

Appendix A – Parental and Student Consent Form

Dear Parent/ Guardian:

Invitation

Your child is invited to participate in a research study entitled, “Exploring the Use of Blogging on Mathematical Communication in Grade Nine Classrooms”. This form outlines the purpose of the study, provides a brief description of what the study involves and describes your child’s rights as a participant. It also includes a consent section.

Participating in this research study is completely voluntary. There is no impact on course success or marks if your child chooses not to participate.

Tracy Murray, a graduate student in the Faculty of Education, at the University of Ontario Institute of Technology (UOIT), is the principal investigator for this study.

Purpose of the Study

Writing in mathematics class has the potential to increase mathematical knowledge, thinking and communication. Blogging is one strategy that can be used to include writing in the mathematics classroom. The blogging site Kidblog (kidblog.org) will be used in this study. The purpose of this study is to,

1. Assess the impact of bogging on grade nine students’ communication of mathematical thinking, mathematical knowledge, and confidence in mathematics.
2. Assess students’ attitudes towards using blogging in mathematics class, and examine if any gender differences exist.

Methodology

During three math units your child will be asked to engage in mathematical conversations on the blog. Your child will be given time each week in class to write on the blog, but they will also be required to access the blog outside of class as part of their homework. Your child will also complete pre- and post- tests at the start and end of each unit. These activities will be part of the regular classroom curriculum and will be completed by all students. However, only those students who have consent for the research study will have their work collected and analyzed by the researcher. Students who have consent for the research study will also complete surveys at the start and end of the study, which will ask questions around confidence in mathematics, and attitudes towards blogging. All activities will be run and monitored by your child’s classroom teacher. The activities are listed in the table.

| Activity | Who Completes the Activity? | Time to Complete Activity? |
|----------------------------------|---|---|
| Demographics Survey | Students with consent only. | 10 minutes |
| Mathematics Confidence Survey | Students with consent only. | 10 minutes |
| Pre- and Post- Tests | All students. Students with consent will have their results given to the researcher. | 15 minutes/ test |
| Blogging | All students. Students with consent will have their results given to the researcher. | 15 minutes of class time. 30 minutes outside of class. |
| Attitudes Toward Blogging Survey | Students with consent only. | 10 minutes |

Benefits of Participation

Your child will gain experience using a blogging platform, and thereby increase their technology skills. Your child will engage in meaningful mathematical conversations with their peers and teacher, which may increase overall success and confidence in mathematics. All tasks in this research study link directly to the curriculum expectations and therefore are an additional learning tool for students.

Potential Risk to the Participants

Your child may feel anxious during the research study if they struggle in mathematics, or if they are unfamiliar with technology/blogging. Your child may also worry about being judged by others. However, the risk of anxiety is no greater than what might be experienced on a regular school day.

Right to Withdraw and Confidentiality

Your child's participation in this study is voluntary. Your child's confidentiality will be preserved at all times. All raw data will be coded. Once all data has been coded the code key will be destroyed. Therefore, all data will be unidentifiable. All data collected will be kept on a password-protected laptop.

Your child is free to withdraw from the study at anytime, prior to the data being coded and anonymized, by informing the researcher. After this time, the data will be unidentifiable. If your child withdraws from the study any data that had been collected will be destroyed. If your child withdraws from the study they will still continue to participate in the study activities listed above, as they meet curriculum expectations. There will be no penalty if your child withdraws from the study.

Participant Concerns and Reporting

This study (REB #13-117) has been officially approved by the University of Ontario Institute of Technology Review Ethics Board on June 4, 2014, and by the Durham District School Board on June 23, 2014. If you have any questions regarding the research study please contact the researcher, Tracy Murray, at 289-385-2662 or tracy.murray@uoit.ca. If

you have any questions regarding your rights as a participant, complaints or adverse events, please contact the Compliance Office at 905-721-8668 ext. 3693.

The researcher will use the information from this study to write research reports, give presentations, and share insights with other teachers and researchers. When the study is complete a report on the findings will be available to interested parents in the school library.

If you agree to allow your child to participate in this study please sign the consent section and return to your child's classroom teacher by Mon, Oct 20, 2014.

