is better for this data set than a bar graph.	GSSDP • Page 185
	Q: Collect either primary or secondary data that you think will be well suited for a histogram, and arrange your data in a frequency table with intervals. Next, display the data on a histogram. Then, make a second histogram with a different scale and/or intervals. What conclusions could you make based on each of your graphs?	GSSDP • Page 190
Data Visualization		
D1.3 select from among a variety of graphs, including histograms and broken-line graphs, the type of graph best suited to represent various sets of data; display the data in the graphs with proper sources, titles, and labels, and appropriate scales; and justify their choice of graphs	**Q:** Shen thinks that the best way to display the data values that he is working with is to use a broken-line graph. What data might he be displaying? Collect similar data, and display the data on a broken-line graph.	GSSDP • Page 64
	Q: Choose two of the following types of graphs: bar graph line plot pictograph double bar graph broken-line graph stem-and-leaf plot Tell how they are alike and how they are different.	GSSDP • Page 67
	Q: Some people say that the best way to display continuous data is to use a broken-line graph. Do you agree with this statement? Why or why not?	
	Q: Ella looks at a set of data and decides quickly that using a stem-and-leaf plot is not a good way to display the data. What do you think that Ella noticed about the data that made her decide this?	GSSDP • Page 102
	Q: Add a scale on a graph type of your choice for each of these situations: A. The highest value is a three-digit number, and the lowest value is a two-digit number. B. The range of the data is about 40. C. All the values are between 900 and 1000.	
	Q: Alanna collects data and thinks that the best way to display the data is on a continuous line graph. What data might she have collected? Collect similar data, and create a continuous line graph of the data using a digital device.	GSSDP • Page 104

D1.3 (continued)	**Q:** Research measurements of something that can be shown on a continuous line graph. Then, research measurements of something that cannot be shown on a continuous line graph. Make a graph for each using a digital device. Tell why each of your graphs make sense for the measurements that you have researched.	GSSDP • Page 105
	Q: Choose a continuous line graph and one of these graphs: bar graph stem-and-leaf plot double bar graph broken-line graph Describe a situation where it makes sense to use each graph that you chose. Then, describe a situation where it doesn't make sense to use each graph that you chose. Explain your answer.	GSSDP • Page 106
	Q: Andy thinks the best way to display the data that he is working with is by using a histogram. Collect primary or secondary data that could be similar to Andy's data, and display the data on a histogram.	GSSDP • Page 181
	Q: What other type of graph is a histogram most like? Why? What other type of graph is a histogram most different from? Why?	GSSDP • Page 183
	Q: Conduct a survey or experiment in which the results are better suited for a histogram than a bar graph. Using a digital device, display your data on a histogram, and justify why a histogram is better for this data set than a bar graph.	GSSDP • Page 185
	Q: Survey your classmates on a topic of your choice where the results are numbers. Using a digital device, display the data on two very different types of graphs. Tell which one you think gives a better sense of the data and why.	
	Q: Describe a situation where you would use a histogram and a situation where you would not use a histogram. Explain your answer. Then, repeat for scatter plots.	GSSDP • Page 187
	Q: "Histograms are not as useful as bar graphs." Do you agree with this statement? Why or why not?	
	Q: Collect either primary or secondary data that you think will be well suited for a histogram, and arrange your data in a frequency table with intervals. Next, display the data on a histogram. Then, make a second histogram with a different scale and/or intervals. What conclusions could you make based on each of your graphs?	GSSDP • Page 190

