Parent's Introductory Guide to 6th Grade Common Core Math

By: Jennifer Berry

Dear Parents,

We know how difficult it can become to help your child with math, especially since it is constantly changing and more and more is expected of your child. Common Core has set some new standards in place for your child. In hopes of helping with the frustration of new and changing curriculum, I have created a booklet to hopefully give you some examples of some of the main concepts we will be focusing on in sixth grade this year.

This book is meant to be an overview and give you a few examples since we do not have a textbook. Your child's interactive notebook is also a great place to go for added guidance. At the top of each section is the standard (paraphrased) of what your child is expected to do with the material. I have put the topics in the order that we will be covering them. All I ask is please do not write in the book and that when you are done, that you would please return the book, so I can pass it along to other parents next year. I hope that this may help as we team together to help your child have a great and successful year in math!

Mrs. Berry

Unit 1: The Number System

The number system focuses on the foundations of numbers that the students will need to know in order to move on to prealgebra and algebra in junior high.

Key Vocabulary:

1.) Reciprocal: The inverse of a fraction. Example: $4/1 \rightarrow \frac{1}{4}$
2.) Multiplicative inverse: A fraction and it's reciprocal (inverse) Example: $\frac{1}{2}$ and 2/1 because $2/1 \times \frac{1}{2} = 1$
3.) Visual Fraction Model: A model used to show how to divide fractions.
4.) Multi Digit: A number that has many digits
5.) Factors: Numbers that multiply to get another number. Example: 3x5= 15 so 3 and 5 are factors.
6.) Multiples: A number that can be gotten by multiplying numbers
7.) Greatest Common Factor (GCF): The largest factor that two numbers have in common.
8.) Least Common Multiple (LCM): The lowest common multiple between two numbers.
9.) Prime Numbers: A number is prime if it has only 2 distinct factors.
10.) Composite Numbers: A number is composite if it has more than 2 factors.
11.) Relatively Prime: Numbers are considered relatively prime if their Greatest Common Factor is 1.

12.) Prime Factorization: Breaking a number down into prime factors.
13.) Distributive Property: A way to expand an expression and create an equivalent expression. Example: $2(3 + 6) = 2x3 + 2x6$
14.) Rational Numbers: A number that can be written as a fraction
15.) Opposites: The same distance from 0, but on opposite sides of 0.
16.) Absolute Value: The distance a number is from 0
17.) $<$, $>$, $\leq$, $\geq$: Inequalities: less than, greater than, less than or equal to, greater than or equal to.
18.) Coordinate Plane: Also known as a coordinate grid. Used to plot ordered pairs.
19.) Origin: Center of a coordinate plane
20.) Quadrants: A coordinate plane is broken into 4 sections or quadrants
21.) X axis: The horizontal axis (input)
22.) Y axis: The vertical axis (output)
23.) Coordinates: Ordered pairs that help us find a location.

Multiplying and Dividing Fractions

6.NS.1 The students will divide fractions by fractions and use visual models if needed.

In 5th grade students learned how to multiply fractions and simplify fractions.

**Rule: Multiply the top numbers across. Then multiply the bottom numbers across. If they both can be divided by a common number, it can be simplified.

Example: $\frac{3}{4} \times \frac{6}{8} = \frac{3 \times 6}{4 \times 8} = \frac{18}{32}$

$\frac{18}{32}$ can be simplified because they both can be divided by 2.

$\frac{18 \div 2}{32 \div 2} = \frac{9}{16}$ so 9/16 is the answer.

Division is similar, as multiplying is the inverse operation of division. In division we KEEP, CHANGE, FLIP.

Example 1: $\frac{3}{4} \div \frac{1}{4} =$

- Keep the first fraction the same, change the sign to multiplication, then flip the last fraction (reciprocal).

$\frac{3}{4} \times \frac{4}{1} = \frac{3 \times 4}{4 \times 1} = \frac{12}{4}$ to simplify divide both by 4.

$\frac{12 \div 4}{4 \div 4} = \frac{3}{1} = 3$

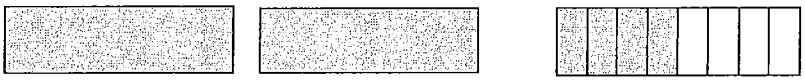
- To model: Color in $\frac{3}{4}$

How many $\frac{1}{4}$ section can fit into the shaded portion? 3

Example 2: $2\frac{4}{8} \div \frac{1}{2} =$ (Change mixed number into fraction by "horseshoe method". Multiply 8x2 then add 4. So 20 is the top number and keep the denominator the same,8)

$\frac{20}{8} \div \frac{1}{2} =$

$\frac{20}{8} \times \frac{2}{1} = \frac{20 \times 2}{8 \times 1} = \frac{40}{8} = 5$



How many $\frac{1}{2}$ sections can fit in the colored portion? 5

*Students are expected to write their answer in equation form:

Example: $\frac{20}{8} \div \frac{1}{2} = 5$

*Students are expected to show how to check their work by doing the inverse.

Example: $5 \times \frac{1}{2} = \frac{20}{8}$

Long Division

6.NS.2 The students will fluently divide multi digit numbers using the standard algorithm. (normal, old school way) ☺

*In fifth grade students may have used partial quotients to find the answer. In 6th grade students are expected to use the standard long division method to divide 5 digit by 2 digit numbers. Students need to divide numbers that work out evenly, numbers that will have a fraction remainder and using decimals. They will not be allowed to use calculators.

1.) Steps of division include DIVIDE, MULTIPLY, SUBTRACT, BRING DOWN, and REPEAT.

