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Kentucky Core Content Test Assessment Project for Grade 5

Multiple Choice Questions for Grade Level 5:

Question 1:

If the cost of an item is \$85, and you have \$43, which is the correct equation for the amount you still need to buy the item?

- a. $n + 85 = 43$ c. $85 + 43 = n$
b. $n - 85 = 43$ d. $43 + n = 85$

Kentucky Academic Expectations for Question 1

The content of multiple choice question 1 addresses the following Mathematics Academic Expectations: Kentucky Academic Expectation 1.5 – 1.9 which states that “Students use mathematical ideas and procedures to communicate, reason, and solve problems;” and Kentucky Academic Expectation 2.8 which states that “Students understand various mathematical procedures and use them appropriately and accurately.”

Kentucky Core Content for Mathematics Assessment for Question 1

Multiple choice question number 1 provides a way for students to show their understanding in the content strand number 4, Algebraic Ideas. By finding the correct equation for the question, students are meeting Kentucky Core Content ‘MA-E-4.1.2,’ in the Algebraic Thinking strand in that “Students will describe properties of, define, give examples of, and apply to both real-world and mathematical situations, number sentences with a missing value or variable.”

Correct Answer

The correct answer to multiple choice question 1 is ‘d’ ($43 + n = 85$.)

Rationale for Choosing the Other Distracters

- a. I chose to offer answer ‘a’ ($n + 85 = 43$) as a possible choice because students may misread the problem initially as asking them what number plus \$85 will give the amount needed to reach the \$43.
- b. I chose to offer answer ‘b’ ($n - 85 = 43$) as a possible choice because students may misread the problem and think it is asking them what number minus the cost of the item (\$85) will give the amount which you have on hand (\$43.)
- c. I chose to offer answer ‘c’ ($85 + 43 = n$) as a possible choice because students may misread the problem as asking them to find the amount that \$85 plus \$43 will produce. All three of the distracters, ‘a’, ‘b’, and ‘c’ are variations of the correct equation, and unless students read the question carefully to see the missing amount for which the equation is being written, any of the distracters could be mistakenly chosen.

Multiple Choice Questions for Grade Level 5 (continued):

Question 2:

What number will finish the pattern?

- .4, .6, .8, _____, 1.2
- a. .10 c. 1.0
b. 10 d. 1.1

Kentucky Academic Expectations for Question 2

The content of multiple choice question 2 addresses the following Mathematics Academic Expectations: Kentucky Academic Expectation 1.5 – 1.9 which states that “Students use mathematical ideas and procedures to communicate, reason, and solve problems;” and Kentucky Academic Expectation 2.11 which states that “Students understand mathematical change concepts and use them appropriately and accurately.” In problem number 2, students are meeting Academic Expectation 2.11 when they are asked to extend the pattern in the number sequence provided.

Kentucky Core Content for Mathematics Assessment for Question 2

Multiple choice question number 2 provides a way for students to show their understanding in the content strand number 4, Algebraic Ideas. By finding the correct number to finish the pattern in problem number 2, students are meeting Kentucky Core Content ‘MA-E-4.2.1.’ As the correct answer is chosen to finish the pattern, Kentucky Core Content is met in that the “Students will perform mathematical operations and procedures accurately and efficiently, explain how the skills work in real-world or mathematical situations, and are able to find rules for, extend, and create patterns.”

Correct Answer

The correct answer to multiple choice question 2 is ‘c.’

Rationale for Choosing the Other Distracters

- a. I chose to offer answer ‘a’ (.10) as a possible answer because students could incorrectly select that answer if they are looking only at the numbers (i.e. .4, .6, .8,) and are not looking at the pattern of .2 being added to the previous number. If students do not notice the amount being added to each consecutive number, they might choose the next number in the sequence, which would be 10, and then merely put the decimal in front of the number 10.
- b. I chose to offer answer ‘b’ (10) as a possible answer because some students could incorrectly select that answer if they are not noticing that the numbers in the sequence are decimal numbers. Students not noticing the decimal points would naturally choose the whole number 10 as being the next number in the series.
- d. I chose to offer answer ‘d’ (1.1) as a possible answer because some students could incorrectly select that answer if they are adding .2 to the last number in the series (.8), and incorrectly carry the numbers that they are adding, resulting in an answer of 1.1.

