KUMA: A LEARNING TOOL FOR PROBLEM-SOLVING ENGAGEMENT

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This curriculum is recommended for Grade 5, Grade 6, and Grade 7 Mathematics.

Keywords: problem-solving, holistic, problem-solving strategies

Teaching Standards: See Appendix1

Synopsis:

The problem-solving and critical thinking is the heart of mathematics. But unfortunately, the learners are struggling with how to deal with these matters. Hence, this curriculum helps you see that there is a holistic and scientific approach to assist you and your learners solve the problem-solving dilemma. This curriculum presents KUMA. It is an abbreviation for Known, Unknown, Methods, and Answers. In this curriculum, you will be guided on how to teach and integrate problem-solving in class and solve it using different problem-solving strategies. It has varieties of problem-solving where students act, draw, illustrate, move, talk and explain ideas.

I will use the activities in my class this school year for my 86 learners.
Moreover, I am giving permission for Charlotte Teachers Institute to publish my curriculum unit in print and online. I will be credited as the author of my work.

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Introduction

Rationale

It is a notion that thinking happens if a problem arises (Sevilla et al., 2006). It can be inferred that problems push the person to develop meaningful ideas to create a solution. Schoenfeld (1987, cited in Taplin, n.d.) stressed that problems as situations trigger people to apply their skills in decision-making and strategies to cope with them. With this kind of perception of the structure of word problems, many educators have been interested in exploring, investigating, and applying their system. Their application in real-life settings adds fun to learning and surviving in this world that considers problem-solving the "heart of mathematics" (Cockroft,1987, cited in Taplin, n.d.).

Furthermore, the constructivists believed that problem-solving is more than logical thinking and providing students with a context for learning mathematical knowledge. It can also enhance the transfer of skills to specific situations, which is an aesthetic form. In addition, problem-solving helps the learners construct knowledge and provide ambiance for active learning. Added to this, problem-solving can create a context that stimulates real-life situations. National Council for Teachers in Mathematics (1980, cited in Taplin,n.d.) emphasized the need to use problem-solving because it embraces skills and functions essential in everyday life. Furthermore, Cockcroft (1982, cited in Taplin,n.d.) advocated problem-solving as a means of developing mathematical thinking as a tool for daily living in which mathematics can be applied to various unfamiliar situations.

Indeed, problem-solving is a must for every learner. However, this skill is a complex process. It requires intelligence, motivation, and set and functional fixedness are some factors attributed to knowledge of the language and calculation skills (Charles, n.d.). Therefore, as a classroom teacher, it is vital to determine strategies to develop this skill.

In this seminar-workshop, I am nurtured that everything can be learned. t only requires patience, process, and perseverance. Hence, I compared problem-solving to learning to move

systematically and dance. o dance, you need to have connections and embrace differences. In problem-solving, it needs to be realistic and feasible to have connections and relevance to life to have meaningful engagement.

Furthermore, dance should be taught in processes and phases. The proper dynamics are needed to go from one movement to another, so there is cohesiveness in movement and structure. Therefore, problem-solving should be taught according to phase.

The first phase is about understanding the problem and then making plans or strategies to solve the problem; the next stage is solving the problem; and finally, looking back and reflecting on the problem. The students can use different strategies from these phases (Polya, 1945 cited in Charles n.d.). For example, Laset and Limjap (2005) listed the different strategies used by the students in solving word problems, such as guessing and checking, computing or simplifying, using formulas, considering more straightforward cases, making models, eliminating, making charts, and tables or lists, and looking for patterns.

Despite the encouragement and revelations of strategies to help my learners solve word problems, some difficulties have been traced among my students in solving word problems. Some of these classroom learning problems that affect the students' skills and abilities are reading and language comprehension, speaking and understanding the meaning of terms, and expressing the language of math principles to solve the problems. In addition, several students have struggled with mental and visual representations, following verbal explanations, and sequencing the steps in complex operations. Furthermore, some of the learning challenges in the classroom occurred in establishing the relationship between knowledge and intuition about concrete structures and abstract nature mathematics. Moreover, students constantly think of mathematics as affiliated with numbers that mislead students in solving word problems.

Hence, I would like to design a curriculum plan for Grade 7 learners to develop and teach problem-solving in Mathematics using the interactive approach that incorporates active learning and movement. The KUMA Approach will be utilized in developing problem-solving skills. This strategy has been coined by the Grade 7 team of the school year 2021-2022 with Atalya Odems, Tanesha Sistrunk, and yours truly. The KUMA is an abbreviation for solving problems (Known, Unknown, Method and Answer).

With the gradual approach to developing the skills of understanding the problem, visualizing the problem, solving the problems, and checking the solution, students are assumed to develop a dynamics on how to solve problem-solving.

Demographics

Cochrane Collegiate Academy is a public school located in Charlotte, NC. It has 853 students in grades 6 through 12 with a student-teacher ratio of 16 to 1. According to state testing results, 23% of students are proficient in at least math and 19% in reading (*Cochrane Collegiate Academy in Charlotte, NC*, n.d.).

My classroom is dominated by the Hispanic Community, followed by the African-American. I have many non-English speakers and learning difficulties in my classroom. In a classroom, I have an excessive number of Math classes. I have 31 students in the second block, 30 students in the third block, and 26 students in the fourth block.

Description of Units

In each unit, there are problem-solving incorporated. This paper will show problems that can be used in each lesson. The problems included support the OPEN UP Curriculum of Charlotte-Mecklenburg School. The development of problem-solving skills is the main target of this paper.

Unit 1 Scale and Scale Factor- In this unit, students study scaled copies of pictures and plane figures, then apply what they have learned to scale drawings, e.g., maps and floor plans. This provides geometric preparation for grade 7 work on proportional relationships and grade 8 work on dilations and similarity.

Unit 2 Introduction to Proportional Relationships- In this unit, students develop the idea of a proportional relationship out of the grade 6 idea of equivalent ratios. Proportional relationships prepare the way for the study of linear functions in grade 8.

Unit 3 Circles- In this unit, students extend their knowledge of circles and geometric measurement, applying their knowledge of proportional relationships to studying circles. They extend their grade 6 work with perimeters of polygons to circumferences of circles and recognize that the circumference of a circle is proportional to its diameter, with a constant of proportionality. In addition, they encounter informal derivations of the relationship between area, circumference, and radius.

Unit 4 Proportional Relationship- Students deepen their understanding of ratios, scale factors, unit rates (also called constants of proportionality), and proportional relationships, using them to solve multi-step problems set in various contexts that involve fractions and percentages.

Unit 5 Rational Number Arithmetic-The unit begins by revisiting ideas familiar from grade 6: how signed numbers are used to represent quantities such as measurements of temperature and elevation, opposites (pairs of numbers on the number line that are the same distance from zero), and absolute value. In the unit's second section, students extend addition and subtraction from fractions to all rational numbers. They begin by considering how changes in temperature and elevation can be represented—first with tables and number line diagrams, then with addition and subtraction expressions and equations. The third section of the unit focuses on multiplication and division. It begins with problems about the position, direction, constant speed, and constant velocity in which students represent quantities with number line diagrams and tables of numerical expressions with signed numbers. In the fourth section of the unit, students work with expressions that use the four operations on rational numbers, using structure. In the fifth section of the unit, students begin working with linear equations in one variable with rational number coefficients. The focus of this section is representing situations with equations and what it means for a number to be a solution for an equation rather than methods for solving equations. The last section of the unit is a lesson in which students use rational numbers in the context of stock-market situations, finding values of quantities such as the value of a portfolio or changes due to interest and depreciation.

Unit 6 Expressions, Equations, and Inequalities- In this unit, students solve equations of the forms $px + q = r$ and $p(x+q)=r$ and solve related inequalities.

Unit 7 Angles, Triangles, and Prisms- In this unit, students investigate whether sets of angle and side length measurements determine unique triangles or multiple triangles or fail to determine triangles. Students also study and apply angle relationships, learning to understand and use the terms "complementary," "supplementary," "vertical angles," and "unique."

Unit 8 Probability and Sampling- In this unit, students understand and use the terms “event,” “sample space,” “outcome,” “chance experiment,” “probability,” “simulation,” “random,” “sample,” “random sample,” “representative sample,” “overrepresented,” “underrepresented,” “population,” and “proportion.”