Step 1:	65400 ÷ 20 3 20 | 65400
Step 2:	3 20 | 65400 60
Step 3:	3 20 | 65400 -60 5

Step 4:	3 20 | 65400 -60 54
Step 5:	3270 20 | 65400 -60 54 -40 140 -140 00 -0

*With Fraction Remainders

Same process until the end.

Step 1:	$65400 \div 22$ 2 22 | 65400
Step 2:	2 22 | 65400 44

Step 3:	2 21 | 65400 -44 21
Step 4:	2 22 | 65400 -44 21
Step 5:	2972 22 | 65400 -44 214 -198 160 -154 60 -44 16
Step 6:	Take the remainder and put it over the divisor. So 2972 $\frac{16}{22}$ or simplify 2972 $\frac{8}{11}$

*With adding decimals

Same process until the end.

Step 1:	65400 ÷ 22 2 22 | 65400
Step 2:	2 22 | 65400 44
Step 3:	2 22 | 65400 -44 21
Step 4:	2 22 | 65400 -44 21
Step 5:	2972 22 | 65400 -44 214 -198

	160 -154 60 -44 16
Step 6:	Add a decimal and 0 and continue until it says to end or it ends. (I usually go to the hundredths.) 2972.72 22 | 65400.00 -44 214 -198 160 -154 60 -44 160 -154 60 -44 160 -154

Adding and Subtracting Decimals

6.NS.3 The students will add and subtract decimals using the standard algorithm.

*This is a repeat of a fifth grade standard. This year they are not required to use models, but they need to understand the standard algorithm.

Rule: When adding and subtracting decimals, the student needs to line up the place value or the decimal point and bring it straight down in the answer to get the right answer.

Example:

	1 1	
	3.49	65.876
	+ .65	- 3.41
	4.14	62.466

Multiplying Decimals

6.NS.3 The students will multiply decimals using the standard algorithm.

*This is a repeat of a fifth grade standard. This year they are not required to use models, but they need to understand the standard algorithm.

Rule: When multiplying decimals, the student needs to line up the numbers, (ignore the decimal point until the answer). Once they multiply like normal ignoring the decimal point, they count up how many total numbers in the problem are after the decimal point and starting at the far right, they move the decimal point in the answer that many to the left.

Example: 3.45 There are 3 total numbers after the decimal .

X 3.1

345

+10350

10695 → 10.695

Dividing Decimals

6.NS.3 The students will divide decimals using the standard algorithm.

*This is a repeat of a fifth grade standard. This year they are not required to use models, but they need to understand the standard algorithm.

*Rule: Set up the problem like normal. If there is a decimal on the outside, move it to the right to make it a whole number. If you move it 2, you must move the decimal on the inside 2.

Step 1:	65.400 ÷ .22 2 22 | 6540.0
Step 2:	2 22 | 6540.0 44
Step 3:	2 22 | 6540.0 -44 21

Step 4:	2 22 | 6540.0 -44 21
Step 5:	297.2 22 | 6540.0 -44 214 -198 160 -154 60 -44 16
Step 6:	297.272 22 | 6540000 -44 214 -198 160 -154 60 -44 160 -154 60 -44 160 -154

Prime Factorization

6.NS.4 I can find the GCF of 2 numbers less than 100. I can find the LCM of 2 numbers less than 12.

Prime Numbers are numbers that can only be divided by 1 and itself.

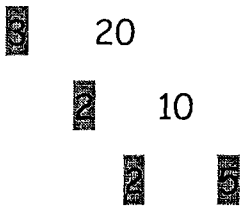
Ex. 2, 3, 5, 7, 11, 13 .....

Composite Numbers are numbers that can be divided by more than 2 numbers.

Ex. 4, 6, 8, 9, 10.....

Prime factorization is breaking a number down into only its prime factors. We usually do a factor tree to figure this out.

Ex. 60



So the Prime Factorization is $3 \times 2 \times 2 \times 5$ or $3 \times 2^2 \times 5$

Greatest Common Factor and Least Common Multiple

6.NS.4 I can find the GCF of 2 numbers less than 100. I can find the LCM of 2 numbers less than 12.

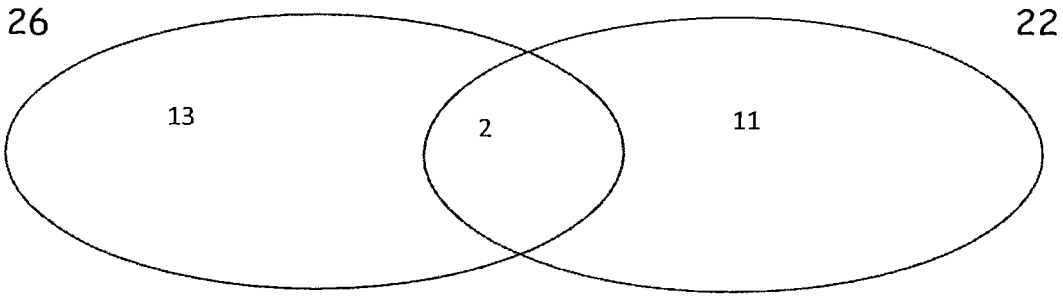
Greatest Common Factor is the largest number that can go into 2 numbers. Many students may be able to reason this if they know their facts well. Others may need the following Venn diagram method to help.

Ex. Find the GCF of 26 and 22

1.) Do the prime factorization of each

26 22

First you put any prime numbers that just go into 26 in the left circle and any prime numbers that just go into 22 in the right circle. Any numbers that go into both go in the center. The GCF is 2.



If there are 2 numbers in the center. Let's say 2 and 3. You multiply them together to get the GCF. To get the LCM of 26 and 22 you do the same and you just multiply all numbers written in circles. So the LCM is 13 x 2 x 11 = 286

Distributive Property

6.NS.4 I can use the distributive property to rewrite expressions as the sum of 2 factors.