Thank you,

Tracy Murray
Graduate Student, Department of Education, University of Ontario Institute of Technology

Exploring the Use of Blogging on Mathematical Communication in Grade Nine Classrooms Consent Form

I, (parent name- print) _____, have read the above information and I agree to have my child (student name- print) _____ be a participant in the study described. I understand I can ask questions at any time.

I, (student name- print) _____, have read the above information and I agree to participate in the study described. I understand that I can ask questions at any time.

By signing the research consent section below I give permission to participate in the research study, understanding that I can withdraw from the study at anytime without penalty.

By signing this form I do not waive any legal rights or recourse.

Parent Signature: _____ Date: _____

Student Signature: _____ Date: _____

Appendix B - Teacher Consent Form

Dear Teacher:

Invitation

You are invited to become a partner in the research study entitled, “Exploring the Use of Blogging on Mathematical Communication in Grade Nine Classrooms”. As a research partner, you would be required to make curricular adjustments to your mathematics course.

My name is Tracy Murray, and I am a graduate student at the University of Ontario Institute of Technology (UOIT). I am the principal investigator for this study.

Purpose of the Study

Writing in mathematics class has the potential to increase mathematical knowledge, thinking and communication. Blogging is one strategy that can be used to include writing in the mathematics classroom. The blogging site Kidblog (kidblog.org) will be used in this study. The purpose of this study is to,

3. Assess the impact of blogging on grade nine students’ communication of mathematical thinking, mathematical knowledge, and confidence in mathematics.
4. Assess students’ attitudes towards using blogging in mathematics class, and examine if any gender differences exist.

Methodology

During three math units your students will engage in mathematical conversations on a kidblog. Your students will be given time each week in class to write on the blog, but they will also be required to access the blog as part of their homework. Your students will also complete surveys at the start, during and end of the study, which will ask questions around confidence in mathematics, and attitudes towards blogging. Student learning will be examined through your regular pre- and post- unit tests. All activities will be run and monitored by you, the classroom teacher.

Your participation involves:

- Participating in a lesson on how to use kidblog (approximately 1 hour).
- Administering and collecting consent forms from students and parents.
- Administering and collecting surveys during the study (approximately 10 minutes per survey).
- Administering and collecting pre- and post-tests as per your usual classroom routine.
- Setting up and monitoring blogging activities for your students during the three units on kidblog.org (approximately 10 minutes of prep time each week, 15 minutes of class time each week, and 20 minutes of blog reading every other night each week). Tasks include,
 - Putting the students into groups each week.
 - Starting a new blog post each week by posting the weekly blog question.
 - Monitoring blog entries, and providing support and feedback to students as needed.

Throughout the research process you will have support from me, the researcher.

Confidentiality

All raw data collected from students will be coded and completely unidentifiable. All data collected will be kept on a password-protected laptop.

Concerns and Reporting

This study (REB #13-117) has been officially approved by the University of Ontario Institute of Technology Review Ethics Board on June 4, 2014, and by the Durham District School Board on June 23, 2014. If you have any questions regarding the research study please contact the researcher, Tracy Murray, at 289-385-2662 or tracy.murray@uoit.ca. If you have any questions regarding your rights as a participant, complaints or adverse events, please contact the Compliance Office at 905-721-8668 ext. 3693.

The researcher will use the information from this study to write research reports, give presentations, and share insights with other teachers and researchers. When the study is complete a report on the findings will be available to you in your school library.

If you agree to become a partner in this study please sign the consent section below.

Attached is a Teacher Demographic Survey, which attempts to gain information about you, the teacher, and your classroom. The data collected from this survey will be confidential. This survey is voluntary. It does not have to be completed to become a partner in this research study. If you do not wish to participate in the survey you can simply not complete it and return it blank (submitting it completed will imply your consent). You can withdrawal from the survey at any time without any penalty and ask to have your data removed. By consenting to participate, you do not waive any legal rights or recourse.

Thank you,

Tracy Murray
Graduate Student, Department of Education, University of Ontario Institute of Technology

Exploring the Use of Blogging on Mathematical Communication in Grade Nine Classrooms Consent Form

I, (teacher name- print) _____, have read the above information and I agree to become a partner in the study described. I understand that being a partner in this study will require me to make adjustments to my mathematics course. I understand that I may ask questions in the future.