Content Research

The Origin of Kuma

There are different ways to develop problem-solving skills. However, because of the procedural structure of the solution, learners solve the problem in a routine structure. One of which is the AGONSA. His abbreviation means that to solve problems, students must know what is Asked on the problem, what is the Given problem, what the operations are to be used, what is the Number Sentence, and what the answer is. A routine structure in solving a problem is acceptable, but the problem is solved differently in real life. Therefore, it has breadth and depth. It must be thought through thoroughly. Hence, KUMA, as the problem-solving approach, is a simplified approach to this task. It is based on the idea of George Polya.

George Polya was a European-born scientist and mathematician who moved to the United States in 1940 to work at Stanford University. As he reviewed his experiences teaching math in the classroom, he noticed that students needed to be presented with a perspective on math that excited and stimulated them. So he suggested presenting mathematics in terms of problem-solving ability. This 1944 book, "How to Solve," contains his famous four-step problem-solving heuristic. Olya suggests that presenting mathematical thinking as a way to find "unknowns" becomes more engaging for students. e even goes as far as to say that his general four-step problem-solving heuristic can be applied to any field of human endeavor—to any opportunity where a problem exists. The steps are understanding the problem, devising a plan, carrying out a plan, and looking back (Todd, n.d.).

The Framework of KUMA

KUMA is operationalized and modified approach based on George Polya. This is how the KUMA is utilized to solve and investigate the "unknown." This is a scientific approach to solving the problem.

Phase I. Knowing the provided facts.

In any problem, there are always included facts, properties, or concepts involved. n Mathematics, the problems presented to the class are based on underlying mathematical ideas, concepts, or principles. Hence, as learners read the problem, the learners must be able to pull down information and break this information into pieces to analyze the given scenario.

During this phase, students are asked to do the following:

a) Highlight important words or ideas problem
b) Define the terms involved
c) List the given information

Phase II- Understanding the “Unknown” for investigation.

After determining the given facts, principles, concepts, and ideas, students are now ready to determine questions that need further investigation or exploration. It has to be broken into parts and connected to the "known facts ."n some instances where the problem is a multistep word problem, it is essential to determine the hidden facts or ideas that need to be solved to proceed with the final answer. To understand the problem, paraphrasing and restating are done in this part.

Phase III- Determining the appropriate methods or strategies to solve the problem

In solving the problems, students may see things differently. Hence, a diverse solution is expected of the learners. In some situations where problems are open-ended problems, students will show their work in various ways. In this case, the concept of body thinking is highly utilized.

One of the great insights I had during the seminar was the concept of body thinking. Carpenter (2011) described body thinking by stating that the mind uses the body to interpret abstract ideas. In addition to perceiving and communicating concepts, actions, and sensations such as nodding, smiling, or giving a thumbs-up can also influence language comprehension and social judgment. For example, the body represents concepts of the past and future in a code that includes the perception of space and the direction of movement. Likewise, people represent concepts of the past and future in a code that includes the perception of space and movement. Through this perspective, we can gain a deeper understanding of ourselves and the actions and feelings that we are capable of. This can help us improve our learning and thinking.

With this thought, I realized that students should be given different opportunities to solve problems that allow them to move, think and decide. They need to maximize their potential and develop optimism, not just getting the correct answer but trying to find a way to solve a problem. Hence, the following are the suggested ways of solving the problems as described in NZmaths (n.d.):

Guess and Check Strategies- One of the most straightforward strategies is guessed and check, which allows one to determine if their answer fits the given conditions. Since it is so simple, some students may need help to give up on guess and checking. However, as problems get more complex, other strategies may become more effective. When students are entirely stuck, giving up on guessing and checking can allow them to explore their problems and develop better solutions.

Another strategy that is more sophisticated than check and guess is to guess and improve. It involves using your first incorrect guess to improve your next one. This method can be used for simple problems. It is usually easier to improve the last guess in these problems. However, in some cases, it may not be possible to determine which way to go to improve the guessing.

Act it out. Children enjoy using Act it Out. They can take on the roles of various things in the problem. This strategy is very effective for demonstration, as it can be used in front of the entire class. However, it can be some work with groups, as many students might be participating. In addition, the students may get less out of the exercise than those watching. This is because they are so focused on the mechanics of the problem that they overlook the underlying mathematics.

Act it Out involves using equipment that can be used to represent the situation that the students are trying to solve. One of the challenges with this strategy is keeping track of the student's progress. This is because, while they are manipulating the equipment, they need to keep track of their actions. In addition, some students prefer to use the equipment instead of drawing. This is because drawing gives them a better representation of the issue. Since there are specific problems where using equipment is more effective, you should encourage students to use it by modeling its use.

Drawing or Illustrating the problem. Drawing a picture is a fairly common strategy that can be used to solve a problem. However, it should be simple enough. Instead, it should only contain enough details to help the student develop a strategy that will work. This strategy can be very useful in helping students develop their skills and eventually develop a more sophisticated approach. It is a tactile movement that allows the students to show their thinking and a springboard of their ideas to solve the problem.

Making an organized list. One of the most important aspects of working with a system is making organized lists and tables. Most students start by recording their attempts at haphazardly solving problems. This practice helps them develop a more systematic and logical understanding of their mathematics. It can also help them bring their explorations into the fold.

There are many ways to utilize the Make a Table activity. These include solving problems like the Farmyard and the more complex logic puzzles involving ticks and crosses. Table numbers can also be used to find patterns in numbers. In organized list should be placed so that it has some natural order in its construction. For instance, shopping lists typically need to be more organized. They can grow haphazardly as you think about each item, so a bit of thought can help make them more organized. For example, cutting all the food items together could do this. Another way to make your list more organized is by placing all the meat products in alphabetical order. This would allow you to quickly find the items at the grocery store.

Being Systematic, Keeping Track, Looking For Patterns, Use Symmetry and Working Backwards and Use Known Skills. This strategy category is often used as a catch-all for various strategies. t is the result of being keenly observant and facilitating body thinking effectively. These include being systematic, looking for patterns, utilizing symmetry, and using known skills. These are different from the over-arching strategies that we've already talked about. n addition to being systematic, looking for patterns, and utilizing symmetry is also essential when solving problems.

Being systematic means making a list or a table, which can also involve keeping it organized. This can be done by ensuring that you're working in a specific order so that you can easily follow it when you return to it. Another important aspect of being systematic is being able to follow an idea for a while so that you can see where it leads.

One of the most important aspects of being systematic is keeping track of your work. I have seen students having trouble finishing a project due to not knowing what they were doing. This is especially important in situations like Act It Out and Using equipment. This type of record can help students avoid getting muddled and having difficulty finishing their tasks. Another important aspect of being systematic is keeping track of where they are going and what they're doing. This can help prevent them from getting lost in the process.

Being able to find patterns is also essential when it comes to mathematics. This lets us know how things work and what makes them connect. Having a pattern can help us control what we are doing. Having a clear understanding of how objects work can make things easier.

Having symmetry can also help us reduce the difficulty level of a specific problem. For instance, if you are playing Noughts and Crosses, you will have learned that there are only three ways to put the first symbol Down. This eliminates a lot of possibilities, making it easier to analyze. Therefore, this type of argument should be grabbed with delight whenever you see it.

Lastly, on the people's most common strategies when solving problems is finally working backward. Again, this is a standard strategy with limited use, but it can be compelling. In particular, it can be beneficial when looking at a game's end. Entirely doing this, you can see what moves are best and then work backward to determine which ones are most advantageous.