The distributive property says 3 (2 + 6) is the same as 3 x 2 + 3 x 6

You take what is on the outside and "distribute" (multiply) by everything on the inside.

Ex. 5 (3 - 1) = 5 x 3 - 5 x 1 which in turn = 15 - 5 = 10

Same if you do order of operations and do the parentheses first. 3-1=2

So 5 x 2 = 10.

Students not only need to know to distribute the outside through, but they must be able to go backwards by pulling out the GCF.

Ex. 27 + 30 Students need to find the GCF of 27 and 30

The GCF = 3 So we pull 3 on the outside 3 (___ + ____) .

We then ask ourselves 3 x ? = 27 and 3 x ? = 30

So 27 + 30 is equivalent to 3 (9 + 10) .

Integers

6.NS.5 I can use integers in real world situations

6.NS.6 I can recognize opposites

Integers: Are any positive or negative whole number.

Students will need to know the difference between positive and negative numbers and put them on a number line. Negative numbers are on the left of zero and positive numbers are on the right of zero.

Students will need to recognize real world situations and describe them by integers.

Ex. A loss of $6 = -6

200 feet above sea level = 200

Students also need to understand the meaning of 0.

Ex. 0 might mean sea level in a sea level question.

Students need to recognize that opposites are the same distance from 0.

Example: 3 and -3 are opposites because they are both 3 from zero, but are on opposite sides of 0.

Students also need to know the opposite of the opposite (silly, we know!) The opposite of the opposite of -9 is -9. Because the opposite of -9 is 9, and the opposite of that is -9.

Absolute Value

6.NS. 7 I can determine the absolute value of a number. I can compare numbers using absolute value.

Absolute Value: The Distance a number is from zero.

Absolute value is symbolized by 2 walls around the number.

Ex. $|-2| = 2$

Absolute value will NEVER be negative. It is always positive because the distance from zero is positive. So the absolute value of -2 is 2 because -2 is 2 away from zero.

Ex. $|45| = 45$

The absolute value of 45 is 45 because it is 45 away from zero.

Students will also need to compare numbers and absolute value.

Ex. -11 ___>___ -15 -11 is bigger than -15 because it is closer to 0 or less negative.

Rational Numbers

6.NS.6 I can position rational numbers on a number line.

Rational Numbers: Any number that can be written as a fraction (fractions, terminating decimals, integers).

Students will need to be able to change decimals to percents to fractions and vice versa.

1.) Decimal to Percent: Move the decimal 2 places to the right.

Ex. .36= 36%

2.) Percent to a Fraction: Put the number over 100, because percent means per 100.

Ex. 89% is 89/100

3.) Decimal to a Fraction: Read the decimal using place value.

Ex. .45 = 45/100

4.) Fraction to a decimal: Take the top number and divide it by the bottom number.

Ex. $\frac{3}{4}$ -> 3 divided by 4 = .75

5.) Fraction to a percent: Turn the fraction into a decimal then move the decimal 2 to the right.

Ex. $\frac{1}{2}$ → .50 → 50%

6.) Percent to a decimal: Move the decimal 2 to the left.

Ex. 45% = .45

Rational Numbers

6.NS. 6 I can position rational numbers on a number line.

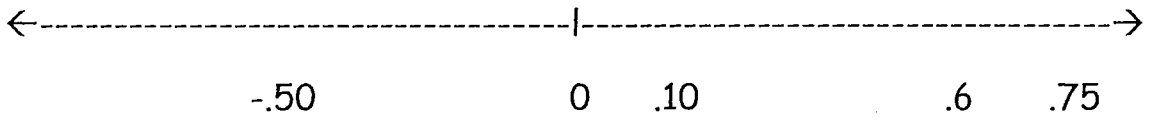
Students will be given different rational numbers and must put them on number lines and compare them.

Ex. $\frac{3}{4}$ .10 -1/2 .6

*Students should change them all to the same type, so either change them all to fractions or decimals.

I would change these to decimals.

.75 .10 -.50 .6



List from least to greatest using inequality symbols.

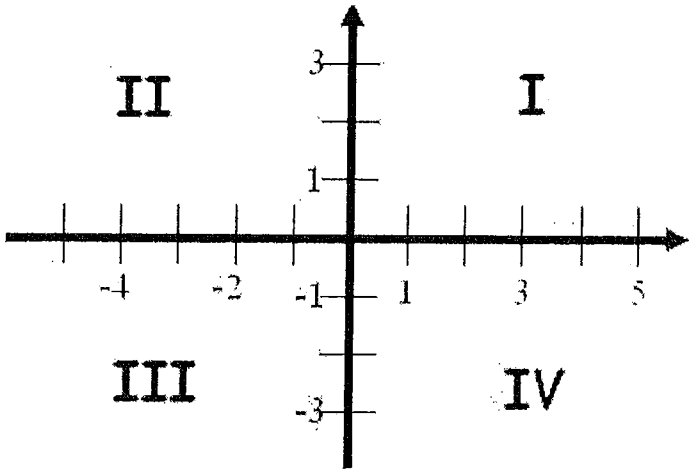
-.50 < .10 < .6 < .75 or -1/2 < .10 < .6 < $\frac{3}{4}$

Coordinate Grids

6.NS. 6 I can understand signs of numbers as a location on a quadrant.

I can recognize when 2 ordered pairs differ only by signs the locations are related by reflections.

A coordinate plane is broken into 4 sections or quadrants. The x axis goes side to side, the y axis goes up and down. The origin is in the center at (0, 0)



Students must plot ordered pairs on a grid.

Ordered pairs look like (2, 3). To plot this the students move 2 to the right and 3 up. If they are plotting (-2, 3), they move 2 to the left and up 3.