By signing the consent form I give permission to become to a partner in this research study.

Signature: _____ Date: _____

Appendix C – Thank You Letter

Dear Participant,

Thank you for participating in the University of Ontario Institute of Technology study.

This study (REB # 13-117) was officially approved by the University of Ontario Institute of Technology Review Ethics Board on June 4, 2014, and by the Durham District School Board on June 23, 2014. If you have any questions regarding the research study please contact the researcher, Tracy Murray, at 289-385-2662 or tracy.murray@uoit.ca. If you have any questions regarding your rights as a participant, complaints or adverse events, please contact the Compliance Office at 905-721-8668 ext. 3693.

You are free to withdraw from the study at anytime, prior to the data being coded and anonymized, by informing the researcher. After this time, the data will be unidentifiable. If you withdraw from the study any data that had been collected will be destroyed. There will be no penalty if you withdraw from the study.

The researcher will use the information from this study to write research reports, give presentations, and share insights with other teachers and researchers. When the study is complete a report on the findings will be available to interested parties in the school library.

Thank you

Tracy Murray
Graduate Student
Department of Education
University of Ontario Institute of Technology

Appendix D - Participant Demographics Survey

This survey is to provide background knowledge about the participant, and therefore is filled out by the participant.

Child's Name: _____

Age: _____ **D.O.B. (mm, dd, yy):** _____

Gender: Female Male

1. How frequently do you have access to the internet at home?
(Never, Rarely, Sometimes, Often, Always)
2. How comfortable are you with school-based technology (i.e. technology used at school)?
(Not at all comfortable, Somewhat comfortable, Comfortable, Very Comfortable)
3. How comfortable are you with blogging?
(Not at all comfortable, Somewhat comfortable, Comfortable, Very Comfortable)

Appendix E - Teacher Demographics Survey

This survey is to provide background knowledge about the teacher and their classroom.

Teacher's Name: _____

1. Years of teaching experience: _____
2. Years of experience teaching Grade 9: _____
3. Years of experience teaching mathematics: _____
4. How comfortable are you with teaching mathematics?
(Not at all comfortable, Somewhat comfortable, Comfortable, Very comfortable)
Please explain your selection. _____
5. How comfortable are you with using technology?
(Not at all comfortable, Somewhat comfortable, Comfortable, Very comfortable)
6. How comfortable are you with using technology in your classroom?
(Not at all comfortable, Somewhat comfortable, Comfortable, Very comfortable)
7. Please rate your experience level with blogging.
(No experience, Little experience, Some experience, Lots of experience)
8. a) Complete the table below to list the technology that is available in your classroom.
Please add any items that are not listed.

| Item | Yes (Y) or No (N) | Number Available |
|------------------|-------------------|------------------|
| Laptop | | |
| Desktop Computer | | |
| LCD projector | | |
| Smartboard | | |
| | | |

- b) Please rate the level of technological support at your school.
(No support, Poor, Fair, Good, Excellent)
- c) What is your overall experience with using technology at your school?

Appendix F – Participant Confidence in Mathematics Survey

Name: _____

Instruction

Please select a number indicating how much you agree or disagree with each of the following statements.

Please fill out the questions below about your confidence in mathematics.

| | Strongly Disagree 1 | Disagree 2 | Neutral 3 | Agree 4 | Strongly Agree 5 |
|--|--------------------------------------|-----------------------------|----------------------------|--------------------------|-----------------------------------|
| a. I like mathematics. | 1 | 2 | 3 | 4 | 5 |
| b. I am good at mathematics. | 1 | 2 | 3 | 4 | 5 |
| c. I speak up and share my ideas in mathematics class. | 1 | 2 | 3 | 4 | 5 |
| d. I always try my best in mathematics class. | 1 | 2 | 3 | 4 | 5 |
| e. I speak up and get assistance in mathematics class. | 1 | 2 | 3 | 4 | 5 |
| f. I am confident in my mathematic skills. | 1 | 2 | 3 | 4 | 5 |

g) Why do you like math?

h) Why do you dislike math?

i) Overall, how confident are you in math? Please explain.

