

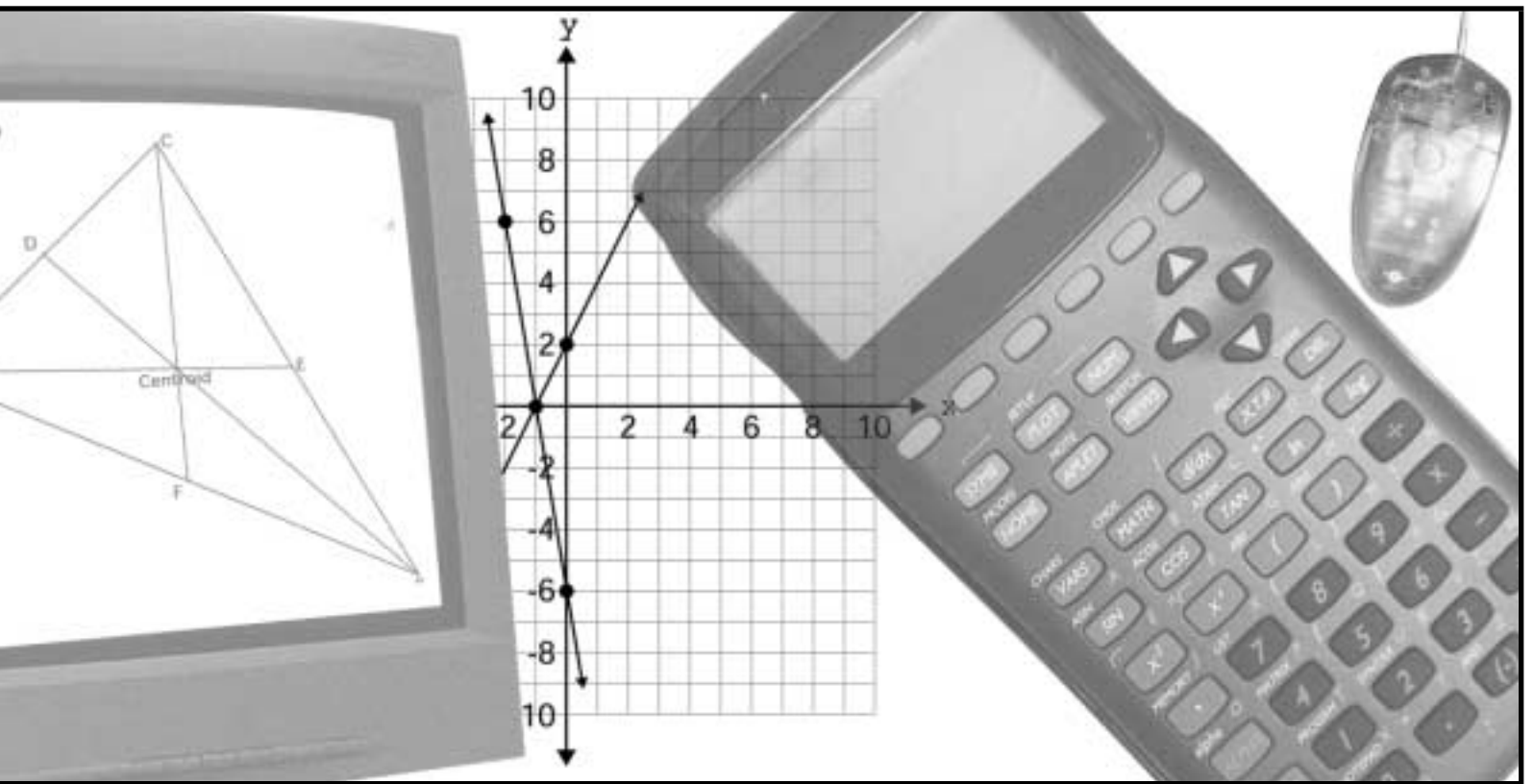
Grade 9 Assessment of Mathematics, 2000–2001

# Release Items

**Applied Program**



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# Multiple-Choice Questions

Release Materials



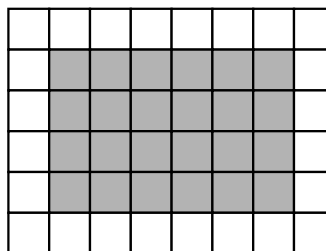
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# Directions to Students about Answering Multiple-Choice Questions

- For this part of the assessment, make sure that you have the following materials along with *Booklet 1*:
  - a *Student Answer Sheet*
  - an HB pencil and an eraser
  - a ruler and a protractor
  - a scientific calculator or a graphing calculator
  - some paper for rough work
- Be sure to read the problem and all four answer choices for each question carefully. When you choose an answer, fill in the circle on your answer sheet that goes with that answer.
- Always choose the best answer. Mark only one answer for each question.
- There are 24 questions in *Booklet 1*. Try to answer all of them. Do not spend too much time on any one question.
- Figures in this section are not drawn to scale.
- Now do the following sample question. Fill in your choice on your *Student Answer Sheet* in the sample question box.

## Sample Question


Find the area of the shaded region in the rectangle below.



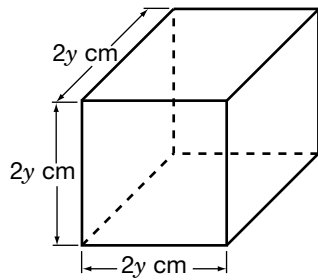
 1 square unit

- A** 16 square units
- B** 24 square units
- C** 30 square units
- D** 36 square units

For the sample question, you should have filled in the circle  $\textcircled{\text{B}}$  on your answer sheet. If you did not mark the circle that goes with B, erase the answer you marked and fill in the correct answer.

- You will have **30 min** to do the 24 multiple-choice questions.
- When you see the  sign, you have completed *Booklet 1*. Check your answers. Then wait quietly for directions from your teacher.

1. Each side of a cube is  $2y$  cm long. What is the volume of the cube?



- A  $8y^3 \text{ cm}^3$   
 B  $6y \text{ cm}^3$   
 C  $4y^3 \text{ cm}^3$   
 D  $2y \text{ cm}^3$
2. The total cost,  $C$ , in dollars, of running an advertisement in a newspaper is made up of an initial cost of \$12, plus a charge of \$5 per day, where  $n$  represents the number of days.