These two points are called reflections (like a mirror) because they are mirror images of each other. This happens when one numbers is the same and the other numbers are opposite.

Ex. (9, 8) and (-9, 8) are reflections

(-4, 5) and (-4, -5) are reflections

Coordinate Grids

6.NS. 6 I can understand signs of numbers as a location on a quadrant.

I can use absolute value to find the distances between two points.

Students are required to find the distance between points. They can count the distance, but they also need to be able to explain how to use absolute value to find the distances.

Ex. (3, 5) and (3, 8)

To find the distance between them, we ignore the numbers they have the same. So we will ignore the 3. Now we need to use the

Absolute value of 5 and the absolute value of 8 to find the distance. The absolute value of 5 = 5 The absolute value of 8 = 8

5 and 8 are 3 away from each other (8-5 =3) So they are 3 apart. We subtract them because they are both the same sign (positive 5 and positive 8)

Ex. (-4, 7) and (5, 7)

We ignore the 7 because they are the same.

The absolute value of -4 = 4 The absolute value of 5 = 5

This time we add them together because the signs were opposite

(-4 and 5) So 4 + 5 = 9. They are 9 away from each other.

SAME = SUBTRACT OPPOSITE = ADD

Unit 2: Ratios and Proportions

Ratios and Proportions focuses on using ratios and rates to solve problems. The students are not actually required to use proportions at the sixth grade level, but many will find it useful. They will have to learn it in seventh grade anyways.

Key Vocabulary:

1.) Ratio: Comparison of 2 values
2.) Equivalent Ratios: Ratios that have the same value when simplified.
3.) Tape Diagram: Model that compares ratios, percents or fractions.
4.) Unit Rate: Rate per one unit
5.) Part to Part: Ratio comparing one piece to another piece
6.) Part to Whole: ratio comparing one piece to the total
7.) Percent: Out of 100

Ratios

6.RP.1 I can understand the concept of a ratio and how to write a ratio, identify a ratio, and compare ratios.

Students can write ratios in three different ways: a fraction, a colon, or with the word to. They can also explain it in words.

Ex. 3:4 $\frac{3}{4}$ or 3 to 4 also For every 3 _____ there are 4 _____.

There are 3 types of ratios: part to part, part to whole, whole to part.

Ex. Parent write the ratio of vowels to total letters = 2: 6

This is part to whole because you are comparing part of it to the total. 6:2 would be incorrect, because you must follow the order requested. ORDER MATTERS!

Students also need to understand that 2:6 and 1:3 are equivalent ratios, because they are equivalent fractions. (They learned these in 5th grade and reviewed earlier this year).

Proportions

6.RP.3 I can solve real world problems using ratios and rates.

Proportions are just 2 equivalent ratios.

We can check to see if they are proportionate by cross multiplying.

Ex. $\frac{1}{2}$ $\frac{6}{18}$ We multiply diagonally. 1 x 18 = 18 2 x 6 = 12 18 and 12 are not equal so they are not proportionate

To solve for a missing number, we multiply diagonally and divide by the other number left.

Ex. $\frac{1}{4}$ $\frac{7}{x}$ So 4x 7 = 28 and 28 ÷ 1= 28 so x = 28

Rates/Unit Rates/Unit Prices/Constant Speed

6.RP.3 I can solve real world problems using ratios and rates.

A Rate is a ratio that has units added. Ex. $\frac{20\ miles}{2\ hours}$

A unit rate or unit price means per 1 unit. So

Ex. $\frac{20\ miles}{2\ hours} = \frac{x}{1\ hour}$ We solve our proportion by multiplying 20 x 1 and then dividing by 2 and we get 10 miles per hour.

Students may also need to solve for more than 1.

Ex. I travel 180 miles in 3 hours. How far can I go in 5 hours?

$\frac{180\ miles}{3\ hours} = \frac{x}{5\ hours}$ so x = 300 miles

Measurement

6.RP.3 I can convert measurements across metric and customary systems.

Students will be given a basic list of measurement conversions and use their knowledge of rates to solve the conversion.

Ex. 12 inches = 1 foot How many inches in 43 feet?

They can reason and multiply or set up a proportion.

$\frac{12\ inches}{1\ foot} = \frac{x}{43\ feet}$ x = 516 inches

Equivalent Ratio Tables and Diagrams

6.RP.3 I can make tables of equivalent ratios and plot the ordered pairs.

6.RP.3 I can use tape diagrams and double number lines.

If I travel 20 miles in 2 hours. How many miles can I travel in 6 hours. Students can make an equivalent ratio table to show this and then plot their points on a graph.

The students can then list the ordered pairs.

Ex. (1, 10)

(2, 20), (3, 30)

And plot them on

A grid.

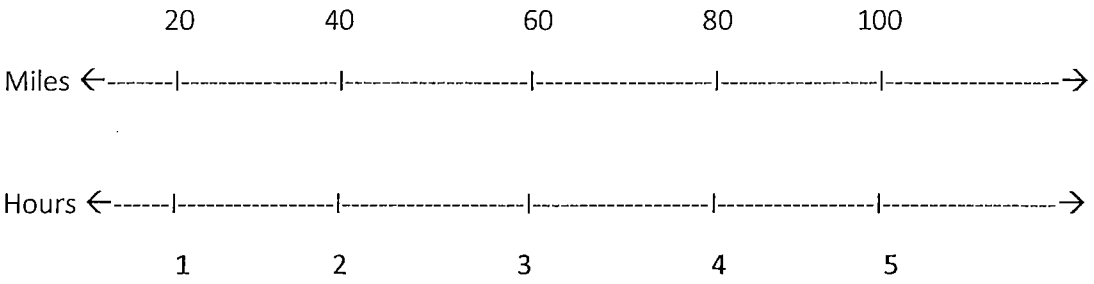
x (hours)	Y (miles)
1	10
2	20
3	30
4	40
5	50
6	60

The x is the Independent variable because it's the INPUT. They y is the dependent variable because it's the output.