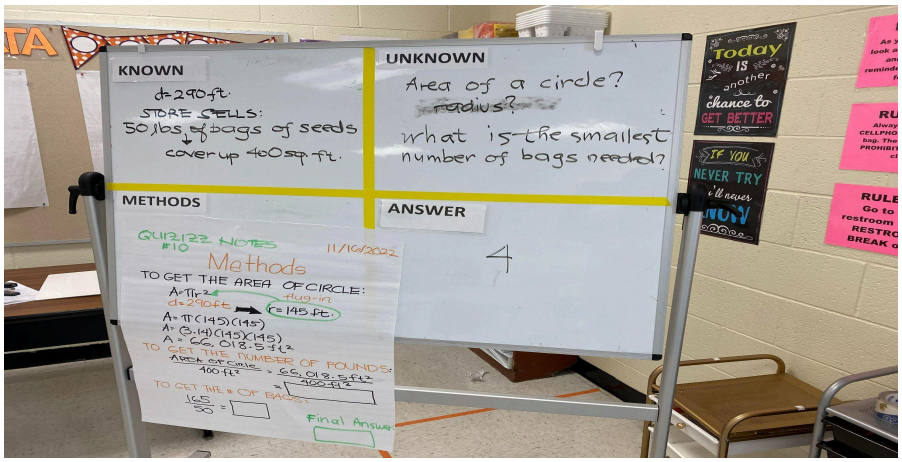
Phase IV- Generating answers by making meaning of the information and methods. In scientific terms, this is a generalization. This phase is the culmination of problem-solving. After the thorough deliberation of the solution to the problem, there must be a final answer derived. However, it requires metacognition. Metacognition is a way to verify thoughts and derive ideas based on a given situation.

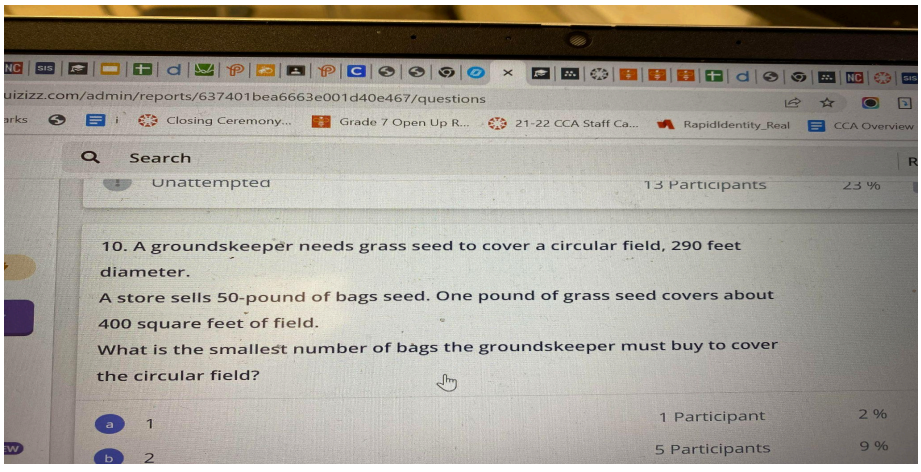
Instructional Implementation

KUMA is implemented by having a blank diagram with the problem on the center on a piece of paper or on the board. This is a blank template you will give the students as they solve the problems. This is their way of documenting their ideas and answer, which will serve as their notes.

Known	Unknown
Problem	
Method	Answer

You may also design your board for this purpose. This question was posted in Quizizz, but it was solved using KUMA.





On paper, I use this template.

Problem:

What do you know? For example, numbers, keywords, and given information)	What is unknown? What is the problem asking, missing information)
What methods/strategies could I use to solve the problem? Why?	Answer the question/Solve the problem

To process the activities in a class setting, the script of Montague (1992) can be used. This guided conversation structure will facilitate the discussion and activities in which body thinking and the mathematical problem-solving structure will be used simultaneously. This table is called "SAY-ASK-CHECK."

‘Say-Ask-Check’ Metacognitive Prompts Tied to a Word-Problem Cognitive Strategy (Montague, 1992)		
Cognitive Strategy Step	Metacognitive ‘Say-Ask-Check’ Prompt Targets	Sample Metacognitive ‘SayAsk-Check’ Prompts
(K) KNOWN		
Read the problem.	‘Say’ (Self-Instruction) Target: The student reads and studies the problem carefully before proceeding. ‘Ask’ (Self-Question) Target: Does the student fully understand the problem? ‘Check’ (Self-Monitor) Target: Proceed only if the problem is understood.	Say: "I will read the problem if I don't understand it." Ask: “Now that I have read the problem, do I fully understand it?” Check: “I understand the problem and
(U) UNKNOWN		
Paraphrase the problem, then determine the "unknown" from the problem.	'Say' (Self-Instruction) Target: The student restates the problem to demonstrate understanding. Ask' (Self-Question) Target: Is the student able to paraphrase the problem? Check' (Self-Monitor) Target: Ensure that any highlighted keywords are relevant to the question.	Say: "I will highlight keywords and phrases related to the problem question." For example, "I will restate the problem in my own words." Ask: "Did I highlight the most important words or phrases in the problem?" Then, check: "I found the keywords or phrases that will help to solve the problem."
(M) METHOD		
‘Draw’ the problem.	'Say' (Self-Instruction)	Say: “I will draw a diagram

	Target: The student draws the problem to consolidate understanding. ‘Ask’ (Self-Question) Target: Is there a match between the drawing and the problem? 'Check' (Self-Monitor) Target: The drawing includes in visual form the critical elements of the math problem	of the problem.” Ask: "Does my drawing represent the problem?" Then, check: "The drawing contains the essential parts of the problem."
Create a plan to solve the problem.	‘Say’ (Self-Instruction) Target: The student generates a plan to solve the problem. ‘Ask’ (Self-Question) Target: What plan will help the student to solve this problem? ‘Check’ (Self-Monitor) Target: The plan is appropriate to solve the problem	Say: “I will make a plan to solve the problem.” Ask: "What is the first step of this plan? What is the next step of the plan?" Then, check: "My plan has the right steps to solve the problem."
(A)ANSWER		
Predict/ estimate the answer.	'Say' (Self-Instruction) Target: The student uses estimation or other strategies to predict or estimate the answer. Ask' (Self-Question) Target: What estimating technique will the student use to predict the answer? Check' (Self-Monitor) Target: The predicted/estimated Answer used all essential problem information.	Say: “I will estimate what the answer will be.” Ask: “What numbers in the problem should be used in my estimation?” Check: “I did not skip any important information in my estimation.”
Compute the Answer	Say’ (Self-Instruction) Target: The student follows the plan to compute the solution to the problem.	Say: “I will compute the answer to the problem.” Ask: “Does my answer sound right?” “Is my

	Ask' (Self-Question) Target: Does the Answer agree with the estimate? Check' (Self-Monitor) Target: The steps in the plan were followed, and the operations were completed in the correct order.	answer close to my estimate?" Check: "I carried out all the operations correctly to solve this problem."
Check the answer	'Say' (Self-Instruction) Target: The student reviews the computation steps to verify the answer. 'Ask' (Self-Question) Target: Did the student check all the steps in solving the problem, and are all computations correct? 'Check' (Self-Monitor) Target: The problem solution appears to have been done correctly	Say: "I will check the steps of my answer." Ask: "Did I go through each step in my answer and check my work?" Check: State your final answer and stand to it with firmness but an open mind.

Word Problems

A word problem is a sentence that describes a scenario in which a mathematical calculation is required to solve a problem. They help children develop their mathematical skills and apply knowledge to real-world situations. They also help them understand the concepts of math. For this curriculum, we have routine and non-routine word problems.

In this curriculum, word problems are grouped into two categories- routine Math problems and non-routine math problems. Routine Math problems are problems recognized on specific concepts and have an algorithm. Often, the approach is convergent, but the procedure for computing the answer is divergent. Fon-Routine problems are real-life problems and require a complex process or thought to solve the problem. Therefore, this curriculum specifically included only routine word problems.

Routine Word Problems

The concept of routine problem-solving emphasizes the use of prescribed procedures and known algorithms to solve problems. This approach is easy to assess and can be done in various ways, such as paper-pencil tests. Since using calculators and computers has made it easier to perform complex mathematical procedures, the typical worker can have low expertise in this discipline. However, many people are still expected to be proficient in this area (*Pentathlon Institute Active Problem-Solving*, n.d.).

In this curriculum, the problems being utilized are on DeltaMath. DeltaMath is a software with a set of word problems. t is used to allow students to practice the skills they learned during the discussions. However, students need further clarity in structuring their thoughts to solve word problems. Hence, I provided a procedure and structure for doing it in class.

Procedure in Using KUMA

After determining the day's learning target, you may include the problems in your class. Remember, all types of problems can be placed and structured in KUMA. Here is the procedure for making this approach.