Which equation represents this relationship?

- F  $C = 12n + 5$   
 G  $C = 12 + 5n$   
 H  $C = (12 + 5)n$   
 J  $C = 12 + 5 \div n$

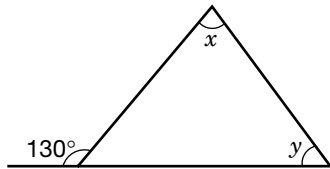
3. The cost,  $C$ , in dollars to print leaflets,  $n$ , is given by the formula  
 $C = 35 + 0.03n$ .



What is the cost of printing 900 leaflets?

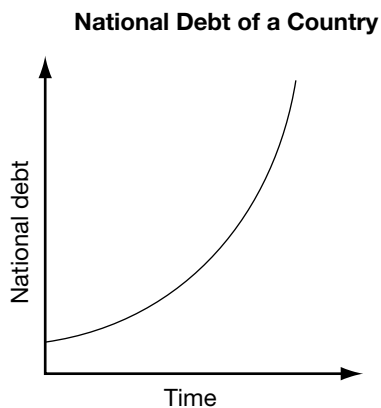
- A \$27.00  
 B \$35.00  
 C \$37.70  
 D \$62.00
4. Simplify the following expression.  
 $(x^2 + 4x + 3) + x(3 - x)$
- F  $x + 3$   
 G  $3x$   
 H  $7x + 3$   
 J  $-2x^2 + 4x + 3$

5. Pat draws this figure.



What is the relationship between the angles in this diagram?

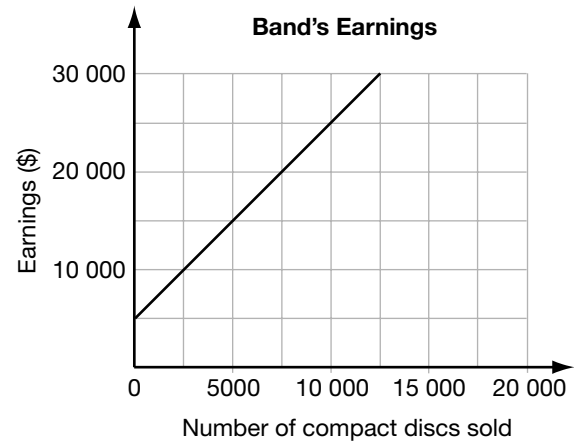
- A**  $y = x$   
**B**  $y = x + 50^\circ$   
**C**  $x + y = 50^\circ$   
**D**  $x + y = 130^\circ$
6. Study the following graph that shows the relationship between the national debt of a country and time.



Which statement is true?

- F** The national debt is growing linearly.  
**G** The national debt is growing non-linearly.  
**H** As time increases, the national debt decreases.  
**J** As time increases, the national debt stays constant.

7. A recording company offers a band a \$5000 signing bonus plus \$2 for every CD sold as shown on the graph.

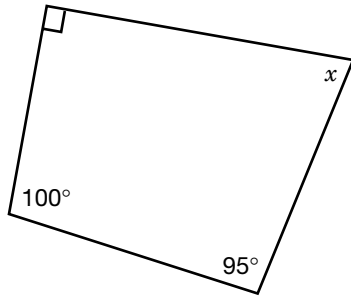


How many compact discs must the band sell in order to earn \$25 000?

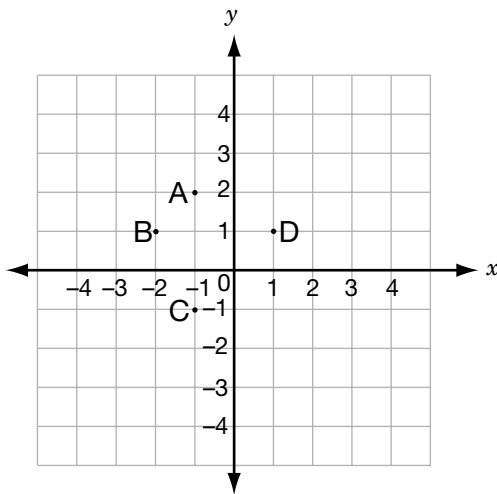
- A** 5000  
**B** 7500  
**C** 10 000  
**D** 15 000



8. What is the value of angle  $x$  in the quadrilateral below?

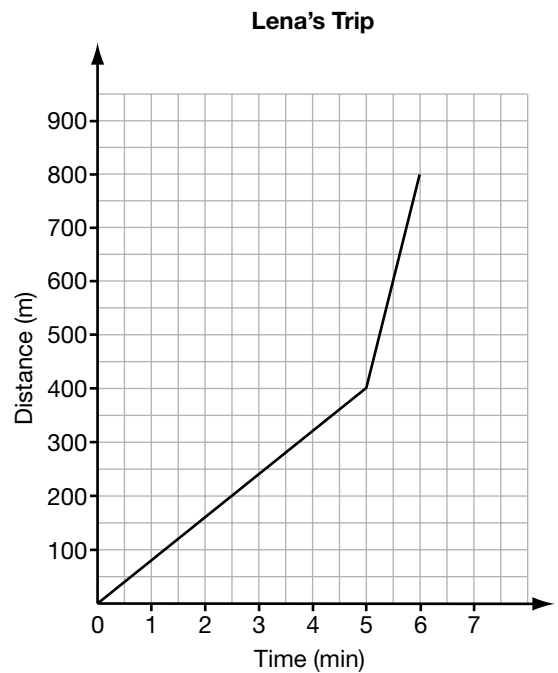


- F  $45^\circ$   
 G  $60^\circ$   
 (H)  $75^\circ$   
 J  $50^\circ$
9. Which points on the graph have the same  $y$ -coordinates?