D1.4 create an infographic about a data set, representing the data in appropriate ways, including in tables, histograms, and broken-line graphs, and incorporating any other relevant information that helps to tell a story about the data	There are no Grade 6 Open Questions that align with this expectation.	
Data Analysis		
D1.5 determine the range as a measure of spread and the measures of central tendency for various data sets, and use this information to compare two or more data sets	**Q:** Create a set of values based on the following conditions:	GSSDP • Page 144
	Q: Describe a situation where you think that comparing the means of two data sets is the best way to compare the sets. Explain why you think this. Then, repeat for either median or mode.	GSSDP • Page 187
D1.6 analyse different sets of data presented in various ways, including in histograms and broken-line graphs and in misleading graphs, by asking and answering questions about the data, challenging preconceived notions, and drawing conclusions, then make convincing arguments and informed decisions	**Q:** The shapes of two broken-line graphs are a lot different from each other. What might the graphs look like?	GSSDP • Page 70
	Q: Reagan collects data about the weather in her community by collecting data in the form of numbers. Wyatt collects data about the weather in his community by collecting data in the form of words. Use data from your own community to show how Reagan and Wyatt might have displayed their data. Then, answer the following questions:	GSSDP • Page 71
	Q: Two broken-line graphs have the same title, labels, and scale, but the shape of the data in each graph is a lot different. Show what the graphs could look like. Compare the two different shapes of data, and explain how else the two graphs differ.	GSSDP • Page 74
	Q: Add information to one of the following graphs that makes sense. Then, tell what conclusions you could make about the data in it.	GSSDP • Page 75
	Q: What do you think these graphs could be about?	GSSDP • Page 107
	Q: Which of these graphs do you think is least like the others?	
	Q: How are these graphs similar? How are they different?	GSSDP • Page 108
	Q: This graph tells a story about a car ride to school: Tell what this story could be. Then, draw a continuous line graph that tells a different story. Challenge a classmate to tell a story about what your graph shows.	GSSDP • Page 109

D1.6 (continued)	**Q:** Think of a task that you can complete a lot of times in 1 minute. Then, ask some of your classmates to perform the task, and collect the results. Using a digital device, display the results on a graph that makes sense for your data. Next, change the scale in a way that makes the shape of the data look a lot different. Then, tell how the graphs are similar and different.	GSSDP • Page 110
	Q: Tell how displaying the same data in different ways can affect the conclusions that people make when viewing the data.	GSSDP • Page 111
	Q: A graph looks like this: Explain what information you could add to the graph so that it makes sense. Then, draw conclusions about the graph. Afterwards, add different information so that the graph makes sense in another way. Tell how you could draw very different conclusions from before based on the new information that you added to the graph.	
	Q: How might two competing companies use graphs in different ways to encourage consumers to buy their products?	GSSDP • Page 112
	Q: Some people think that it doesn't matter what scale you use for a graph as long as you can fit all the data on it. Do you agree? Why or why not?	
	Q: Tell how the shape of the same data can look very different on two different histograms. Give an example that supports your explanation. Explain why someone might want to graph data each of the two ways in your example.	GSSDP • Page 183
	Q: How are these graphs similar? How are they different?	GSSDP • Page 184
	Q: Collect either primary or secondary data that you think will be well suited for a histogram, and arrange your data in a frequency table with intervals. Next, display the data on a histogram. Then, make a second histogram with a different scale and/or intervals. What conclusions could you make based on each of your graphs?	GSSDP • Page 190
	Q: Some histograms show trends. Others do not. Create an example of a histogram that shows a trend. Repeat for a graph that doesn't show a trend. Then, describe any rates of change and trends that you see in your graphs.	GSSDP • Page 192

D2. Probability

Overall Expectation: By the end of Grade 6, students will describe the likelihood that events will happen, and use that information to make predictions

D2.1 use fractions, decimals, and percents to express the probability of events happening, represent this probability on a probability line, and use it to make predictions and informed decisions	**Q:** Describe a probability activity for each of the statements below that would make them true: ...	GSSDP • Page 114
	Q: Michael is about to draw a card from a deck of playing cards. He has decided on values between 0 and 1 to describe the theoretical probability of three different events happening when he chooses the next card. Decide what these events and values might be. Then, draw 10 cards from a deck of cards, and compare your theoretical probabilities against the cards that you drew by using a tool or a representation.	
	Q: Choose one of the following: playing cards coin(s) number cube(s) Think of an activity that involves your item(s). Describe an event that could occur during this activity where it's easy to calculate the theoretical probability of this occurring. Then, ...	GSSDP • Page 115
	Q: How are describing probability situations using fractions and describing probability situations using ratios similar? How are they different?	
	Q: Michelle says that the sum of favourable and unfavourable outcomes in an activity always adds to 1. Do you agree? Why or why not?	
	Q: You overhear your teacher say, "I think that about a quarter of the class ..." Fill in the blank in a way that makes sense.	GSSDP • Page 151
	Q: The theoretical probability of an event is expressed as a fraction. What could the event and fraction be?	
	Q: Choose two of the statistics below, and use them along with estimation to make predictions about your classmates. Explain your predictions.	GSSDP • Page 152
	Q: Choose a sport that interests you. Find two or three probabilities associated with a player or team of that sport that are expressed as fractions, decimals, or percentages. Tell how you can use these probabilities to make predictions about how this player or team will perform during future events.	GSSDP • Page 155
	Q: Imagine that you are going away on a vacation somewhere. Choose where you could be vacationing, and look up the weather forecast for the next week in this area. Show and tell how probabilities in the forecast would help you make decisions about your trip.	