Students can also use a double number line to show equivalent ratios.

Ex. **Double Number Lines**

Sam bikes 20 miles in 1 hour. If he continues at this rate, how far will he go in 4 hours?

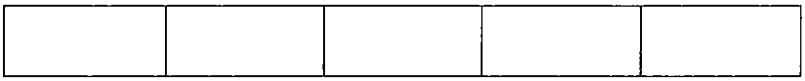


Tape Diagram

Sam bikes 30 miles in 2 hours. How many miles can he bike in 5 hours?

Both of these blocks represent the 30 miles in 2 hours. So 1 block = 15

Well if one block is 15 miles and I have 5 blocks below.... I get 75 miles.



*Tape Diagrams and Double Number Lines are just tools from the Common Core to help students who need the visual. Some students may struggle with the visual concepts more.

Percents

6.RP.3 I can find the percent of a quantity and the find the whole given a part and percent.

I teach the kids what I call a "Magic Formula".

$$\frac{Part\ (is)}{whole\ (of)} = \frac{\%}{100}$$

Once they get the formula down, everything else is just plugging in the pieces.

Ex. 40 is what % of 55?

$$\frac{40\ (is)}{55\ (of)} = \frac{\%}{100}$$

Solve as a proportion. 40 x 100 divided by 55 = 72.7 %

Ex. I buy shoes for $50. The regular price was $80. What was the percent discount?

$$\frac{Part\ 50}{whole\ 80} = \frac{\%}{100}$$

So 50 x 100 divided by 80 = 62.5%

Students will be asked to find discounts, whole prices, and sales prices. With Sales prices they may need to subtract how much they are taking off.

Ex. I buy shoes that are 70% the original price of $55. How much did I spend?

$$\frac{Part\ (x)}{whole\ (55)} = \frac{70\%}{100}$$

So 70 x 55 divided by 100 = 38.50. But this is how much I'm taking off the price. So 55 - 38.50 = 16.50

Unit 3: Expressions and Equations

Algebra really begins and takes off in sixth grade. This is a major foundation for the students as they enter 7^{th} and 8^{th} grade as well as high school.

Key Vocabulary:

1.) Exponent: The power a base is raised to
2.) Base: The large number that will be multiplied.
3.) Numerical Expressions: Only numbers with an operation, no answer
4.) Algebraic Expression: Numbers and letters with an operation, no answer
5.) Evaluate: To solve or answer
6.) Variable: A letter used to take the place of a number
7.) Sum: answer to an addition problem
8.) Term: Each part in an expression
9.) Product: Answer to a multiplication problem
10.) Factor: A number in a multiplication problem
11.) Quantity: An amount
12.) Coefficient: A factor or number before a variable
13.) Constant: A factor or number before a variable
14.) Expression: Has no answer
15.) Equation: has an answer
16.) Like Terms: Terms that look the same

17.) Equivalent Expressions: Expressions that are equal on both sides.
18.) Inequalities: <,>, ≤,≥
19.) Profit: To gain
20.) Exceed: Over the expected amount
21.) Dependent Variables: effected by the change of the independent variable
22.) Independent Variables: The input
23.) Discrete Data: Data that cannot be fractional (ex. People, tents)
24.) Continuous Data: Data that can be fractional (ex. Distance, money)

Exponents/Order of Ops

6.EE.1 I can write and evaluate expressions involving exponents.

6.EE.2 I can solve expressions using numbers and exponents in the proper order.

Exponents:

Students need to understand that 3^2 means 3 x 3 not 3 x 2.

Anything to the zero power = 1 so $3^0 = 1$

They also need to be able to do fractions with an exponent.

Ex. $\frac{1}{2}^2 = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

Order of Operations:

There is a correct order to solve expressions in. We remember this order by the phrase "Please Excuse My Dear Aunt Sally" or PEMDAS.

Parantheses or Brackets

Exponents

Multiply or Divide from left to right

Add or Subtract from left to right

Ex. $3 \times 10 - 2^2 + 4 \times (5 - 3)$

$3 \times 10 - 2^2 + 4 \times 2$

$3 \times 10 - 4 + 4 \times 2$

$30 - 4 + 8$

$26 + 8 = 34$

Expressions

6.EE.2 I can write, read, and evaluate expressions with numbers and letters.

Students need to understand key words that signal addition, subtraction, multiplying, dividing, and equals.

Ex.

Add: sum, more, plus, increased, combined, total, all together

Subtract: less than, fewer than, decreased, minus, difference, lost

Multiply: product, of times

Divide: each, equally, split, quotient, per, out of

Equals: is, are, was, were

Writing/Reading Expressions

Students need to read expressions and write expressions.

Ex.	$5 \times n$	The product of 5 and a number
	$n - 8$	Eight fewer than a number
	$3 (n + 9)$	The product of three and the sum of a number and nine.

Evaluating Expressions

In order to evaluate algebraic expressions, students will need to substitute in for the variables.

Ex. If $y = 5$ evaluate $3y$

$3y = 3 \times 5 = 15$

If $z = 7$ evaluate $2z^3$

$2(7)^3 = 2 \times 343 = 686$

*Order of operations still applies

Algebra Terms

6.EE.2 I can identify the parts of an expression using math terms.

Ex. $13y + 2z + 9$

13 and 2 are called coefficients (the number in front of the variable)

9 is called a constant (has no variable with it)

Y and z are the variables (letters)

There are 3 terms: 13y, 2z, and 9 (parts of the expression)

This is an expression (because there are no equal signs)

Writing/Solving Equations

6.EE.7 I can write and solve one step equations.

