From the web pages of the Derry Village School

**150+ Essential Questions for Math**

# INTRODUCTION

Below is a list of **essential questions** collected from different sources. Care must be taken when selecting questions for curriculum maps from this list. You may find that some **essential questions** are repeated. Other **essential questions** may not be categorized "properly" on this page. The list is intended as guide only.

**What is an essential question?** Essential questions are questions that probe for deeper meaning and set the stage for further questioning. **Essential questions** foster the development of critical thinking skills and higher order capabilities such as problem-solving and understanding complex systems. *A good* ***essential question*** *is the principle component of designing inquiry-based learning.*

**Essential questions** are a means to structure a unit, but they can also be a means to teach your students how to formulate questions. Once you have decided on the **essential questions** for your unit, post them on the classroom wall for easy reference.

Some general examples of **essential questions**... What is math? Was math discovered or invented? How applicable are math skills in the real world?

**Numbers and Operations**

1. When is the “correct” answer not the best solution?
2. What information and strategies would you use to solve a multi-step word problem?
3. When should you use mental computation?
4. When should you use pencil computation?
5. When should you use a calculator?
6. What number or symbol is needed to make number sentences true?
7. How are place value patterns repeated in large numbers?
8. How can a number be broken down into its smallest factors?
9. How are the four basic operations related to one another?
10. How do number properties assist in computation?
11. Is estimation more appropriate than finding an exact answer?
12. How do we use ordinal numbers in everyday life?
13. Where do we see numerals in the real world?
14. What do numerals represent?
15. How do I demonstrate the relationship between numbers, quantities and place value for whole numbers up to 1,000?
16. How can I represent the expanded notation of 3-digit numbers using symbols and concrete tools?
17. How can I represent numbers 100 more and 100 less using symbols and concrete tools?
18. How can I use models, words and expanded formats to order and compare numbers?

***Place Value***

1. How does understanding place value help you solve double digit addition and subtraction problems?
2. How are place value patterns repeated in large numbers?

***Addition and Subtraction***

1. Why do I need to add?
2. Why do I need to subtract?
3. How can knowing the addition and subtraction facts help me?
4. How can I use what I know about tens and ones to add and subtract two-digit numbers?
5. How do I estimate the sums or differences of two-digit numbers?
6. How can I use place value to decompose numbers to find sums or differences?
7. What strategies do I use to find the sums or differences of two whole numbers up to two digits long?
8. How can I use what I know about number relationships to develop efficient strategies for adding/subtracting multi-digit numbers?
9. How do I take apart and recombine numbers in a variety of ways for finding sums and differences?
10. What is expanded notation and how can I use it to assist in finding the sum or difference of two whole numbers up to three digits long?
11. How do I recognize what strategy to use for a specific problem?
12. How can using number relationships help me solve addition and subtraction problems for two digit and three-digit numbers?
13. How can I add tens and then add ones to solve addition problems for two-digit numbers?
14. How can I add hundreds and then add tens (and then add ones) for three-digit numbers?
15. How do I take apart and recombine numbers in a variety of ways for finding sums and differences?
16. How can I estimate the answers for operations involving two and three digit numbers?
17. How do I recognize what strategy to use for a specific problem?
18. What strategies do I use to compute sums and differences mentally?

***Multiplication and Division (Factors, Multiples, Primes)***

1. What are the mathematical properties that govern addition and multiplication? How would you use them?
2. How do you know if a number is divisible by 2, 3, 5, and 10?
3. How can multiples be used to solve problems?
4. What strategies aid in mastering multiplication and division facts?
5. How can numbers be broken down into its smallest factors?
6. How can multiples be used to solve problems?
7. How do you find the prime factors and multiples of a number?
8. How can multiples be used to solve problems?
9. How can I use the array model to explain multiplication?
10. How can I relate what I know about skip counting to help me learn the multiples of 2,5,10?
11. How are repeated addition and multiplication related?
12. How can I use what I know about repeated subtraction, equal sharing, and forming equal groups to solve division problems?
13. How does my knowledge about multiplication facts help me to solve problems?

***Fractions and Decimals***

1. How can I use fractions in real life?
2. How can decimals be rounded to the nearest whole number?
3. How can models be used to compute fractions with like and unlike denominators?
4. How can models help us understand the addition and subtraction of decimals?
5. How many ways can we use models to determine and compare equivalent fractions?
6. How would you compare and order whole numbers, fractions and decimals through hundredths?
7. How are common and decimal fractions alike and different?
8. What strategies can be used to solve estimation problems with common and decimal fractions?
9. How are models used to show how fractional parts are combined or separated?
10. How do I identify and record the fraction of a whole or group?
11. How do I identify the whole?
12. How do I use concrete materials and drawings to understand and show understanding of fractions (from 1/12ths to 1/2)?
13. How do I explain the meaning of a fraction and its numerator and denominator, and use my understanding to represent and compare fractions?
14. How do I explain how changing the size of the whole affects the size or amount of a fraction?