D2.2 determine and compare the theoretical and experimental probabilities of two independent events happening	**Q:** Choose two of the following: using a spinner flipping two coins rolling a number cube drawing playing cards Tell some possible outcomes that could occur in each of these two cases.	GSSDP • Page 151
	Q: This area model can be used to show the four possible outcomes of an experiment involving two independent probability events	GSSDP • Page 152
	Q: Create a probability activity that meets these conditions:	GSSDP • Page 153
	Q: Some people say that knowing the theoretical probability of two independent events happening at the same time helps you to know what would happen during one trial of an experiment involving these events. Do you agree? Why or why not?	GSSDP • Page 154
	Q: When might it be helpful in real life to find the theoretical probability of two independent events occurring at the same time?	
	Q: Draw a tree diagram or area model to help you calculate the theoretical probability of turning up two heads, two tails, or one of each when you flip two coins at the same time. Choose either 12, 16, or 20 rounds of flipping two coins. Then, flip two coins for the number of rounds that you chose. Record the results, and compare your experimental and theoretical probabilities.	GSSDP • Page 197

E. SPATIAL SENSE

E1. Geometric and Spatial Reasoning

Overall Expectation: By the end of Grade 6, students will describe and represent shape, location, and movement by applying geometric properties and spatial relationships in order to navigate the world around them

Geometric Reasoning

E1.1 create lists of the geometric properties of various types of quadrilaterals, including the properties of the diagonals, rotational symmetry, and line symmetry	**Q:** Choose two of the statements below, and tell how you know whether they are true or false. 1. All squares are rectangles. 2. All rectangles are squares. 3. A parallelogram is a kind of quadrilateral. 4. A square is a rhombus. Then, make one or two of your own true or false statements about quadrilaterals. Use the names of at least two types of quadrilaterals in each statement. Explain why each statement is true or false.	GSSDP • Page 112
	Q: Tell lots of things that you know for sure by looking at this picture	GSSDP • Page 113
	Q: A certain shape is called a quadrilateral, but it also has another name. What might the quadrilateral's other name be?	GSSDP • Page 13
	Q: The answer to the same question could be either "square" or "rectangle." What might the question be?	
	Q: Using a geoboard, make two very different quadrilaterals and two very similar quadrilaterals. Tell how they are different or similar.	
	Q: Which one of these shapes do you think is the least like the others?	
	Q: A ________ is also a ________. Use the words below or the names of other shapes to fill in the blanks. square rhombus quadrilateral rectangle parallelogram	
	Q: Choose two of these quadrilaterals. Describe their symmetry, angles, parallel sides, side lengths, and other properties to tell how they are similar and different.	GSSDP • Page 14
	Q: Draw two quadrilaterals that are different. What do you think is the least number of clues that you could give someone so that he or she could make a congruent shape (a shape that is the same size and shape) for each one?	
	Q: Quadrilaterals can be sorted using sorting hoops that look like this: or this: Use either arrangement to sort quadrilaterals two or more ways by either their angles, parallel sides, symmetry, or side lengths.	