Step 1: I determined where I should put the activity/problem. Usually, I placed it in Bellwork during discussion or Cool Down.

Step 2: I presented the problems on the board/slide deck. Just paste the document on the board from the worksheet.

Step 3: Each student will be given a hard copy.

Step 4: I asked them to work in pairs or in trios. assigned roles as recorder, material provider, and reporter. Then, I provided materials for them that were needed in the worksheets.

Step 5: I process the activity using the 'Say-Ask-Check' of Montague. During this step, I asked my students to do the talking, grouping, and collaborating.

Step 6: If the students grasp the problem, they will be asked for generalization. The generalization pertains to the process and their insights towards the problem solved.

Appendices

Implementing Teaching Standards

Unit 1 Activity 1
7.G.A.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

In this activity, the students need to draw and illustrate the problem. Visualizing and solving it will help them succeed in doing this task. They need to understand how to find the scale factor before they can get the area of the scaled object.

Unit 2 Activity 2
7.RP.A.2 Recognize and represent proportional relationships between quantities
7.RP.A.2.c Represent proportional relationships by equations. for example, if the total cost is proportional to the number of items purchased at a constant price, the relationship between the total cost and the number of items can be expressed as t=pn

The proportional relationship can be understood further if the students are asked to illustrate the problem and break down the information. The determination of the unit rate is important for them to understand the concepts.

Unit 3 Activity 1 and Activity 2
7. G.B.4 Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

The circle is a fun concept. However, when it is on the composite figure, the easy way to figure out the object is to break it down into parts. The fun activity here requires them to cut, draw and color to vividly see the different polygons involved.

Unit 4 Activity 1 and Activity 2
7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems.

Visualizing the concept of percent and relating it to decimals and fractions will help them understand and find the relationship and the algorithm on how to solve the missing value.

Unit 5 Activity 1
NS.A.3 Solve real-world and mathematical problems involving the four operations with rational numbers. Computations with rational numbers extend the rules for manipulating fractions to complex fractions.

Numbers can be expressed differently. In this activity, students will have the opportunity to recognize the different ways in which numbers are expressed into complex fractions. They will realize that representation is the same. However, the process of computing numbers is different.

Unit 6 Activity 1
7.EE.B.4.a Solve word problems leading to equations of the form $px+ q=r$ and $p(x+q)=r$, where p, q, and r are specific rational numbers.

Recognizing and solving equations in one variable is the main task of this problem. The students will map out the situation and solve the problems. They need to apply the concept of equality in solving the problem.

Unit 6 Activity 2
7.EE.B.4.a Solve word problems leading to equations of the form $px+ q>r$ or $px+ q<r$, where p, q, and r are specific rational numbers.

Recognizing and solving inequalities in one variable is the main task of this problem. The students will map out the situation and solve the problems. They need to apply the concept of inequality in solving the problem.

Unit 7 Activity 1
7. G.B.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

The angles need to be broken into parts to recognize the properties involved in the problem. Coloring the parts is helpful to see the properties.

Unit 7 Activity 2
7. G.A.2 Draw (freehand, ruler, and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

The triangles need to break the figure into parts to recognize the properties involved in the problem. Coloring and shading the parts are helpful to see the properties.

Unit 7 Activity 3
G.B.6 Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

The prisms need to break the figure into parts to recognize the properties involved in the problem. In finding the volume and surface area, students must be able to see the polygons involved. Coloring and shading the parts are helpful to see the properties. Moreover, asking them to cut the figure will help them see further the problem.

Unit 8 Activity 1
7.SP.C.7.a Develop a uniform probability model by assigning equal probability to all outcomes and use the model to determine probabilities of events

Determining the probability of events can be done in the table. From this, students can able to see the important elements or characters involved. The counting of objects and determining the possible occurrence of events can be visualized easily because of the table.

Worksheets

Unit 1- Scale Drawing

Learning Target: Find the scale of an object and compute the area.
*Standards:***7.G.A.1**Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

Materials Needed: copy paper, graphing paper, marker, ruler, easel paper
Time of Implementation: 5-8 minutes
Body Movement Involved: drawing, talking, walking

Procedure:

1. The teacher will post the instructions on the slide deck.
2. The instructions are as follows:
    a. Work by pair or trio. Work only with the person close to you.
    b. Assign a recorder, materials provider, and reporter
    c. Get the materials to the teacher.
    d. You will be posting their work after they solve the problem.
3. The teacher will post the problem on the slide deck.
4. The teacher will facilitate the activity using the 'Say-Ask-Check' of Montague. During this step, I asked my students to do the talking, grouping, and collaborating.
5. The teacher will ask the students to post their work on the provided area of the wall.
6. The students will be doing the gallery walk.
7. The teacher will ask the following questions:
    a. What are your insights on how they solved the problem?
    b. What did you learn from the activity?

Problem:
The rectangular floor of a classroom is 40 feet in length and 20 feet in width. The scale drawing of the floor has a length of 20 inches. What is the area, in square inches, of the floor in the scale drawing? Source: DeltaMath)

(Known) What do you know? For example, numbers, keywords, and given information) The rectangular floor of a classroom is 40 feet in length and 20 feet in width. scale drawing of the floor has a length of 20 inches	(Unknown) What is unknown? What is the problem asking, missing information) What is the width of the scaled floor? What is the area of the scaled drawing?
Method What methods/strategies could I use to solve the problem? Why? First find the scale factor, k: $(\text{drawing}) \cdot k = (\text{actual})$ $20 \cdot k = 40$ Problem states undefined $\frac{20k}{20} = \frac{40}{20}$ Divide both sides by 20 $k = 2$ Find the **width** of the scale drawing: $(\text{drawing's width}) \cdot k = (\text{actual width})$ $w \cdot 2 = 20$ $\frac{2w}{2} = \frac{20}{2}$ Divide both sides by 2 $w = 10$ in. Click to see alternative method: solve a proportion Find the **area** of the scaled drawing: $A = lw$ $= (20 \text{ in.})(10 \text{ in.})$ $= \boxed{200 \text{ in.}^2}$	ANSWER Answer the question/Solve the problem ***200 square inches***

Unit 2: Proportional Relationship

Learning Target: Determine the unit rate of the given situation.
Standards:

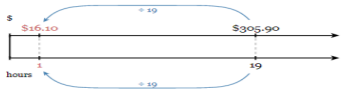
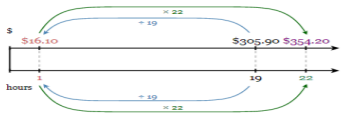
> **7.RP.A.2**Recognize and represent proportional relationships between quantities
> **7.RP.A.2.c**Represent proportional relationships by equations. for example, if the total cost is proportional to the number of items purchased at a constant price, the relationship between the total cost and the number of items can be expressed as $t=pn$

.
Materials Needed: post-it, marker, ruler, easel paper
Time of Implementation: 5-8 minutes
Body Movement Involved: drawing, talking, walking

Procedure:

1. The teacher will post the instructions on the slide deck.
2. The instructions are as follows:
    a. Work by pair or trio.
    b. Work only with the person close to you.
    c. Assign a recorder, materials provider, and reporter
    d. Get the materials to the teacher.
    e. They will post their work after they solve the problem.
3. The teacher will post the problem on the slide deck.'
4. Require the students to illustrate their answers.
5. The teacher will facilitate the activity using the 'Say-Ask-Check' of Montague. During this step, I asked my students to do the talking, grouping and collaborating.
6. The teacher will ask the students to post their work on the provided area of the wall.
7. The students will be doing the gallery walk. During the gallery walk, they will write a comment about the process and the answer of the other groups.
8. The teacher will ask the following questions:
    a. What are your insights on how they solved the problem?
    b. What did you learn from the activity?