Students will write equations just like they did with expressions.

Ex. I have $34 and earn money from babysitting. Now I have $46. How much did I earn? Write an equation with a variable.

$34 + n = 46$

Students will then need to solve equations using inverse operations.

Inverse operations means to do the opposite to undo the operation.

Ex. $34 + n = 46$ We are adding, so to undo it, we must subtract.

$34 + n = 46$ We need to get n by itself, so we subtract 34 from both sides.

$34 + n = 46$

$-34 \quad -34$

$n = 12$

Ex. $N \div 4 = 11$

$\times 4 \quad \times 4$

$n = 44$

Equivalent Expressions

6.EE.4 I can identify when two expressions are equivalent.

To understand equivalent expressions, students must know how to combine like terms and use the distributive property.

Distributive Property (review): $3(4 + 5) = 3 \times 4 + 3 \times 5$

Combining Like terms: Students need to simplify expressions by "squishing" together terms that look alike.

Ex. $3x + 4x = 7x$

Ex. $2x^2 + 3x$ These are not alike because one has an exponent

Ex. $2y + 7y + 6 + 5 = 9y + 11$

Ex. $2(3x + 7) - x = 6x + 14 - x = 5x + 14$

Inequalities

6.EE.8 I can write inequalities to represent a condition in the real world.

6.EE.5 I can use substitution to ask "Would this make it true?"

Students need to understand the difference between <,>,≤,≥. The "mouth" is always open to the bigger number.

When writing inequalities in algebra, students will need to use a variable and a number. I recommend they start with their variable.

Ex. There are no more than 15 bears. $x \leq 15$

What could make this true? 15, 14, 13, 12 .....

I have less than $20. $x < 20$

What could make this true? 19, 18, 17...

Graphing Inequalties

To graph inequalities, we use a number line and a closed (colored in) or open dot.

Ex. $x < 20$ We would draw an open circle on 20, because it doesn't include 20 and draw an arrow to the left, because it includes anything less than 20.

Ex. $x \geq 3$ We would draw a closed circle at 3, because it includes 3 as an answer and draw an arrow to the right to show greater than. (*hint: it's closed when the arrow has an underline)

Relations on a Coordinate Grid

6.EE.9 I can write an equation to represent a relation between independent and dependent variables and use graphs or tables to represent them.

Dependent Variable: Always on the y axis (the answer to your equation)

Independent Variable: Always on the x axis (the input in your equation)

Students need to be able to write an equation from a table, graph it, and identify the variables.

Ex. Julio buys a candy bar for .50. Make a table and write an equation to show how much it would cost for x candy bars.

$.50x = y$

X	y
1	.50
2	1.00
3	1.50
4	2.00

The students then would graph the ordered pairs (1, .50) (2, 1) etc.

The independent variable is x and the dependent variable is y. The cost is always dependent on how many you purchase.

Unit 4: Geometry

Geometry begins to build off of 5th grade. In fifth grade students learn area, perimeter and the concept of volume. 6th grade repeats some of those and adds on to the concepts.

Key Vocabulary:

1.) Surface Area: The area of all surfaces of a 3d object added together.
2.) Volume: The amount of space taken up inside a 3d object.
3.) Decomposing: Breaking shapes into familiar shapes.
4.) Edges: Where 2 sides meet
5.) Dimensions: The length, width, and height of an object.
6.) Net: When an object is flattened out.
7.) Vertices: The corner of a 3d object.
8.) Face: One side of an object
9.) Right Rectangular Prism: Looks like a box and has 3 dimensions.
10.) Legs: The sides (base and height) of a right triangle.
11.) Hypotenuse: The side opposite the right angle in a right triangle.

Area and Perimeter

6.G.1 I can find the area of right triangles and other triangles.

6.G.1 I can find the area of special quadrilaterals by decomposing them into familiar shapes.

Perimeter: Add up all the sides measurements and label it plainly.

Ex. 5 cm or 15 inches

Area of a Square: base x height

Area of a Rectangle: base x height

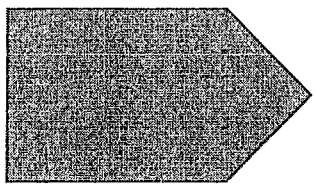
Area of a parallelogram: base x height

Area of a triangle: base x height ÷ 2

The students need to know these formulas.

Area is labeled as square units. Ex. $6cm^2$

Students also need to be able to find the area of odd shapes by cutting them into familiar shapes like triangles and rectangles.

Ex. 

Students should cut this into a rectangle and triangle. Find the area of each and add the areas together.

Students will also need to plot points on a grid and find the area of the shape they plotted.

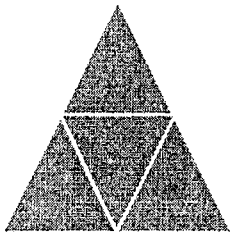
Nets and Surface Area

6.G.4 I can represent 3d figures using nets.

6.G.4 I can find the surface area by using nets.

Students need to understand the vocabulary associated with 3d shapes such as vertex, edge, and face.

A net is a 3d shape that has been unfolded. Students need to be able identify shapes by their nets.

Ex. 

This is a net for a triangular pyramid.

To find the surface area, students will use a net like the one above. They will find the area of each face (side). Once the find all the areas, they add them all together to find the total area.

Surface Area is labeled as square units just like area.

Ex. 450 m^2

Volume

6.G.2 I can find the volume of a right rectangular prism with fractional edge lengths with the formula and by using cubes.

In fifth grade, the students learn to figure out volume by counting how many cubes there are in a shape.