E1.1 (continued)	**Q:** Tell lots of things that you know about quadrilaterals by looking at this picture:	GSSDP • Page 15
	Q: Choose two of the quadrilaterals below. Imagine that you had to describe a picture of each of these shapes without seeing it. Tell all the things that you would know for sure about each shape. Then, tell all the things about each shape that you would not be so sure about. rectangle square trapezoid parallelogram rhombus.	
	Q: Choose two quadrilaterals that are a lot different from each other. Then, write a description of each one that would help someone make an exact copy of each shape without seeing it. Share each description with a partner, and see if he or she can make an exact copy of each of your shapes. Compare your shapes with your partner's shapes.	GSSDP • Page 85
	Q: What is a shape that you would have to provide a lot of details about to allow someone to make an exact copy of it? What is a shape that you would have to only give a few details about to allow someone to make an exact copy of it? Explain your answer.	GSSDP • Page 87
	Q: Which two of these shapes do you think are the most alike? Why?	GSSDP • Page 88
	Q: You trace a shape. Then, you rotate the shape less than a full turn, and it fits back in its original outline. What might the shape be?	
	Q: Choose two identical pattern blocks. How many different ways can you rotate one of the blocks so that it looks like a reflection of the other block?	
	Q: Make a rule for each ring on the Venn diagram by applying the following conditions:	GSSDP • Page 89
	Q: Sort these shapes in two ways using a rule about either the order of rotational symmetry or the number of lines of symmetry of the shapes. First, decide on a rule that will give you groups of an almost balanced number of shapes. Then, decide on a rule that will give you groups of an unbalanced number of shapes.	
	Q: Choose two or three of these quadrilaterals: rhombus trapezoid square rectangle parallelogram If you didn't see an image of these shapes, what would you know about each shape's angles, sides, and symmetry? What wouldn't you know about each one's angles, sides, and symmetry?	GSSDP • Page 90
	Q: How might you show someone some effective strategies for figuring out the number of lines of symmetry and the order of rotational symmetry of polygons?	
	Q: Imagine that each of the rings in this Venn diagram has a different rule: one is about angles, one is about sides, and one is about symmetry. Tell how it's possible to have the same polygon in different sections of the rings depending on the rules that you choose.	

E1.1 (continued)	**Q:** Sketch a shape that has an odd number of lines of symmetry but more than one line of symmetry. Then, sketch a different shape that has an even order of rotational symmetry.	GSSDP • Page 123
	Q: A quadrilateral shows symmetry. What kind of quadrilateral might it be? What kind of quadrilateral could it not be?	
	Q: Make a sorting rule for each ring on the Venn diagram by applying the following conditions: A. One ring has a rule about line or rotational symmetry. B. One ring has a rule about angle measurements. C. One ring has a rule about sides. Then, sort a variety of triangles and quadrilaterals by drawing them into the rings. Challenge a classmate to determine your three sorting rules by looking at your sorted shapes.	GSSDP • Page 124
	Q: Which two of the following shapes do you think have the most similar geometric properties? Why?	GSSDP • Page 163
	Q: Using square dot paper, do the following: • Draw four different quadrilaterals that are rhombuses and four others that are not rhombuses. • Draw two diagonals through each quadrilateral by drawing a line from each vertex to the vertex that it does not share a side with. • Tell all the things that you notice after adding these diagonals.	GSSDP • Page 164
	Q: You start sorting quadrilaterals with a square in the middle of a Venn diagram like this ...	GSSDP • Page 165
	Q: In some quadrilaterals, the diagonals in them are perpendicular bisectors. In other quadrilaterals, they are not. What do you know for sure about the quadrilaterals in each case? What are you not so sure about?	GSSDP • Page 166

E1.2 construct three-dimensional objects when given their top, front, and side views	**Q:** Draw a picture of something that you can find in the classroom. Draw it from a front view, side view, top view, and back view. Tell how your pictures are similar and different.	GSSDP • Page 91
	Q: Imagine that you arranged five objects on a bookshelf that looks like this: Draw what the bookshelf would look like from the front. Then, draw what the bookshelf might look like from the back.	
	Q: If you could see only three views of a structure to help you build it, which of the following views would you choose? Which views would you not choose? Why?	GSSDP • Page 93