Appendix G - Participant Attitudes Toward Blogging Survey

Name: _____

1. Please fill out the questions below on your attitudes toward blogging in mathematics, by selecting a number to indicate how much you agree or disagree with each statement.

| | Strongly Disagree 1 | Disagree 2 | Neutral 3 | Agree 4 | Strongly Agree 5 |
|---|------------------------------------|-----------------------|----------------------|--------------------|---------------------------------|
| a) The blogging site was easy to access. | 1 | 2 | 3 | 4 | 5 |
| b) The blogging site was easy to navigate. | 1 | 2 | 3 | 4 | 5 |
| c) I was comfortable sharing my ideas on the blogging site. | 1 | 2 | 3 | 4 | 5 |
| d) I found the blogging site a useful learning resource. | 1 | 2 | 3 | 4 | 5 |
| e) I used the blogging site regularly on my own time. | 1 | 2 | 3 | 4 | 5 |
| f) I enjoyed using the blogging site in mathematics class. | 1 | 2 | 3 | 4 | 5 |

g) What did you like about using the blog in mathematics class?

h) What did you dislike about using the blog in mathematics class?

Appendix H – Academic Knowledge Test

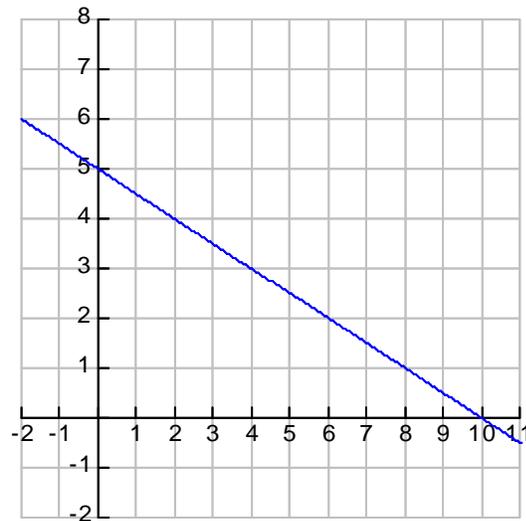
Unit 1: Slope

1. Calculate the slope between the following points without graphing. Reduce, if necessary.

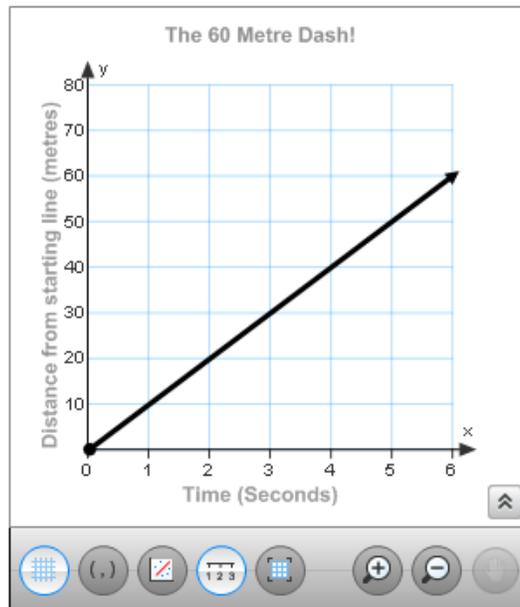
A(-3, 4), B(7, -6)

2. Describe the following graph by filling in the table with points that satisfy the line and by creating an equation.

| x | y |
|-----|-----|
| | |
| | |
| | |
| | |
| | |



3. Below is a graph showing William's performance on the 60 metre dash.
 - a) How fast is William running?
 - b) How long did it take him to finish the race?