- A A and B  
 B A and C  
 C B and C  
 (D) B and D

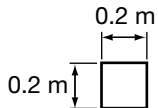
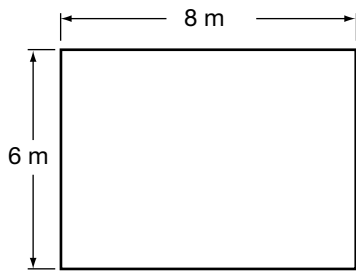
10. The graph below shows how far Lena jogged during a period of 5 min, and then sprinted during the next 1 min.



What was Lena's average speed, in metres per minute, for the first 5 min period?

- (F) 80 m/min  
 G  $133 \frac{1}{3}$  m/min  
 H  $213 \frac{1}{3}$  m/min  
 J 400 m/min

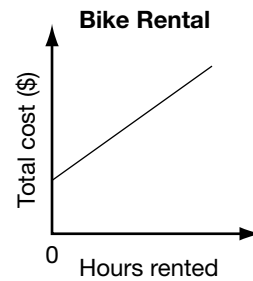
11. Troy wants to cover a rectangular floor that is 8 m by 6 m using tiles that are 0.2 m  $\times$  0.2 m.



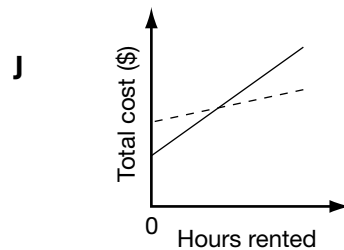
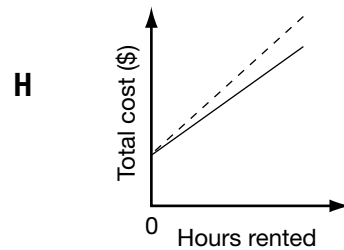
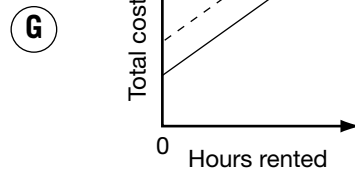
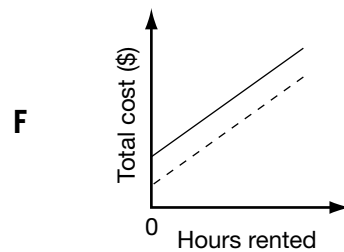
How many tiles will he need to cover the floor?

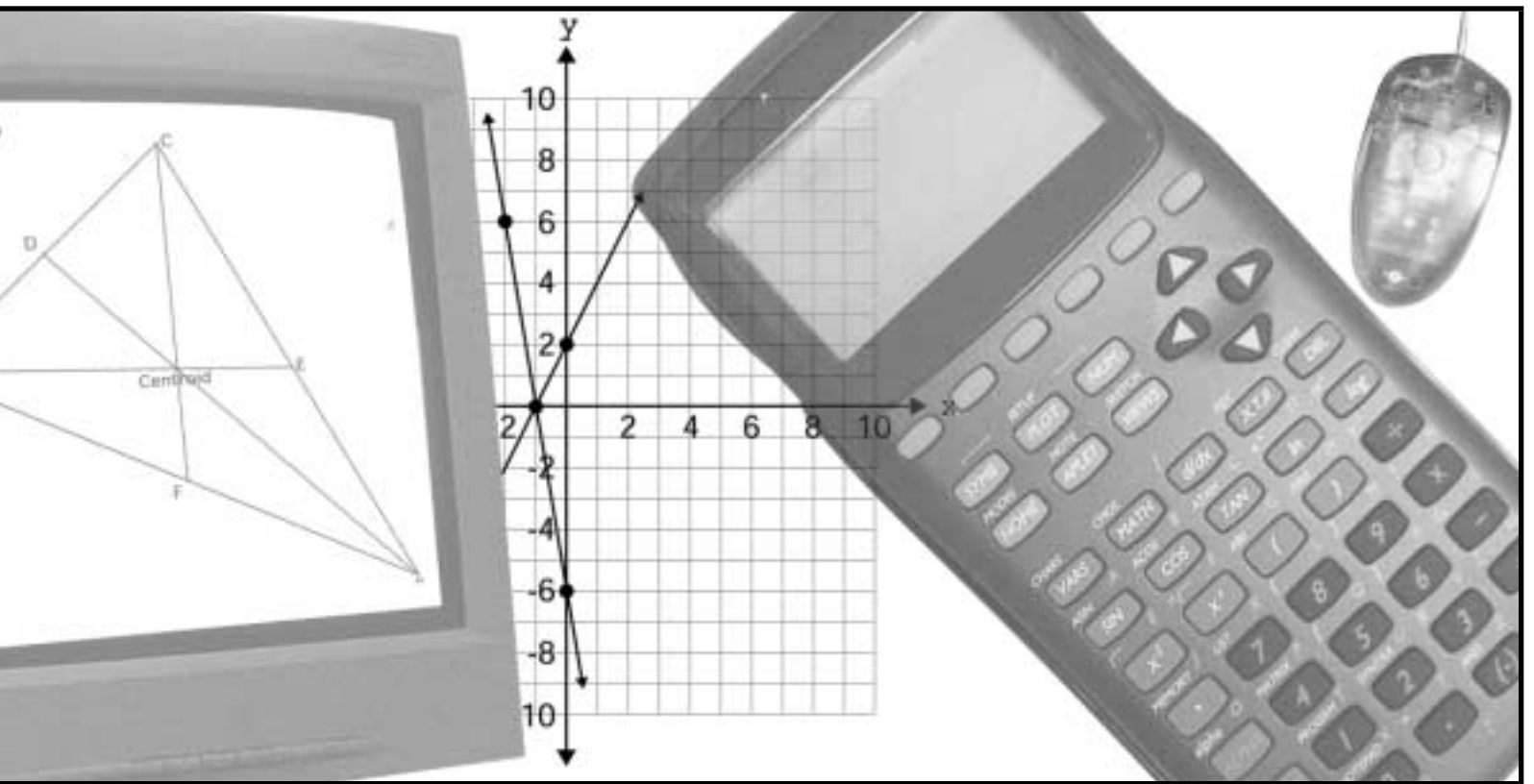
- A 400
- B 1 200**
- C 2 300
- D 4 500

12. Pierre rents a bicycle and pays an initial fee plus an hourly rate as shown on the graph.



The next week he finds the initial fee has gone up but the hourly rate has stayed the same. Which new graph (dotted line) best represents the change?





