Create a set of multiple-choice questions for whole number, fraction and decimal addition, subtraction, multiplication, and division that include distracters generated by using typical error patterns for the respective problem type.

Solution: Answers will vary.

Develop at least 2 alternate ways of doing any given arithmetic problem that involves using a rule for addition, subtraction, multiplication, and division of whole numbers.

Solution: Answers will vary.

List at least 3 sources of “unusual” exercises that could be used to provide basic skill practice for students.

Solution: Answers will vary.

Describe at least two games that could be used to provide basic skill drill for GED students.

Solution: Answers will vary.

Do 16,873 ÷ 47 using long division. List all the potential problem areas or places where errors could be made.

Solution: Answers will vary. You should see rounding, estimation, place value, multiplication in strange configuration, subtraction, and division in strange configuration.

Describe the reading difficulties that would be associated with $6\frac{4}{5} - 3\frac{7}{8}$, carrying the discussion through to the answer of $2\frac{37}{40}$.

Solution: Answers will vary. You should see the idea of diagonal, top to bottom, and varying reading orientations rather than the typical left to right process.

Create a word problem that would appeal to a student in a GED mathematics setting.

Solution: Answers will vary.

Describe how the concept of number has evolved through the ages.

Solution: Answers will vary. You should see ideas that zero took a long time to develop because there was no need. If a cave wall had no pictures of an object, everyone knew that caveman did not have any of those. Similarly, fractions, negative values, etc., were slow to develop.

Trace the evolution of place value systems.

Solution: Answers will vary. The discussion should include ideas like Roman Numerals, which, while not a true place value system, does have some ideas that could have lead to place value. Roman Numerals were preceded by the Egyptian additive system, which had a collection of symbols to represent a particular value. The “coiled rope” represented 100 and if you saw three coiled ropes, no matter where they were place, you knew they stood for 300 as a part of the number being expressed.

Describe the development of zero from its rudimentary conceptualizations through how we write it today.

Solution: Answers will vary. You should see ideas that zero took a long time to develop because there was no need. If a cave wall had no pictures of an object, everyone knew that caveman did not have any of those.

Document the beginning of fractions and how they were used in early computations. Be sure to investigate computation involving unit fractions.

Solution: Answers will vary. You should see ideas that fractions took a long time to develop because there was no need. A cave wall would not have partial pictures of an object.

Document the beginning of decimals and how they were used in early computations.

Solution: Answers will vary. You should see ideas that decimals took a long time to develop because there was no need.

Describe the development of negative numbers and how they were used in early computations.

Solution: Answers will vary. You should see ideas that negative numbers took a long time to develop because there was no need.

Investigate regular polygons. How did the names originate? How were they constructed?

Solution: Answers will vary. The term “regular” is confusing for many. The response should include the idea that a regular polygon has congruent sides AND congruent angles.

Research at least one of the following topics and prepare a written summary of its development: Egyptian pyramids, golden section, golden ratio, Fibonacci numbers, networks, twisted surfaces, computational short cuts, percent, or measurement.

Solution: Answers will vary.

Visualize a checkerboard. Assuming you can travel only up or right, and only along sides of the little squares, turning or going straight through any small square’s corner, how many different routes are available to go from the lower left corner of the board to the upper right corner of the board? Believe it or not, there are 12,870 different routes that could be taken. Check it out!

Solution:

1	9	45	165	495	1287	3003	6435	B	12870
1	8	36	120	330	792	1716	3432		6435
1	7	28	84	210	462	924	1716		3003
1	6	21	56	126	252	462	792		1287
1	5	15	35	70	126	210	330		495
1	4	10	20	35	56	84	120		165
1	3	6	10	15	21	28	36		45
1	2	3	4	5	6	7	8		9
A									
	1	1	1	1	1	1	1	1	

References

Brumbaugh, D. K., Ortiz, E., Gresham, G. (2006). *Teaching Middle School Mathematics*. Mahwah, NJ: Lawrence Erlbaum Associates.

Brumbaugh, D., Rock, D. (2001). *Scratch Your Brain C1*. Pacific Grove, CA: Critical Thinking Books and Software.