Problem: One week, Isabella earned $305.90 at her job when she worked for 19 hours. f she is paid the same hourly wage, how much would she make the next week if she worked 22 hours? Source: DeltaMath)

(Known) What do you know? For example numbers, key words, and given information) earned $305.90 at her job She worked for 19 hours paid the same hourly wage	(Unknown) What is unknown? What is the problem asking, missing information) How much does she earn in an hour? How much does she earn in 22 hours?
Method What methods/strategies could I use to solve the problem? Why? Method #1: First, find how much she is paid in *one* hour:  $305.90 ÷ 19 hours = $16.10 per hour Use this to find how much she earns in 22 hours:  $16.10 per hour × 22 hours = $354.20 She would make $354.20 if she worked 22 hours. Method #2: Set up a proportion and solve: $\frac{\text{dollars}}{\text{hours}} = \frac{\text{dollars}}{\text{hours}}$ $\frac{305.9}{19} = \frac{x}{22}$ We don't know how many dollars for 22 hours– call it x $305.9 \cdot 22 = 19 \cdot x$ "Cross multiply" $6729.8 = 19x$ $\frac{6729.8}{19} = \frac{19x}{19}$ Undo multiplication by dividing both sides by 19 $354.2 = x$ She would make $354.20 if she worked 22 hours.	***ANSWER*** Answer the question/Solve the problem $354.20

Unit 3- Measuring Circles

Learning Target: Find the perimeter of the figure.
Standards:

> **7.G.B.4**Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

Materials Needed: post -it, marker, ruler, easel paper, coloring materials
Time of Implementation: 5-8 minutes
Body Movement Involved: drawing, talking, walking, coloring

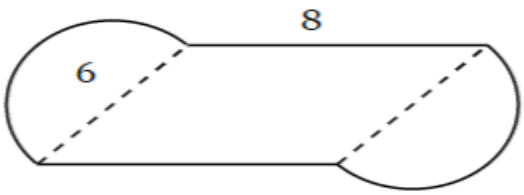
Procedure:

1. The teacher will post the instructions on the deck.
2. The instructions are as follows:
    a. Work by pair or trio.
    b. Work only with the person close to you.
    c. Assign a recorder, materials provider, and reporter
    d. Get the materials to the teacher.
    e. They will post their work after they solve the problem.
3. The teacher will post the problem on the slide deck.
    a. Ask the students to color the circle RED and color the parallelogram yellow.
    b. Recall the formula of circumference of the circle.
4. Require the students to illustrate their answers.
5. The teacher will facilitate the activity using the 'Say-Ask-Check' of Montague. During this step, I asked my students to do the talking, grouping and collaborating.
6. The teacher will ask the students to post their work on the provided area of the wall.
7. The students will be doing the gallery walk. During the gallery walk, they will write a comment about the process and the answer of the other groups.
8. The teacher will ask the following questions:
    a. What are your insights on how they solved the problem?
    b. What did you learn from the activity?

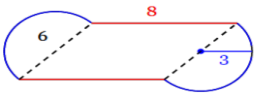
Perimeter

Problem:
Solve the problem:

Find the Perimeter of the figure below, composed of a parallelogram and two semicircles. *Round to the nearest tenths place.*



(Known) What do you know? For example: numbers, key words, given information) C= πd diameter= 8 units Perimeter means adding all sides	(Unknown) What is unknown? What is the problem asking, missing information) What is the circumference of a circle? What is the perimeter of the figure?
Method What methods/strategies could I use to solve the problem? Why?	***ANSWER*** Answer the question/Solve the problem 34. 8 units



Perimeter of the object is
the distance around the object.

Circumference of circle $= 2\pi r = 2\pi(3) = 6\pi$

Blue side of shape = Half the circumference — a semicircle has half the circumference of a full circle

Blue side of shape $= 3\pi$

$P = 8 + 8 + 3\pi + 3\pi$ — add up all sides of the shape – including two semicircles

$P = 16 + 6\pi$ — combine like terms

$P = 34.84955592153876$ — multiply and add

$P = 34.8$ — round to the nearest tenths place

The correct answer is 34.8

Area

1. The teacher will post the instructions on the deck.
2. The instructions are as follows:
    a. Work by pair or trios.
    b. Work only with the person close to you.
    c. Assign a recorder, materials provider, and reporter
    d. Get the materials to the teacher.
    e. They will post their work after they solve the problem.

3. The teacher will post the problem on the slide deck.
    a. Ask the students to color the circle RED and color the parallelogram yellow.
    b. Recall the formula of the area of the circle and rectangle.

4. Require the students to illustrate their answers.

5. The teacher will facilitate the activity using the 'Say-Ask-Check' of Montague. During this step, I asked my students to do the talking, grouping, and collaborating.

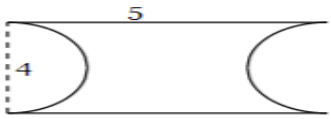
6. The teacher will ask the students to post their work on the provided area of the wall.

7. The students will be doing the gallery walk. During the gallery walk, they will write a comment about the process and the answer of the other groups.

8. The teacher will ask the following questions:
    a. Using What are your insights on how they solved the problem?
    b. What did you learn from the activity?

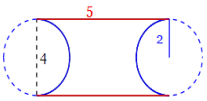
Problem:
Solve the problem:

Find the Area of the figure below, composed of a rectangle with two semicircles removed. *Round to the nearest tenths place.*



Source: DeltaMath

(Known) What do you know? For example numbers, key words, given information)	(Unknown) What is unknown? What is the problem asking, missing information)
Method What methods/strategies could I use to solve the problem? Why?	***ANSWER*** Answer the question/Solve the problem 7.4 square units



The Area of the object is
the space inside a Two Dimensional object.

Area of circle $= \pi r^2 = \pi(2)^2 = 4\pi$

Area of Semicircle = Half the Area of a Circle — a semicircle has half the area of a full circle

Area of Semicircle $= 2\pi$

Area of Rectangle $= lw = (5)(4) = 20$

$A = 20 - 2\pi - 2\pi$ — subtract the area of the missing semicircles from the area of the rectangle

$A = 20 - 4\pi$ — combine like terms

$A = 7.433629385641$ — multiply and subtract

$A = 7.4$ — round to the nearest tenths place

The correct answer is 7.4

Unit 4- Proportional Relationship and Percentages

Learning Target: Find the part of a whole using percent
Standards:

7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems.

Materials Needed: post-it, marker, ruler, highlighter
Time of Implementation: 5-8 minutes
Body Movement Involved: drawing, talking, walking, coloring

Procedure:

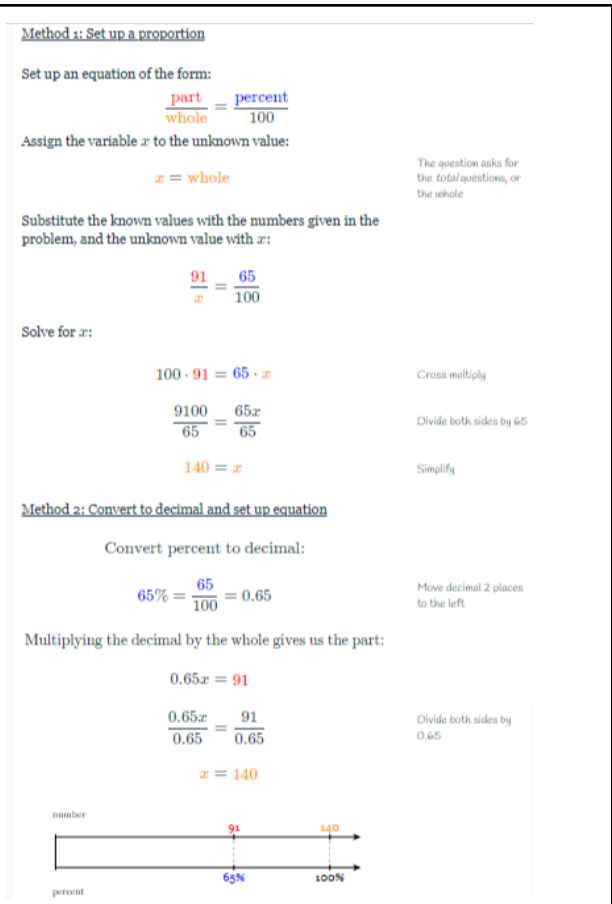
1. The teacher will post the instructions on the deck.
2. The instructions are as follows:
    a. Work by pair or trio.
    b. Work only with the person close to you.
    c. Assign a recorder, materials provider, and reporter
    d. Get the materials to the teacher.
    e. They will post their work after they solve the problem.