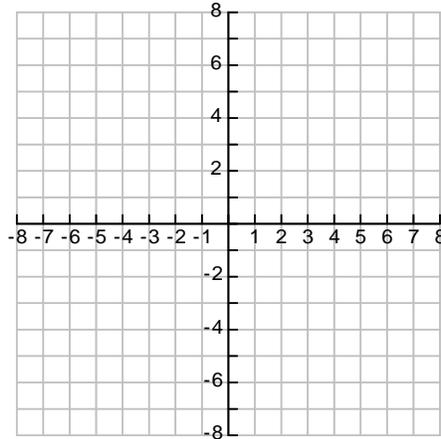
Unit 2: Linear Relationships

1. Graph the following line on the grid below by plotting the x and y intercepts. SHOW YOUR CALCULATIONS. State the intercepts as ordered pairs.

$$3x + 2y - 12 = 0$$

x-int: (,)

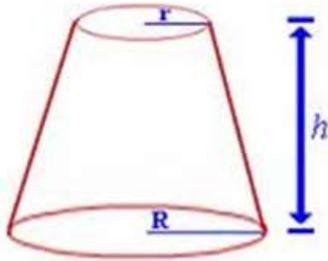
y-int: (,)



2. Determine the equation of the line that goes through $C(4, -5)$ and is parallel to the line $2x - 10y + 90 = 0$

Unit 3: Measurement- Optimization

1. The object below is called a frustum. If $r = 8$ cm, $h = 20$ cm, and $R = 12$ cm, can you find its surface area?



hint: Extend the frustum until you create a cone. Then use proportions to find out total height of cone.

2. What is the maximum area of a rectangular horse paddock that can be enclosed with 160 m of fencing in each case? Draw a sketch of each situation.
- The yard is enclosed on all four sides.
 - The yard is enclosed on three sides.

Appendix I – Applied Knowledge Tests

Unit 1: Rates & Ratios

1. Complete the following table:

| <i>Fraction in lowest terms</i> | <i>Decimal</i> | <i>Percent</i> |
|---------------------------------|----------------|----------------|
| $\frac{3}{32}$ | | |
| | 0.45 | |

2. Alice bought 17 apples for \$6.75. How many apples can he buy for \$27.00?
3. Adam wanted to buy a shirt. It was regularly \$67.00, but is on sale for 20% off. What is the sale price of the shirt?

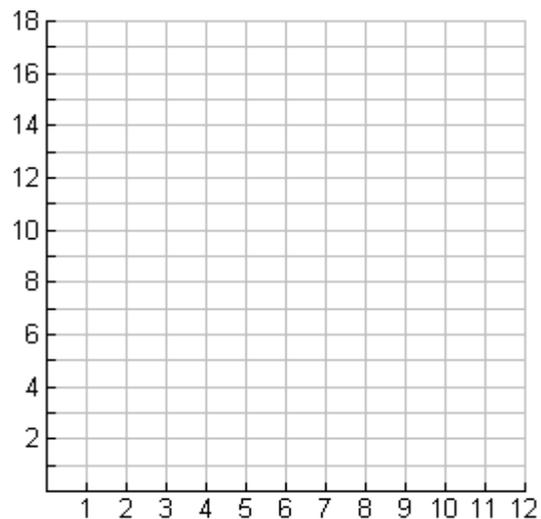
Unit 2: Patterning

1. Find the first differences and then state the equation for this relationship.

| Time (seconds) | Distance (m) |
|----------------|--------------|
| 0 | 90 |
| 1 | 80 |
| 2 | 60 |
| 3 | 30 |
| 4 | -10 |

2. Graph the relation from the table of values below. **Label both axis!** Draw the line (or curve) of best fit for the data.

| x | y |
|-----|-----|
| 9 | 1.5 |
| 2 | 9 |
| 10 | 1 |
| 8 | 2 |
| 0 | 17 |
| 4 | 5 |
| 11 | 0.5 |