Multiple Choice Questions for Grade Level 5 (continued):

Question 3:

Which of the following is the correct expanded notation for 3,040,070?

- a. $300,000 + 40,000 + 70$
- b. $3,000,000 + 40,000 + 700$
- c. $3,000,000 + 400,000 + 70$
- d. $3,000,000 + 40,000 + 70$

Kentucky Academic Expectations for Question 3

The content of multiple choice question 3 addresses the following Mathematics Academic Expectations: Kentucky Academic Expectation 1.5 – 1.9 which states that “Students use mathematical ideas and procedures to communicate, reason, and solve problems;” and Kentucky Academic Expectation 2.7 which states that “Students understand number concepts and use numbers appropriately and accurately.” In problem number 3, students are meeting Academic Expectation 2.7 when they investigate and model multiple representations of whole numbers by representing a whole number in expanded form.

Kentucky Core Content for Mathematical Assessment for Question 3

Multiple choice question number 3 provides a way for students to show their understanding in content strand number 1, Number / Computation. By finding the correct representation of the whole number in expanded form, students are meeting Kentucky Core Content 'MA-E-1.1.4.' As the correct expanded form of the number is chosen in question number 3, the "Students will describe properties of , give examples of, and apply to real-world or mathematical situations place value, expanded form, and number magnitude to 100,000,000 and decimals through thousandths."

Correct Answer

The correct answer to multiple choice question 3 is 'd.'

Rationale for Choosing the Other Distracters

- a. I chose to offer answer 'a' ($300,000 + 40,000 + 70$) as a possible answer because students could incorrectly select that answer if they do not notice that the 3 in the original problem is in the '1 millions place.' If the students look at the place value of the 3 incorrectly, they might think that the 3 is in the 'hundred thousands place.' This would be the correct answer if the 3 were in the 'hundred thousands place.'
- b. I chose to offer answer 'b' ($3,000,000 + 40,000 + 700$) as a possible answer because students could incorrectly select that answer if they do not notice that the 7 in the original problem is in the 'tens' place. If the students look at the place value of the 7 incorrectly, they might think that the 7 is in the 'hundreds' place. This would be the correct answer if the 7 were in the 'hundreds' place.
- c. I chose to offer answer 'c' ($3,000,000 + 400,000 + 70$) as a possible answer because students could incorrectly select that answer if they do not notice that the 4 in the original problem is in the '10 thousands place.' If the students look at the place value of the 4 incorrectly, they might think that the 4 is in the 'hundred thousands place.' This would be the correct answer if the 4 were in the 'hundred thousands place.'

Open-Response Question in Mathematics for Grade Level 5:

Kentucky Academic Expectations for "Mini Roller Coaster Ride" Open-Response

The content of the open-response question "Mini Roller Coaster Ride" addresses the following Mathematics Academic Expectations:

- 1.5 – 1.9 "Students use mathematical ideas and procedures to communicate, reason, and solve problems."
- 2.7 "Students understand number concepts and use numbers appropriately and accurately."
- 2.8 "Students understand various mathematical procedures and use them appropriately and accurately."

Kentucky Core Content for "Mini Roller Coaster Ride" Open-Response

The "Mini Roller Coaster Ride" open-response question in mathematics provides a way for students to show their understanding of several concepts from the Core Content for Mathematics Assessment. This open-response question addresses strand number 1, Number/ Computation. In this open-response, students are asked to demonstrate their understanding of the mathematical concepts of whole numbers, addition, subtraction, multiplication, and division, and what these concepts mean in the context of a mathematical problem or situation. The students meet the Kentucky Core Content 'MA-E-1.1.2,' which states that "Students will describe properties of, give examples of, and apply to real-world or mathematical situations the operations of addition, subtraction, multiplication, and division." In this open-response, students are also asked to demonstrate their understanding of and application of the mathematical skills of addition,

subtraction, multiplication, and division. The students meet the Kentucky Core Content 'MA-E-1.2.2' which states that "Students will perform mathematical operations and procedures accurately and efficiently, explain how the skills work in real-world or mathematical situations, and are able to add, subtract, multiply, and divide whole numbers using a variety of methods (e.g., mental, paper and pencil, calculator.)"