3. The teacher will post the problem on the slide deck. They need to read their printed paper.
    a. Ask them to highlight the words they perceived as essential for them to to solve the problem.
4. Require the students to illustrate their answers. They may use number lines or blocks.
5. The teacher will facilitate the activity using the 'Say-Ask-Check' of Montague. During this step, I asked my students to do the talking, grouping and collaborating.
6. The teacher will ask the students to post their work on the provided area of the wall.
7. The students will be doing the gallery walk. During the gallery walk, they will write a comment about the process and the answer of the other groups.
8. The teacher will ask the following questions:
    a. Using What are your insights on how they solved the problem?
    b. What did you learn from the activity?

Solving Problem with Percent

Problem: Solve the problem: Mariana answered 91 questions correctly on her multiple-choice science final and earned a grade of 65%. How many total questions were on the final exam? Source: DeltaMath

(Known) What do you know? For example: numbers, key words, given information) Mariana answered 91 questions correctly This is equal to 65%	(Unknown) What is unknown? What is the problem asking, missing information) How many total questions were on the final exam?
Method What methods/strategies could I use to solve the problem? Why?	***ANSWER*** Answer the question/Solve the problem 140

Percent Increase/Decrease

Unit 4- Proportional Relationship and Percentages

Learning Target: Find the part of a whole using percent
Standards:

7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems.

Materials Needed: post it, marker, ruler, easel paper, coloring materials
Time of Implementation: 5-8 minutes
Body Movement Involved: drawing, talking, walking, coloring

Procedure:

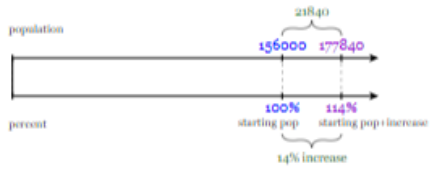
1. The teacher will post the instructions on the deck.
2. The instructions are:
    a. Work by pair or trio.

b. Work only to the person close to you.
c. Assign a recorder, materials provider and reporter
d. Get the materials to the teacher.
e. They will post their work after they solve the problem.

3. The teacher will post the problem on the slide deck.
    a. Ask the students to recall the formula of writing and converting decimal to percent.
4. Require the students to illustrate their answers.
5. The teacher will facilitate the activity using the 'Say-Ask-Check' of Montague. During this step, I asked my students to do the talking, grouping and collaborating.
6. The teacher will ask the students to post their work on the provided area of the wall.
7. The students will be doing the gallery walk. During the gallery walk, they will write a comment about the process and the answer of the other groups.
8. The teacher will ask the following questions:
    a. What are your insights on how they solved the problem?
    b. What did you learn from the activity?

Problem: One year, the population of a city was 156,000. Several years later it was 177,840. and the percent increase.

(Known) What do you know? For example: numbers, key words, given information) 156, 000→ population in a year 177, 000→ Population after several years	(Unknown) What is unknown? What is the problem asking, missing information) How much is the difference? What is percent increase?
Method What methods/strategies could I use to solve the problem? Why?	***ANSWER*** Answer the question/Solve the problem

100% represents the starting population: 156000. Method 1 Express the ending population as a percentage of the starting population: $\frac{177840}{156000} = 1.14$ $1.14 \times 100 = 114\%$ Subtract the starting 100% to get the percent increase: $114\% - 100\% = \boxed{14\%}$ Method 2 Find the increase in population: $177840 - 156000 = 21840$ Express the increase in population as a percentage of the starting population: $\frac{21840}{156000} = 0.14$ $0.14 \times 100 = \boxed{14\%}$ 	14%

Unit 5- Rational Arithmetic Number

Learning Target: Solve for the rate involving complex fractions.
Standards:

NS.A.3 Solve real-world and mathematical problems involving the four operations with rational numbers. Computations with rational numbers extend the rules for manipulating fractions to complex fractions.

Materials Needed: post-it, marker, ruler, easel paper, coloring materials
Time of Implementation: 5-8 minutes
Body Movement Involved: drawing, talking, walking, coloring

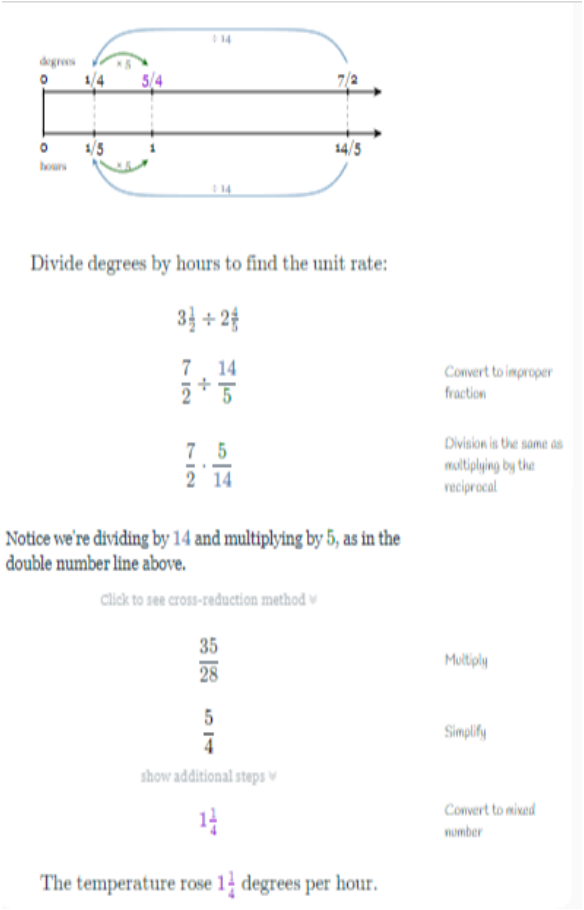
Procedure:

1. The teacher will post the instructions on the deck.

2. The instructions are as follows:
    a. Work by pair or trio.
    b. Work only with the person close to you.
    c. Assign a recorder, materials provider, and reporter
    d. Get the materials to the teacher.
    e. They will post their work after they solve the problem.
3. The teacher will post the problem on the slide deck.
    a. Ask the students to recall the algorithms of multiplying and dividing numbers.
4. Require the students to illustrate their answer.
5. The teacher will facilitate the activity using the 'Say-Ask-Check' of Montague. During this step, I asked my students to do the talking, grouping and collaborating.
6. The teacher will ask the students to post their work on the provided area of the wall.
7. The students will be doing the gallery walk. During the gallery walk, they will write a comment about the process and the answer of the other groups.
8. The teacher will ask the following questions:
    c. What are your insights on how they solved the problem?
    d. What did you learn from the activity?

Problem: Hunter conducted a scientific experiment. For a certain time, the temperature of a compound rose $3\frac{1}{2}$ degrees every $2\frac{4}{5}$ hours. What was the rate, in degrees per hour, that the temperature of the compound rose? Enter your answer as a whole number, proper fraction, or mixed number in simplest form. Source: DeltaMath

(Known) What do you know? For example: numbers, key words, given information) Temperature rose 3 ½ degrees every 2 ⅘ hours	(Unknown) What is unknown? What is the problem asking, missing information) What is the rate per hour?
Method What methods/strategies could I use to solve the problem? Why?	***ANSWER*** Answer the question/Solve the problem

	1 ¼ degrees per hour

Unit 6- Expressions, Equations, and Inequalities

Learning Target: Solve word problems involving equation.
Standards:

7.EE.B.4.a Solve word problems leading to equations of the form px+ q=r and p(x+q)=r , where p, q, and r are specific rational numbers.

Materials Needed: post-it, marker, ruler, easel paper
Time of Implementation: 5-8 minutes
Body Movement Involved: drawing, talking, walking, coloring

Procedure:

1. The teacher will post the instructions on the deck.
2. The instructions are as follows:
    a. Work by pair or trio.
    b. Work only with the person close to you.

c. Assign a recorder, materials provider, and reporter
d. Get the materials to the teacher.
e. They will post their work after they solve the problem.

3. The teacher will post the problem on the slide deck.
    a. Ask the students to use post - it in labeling work or illustrate their

4. Require the students to illustrate their answers.

5. The teacher will facilitate the activity using the 'Say-Ask-Check' of Montague. During this step, I asked my students to do the talking, grouping and collaborating.