# Short Answer Items


Release Materials



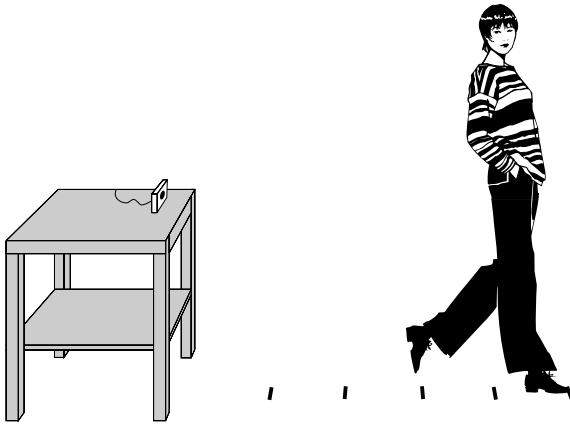
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# Directions to Students about Answering Short Answer Items

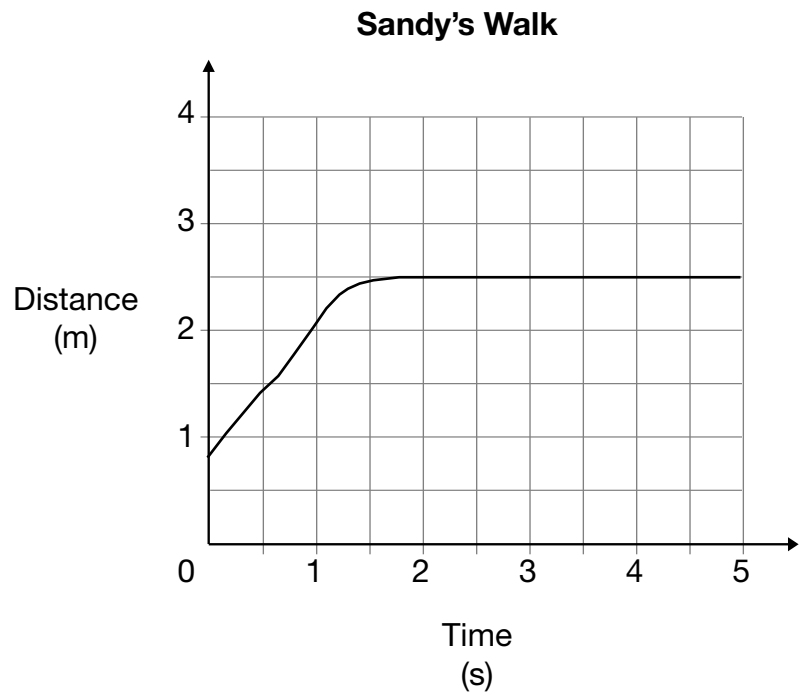
1. For this part of the assessment, make sure you have the following items along with *Booklet 3*:
  - a pencil and an eraser or a pen
  - a scientific or a graphing calculator
  - a ruler and a protractor
2. Do all of your work (even rough work) in *Booklet 3*.
3. You will have 30 min to do these 10 items. That means you have about 3 min for each one. Give yourself time to answer all of the questions.
4. Figures in this section are not drawn to scale.
5. These questions are designed to get you to think deeply about the mathematics you know but they do not require you to write a great deal. Be sure to watch for the terms listed in the *Key Words and Phrases in Instructions* and do just what the prompt asks you to do.

For example, the question might ask you to “**Explain** your answer.” The *Key Words and Phrases in Instructions* sheet says, “**Explain** means to use words and symbols to make your solutions clear and understandable.” As soon as you can explain a mathematical reason for the answer, do so. You do not need to provide lots of calculations to illustrate your point.
6. In short answer questions, you do not have to provide lots of examples to illustrate your answer. Write a short answer.
7. You have **30 min** to work.
8. When you see the  sign, you have completed *Booklet 3*. Check your answers. Then wait quietly for directions from your teacher.

1. Sandy walked away from a motion detector.



Below is a screen captured from the graphing calculator and a graph representing her walk.



**Describe** Sandy's walk using mathematical language.

Use any of the information presented above.

Sandy began her walk at about 80 cm away from the motion detector. She walked at a constant rate until she was 2.5 m away from the motion detector, which was at time 1.5 seconds. She then remained standing still until 5 seconds were up.