**Functions and Algebra**

***Patterns, sequencing, letters and symbols to represent quantities, linear expressions***

1. Are patterns important in the world today?
2. What is the unknown?
3. Why do we use variables?
4. How can a variable transform itself?
5. How would you describe the order of operations?
6. What are the tools needed to solve linear equations and inequalities?
7. Are you able to solve a linear inequality by graphing?
8. When are algebraic and numeric expressions used?
9. How do we create, test and validate a model?
10. Do mathematical models conceal as much as they reveal?
11. What patterns or relationships do we see in each type of mathematics?
12. What are the different ways to represent the patterns or relationships?
13. What different interpretations can be obtained from a particular pattern or relationship?
14. What predictions can the patterns or relationships support?
15. How can we use or test our predictions? Are they valid? Are they significant?
16. Where in the real world would I find patterns?
17. Why is comparing sets important?
18. Why are variables used?
19. What strategies can be used to solve for unknowns in algebraic equations?
20. When are algebraic and numeric expressions used?

**Data, Statistics and Probability**

***Graphs, measures of central tendency***

1. When solving multi-step word problems using charts, tables, and graphs, how can you tell if the information is sufficient?
2. When using a specific mean, median, you calculate the arithmetic mean?
3. How do you collect data?
4. How can you collect, organize, and display data?
5. How do you interpret the data you have collected?
6. What information does a chart or table give?
How do charts, tables, and graphs help you interpret data?
7. How does the type of data influence the choice of graph?
8. What kinds of questions can be answered using different data displays?
9. In what ways can sets of data be represented by statistical measures?
10. What data display is appropriate for a given set of data?
11. How is the likelihood of an event determined and communicated?
12. How is the probability of an event determined and described?
13. Do statistics always lie?
14. Why are graphs helpful?
15. What kinds of questions can be answered using different data displays?
16. What data display is appropriate for a given set of data?
17. How does the type of data influence the choice of graph?
18. How can the mean, median, mode, and range be used to describe the shape of the data?
19. How can mean, median, and mode be computed and compared?

**Geometry and Measurement**

***Angles***

1. How are angles measured?
2. How are angles classified?

***Lines***

1. What is the difference between a point, ray, line, line segment?
2. How are points, lines, line segments, rays, and angles related?

***Position***

1. How are position words useful?

***Measurement (Perimeter and Area)***

1. How do you use weight and measurement in your life?
2. What tools and units are used to measure the attributes of an object?
3. How are the units of measure within a standard system related?
4. How do you decide which unit of measurement to use?
5. How could walking off and rough comparison help you predict or estimate measurement?
6. If you could redecorate your house any way you wanted, how much carpeting, linoleum, paint, or wallpaper would you need to buy? How much would these materials cost?
7. How can I measure length, mass and capacity by using non-standard units?
8. What is perimeter and how is it measured?
9. How do I measure accurately\* to the nearest inch? Nearest centimeter?
10. How do I choose the appropriate tool and unit when measuring?
11. How do I estimate and measure?
12. What benchmarks do I use to estimate the weight of common objects?

***Shapes***

1. Where in the real world can I find shapes?
2. Where would you find symmetry?
3. How can objects be represented and compared using geometric attributes?
4. Is geometry more like map-making and using a map, or inventing and playing games like chess?
5. How can I identify and describe solid figures by describing the faces, edges, and sides?
6. In what ways can I match solid geometric figures to real-life objects?
7. How can I put shapes together and take them apart to form other shapes?

***Area and Perimeter***

1. How can patterns be used to determine standard formulas for area and perimeter?
2. How do you find perimeter, area, and volume of geometric figures?

**Money and Time**

1. When should you estimate amounts of money?
2. What is the difference between length of time and time of day?
3. What tools and units are used to measure the attributes of time?
4. Why is it important to understand the values of coins?
5. Why is telling time important?
6. How do you use a calendar in daily life?
7. How do the different units of time (minutes, day, weeks) relate to each other?
8. How do I use a clock to tell time to the nearest quarter hour?
9. How can I tell time using both digital and analog clock faces?
10. How can I represent the same amount of money using different combinations of coins and bills?
11. How can I model and solve problems by representing, adding and subtracting amounts of money?
12. How can I represent various amount of money using decimal notation and the symbols for cents or dollars?
13. How many different ways can I make a specific amount of money using various denominations of coins and bills?
14. How can I create efficient ways for combining coins and making change?
15. How do I determine the duration of time intervals in hours?
16. How can I tell time to the nearest quarter hour?
17. How do I determine how much time has passed between events?
18. How do I make an estimate for the length of time of a determined event and know if the estimate is reasonable?

**Communicating Mathematical Ideas**

1. How do we translate verbal ideas to the language of mathematics?
2. How do we translate the mathematics into English?
3. What are the different ways of communicating mathematics with clarity?
4. What is the most appropriate way of communicating a mathematical idea in a particular situation?

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