Location and Movement		
E1.3 plot and read coordinates in all four quadrants of a Cartesian plane, and describe the translations that move a point from one coordinate to another	**Q:** What might the coordinates of the point below be? What could the coordinates of a point far away from this point be?	GSSDP • Page 128
	Q: Draw a polygon on a Cartesian coordinate grid with the following conditions:	GSSDP • Page 129
	Q: Imagine that your geoboard is a Cartesian coordinate grid. Make a triangle on the grid. Tell the coordinates of its vertices. Next, shift the triangle 2 units left and 1 unit down. Then, tell the coordinates of each new vertex. Repeat for at least one other polygon. Tell what you notice.	
	Q: How does looking at the coordinates of points on a Cartesian coordinate grid help you understand how to get from one point to another?	GSSDP • Page 130
	Q: Two points are close together on a Cartesian coordinate grid but are not in the same quadrant. Two other points are far apart on a coordinate grid but are in the same quadrant. What might the coordinates be for each of the points? Tell why your answers make sense.	
	Q: Create a growing geometric pattern for a graph that includes the points (4, 11) and (7, 20). What could the pattern, the table of values, and the graph look like?	MPA • Page 108
	Q: The graph of a pattern is not a straight line. Create three possible patterns, and show that their graphs are not straight lines.	MPA • Page 109
	Q: Choose values for *A* and *B*. Pattern 1: Start at *A* and add *B* to each term to get the next term. Pattern 2: Start at *B* and add *A* to each term to get the next term. Create tables of values and graph both patterns. Compare the graphs. What do you notice? Repeat for two other values of *A* and *B*. What do you notice? Do you think your observations would be the same for any values of *A* and *B*?	MPA • Page 110
	Q: Choose a value and call that value *A*. To get the term value for a particular term in a pattern, multiply the term number by *A* and subtract 3. Create tables of values and graphs for two or more values of *A*. How are the tables and graphs alike? How are they different?	MPA • Page 111

E1.4 describe and perform combinations of translations, reflections, and rotations up to 360° on a grid, and predict the results of these transformations	**Q:** Draw one of these letters onto square dot paper: Next, use a combination of translations and reflections to move the letter to a different spot on your paper. Then, show and explain a different way that you could have used translations and reflections to get to the same spot.	GSSDP • Page 54
	Q: On grid paper, make a design using six to eight squares. Make each square one colour, using two or three colours in total. Next, in a random order, perform the following transformations of your design: a reflection, a translation, a 90° rotation, and a 180° rotation. Then, challenge ...	GSSDP • Page 98
	Q: How might this triangle have transformed from position A to position B?	GSSDP • Page 173
	Q: On grid paper, draw a map of our classroom. For the objects on your map, use simplified shapes that take up full squares. Then, perform eight or more transformations of some of the objects on your map that include ...	GSSDP • Page 174
	Q: Think of an activity that you enjoy. Describe how you use transformations while doing this activity.	
	Q: Imagine that you are doing a chore or cleaning an area of your home. Tell how translations, rotations, and reflections are incorporated into this task.	GSSDP • Page 177
	Q: Which two types of transformations are the most similar? Explain your answer.	
	Q: Draw a block-letter shape that has only right angles. Create a pattern by rotating the shape using a 90° clockwise rotation.	MPA • Page 116
	Q: Create a repeating pattern involving both 90° and 180° rotations. Describe your pattern.	
	Q: A repeating shape pattern is created using at least one half turn, at least one 90° clockwise turn, and at least one 90° counter-clockwise turn. Create two or more possible patterns. Predict what the 100th term will look like, and explain why.	MPA • Page 117
	Q: The 7th term of a repeating rotation pattern looks the same as the 35th term. What might the core of the pattern be? Explain.	
	Q: Kai and Deesha have the same pattern, but Kai's rule involves rotating a shape 90° clockwise and Deesha's rule involves rotating a shape 90° counter-clockwise. How is that possible?	

E2. Measurement **Overall Expectation:** By the end of Grade 6, students will compare, estimate, and determine measurements in various contexts		
The Metric System		
E2.1 measure length, area, mass, and capacity using the appropriate metric units, and solve problems that require converting smaller units to larger ones and vice versa	**Q:** Fill in the blanks with metric units to make the statement true. Do this with at least two sets of units.	MPA • Page 88
	Q: About how many packages of 100 sheets of paper do you think you could stack from the floor to the ceiling? Explain your estimate.	MPA • Page 90
	Q: Choose three small items and measure the length of each item in centimetres. Then, convert the measurements to metres. What do you notice about the two numbers? Why does what you notice make sense?	MPA • Page 108
	Q: About how many kilograms of grapes do you think this is? How many grams is that? Explain your estimate.	MPA • Page 122
	Q: The floor of Ella's room is more than 95 000 cm2 in area. How many square metres might it be?	
	Q: What objects might reasonably have a mass of 3 000 000 mg? Think of two or more objects.	MPA • Page 123
	Q: Do some research to find out how fast a snail moves. How much longer might it take a snail to move 1 000 000 cm than to move 1 000 000 mm?	
	Q: Create and solve a problem involving mass that would require you to convert a metric measurement to a different metric measurement.	
	Q: What number could go in the blank to make this statement true? cm^2 is just a little more than 0.4 m^2. Explain your answer.	MPA • Page 124
	Q: A sign says that a new shopping mall will be 2 000 000 cm2. Is it easy to tell if it is a giant mall, a small mall, or neither? Explain.	MPA • Page 152
	Q: Think of an object with either a surface area or a volume that people would not consider very big. Describe the object using different units so that it sounds big.	MPA • Page 153
	Q: What units could go in the blanks to make this statement true? Think of at least three pairs of units. 1.2 ___= 1 200 000	MPA • Page 154
	Q: Choose a decimal number of square centimetres. Rename that area as a number of square metres.	