In sixth grade the students still need to understand that volume means to fill up a shape, but also that the formula length x width x height can get volume.

Volume is labeled as cubic units.

Ex. 45 in^3

So to find the volume of a rectangular prism with a length of 5, width of 10, and height of 3 you:

Multiply 5 x 10 x 3 = 150 $units^3$

This also means that there are 150 cubes that are 1 x 1 x 1 in it.

In sixth grade, students will also need to figure out what the volume is if they have 160 cubes that are not 1x1x1 but $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ inches.

To do this, students need to find the volume of the little cube.

$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ = 1/8 $inches^3$

160 cubes x 1/8 = 160/8 = The volume is then 20 inches^3

In the same manner if a student sees a rectangular prism with

Length = 6 cm

Width= 1 cm

Height= $\frac{3}{4}$ cm

And we are using cubes that are $\frac{1}{4} \times \frac{1}{4} \times \frac{1}{4}$ cm. How many cubes can fit in?

We figure out how many small cubes can fit on each side.

So length.....$6 \div \frac{1}{4}$ = 24 cubes long

So width... $1 \div \frac{1}{4}$ = 4 cubes wide

So height... $\frac{3}{4} \div \frac{1}{4}$ = 3 cubes high

To find how many fit: 24 x 4 x 3 = 288 cubes

Unit 5: Statistics

Statistics is completely new to students when they get to sixth grade. These concepts for the most part will be unexplored territory for them.

Key Vocabulary:

1.) Measures of Center: Measure the center of the data. These include mean, median, and mode.
2.) Measures of Variation: Measure how the data differs or varies. These include range, mean absolute deviation, interquartile range, upper quartile, and lower quartile.
3.) Interval: A range of data
4.) Dot plot: Uses dots to record data above a number line.
5.) Box Plot: Also known as a box and whisker plot, gives a quick 5 point summary of the data.
6.) Histogram: Similar to a bar graph, that shows ranges or frequencies.

Statistical Questions

6.SP.1 I can identify a statistical question.

Statistical Questions are questions that have many answers. The answer can be numbers or words.

Ex. How many students are in each 6^{th} grade class.

This is statistical because you will get numerous answers, such as 25, 26, 26, 25, 23, 22

Ex. How many students are in Mrs. Berry's class.

This is NOT statistical because there is only 1 answer. 26

Ex. What days does each student in the class exercise?

This is statistical because you may get 7 different answers all from different kids!

Measures of Center

6.SP.3 and 5 I can summarize data by the mean and median

Measures of Center:

Mean: to find the mean, add all the numbers together and divide by how many you added.

Ex. 34, 45, 67, 23

$$\frac{34 + 45 + 67 + 23}{4} = 42.25$$

Median: Put the numbers in order from least to greatest and find the middle number. If there are two numbers in the middle, find the mean or average of the two middle numbers.

Ex. 34, 45, 67, 23

23, 34, 45, 67 so 34 and 45 are in the middle

34 + 45 = 79 ÷ 2 = 39.5

Mode: The most commonly seen number. There may be more than 1 mode or no mode.

Ex. 34, 35, 34, 36, 34 34 is the mode

Measures of Variation

6.SP.3 and 5 I can give measures of variability and describe deviations and the distribution.

Range: The highest number minus the lowest number

Ex. 45, 36, 32, 12 so 45 -12 = 33

Lower Quartile: Put the numbers in order, find the median, then find the median of the lower half.

Upper Quartile: Put the numbers in order, find the median, then find the median of the upper half.

Ex. 12, 13, 14, 14, 16, 19 So median is 14 and 14 (or right between the 14s. If we draw a line in between the two 14s. We find the median of the lower half which is 13. So the lower quartile is 13.

So the upper quartile is 16.

Interquartile Range: You subtract the upper (3^{rd}) quartile and the lower (1^{st}) quartile.

Ex. If we use the above examples are lower quartile is 13 and upper is 16 so the IQR or interquartile range is 16-13 = 3

Ex 2: 13, 14, 15, 16, 16

Lower quartile: The median is 15, so if we draw a line through it, our lower quartile is between 13 and 14. So Lower quartile is 13.5

Upper quartile: The median is 15, so if we draw a line through it, our upper quartile is 16.

Mean Absolute Deviation: The MAD is a way to find out how much a number differs from the mean. First you find the mean of the set of given numbers. Then you find out how far each number is away from the mean. Finally take those numbers and find the mean of those. (confusing, we know!)

Ex.

5, 6, 7, 5, 4, 3,

Mean = 5 + 6 + 7+ 5 + 4 + 3 = 30 ÷ 6 = 5

Now we find how far each one is away from 5

5 → is 0 away So 0 + 1 + 2+ 0 + 1 + 2 = 6 ÷ 6 = 1

6→ is 1 away

7 → is 2 away

5→ is 0 away

4 → is 1 away

3 → is 2 away

Dot Plots

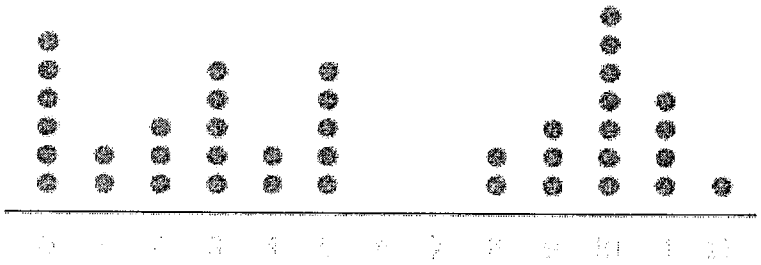
6.SP.4 I can display numerical data on number lines, including dot plots, histograms, and box plots.

Students learned line plots in 5th grade. Dot plots are exactly the same except they use dots.