"Mini Roller Coaster Ride"

The mini roller coaster ride at the amusement park carries 24 people on a new ride every 2 minutes. The 2 minutes time includes the time needed to load and unload the ride, plus the time of the actual ride itself. There are 12 cars on the mini roller coaster ride.

- a. If all of the cars on the ride were full, how many people would be in each car? Explain your answer and show all work.
- b. If all of the cars on the ride are full, how many people would ride the mini roller coaster in 60 minutes? Explain your answer and show all work.
- c. If you were the 49th person in line at the ride, how long would you have to wait before you boarded the roller coaster ride? Explain your answer and show all work.

Open-Response Question in Mathematics for Grade Level 5:

"Mini Roller Coaster Ride"

The mini roller coaster ride at the amusement park carries 24 people on a new ride every 2 minutes. The 2 minutes time includes the time needed to load and unload the ride, plus the time of the actual ride itself. There are 12 cars on the mini roller coaster ride.

- a. If all of the cars on the ride were full, how many people would be in each car? Explain your answer and show all work.
- b. If all of the cars on the ride are full, how many people would ride the mini roller coaster in 60 minutes? Explain your answer and show all work.
- c. If you were the 49th person in line at the ride, how long would you have to wait before you boarded the roller coaster ride? Explain your answer and show all work.

**Scoring Guide for Grade 5 Mathematics Open-Response
“Mini Roller Coaster Ride”**

Score	Description
4	Student gives the correct answer for each of the parts, ‘a’, ‘b’, and ‘c.’ Clear and correct explanations and computations are given for each answer, and all work is shown for all three parts of the answer.
3	<p>Student gives correct answers to parts ‘a’ and ‘b’ while showing all work, and clear and correct explanations are given for both parts. Student correctly answers part ‘c’ while showing all work, but the explanation (which shows understanding) is vague or contains minor errors.</p> <p>OR</p> <p>Student gives correct answers to parts ‘a’ and ‘c’ while showing all work, and clear and correct explanations are given for both parts. Student correctly answers part ‘b’ while showing all work, but the explanation (which shows understanding) is vague or contains minor errors.</p> <p>OR</p> <p>Student gives correct answers to parts ‘b’ and ‘c’ while showing all work, and clear and correct explanations are given for both parts. Student correctly answers part ‘a’ while showing all work, but the explanation (which shows understanding) is vague or contains minor errors.</p> <p>OR</p> <p>Student gives clear and correct explanations to all three parts of the answer, but one of the three answers is incorrect due to computation errors in the work shown.</p> <p>OR</p> <p>Student gives correct answers to all 3 parts of the question while showing all work, but only 2 of the three parts have clear and correct explanations (which show understanding.) One of the 3 explanations is missing.</p>
2	<p>Student gives correct answers to all parts, ‘a’, ‘b’, and ‘c’, with little or no explanation or work shown.</p> <p>OR</p> <p>Student gives correct answers to all parts, ‘a’, ‘b’, and ‘c’, showing all work and explanations for all parts; but the explanation for 2 of the 3 answers is incorrect.</p> <p>OR</p> <p>Student gives correct answer to one part, showing all work and a clear</p>

	explanation (shows understanding), but the answers to 2 of the parts are incorrect due to computation errors. The explanations for the 2 incorrect answers however, do show understanding of the skills and concepts, beyond the computation errors.
1	Student response is minimal (e.g., student shows minimal understanding of the correct skills and application of the mathematical operations of addition, subtraction, multiplication, and division in real-world situations.)
0	Student response is totally incorrect or irrelevant.
Blank	No response is given to the question.

**Scoring Guide for Grade 5 Mathematics Open-Response
“Mini Roller Coaster Ride”**

Answers:

Part ‘a’: **There would be 2 people in each car.** Explanation expresses the fact that a total of 24 people in 12 cars would be solved by dividing the total number of people by the number of cars holding the people (24 divided by 12); or by a problem-solving strategy such as drawing a picture or making a table.

Part ‘b’: **720 people would ride the mini roller coaster in 60 minutes.** Explanation expresses the fact that if 24 people ride the coaster in 2 minutes, you must multiply that same number of people riding in 2 minutes times 30 in order to find the total number of people riding the coaster in 60 minutes (24 x 30.) Explanation indicates that the number of people riding in 2 minutes, (24) is multiplied by 30 because 60 minutes time is 30 times larger than the 2 minutes of time in one ride.