Angles		
E2.2 use a protractor to measure and construct angles up to 360°, and state the relationship between angles that are measured clockwise and those that are measured counter clockwise	**Q:** Estimate the size of some of the angles on pattern blocks. Tell why your estimates make sense.	GSSDP • Page 84
	Q: The answer to a riddle about angles is the shape to the right. What might the riddle be? Then, create and solve your own angle riddle.	GSSDP • Page 85
	Q: On a geoboard, make two lines that cross each other. Estimate the size of the four angles at the intersection. Explain your estimates.	GSSDP • Page 120
E2.3 use the properties of supplementary angles, complementary angles, opposite angles, and interior and exterior angles to solve for unknown angle measures	**Q:** Some people think that there is no sense in estimating before measuring an angle because protractors are accurate. Do you agree? Why or why not?	GSSDP • Page 87
	Q: I bisected some angles. The results were acute angles. What could the original angles have been? What could they not have been? Bisect angles using a protractor to show that you are right.	GSSDP • Page 121

Area and Surface Area		
E2.4 determine the areas of trapezoids, rhombuses, kites, and composite polygons by decomposing them into shapes with known areas	**Q:** How would you figure out the area of this shape?	MPA • Page 96
	Q: Make a design based on three squares of different sizes. At least two of the squares should overlap. What is the total area of the squares? What is the approximate area of the design?	MPA • Page 125
	Q: Which of these shapes do you think has a greater area? Why?	
	Q: A trapezoid has a base of 40 cm but a very small area. What could the other dimensions be?	
	Q: A composite shape made up of a trapezoid and some triangles has an area of less than 100 cm^2. What might the shape look like? What are the dimensions and areas of the triangles and trapezoid? What is the total area of the composite shape?	MPA • Page 126
	Q: The area of a trapezoid is 25 cm^2. Draw the trapezoid and label its dimensions and height.	
	Q: Design a piece of jewellery in the shape of a trapezoid. What is its area?	
	Q: A shape is made by putting together three identical triangles. Draw the shape and label its side lengths. What is the area of the shape?	MPA • Page 127
	Q: Choose the dimensions of a mirror like the one shown below. What is the area of the whole mirror (including the frame) and the area of just the glass? Estimate the dimensions where you need to.	
	Q: A parallelogram has the same area as this trapezoid. What could the parallelogram's dimensions be?	MPA • Page 128
	Q: Someone says that if you know how to figure out the area of a parallelogram and the area of a triangle, then you don't need to remember the formula for the area of a trapezoid. Do you agree or disagree? Why?	
	Q: How could you make a trapezoid that has half the area of this trapezoid?	
	Q: What pieces of information do you need to figure out the area of a trapezoid?	
	Q: You increase the length of one base of a trapezoid by 2 cm, but you don't change the height. How much might the area of the trapezoid increase?	