6. The teacher will ask the students to post their work on the provided area of the wall.

7. The students will be doing the gallery walk. During the gallery walk, they will write a comment about the process and the answer of the other groups.

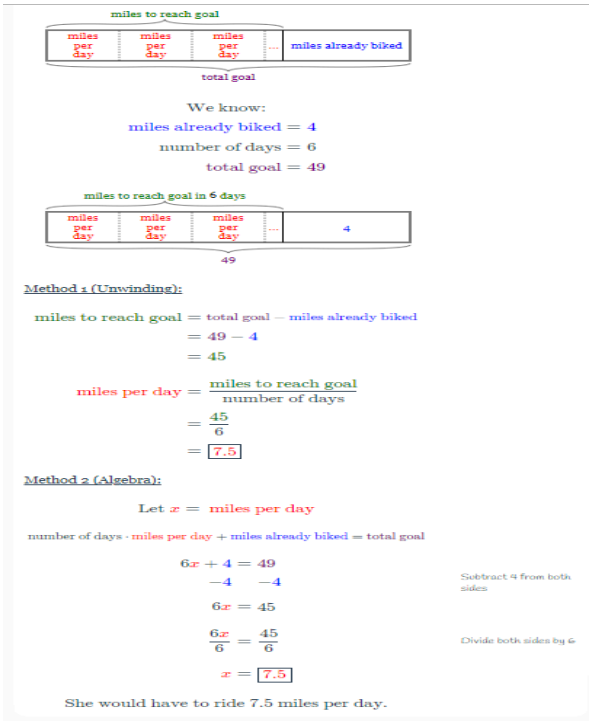
8. The teacher will ask the following questions:
    a. What are your insights on how they solved the problem?
    b. What did you learn from the activity?

Equations

Problem: Ruby wants to ride her bicycle 49 miles this week. She has already ridden 4 miles. If she rides for 6 more days, what is the average number of miles she would have to ride each day to meet her goal?

(Known) What do you know? For example, numbers, keywords, and given information) Riding a bicycle for 49 miles this week 4 miles driven last week She will be riding a bike for 6 more days.	(Unknown) What is unknown? What is the problem asking, missing information) How much does he cover if he lessened the miles last week? What is the average goal for 6 more days?

Method What methods/strategies could I use to solve the problem? Why?	***ANSWER*** Answer the question/Solve the problem 7.5 miles per day



Learning Target: Find the part of a whole using percent
Standards:

> **7.EE.B.4.a**Solve word problems leading to equations of the form px+ q>r or px+ q<r , where p, q, and r are specific rational numbers.

Materials Needed: post, marker, ruler, easel paper
Time of Implementation: 5-8 minutes
Body Movement Involved: drawing, talking, walking

Procedure:

1. The teacher will post the instructions on the deck.
2. The instructions are as follows:
    a. Work by pair or trio.
    b. Work only with the person close to you.
    c. Assign a recorder, materials provider, and reporter
    d. Get the materials to the teacher.

e. They will post their work after they solve the problem.

3. The teacher will post the problem on the slide deck.

4. Require the students to illustrate their answers.

5. The teacher will facilitate the activity using the 'Say-Ask-Check' of Montague. During this step, I asked my students to do the talking, grouping and collaborating.

6. The teacher will ask the students to post their work on the provided area of the wall.

7. The students will be doing the gallery walk. During the gallery walk, they will write a comment about the process and the answer of the other groups.

8. The teacher will ask the following questions:

   a. What are your insights on how they solved the problem? Let them justify their answer, especially by counting the people. Then, the decimal value is computed, and the actual number should be processed.

   b. What did you learn from the activity?

Problem: A group of friends wants to go to the amusement park. They have **at most** $105 to spend on parking and admission. The parking is $16.25, and tickets cost $12.50 per person, including tax. Write and solve an inequality that can be used to determine *p* the number of people who can go to the amusement park. Source: DeltaMath)

(Known) What do you know? For example numbers, keywords, and given information)	(Unknown) What is unknown? What is the problem asking, missing information)
They have **at most** $105 to spend on parking and admission. Parking is $16.25, and tickets cost $12.50 per person, including tax.	About how many people can go to the amusement park

Method What methods/strategies could I use to solve the problem? Why?	***ANSWER*** Answer the question/Solve the problem `p ≤ 7.1 or (0, 1, 2, 3, 4, 5, 6, and 7)`

We know:

parking cost = $16.25

cost per person = $12.50

total to spend = $105

number of people = p

Inequality:

"**No more than**" means they can also spend *less* than $105, so we will use the $\leq$ ("less than or equal to") symbol:

cost per person · # of people + parking cost $\leq$ total to spend

$$\boxed{12.5p + 16.25 \leq 105}$$

Solve:

$$12.5p + 16.25 \leq 105$$

$$-16.25 \quad -16.25$$ Subtract 16.25 from both sides

$$12.5p \leq 88.75$$

$$\frac{12.5p}{12.5} \leq \frac{88.75}{12.5}$$ Divide both sides by 12.5

$$p \leq 7.1$$

Answers:

Inequality: $12.5p + 16.25 \leq 105$

Answer: $p \leq 7.1$

Unit 7- Angles, Triangles, and Prisms

Learning Target: Find the part of a whole using percent

Standards:

7. G.B.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

Materials Needed: post-it, marker, ruler, easel paper, coloring materials

Time of Implementation: 5-8 minutes

Body Movement Involved: drawing, talking, walking, coloring

Procedure:

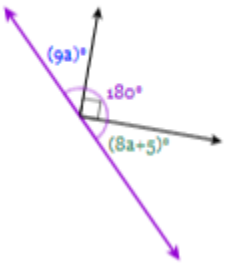
1. The teacher will post the instructions on the deck.
2. The instructions are as follows:
    a. Work by pair or trio.
    b. Work only with the person close to you.

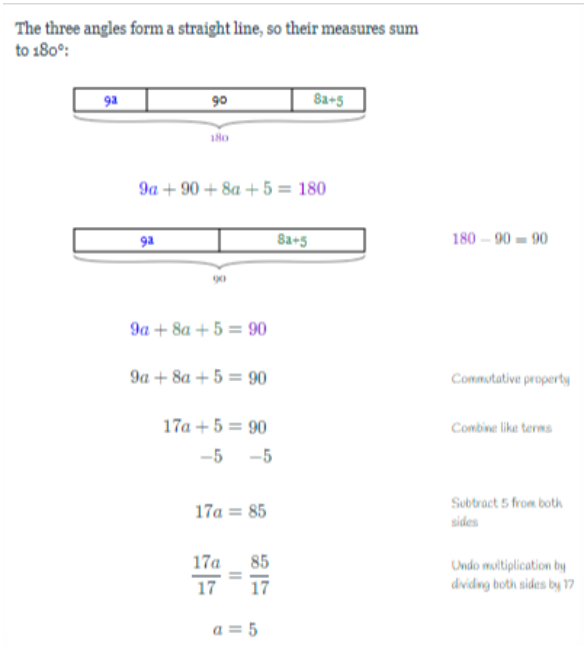
c. Assign a recorder, materials provider, and reporter
d. Get the materials to the teacher.
e. They will post their work after they solve the problem.

3. The teacher will post the problem on the slide deck.
   b. Ask the students to recall the definition of supplementary, complementary, and right angles. Then, they will be asked to act it out and move to show these angles.
   c. On a piece of paper, ask them to color the lines/angles they are solving.
4. Require the students to illustrate their answers.
5. The teacher will facilitate the activity using the 'Say-Ask-Check' of Montague. During this step, I asked my students to do the talking, grouping and collaborating.
6. The teacher will ask the students to post their work on the provided area of the wall.
7. The students will be doing the gallery walk. During the gallery walk, they will write a comment about the process and the answer of the other groups.
8. The teacher will ask the following questions:
   a. What are your insights on how they solved the problem? Emphasize checking and validating answers.
   b. What did you learn from the activity?

Problem:

Solve for the value of a.



(Known) What do you know? For example, numbers, keywords, given information) Definition of supplementary angles, complementary angles, right angle	(Unknown) What is unknown? What is the problem asking, missing information) Solve for a.
Method What methods/strategies could I use to solve the problem? Why?  	***ANSWER*** Answer the question/Solve the problem a= 5

Triangles

Learning Target: Solve for the missing value of a triangle.