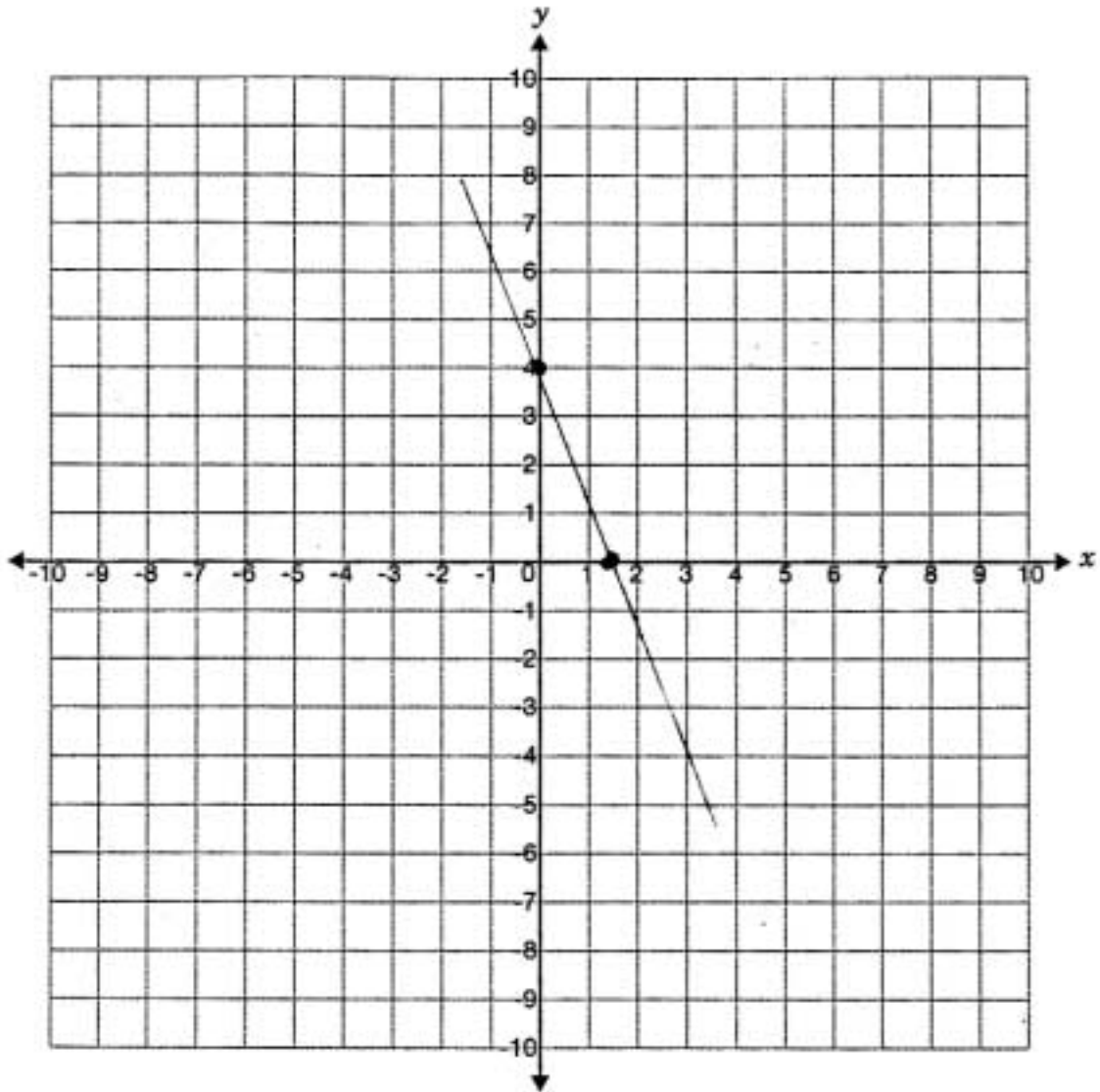
### Coding Guide for Question 1

Question Number	Codes			Category and Strand
	0	1	2	
1	<ul style="list-style-type: none"> <li>• description of walk is incorrect <b>or</b></li> <li>• description of walk includes one correct feature and the rest is incorrect or missing (e.g., Sandy began with a brisk walking speed and reached a comfortable speed that she could keep)</li> </ul>	<ul style="list-style-type: none"> <li>• description of walk is correct and includes two of the following features:                             <ul style="list-style-type: none"> <li>– initial position (<math>\approx 0.8</math> m)</li> <li>– final position (2.5 m)</li> <li>– distance travelled (<math>\approx 1.7</math> m)</li> <li>– action of stopping</li> <li>– she walks away from the motion detector</li> <li>– speed is constant</li> <li>– speed (<math>\approx 1</math> m/s)</li> <li>– travel time (<math>\approx 1.5</math> s)</li> <li>– amount of time stopped (<math>\approx 3.5</math> s)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• description of walk is correct and includes three or more of the following features:                             <ul style="list-style-type: none"> <li>– initial position (<math>\approx 0.8</math> m)</li> <li>– final position (2.5 m)</li> <li>– distance travelled (<math>\approx 1.7</math> m)</li> <li>– action of stopping</li> <li>– she walks away from the motion detector</li> <li>– speed is constant</li> <li>– speed (<math>\approx 1</math> m/s)</li> <li>– travel time (<math>\approx 1.5</math> s)</li> <li>– amount of time stopped (<math>\approx 3.5</math> s)</li> </ul> </li> </ul>	AP R

### Assigned Code and Rationale for Student Work

Question	Code	Rationale
1	2	<ul style="list-style-type: none"> <li>• The general description of the walk includes discussion of Sandy's starting position, direction, rate and stopping position. The student response contains three or more features stated in the scoring guide: an initial position of 80 cm, a travel time of 1.5 seconds and a final position of 2.5 m away from the motion detector.</li> </ul>

2. **Graph** the line with a  $y$ -intercept of 4 and a slope of  $\frac{1}{2}$ .



### Coding Guide for Question 2

Question Number	Codes			Category and Strand
	0	1	2	
2	<ul style="list-style-type: none"> <li>more than one error in graphing the line</li> </ul>	<ul style="list-style-type: none"> <li>one error in graphing the line (e.g., the line drawn has a slope of 2 or <math>-\frac{1}{2}</math> <b>or</b> the intercept of 4 has been drawn as an <math>x</math>-intercept)</li> <li>no line drawn through two or more correct points</li> </ul>	<ul style="list-style-type: none"> <li>correct graph (e.g., <math>y</math>-intercept of 4 and <math>x</math>-intercept of <math>-8</math> <b>or</b> <math>y</math>-intercept of 4 and slope of <math>\frac{1}{2}</math>)</li> <li><b>Note:</b> arrows at the ends of the line are not necessary</li> </ul>	KU G

### Assigned Code and Rationale for Student Work

Question	Code	Rationale
2	1	<ul style="list-style-type: none"> <li>The <math>y</math>-intercept of 4 is graphed correctly, but there is an error in determining the slope.</li> </ul>

3. There are about  $1.6 \times 10^5$  students in Ontario writing this Grade 9 assessment. **Write** this number in standard numerical form.