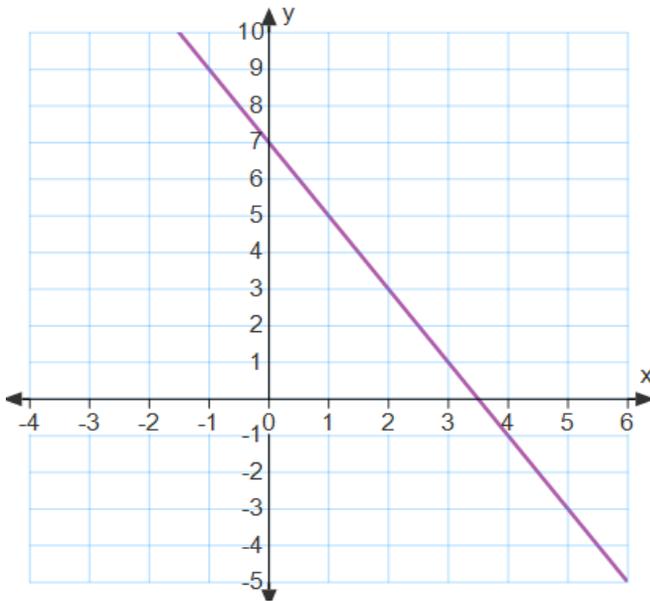


Unit 3: Linear Relationships

1. a) Determine the pattern rule for the pattern represented by this table of values.
- b) Predict the number of tiles in the 10th position of this pattern.

| position number, x | number of tiles, y |
|-------------------------|-------------------------|
| 1 | 8 |
| 2 | 16 |
| 3 | 24 |

2. Fill in the table of values and then create the equation that represents the line.



| x | y |
|-----|-----|
| | |
| | |
| | |
| | |
| | |

a)

Appendix J- Academic Blogging Questions

Topic #1: Slope

| Question 1: Closed | Question 2: Open-ended | | | | | | | | |
|--|---|----------------|--------|------|--------|------|--------|------|--|
| <p>Hannah's total pay includes a base salary and a percent of her sales.</p> <p>The following table shows her total pay for three different sales levels.</p> <table border="1" data-bbox="306 693 706 940"> <thead> <tr> <th>Sales (\$)</th> <th>Total pay (\$)</th> </tr> </thead> <tbody> <tr> <td>15 000</td> <td>1700</td> </tr> <tr> <td>17 500</td> <td>1825</td> </tr> <tr> <td>28 000</td> <td>2350</td> </tr> </tbody> </table> <p>Determine Hannah's total pay when her sales are \$47 000.</p> <p>Justify your answer by showing work.</p> | Sales (\$) | Total pay (\$) | 15 000 | 1700 | 17 500 | 1825 | 28 000 | 2350 | <p>For safety reasons the slope of a ladder should be between 6.3 and 9.5.</p> <p>Give some circumstances where a ladder leaning on a wall would be safe for you to climb.</p> <p>Justify your thinking by showing work.</p> |
| Sales (\$) | Total pay (\$) | | | | | | | | |
| 15 000 | 1700 | | | | | | | | |
| 17 500 | 1825 | | | | | | | | |
| 28 000 | 2350 | | | | | | | | |
| <p>Teacher Prompts:</p> <ul style="list-style-type: none"> -What is slope? -How can you find slope? -What is another way to describe percent of sales? -What is Hannah's base pay? -How do you calculate the percent of something? -Can you model this question with an equation? -How can you ensure your answer is correct? | <p>Teacher Prompts:</p> <ul style="list-style-type: none"> -What is slope? -How do you calculate slope? -Can you draw a picture of a ladder on a wall? -Is there more than 1 correct answer? -What do 6.3 and 9.5 in the question represent? -What would the wall represent? -What would the distance between the wall and the foot of the ladder represent? - How far would the ladder need to be from the wall to be safe? - How far up the wall can the ladder reach to be safe? | | | | | | | | |

Topic #2: Linear Relationships

| Question 1: Closed | Question 2: Open-ended |
|---|--|
| <p>For safety reasons divers need to be aware of the pressure as they dive.</p> <p>At a depth of 4m, the pressure is 140kPa (kilopascals) and at 9m it is 190kPa.</p> <p>At what depth is the pressure double that at the surface?</p> | <p>The equation $C = 20n + 35$ represents the relationship between the cost of school volleyball uniforms, C, in dollars, and the number of uniforms ordered, n.</p> <ul style="list-style-type: none"> • The uniform company requires that the school order a minimum of 15 uniforms. • The school has a maximum of \$600 to spend on the uniforms. <p>Determine possible values for n and C in this situation.</p> <p>Show your work.</p> |
| <p>Teacher Prompts:</p> <ul style="list-style-type: none"> -What is slope? -What is a linear relationship? -Can you find the slope for this question? -Can you write an equation for this question? -What coordinates would you use in this question? -What depth is at the surface? | <p>Teacher Prompts:</p> <ul style="list-style-type: none"> -What is slope? -What is a linear relationship? -What does it mean by “possible values”? -Do you have to order 15 uniforms? -Do you have to spend all of the \$600? -Is there only 1 correct answer? -How many different answers can you come up with? -How does this situation apply to real-life? |