E2.5 create and use nets to demonstrate the relationship between the faces of prisms and pyramids and their surface areas	There are no Grade 6 Open Questions that align with this expectation.	
E2.6 determine the surface areas of prisms and pyramids by calculating the areas of their two-dimensional faces and adding them together	**Q:** A prism has a surface area that is exactly 20 cm^2 greater than the surface area of another prism. What could the dimensions of the two prisms be?	MPA • Page 102
	Q: How is figuring out the surface area of a triangular prism like figuring out the surface area of a rectangular prism? How is it different?	MPA • Page 103
	Q: How many calculations do you need to do to figure out the surface area of a triangular prism?	
	Q: The surface area of a prism is easy to figure out. Create a net to show what the prism might look like. Why is it easy to figure out the surface area of the prism?	MPA • Page 129
	Q: One prism has a surface area that is about 100 cm^2 more than the surface area of another prism. What could the dimensions of the prisms be?	MPA • Page 133

F. FINANCIAL LITERACY		
F1. Money and Finances **Overall Expectation:** By the end of Grade 6, students will demonstrate an understanding of the value of Canadian currency		
Money Concepts		
F1.1 describe the advantages and disadvantages of various methods of payment that can be used to purchase goods and services	There are no Grade 6 Open Questions that align with this expectation.	
Financial Management		
F1.2 identify different types of financial goals, including earning and saving goals, and outline some key steps in achieving them	**Q:** You spent almost $600 buying several of the same item. Using mental math, figure out how many items you bought and what each item each cost. Think of three or more possibilities.	Number • Page 143
F1.3 identify and describe various factors that may help or interfere with reaching financial goals	There are no Grade 6 Open Questions that align with this expectation.	
Consumer and Civic Awareness		
F1.4 explain the concept of interest rates, and identify types of interest rates and fees associated with different accounts and loans offered by various banks and other financial institutions	There are no Grade 6 Open Questions that align with this expectation.	
F1.5 describe trading, lending, borrowing, and donating as different ways to distribute financial and other resources among individuals and organizations		

Grade 6 Open Questions that now align with other grades of the 2020 Ontario Curriculum		Book & Page #
Grade 4 Expectations		
Grade 4 **B2.4**	**Q:** Create an addition problem and a subtraction problem that you can solve using mental math. Both problems should use one four-digit number and one two-digit number. Tell why mental math is reasonable for each problem.	Number • Page 143
Grade 5 Expectations		
Grade 5 **B1.1**	**Q:** Use three words to write three or more five-digit numbers. What could the numbers be? What do you notice about the numbers?	Number • Page 114
	Q: How many words might you use to write a number less than 100 000? Give an example for each possible number of words. When would you use a lot of words? When would you use only a few words? How do you know there are no other possibilities?	Number • Page 115
Grade 5 **B1.3**	**Q:** Why might someone say that the red pattern block is 1 ., but someone else might say it's a different fraction?	Number • Page 124
	Q: One improper fraction is much less than another. What might the two fractions be? How do you know?	
	Q: What improper fractions or mixed numbers do you see in this pattern? List four or more fractions.	Number • Page 125
	Q: Choose an improper fraction. Create three or more representations of that fraction. At least two of the representations should be similar. Tell why the representations are similar. Why are the other representations not quite as similar as these two representations?	
	Q: Model three different improper fractions with a numerator of 6. What is the same about all of them? What is different?	Number • Page 126
	Q: Model several different improper fractions with a denominator of 8. What is the same about all of them? What is different?	
	Q: Is it possible for the improper fraction X to be equivalent to X ? Why?	Number • Page 129

Grade 5 **B1.4**	**Q:** Use a diagram to show a mixed number and what its improper fraction equivalent is.	Number • Page 127
Grade 5 **B2.1**	**Q.** Choose a two-digit number that does not end in zero. Explain how you would use mental math to multiply it by 6.	Number • Page 144
	Q. You want to divide a number in your head by first dividing it by a bigger number. What might you be dividing by and why?	
Grade 5 **B2.3**	**Q.** How is multiplying 0.01 X 34 similar to multiplying 0.34 X 100?	Number • Page 153
	Q. Do you think it is easier to multiply by 0.1 or divide by 10 to calculate one-tenth of 384?	
	Q. You multiply a whole number by 0.1, and there is a 4 in the tenths place. If you multiply that same number by 0.01, there is a 7 in the ones place. What might the number be? Why are there so many options?	
Grade 5 **B2.4**	**Q:** You subtract two whole numbers and estimate the difference to be 420. What might the numbers be?	Number • Page 142
	Q: Two nearby towns decide to join together to become a single town to save administrative costs. The total population of the two towns is about 8000, but the larger town's population is about 500 more than the smaller town's population. What might the exact population of the two original towns be? Think of at least three possibilities. Describe your strategy for at least one choice.	Number • Page 143
	Q: Create a question involving the addition and subtraction of four-digit numbers that might look difficult, but is really pretty easy. Explain why it's easy.	Number • Page 144
Grade 5 **B2.6**	**Q:** You solve a problem where you divide 442 by 3. What might the problem be? How would you estimate the result?	Number • Page 142
	Q: How might you multiply 40 X 32 mentally?	
	Q: You multiply two numbers in your head. The answer is about 400. What numbers might you have multiplied?	
	Q: You solve a problem involving the multiplication of a two-digit number by a four-digit number, and the answer is about 100 000. What might the problem be? Explain.	Number • Page 145
	Q: Choose a two-digit number and a four-digit number. Create a problem that involves multiplying these two numbers, and then solve the problem. Create three other problems with different sets of numbers.	Number • Page 146
	Q: Describe two or more good ways to estimate 4930 X 38. Which of your estimates do you think is closer to the exact product? Why?	Number • Page 147