160 000

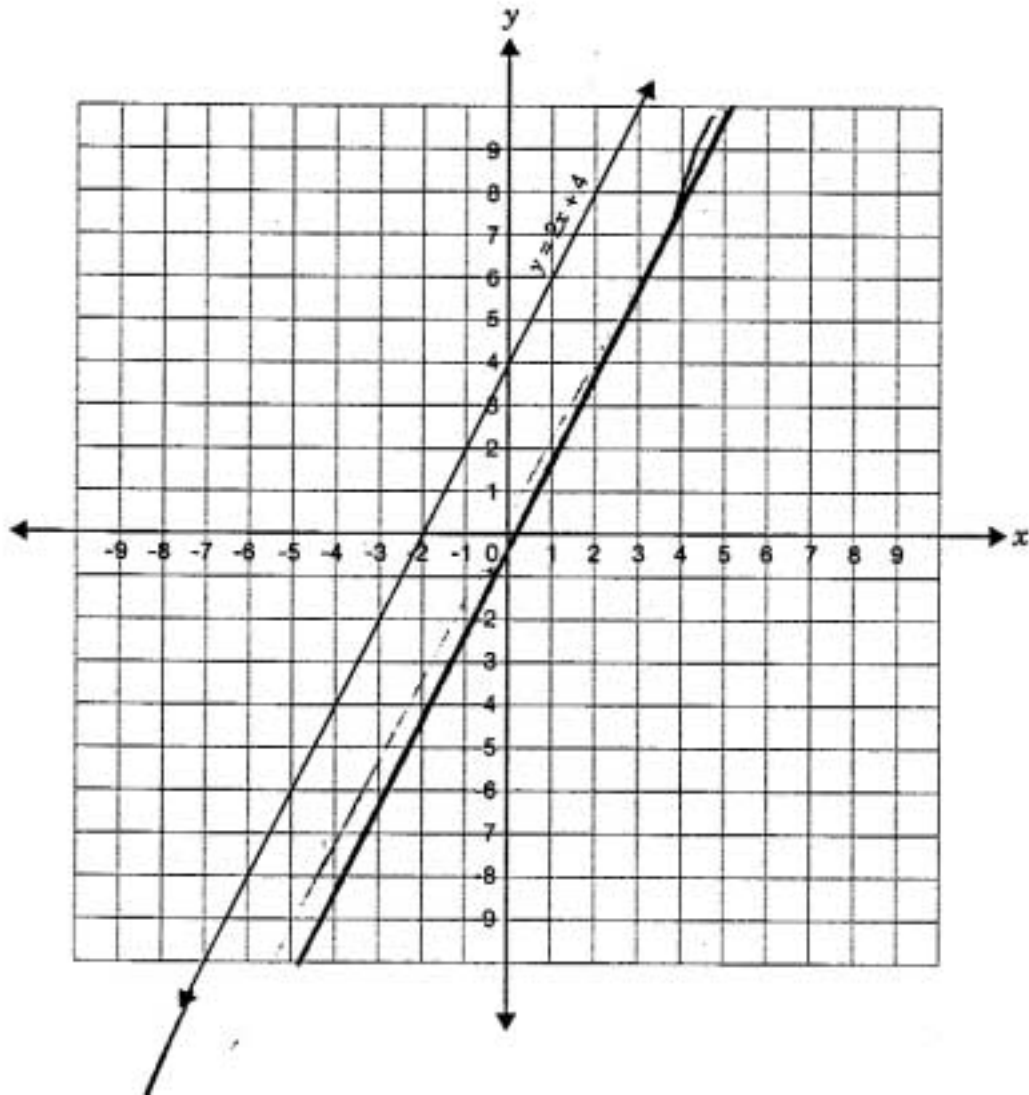
### Coding Guide for Question 3

Question Number	Codes			Category and Strand
	0	1	2	
3	<ul style="list-style-type: none"> <li>incorrect answer (e.g., 1605 or 1 600 000)</li> </ul>	<ul style="list-style-type: none"> <li>partially correct answer (e.g., <math>1.6 \times 10 \times 10 \times 10 \times 10 \times 10</math>)</li> </ul>	<ul style="list-style-type: none"> <li>correct answer (i.e., 160 000)</li> </ul>	KU N

### Assigned Code and Rationale for Student Work

Question	Code	Rationale
3	2	<ul style="list-style-type: none"> <li>A correct response of 160 000 is provided.</li> </ul>

4. Draw a line **parallel** to  $y = 2x + 4$  and **write** its equation.



### Coding Guide for Question 4

Question Number	Codes			Category and Strand
	0	1	2	
4	<ul style="list-style-type: none"> <li>inappropriate line drawn and incorrect equation stated</li> </ul>	<ul style="list-style-type: none"> <li>inappropriate line drawn (i.e., not parallel to <math>y = 2x + 4</math>) with correct equation stated (e.g., <math>y = 3x + 4</math>) <b>or</b></li> <li>line drawn parallel to <math>y = 2x + 4</math> with an incorrect equation stated</li> </ul>	<ul style="list-style-type: none"> <li>appropriate line drawn parallel to <math>y = 2x + 4</math> with correct equation stated (e.g., <math>y = 2x</math>)</li> </ul>	AP G

### Assigned Code and Rationale for Student Work

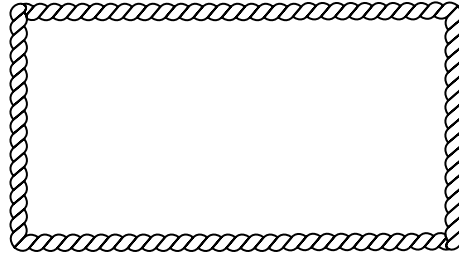
Question	Code	Rationale
4	1	<ul style="list-style-type: none"> <li>The line drawn is parallel to <math>y = 2x + 4</math>. The correct equation for this line has not been stated</li> </ul>

5. Decide whether the following statement is true or false.

“In a quadrilateral, the maximum area that can be enclosed by 600 cm of rope is a rectangle with dimensions 200 cm  $\times$  100 cm.”