Topic #3: Measurement- Optimization

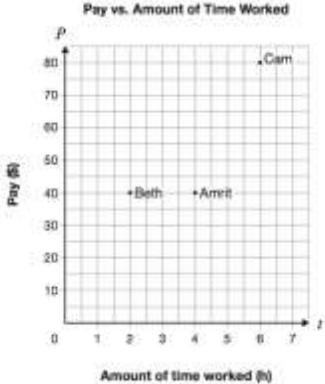
| Question 1: Closed | Question 2: Open-ended |
|---|---|
| <p>The object below is called a frustum.</p> <p>If $r = 8$ cm, $h = 20$ cm, and $R = 12$ cm, can you find its surface area?</p> <div data-bbox="365 573 690 831" data-label="Image"> </div> <p>Hint: Extend the frustum until you create a cone. Then use proportions to find out total height of cone.</p> | <p>A packaging consultant is designing a new package for selling candy. It can be any shape, but the surface area cannot be over 500cm^2.</p> <p>What shape would you make the package?</p> <p>Justify your reasoning.</p> |
| <p>Teacher Prompts:</p> <ul style="list-style-type: none"> -What is surface area? -What is the equation for SA of a cone? -What is the slant height? -What does proportions mean? -How are the cone and frustum related? -What is the different between r and R? | <p>Teacher Prompts:</p> <ul style="list-style-type: none"> -What is surface area? -What kind of things should you consider in making your choice? -What does maximize the capacity mean? -Why would you want to maximize the capacity? -Why would you choose one shape over another? -Can your answer to this question be wrong? |

Appendix K- Applied Blogging Questions

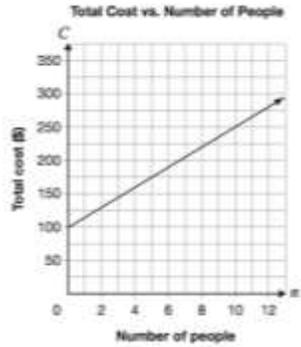
Topic #1: Rates and Ratios

| Question 1: Closed | Question 2: Open-ended |
|--|--|
| <p>Gina is buying 24 oranges. Two stores offer the following deals:</p> <ul style="list-style-type: none"> ▪ Store A: 12 oranges for \$6.48 ▪ Store B: 5 oranges for \$2.65 <p>Gina can buy oranges individually.</p> <p>How much will Gina save if she buys 24 oranges at Store B?</p> <p>Show your work.</p> | <p>Which is the better deal?</p>  <p>Justify your answer.</p> |
| <p>Teacher Prompts:</p> <ul style="list-style-type: none"> -How much does it cost for 1 single orange at each store? -What operations will you need to use in this question? -Can you represent this question as a picture? -Could you use a t-chart to solve this question? -What's the most efficient way to get the answer? | <p>Teacher Prompts:</p> <ul style="list-style-type: none"> -Are \$20 and 20% related? -How do you calculate a discount? -Can you solve for each using an example? -If running shoes cost \$89.99, which deal is better? -If a tv cost \$2367, which is the better deal? -Is there only one correct answer? -Is there is situation where \$20 off is better than 20%? (and vise versa?) |

Topic #2: Patterning

| Question 1: Closed | Question 2: Open-ended |
|---|---|
| <p>Cam, Beth and Amrit are paid at an hourly rate for their time worked.</p> <p>The graph below shows the amount paid and the time worked for these three students.</p>  <p>Determine which student is paid the highest hourly rate.</p> <p>Justify your answer.</p> | <p>Can you create a pattern for this pile of blocks?</p>  |
| <p>Teacher Prompts:</p> <ul style="list-style-type: none"> -What relationship is being shown on the graph? -What operation should you use? -Can you find out how much each person made in one hour? -Can you write an equation for each person's rate of pay? -What's the most efficient way to get the answer? | <p>Teacher Prompts:</p> <ul style="list-style-type: none"> -What is a table of values? -What would be in each column? -Can you estimate how many blocks are on the first layer? What about the top layer? -How do we estimate information? -Is there only 1 correct answer? -How many answers can you come up with? -Can you make an equation for your table of values? |