Standards:

7. G.A.2 Draw (freehand, ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

Materials Needed: post-it, marker, ruler, easel paper, coloring materials
Time of Implementation: 5-8 minutes
Body Movement Involved: drawing, talking, walking, coloring

Procedure:

1. The teacher will post the instructions on the deck.
2. The instructions are as follows:
    a. Work by pair or trio.
    b. Work only with the person close to you.
    c. Assign a recorder, materials provider, and reporter
    d. Get the materials to the teacher.
    e. They will post their work after they solve the problem.
3. The teacher will post the problem on the slide deck.
    a. Ask the students to recall the types of triangles using body movements. Then, they will create or form shapes using their body.
    b. On a paper, ask them to color the lines/angles they are solving.
4. Require the students to illustrate their answer.
5. The teacher will facilitate the activity using the 'Say-Ask-Check' of Montague. During this step, I asked my students to do the talking, grouping and collaborating.
6. The teacher will ask the students to post their work on the provided area of the wall.
7. The students will be doing the gallery walk. During the gallery walk, they will write a comment about the process and the answer of the other groups.
8. The teacher will ask the following questions:
    a. What are your insights on how they solved the problem? Emphasize checking and validating answers.
    c. What did you learn from the activity?

Problem:

The measures of the angles of a triangle are shown in the figure below. Solve for x.

(Known) What do you know? For example: numbers, key words, given information) The sum of the interior angle of a triangle is 180	(Unknown) What is unknown? What is the problem asking, missing information) What is the value of x?
Method What methods/strategies could I use to solve the problem? Why? The angles of a triangle sum to 180°:  $x + 59 + 78 = 180$ Equivalently, $x = 180 - 59 - 78$ $x = 43$	***ANSWER*** Answer the question/Solve the problem x=43

Prisms

Learning Target: Solve for the volume of a prism

Standards:

> **G.B.6**Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Materials Needed: post it, marker, ruler, easel paper, coloring materials, paper cylinders
Time of Implementation: 8-10 minutes
Body Movement Involved: drawing, talking, walking, coloring, cutting

Procedure:

1. The teacher will post the instructions on the deck.

2. The instructions are as follows:
    a. Work by pair or trio.
    b. Work only with the person close to you.
    c. Assign a recorder, materials provider and reporter
    d. Get the materials to the teacher.
    e. They will show their work after they solve the problem.
3. The teacher will post the problem on the slide deck.
    a. Ask the students to cut label the base and height of the cylinder.
    b. Recall the formula of the area of the circle. Instruct them to color and shade the bottom part and the circle.
4. Require the students to illustrate their answer.
5. The teacher will facilitate the activity using the 'Say-Ask-Check' of Montague. during this step, I asked my students to do the talking, grouping and collaborating.
6. The teacher will ask the students to post their work on the provided area of the wall.
7. The students will be doing the gallery walk. during the gallery walk, they will write a comment about the process and the answer of the other groups.
8. The teacher will ask the following questions:
    a. What are your insights on how they solved the problem?
    b. What did you learn from the activity?

Problem: A cylinder has a base diameter of 14 meters and a height of 14 meters. What is its volume in cubic meters, *to the nearest tenths place*? Source: DeltaMath)

(Known) What do you know? For example: numbers, key words, given information) A cylinder has a base diameter of 14 meters and a height of 14 meters.	(Unknown) What is unknown? What is the problem asking, missing information) What is the area of the circle? What is the volume?
Method What methods/strategies could I use to solve the problem? Why?	***ANSWER*** Answer the question/Solve the problem

$h = 14 \quad d = 14$ identify variables $r = 7$ radius is half of the diameter $V = \pi r^2 h$ use volume of a cylinder formula $V = \pi(7)^2(14)$ substitute variables into formula $V = 2155.132560362598$ multiply $V = 2155.1 \text{ meters}^3$ round to the nearest tenths place	2155.10 cubic meters

Unit 8- Probability and Sampling
Learning Target: Find the probability of the event
Standards:

> **7.SP.C.7.a**Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events

Materials Needed: post it, marker, ruler, easel paper, coloring materials
Time of Implementation: 5-8 minutes
Body Movement Involved: drawing, talking, walking, coloring

Procedure:

1. The teacher will post the instructions on the deck.
2. The instructions are as follows:

a. Work by pair or trio.
b. Work only with the person close to you.
c. Assign a recorder, materials provider, and reporter
d. Get the materials to the teacher.
e. They will post their work after they solve the problem.

3. The teacher will post the problem on the slide deck.
4. Require the students to illustrate their answer.
5. The teacher will facilitate the activity using the 'Say-Ask-Check' of Montague. During this step, I asked my students to do the talking, grouping and collaborating.
6. The teacher will ask the students to post their work on the provided area of the wall.
7. The students will be doing the gallery walk. During the gallery walk, they will write a comment about the process and the answer of the other groups.
8. The teacher will ask the following questions:
    a. What are your insights on how they solved the problem? Emphasize the importance of eliminating the not-important given.
    b. What did you learn from the activity?

Problem:

Ellie recorded the grade-level and instrument of everyone in the middle school School of Rock below.

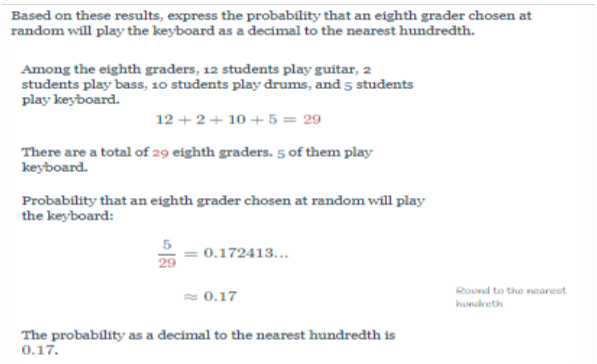
Seventh Grade Students

Instrument	# of Students
Guitar	14
Bass	8
Drums	10
Keyboard	2

Eighth Grade Students

Instrument	# of Students
Guitar	12
Bass	2
Drums	10
Keyboard	5

Based on these results, express the probability that an eighth grader chosen at random will play the keyboard as a decimal to the nearest hundredth.

(Known) What do you know? For example: numbers, key words, given keywords on and) For grade 8 students: Guitar-12 Bass-2 Drums-10 Keyboard-5	(Unknown) What is unknown? What is the problem asking, missing information) What is the total number of grade 8 students? Do we need the table for grade 7 students?
Method What methods/strategies could I use to solve the problem? Why?  Based on these results, express the probability that an eighth grader chosen at random will play the keyboard as a decimal to the nearest hundredth. Among the eighth graders, 12 students play guitar, 2 students play bass, 10 students play drums, and 5 students play keyboard. $12 + 2 + 10 + 5 = 29$ There are a total of 29 eighth graders. 5 of them play keyboard. Probability that an eighth grader chosen at random will play the keyboard: $\frac{5}{29} = 0.172413\ldots$ ≈ 0.17 Round to the nearest hundredth The probability as a decimal to the nearest hundredth is 0.17.	***ANSWER*** Answer the question/Solve the problem 0.17

Resources

For Teachers

Montague, M. (1992). *Response to Intervention | Math | Math Problem Solving*. Intervention Central. Retrieved November 15, 2022, from https://www.interventioncentral.org/academic-interventions/math/math-problem-solving-combining-cognitive-metacognitive-strategies

This reading from a website has a complete set of information on how to help students think mathematically and solve math problems. With the different contexts and procedures in teaching mathematics, developing metacognitive skills is emphasized by this reading. It gives a vivid picture on how to conductofialogue with the learners to become effective problem solvers.

NZMaths. (n.d.). *Problem Solving Strategies*. NZmaths. https://nzmaths.co.nz/problem-solving-strategies

This reading primarily focuses on teaching strategies. This reading simplified the approach in solving word ptoblems. It gives different situations and opportunities to utilize the different apps.

For Students and Teachers

Deltamath

This is an open resource where students can practice their mathematical skills. This resource is helpful in develops develop standing, procedural fluency, and strategic competence. It assists the learners to learn independently.

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