Give a specific example to support your decision.

$$P = 600 \text{ cm}$$



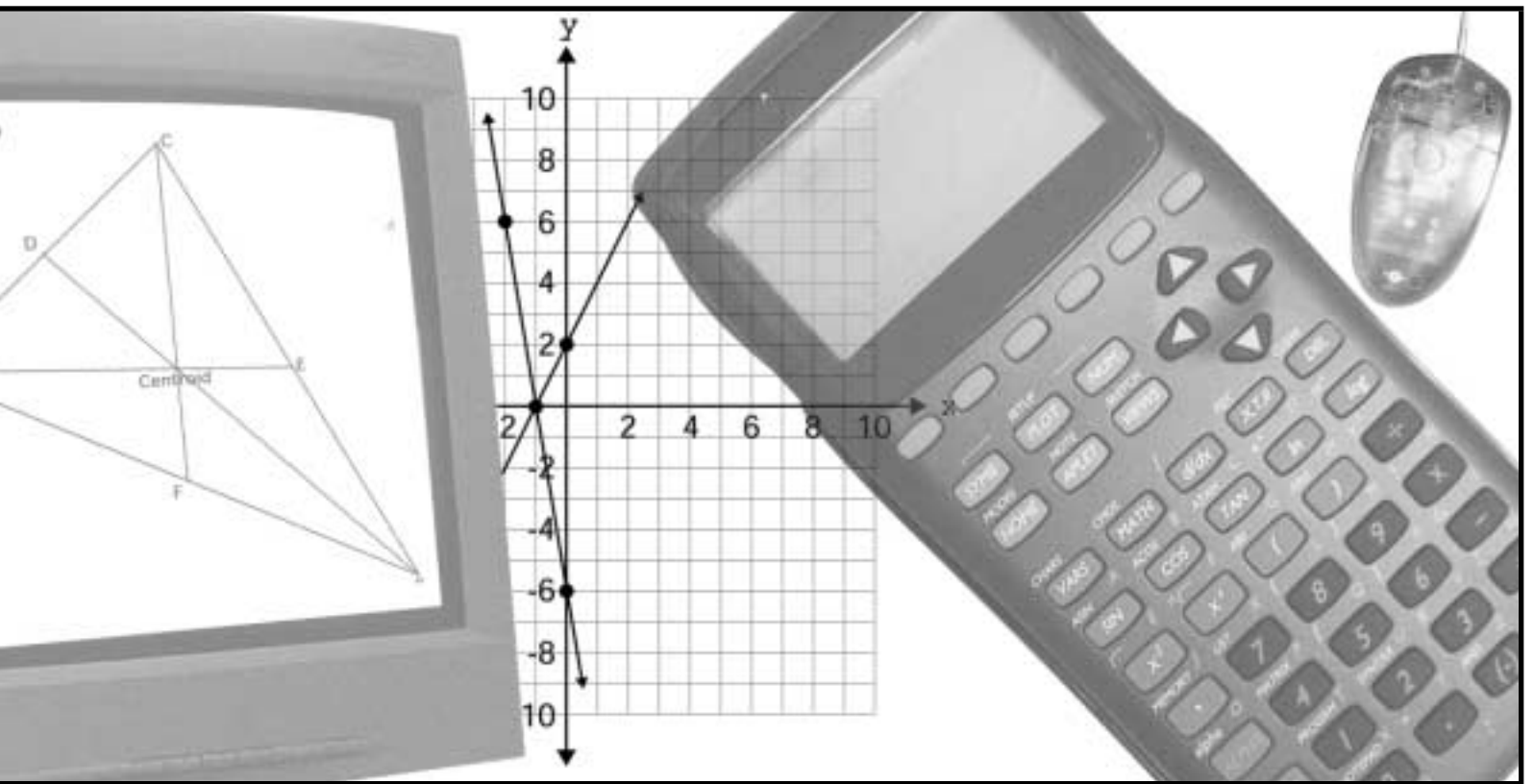
False because all the sides can be 150.

### Coding Guide for Question 5

Question Number	Codes			Category and Strand
	0	1	2	
5	<ul style="list-style-type: none"> <li>• answers true or false without an example to support the conclusion <b>or</b></li> <li>• conclusion does not follow from example given <b>or</b></li> <li>• illogical example with or without a conclusion given</li> </ul>	<ul style="list-style-type: none"> <li>• conclusion follows from partially appropriate example (e.g., False, uses <math>300 \times 300</math> as a counter-example; e.g., True, uses <math>250 \times 50</math> as an example with a smaller area)</li> </ul>	<ul style="list-style-type: none"> <li>• concludes that the statement is false and uses an appropriate example to support the conclusion (e.g., False, dimensions <math>150 \times 150</math> have an area of <math>22\,500\text{ cm}^2</math>)</li> </ul>	PS M

### Assigned Code and Rationale for Student Work

Question	Code	Rationale
5	2	<ul style="list-style-type: none"> <li>• The student's stated conclusion is correct and is supported by dimensions to create the</li> </ul>



# Tasks

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# Directions to Students about Answering Tasks

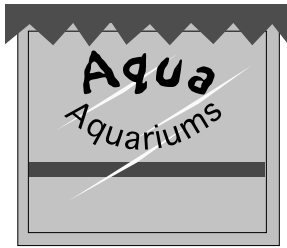
1. For this part of the assessment, make sure you have the following items along with *Booklet 2*:
  - a pencil and an eraser or a pen
  - a scientific or a graphing calculator
  - a ruler and a protractor
2. Do all of your work (even your rough work) in *Booklet 2*.
3. You will have 40 min to do 3 tasks. Allow about 15 min for Tasks 1 and 2 and about 10 min for Task 3. Give yourself time to answer all of the questions.
4. Figures in this section are not drawn to scale.
5. The tasks are designed to allow you an opportunity to show what you know and what you can do. Provide as much information as you can to show your understanding. Your teacher may be marking some of your work. In addition, someone who does not know your work will mark all of it, including what your teacher has marked. So, you must provide clear, well-organized answers to illustrate your complete understanding and ability to communicate in mathematics.
6. Make sure you follow directions from the *Key Words and Phrases in Instructions* sheet. It is provided for you so you will know the kind of question that is being asked.

For example, the question might ask you to “**Show your work.**” Read the *Key Words and Phrases in Instructions* sheet. It says to record all calculations. If you use your calculator, you need to show what calculations you do. If you sketch a graph in the process of getting to your solution, show the sketch and label it. Use proper and correct mathematical conventions when you present your work.
7. When using a calculator, write down the numbers and operations that you carried out on the calculator.

For example: Find the area of a circle with diameter of 7 cm.