Topic #3: Linear Relationships

| Question 1: Closed | Question 2: Open-ended | | | | | | | | |
|--|--|----------------------|----|-----|----|-----|----|-----|--|
| <p>The total cost of a banquet includes a fixed fee to rent the hall and a cost per person. Information about the total cost at two different halls is shown below.</p> <p style="text-align: center;">Hall A</p> <table border="1" data-bbox="349 556 592 735"> <thead> <tr> <th>Number of people, n</th> <th>Total cost, C (\$)</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>275</td> </tr> <tr> <td>20</td> <td>450</td> </tr> <tr> <td>30</td> <td>625</td> </tr> </tbody> </table> <p style="text-align: center;">Hall B</p>  <p>Which hall's total cost includes a lower cost per person? Justify your answer.</p> | Number of people, n | Total cost, C (\$) | 10 | 275 | 20 | 450 | 30 | 625 | <p>How long will this deodorant last?</p>  |
| Number of people, n | Total cost, C (\$) | | | | | | | | |
| 10 | 275 | | | | | | | | |
| 20 | 450 | | | | | | | | |
| 30 | 625 | | | | | | | | |
| <p>Teacher Prompts:</p> <ul style="list-style-type: none"> -How do you read a table? -How do you read a graph? -What is a linear relationship? -Can you write an equation to write the relationship for hall A? Hall B? -How much does hall A cost per person? Hall B? -What operations will you use to solve this question? -How can you check that your answer is correct? | <p>Teacher Prompts:</p> <ul style="list-style-type: none"> -On average, how long does 1 stick of deodorant last? -Is there only 1 correct answer? -Do people always use the same amount of deodorant? -Could you create a table/ or graph for the relationship? -Could you write an equation for this relationship? -How many different answers can you come up with for this question? -What is a non-linear relationship? -Is deodorant use linear or non-linear? | | | | | | | | |

Appendix L - Mathematical Communication Rubric

Sample Question:

For safety reasons divers need to be aware of the pressure as they dive.

At a depth of 4m, the pressure is 140kPa (kilopascals) and at 9m it is 190kPa.

At what depth is the pressure double that at the surface?

| Criteria | Mathematical Criteria | Sample Answers |
|----------------|--|---|
| Level 0 | <p>Did not answer.</p> <p>Answer not relevant to the question.</p> <p>Just agreed with peer responses.</p> | <p>I don't get this.</p> <p>True.</p> |
| Level 1 | <p>Answer shows student understands the question.</p> <p>Answer given, with no explanation.</p> | <p>The equation is on the perimeter of $y=10x+100$.</p> |
| Level 2 | <p>Selects a strategy to use, and tried to use it to answer the question.</p> <p>Cannot justify the strategy chosen.</p> | <p>So if the pressure of the surface is 100, the point where it doubles is 10m. $10 \times 10 = 100 + 100 = 200$. The answer is 10 meters.</p> |
| Level 3 | <p>Selects a strategy to use, and tries to use it to solve the question.</p> <p>Can justify the strategy chosen.</p> | <p>Pressure per metre.</p> $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{9 - 4}{140 - 190} = \frac{5}{-50} = -\frac{1}{10}$ <p>Therefore the pressure at the surface is 100kPa so to double the pressure you would have to reach a depth of 10m.</p> |

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| Level 4 | Answer is correct. A strategy is used correct, with mathematical explanation and justification. | The depth is 2m at double the surface. I found out the slope since I know kPa is y value and the depth is x value. I found out the slope is 10. To find b value I plugged in the values in the $y=mx+b$ equation. I got 100. So the equation is $y=10x+100$. I put 2 for the x value to get the double of the pressure. The answer was 120. $y=120$. $120-10x+100$. I solved this equation and got 2m. So the depth is 2m. <i>(response to feedback)</i> Yes that is the first step. But the question is asking what is the depth when the pressure doubles. |
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