OR

The explanation could show a problem-solving strategy such as organizing and making a table representing the number of people riding the ride every 2 minutes up until the 60 minutes time.

Part ‘c’ : **If you were the 49th person in line, you would have to wait 4 minutes before you boarded the coaster ride.** Explanation expresses the fact that 24 people ride the ride every 2 minutes, so 48 people would ride the ride in 4 minutes. The 49th person would be on the third ride group. The explanation could be found in one of the following ways:

1) by making a table showing the number of people riding every 2 minutes, and going up to the 49th person in line.

2) by finding the multiples of 24 every 2 minutes, and then determining the amount of time the 49th person in line would have to wait (e.g., 24, 48, and 72). This method would show that the 49th person would have to wait 4 minutes for the first 48 people to finish.

3) by correctly subtracting 24 (the number of people per ride) from the number of the person in line (49) and solving. This method would solve for the following equation: $49 - 24 = 25$. This method would show that one more group of 24 would ride the ride before the 25th person would be on the coaster. This solution would show that 2 groups of 24 would ride before the 49th person in line rides, and since each group of 24 takes 2 minutes to complete the ride; 2×2 minutes, or 4 minutes would give the total number of minutes that the 49th person would have to wait before riding.

Sample 4-Point Response of Student Work

a. If all of the cars on the ride were full, there would be 2 people in each car. I solved this problem following way: I knew that the total number of people carried by the car is 24. I also knew that there were 12 cars on the mini roller coaster ride. In order to find the number of people that would be in each car, I used the operation of division. I divided the total number of people (24), by the number of cars (12), because that would then tell me how many people rode in each car.

Student correctly answers parts 'a', 'b', and 'c'.

$$24 \div 12 = 2$$

b. If all of the cars on the ride were full, 720 people would ride the mini roller coaster in 60 minutes. I found this answer in the following way: I knew that 24 people rode on a full ride every 2 minutes. In order to find the number of people who rode on the ride in 60 minutes, I knew that I would have to multiply the number of people who rode every 2 minutes by the number 30. I chose to multiply the number of riders in 2 minutes (which is 24), by 30 because 60 minutes is 30 times larger than 2 minutes. I knew that I would have to multiply the 24 riders in 2 minutes by 30 in order to get the total number of riders in 60 minutes, and I came up 720 people.

Student gives complete explanations, all computations are correct, and answers show understanding of number and computation skills and concepts.

$$\begin{array}{r} 24 \\ \times 30 \\ \hline 00 \\ + 720 \\ \hline 720 \end{array}$$

c. If I were the 49th person in line at the ride, I would have to wait 4 minutes before I boarded the ride. I came up with my answer in the following way: I knew that 24 people rode the

Student gives a complete explanation based on both number computations and displays of data.

mini roller coaster every 2 minutes. I decided to subtract the number of people that ride the ride each time it is full, which is 24, from the number that I am in line, which is 49. Once I subtracted, I came up with a difference of 25. I knew that 24 people rode the ride each time the ride was full, so if the difference was 25, I would have to wait for the first 24 riders in 2 minutes, and then the next 24 riders in another 2 minutes, before the 49th rider (me) could go on the mini roller coaster ride. I also checked my work by making a table to assure that my calculations were correct.

$$\begin{array}{r} 49 \\ - 24 \\ \hline 25 \end{array}$$

As I made the table below and looked at the information, I proved that my computations above were correct. If I were rider #49, I would have to wait for a total of 4 minutes until my rider number was chosen to ride on the mini roller coaster ride. (I would have to wait a total of 4 minutes for the first 48 people to ride before my number was next in line for the ride.)

Length of time for each mini roller coaster ride	2 minutes	2 minutes	2 minutes
Number of riders riding per each full ride	24	24	24
Rider # assigned to the people waiting in line for the mini coaster ride	Rider #1 through Rider #24	Rider # 25 through Rider # 48	Rider #49 through Rider #72

Overall, the student demonstrates a strong understanding of the appropriate use of number concepts and mathematical procedures in order to communicate, reason, and solve problems in real-world situations. The student has also demonstrated the ability to apply mathematical operations using a variety of methods.