Grade 5 **B2.7**	**Q:** You divide a four-digit number by a two-digit number. What do you know about the product?	Number • Page 145
	Q: What is an example of a situation where you might divide 1200 by 4?	
	Q: What is an example of a situation where you might divide 1200 by 4?	
	Q: Create and solve three problems that would be solved by dividing 3008 by 12. Make the problems seem quite different.	Number • Page 146
	Q: This number line shows a division of a four-digit number by a two-digit number. Choose a value for the jump size and a value for point A, and explain what division it shows. Repeat with a different jump size and a different value for A.	
	Q: Choose a division where you would divide a four-digit number by a two-digit number that would be easy to do. Explain your thinking.	Number • Page 147
	Q: Does it make sense to say that __ is halfway between ___ and ___? Explain.	

Grade 5 **B2.9**	**Q:** Tell everything you can about the number of red counters versus the number of blue counters.	Number • Page 130
	Q: If you flip a coin 10 times, what ratios of heads to tails do you think you are likely to get? What ratios are you unlikely to get? Why?	
	Q: Choose one of these ratios. Describe a situation when you are likely to see this ratio. 1:10 1:1 17:10	
	Q: Which of these ratios do you think might describe the ratio of the number of classrooms in a school to the number of students in the school? Why would only the one(s) you chose be possible?	
	Q: Use two colours of counters. Set up a situation where there are more than three times as many colour Avcounters as colour B counters. Then, describe each of these: a) the ratio of colour A: colour B ...	Number • Page 131
	Q: Choose a ratio. Model that ratio three or more ways. How are the models alike? How are the models different?	
	Q: Find three or more recipes used to create drinks or desserts. What ratios of the ingredients are typical in these sorts of recipes?	
	Q: Do you think that the ratios 5:2 and 24:10 are more alike than the ratios 5:2 and 20:17? Explain.	Number • Page 132
	Q: How are ratios like fractions? How are they different?	
	Q: Why would someone say the ratio of 1:2 is equivalent to the ratio of 2:4?	

	Q: Suppose you are comparing two amounts using a ratio and the first term is greater than the second term. What do you know for sure about the comparison?	
Grade 5 **B2.12**	**Q:** You spent almost $400 on seven of the same item. How else could you describe the cost of that item? Describe it in as many ways as you can.	Number • Page 147
	Q: Which rate do you think is more useful and why: km/hour or hour/km?	
Grade 5 **E2.1 & C4**	**Q:** Estimate the total distance in metres that you walk each day. Show how you came up with your estimate.	MPA • Page 89
	Q: What might the mass in kilograms of the water in a swimming pool be?	
	Q: Suppose an apple tree produces enough apples each year to fill 20 boxes with a mass of about 20 kg each. About how many apples might that be?	
Grade 7 Expectations		
Grade 7 **B2.1**	**Q:** Do you think everyone will get the same result when calculating 3 + 4 Å~ 7?	Number • Page 142
	Q. Create four different expressions, each involving at least three operations, which might be calculated differently if the person calculating did not know the rules for order of operations. Indicate which value is actually correct and why.	Number • Page 143
	Q. You want to divide a number in your head by first dividing it by a bigger number. What might you be dividing by and why?	Number • Page 144
	Q. Do you think we would need rules for the order of operations if all the math we did were based on story problems?	
	Q. Why might it be less obvious what X is than what X is?	