Students may have to create a dot plot or read a dot plot. They should always label their graphs.

The following example is from mathisfun.com

Ex.



Students may be asked to identify how many observations they see. So they would count the dots.

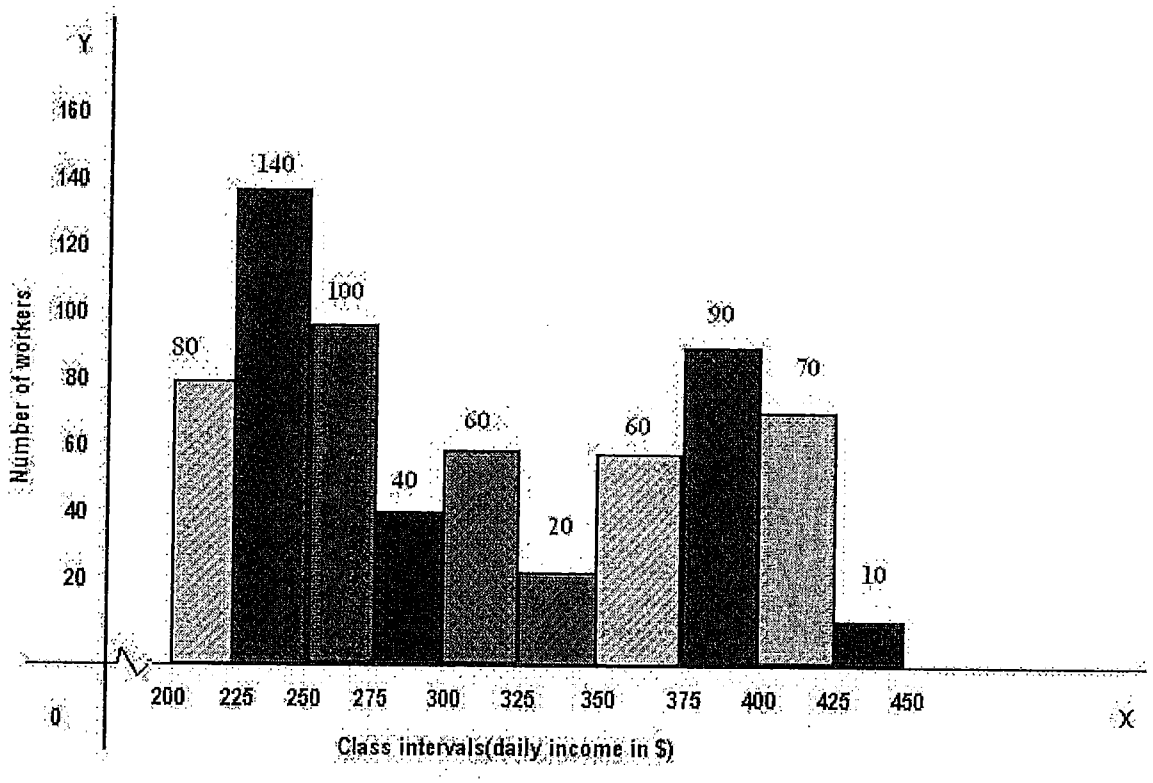
Students may also be asked how many peaks there are. There are 4 peaks.

Students may also be asked to identify the mean or median from the graph or any outliers. Outliers are any that are totally different from the norm.

Histograms

6.SP.4 I can display numerical data on number lines, including dot plots, histograms, and box plots.

The following example is taken from onlinemathhomework.com



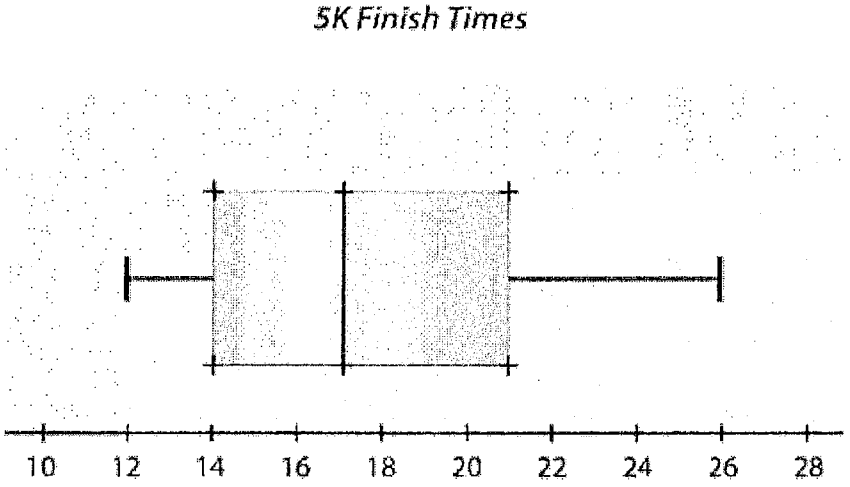
Students may be asked to identify peaks, outliers, or how many observations. To find out how many observations they will add up all the totals (found at the top of the bars).

The bottom of histograms are intervals. Ex. 200-225, so 80 workers made between 200-225.

Box Plots

6.SP.4 I can display numerical data on number lines, including dot plots, histograms, and box plots.

Box Plots require a 5 point summary. Students need to find the minimum value (lowest number) and put a dot or small dash. above the number line at that number. They need to find the maximum value (highest number) and put a dot or small dash above the number line at that number. Third they need to find the median or middle and put a line above the number line. The last two lines are the lower and upper quartiles. Students connect the 3 lines together and draw a line to each dot to form the "whiskers. See the illustration below from www.ck12.org



1.) Minimum = 12
2.) Lower Q = 14
3.) Median = 17
4.) Maximum = 26
5.) Upper Q = 21