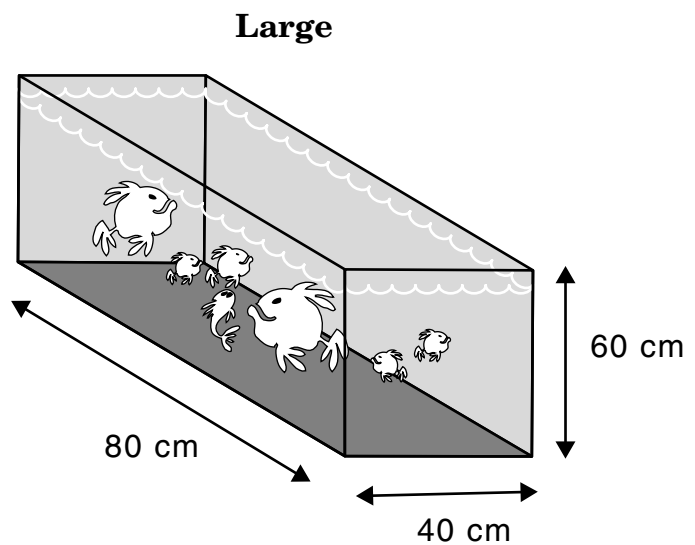
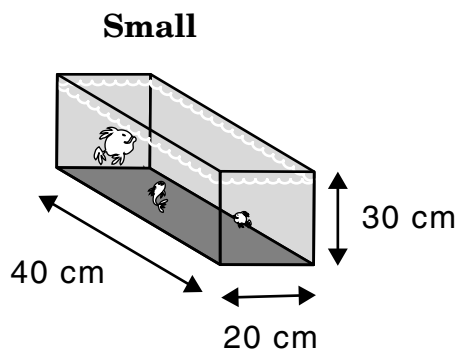
You need to write  $A = \pi(3.5)^2$  as well as the answer you got on your calculator.
8. There are always many different ways to solve a problem. Use your broad range of mathematical knowledge to present a complete and creative solution to each question.
9. You have **40 min** to work.
10. When you see the  sign, you have completed the work for the day. Check your answers. Then wait quietly for directions from your teacher.

# Task 1: Aquarium



Aqua Aquariums sells aquariums in the shape of rectangular prisms. The aquariums are available in two sizes, small and large, with dimensions as shown. Each aquarium has glass sides and bottom, but no top.

**NOTE:** These aquariums are NOT drawn to scale.



a) Calculate the volume of each aquarium.

**Small**

$$\begin{aligned} V &= lwh \\ &= 40 \times 20 \times 30 \\ &= 24\,000 \text{ cm}^3 \end{aligned}$$

**Large**

$$\begin{aligned} V &= lwh \\ &= 80 \times 40 \times 60 \\ &= 192\,000 \text{ cm}^3 \end{aligned}$$

- b) Calculate the total outside surface area of each aquarium.

**HINT:** The aquariums have no tops.

<p style="text-align: center;"><b>Small</b></p> $  \begin{aligned}  A_{\text{total}} &= wh + wh + lw + lh + lh \\  &= (20 \times 30) + (20 \times 30) + (40 \times 20) + (40 \times 30) + (40 \times 30) \\  &= 1200 + 800 + 2400 + 40 \times 30 \\  &= 4400 \text{ cm}^2  \end{aligned}  $	<p style="text-align: center;"><b>Large</b></p> $  \begin{aligned}  A_{\text{total}} &= wh + wh + lw + lh + lh \\  &= (40 \times 60) + (40 \times 60) + (80 \times 40) + (80 \times 60) + (80 \times 60) \\  &= 4800 + 3200 + 9600 + 80 \times 60 \\  &= 17600 \text{ cm}^2  \end{aligned}  $
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- c) The cost of materials required to build the aquariums is \$0.002/cm<sup>2</sup> of **surface area**. Determine the cost of materials required to build each aquarium. **Show your work.**

<p style="text-align: center;"><b>Small</b></p> $  \begin{array}{r}  4400 \text{ cm}^2 \\  \times \quad \$0.002 \\  \hline  \$8.80  \end{array}  $	<p style="text-align: center;"><b>Large</b></p> $  \begin{array}{r}  17600 \text{ cm}^2 \\  \times \quad \$0.002 \\  \hline  \$35.20  \end{array}  $
--	--

- d) The cost of the materials required to build the large aquarium is 4 times the cost of the materials required to build the small aquarium.

$$35.20 \div 8.80 = 4$$

(check)

$$\begin{array}{r}
 8.80 \\
 \times 4.00 \\
 \hline
 35.20
 \end{array}$$

- e) The selling price of the small aquarium is \$24. The selling price of the large aquarium is \$115.

Do the selling prices of the aquariums seem appropriate according to your calculations? **Give reasons for your answer.**

I don't think the selling prices are appropriate because according to my calculations the small aquarium is only \$8.50 and they're selling it for \$24.00. I think that's too much to sell the aquarium for, it's 3 times as much as it costs to build it. And the large aquarium is only \$35.20, but it's selling for \$115.00, this is also too much, it's about 3 times as more of the cost to build it.

f)

Mohammed went into the store to buy an aquarium. After comparing the small and large aquariums, he tells the owner, "The large aquarium should only cost two times as much as the small aquarium."

He gives the following reasons:

- The dimensions of the large aquarium are two times bigger than those of the small aquarium.
- It takes two times more material to build the larger aquarium.

**Explain the mathematical error** in Mohammed's reasons.

**HINT:**  
To answer this question, refer to your previous answers for help.

The error is that he's only thinking that the length of one side of the aquarium is changing by doubling, but when you double all the sides, you're increasing a lot more, so one side is about 3 or 4 times as larger. example →

the side of the small aquarium is 4 times as small as the side on the large.

∴ Each side on the large aquarium would be 4 times as large than the small, so the large needs 4 times as much material not only 2.

**Extended Response Coding Guide — Applied Program**  
**Task #1 — Aquarium**

b – blank: nothing at all is written for the solution

u – unrelated or unengaged: the student has written “I don’t know” or a question mark; the student has simply rewritten the question exactly as posed; the student has offered unrelated comments or drawn pictures; the student has not engaged in the problem solution

Erasures – If it is rubbed out and readable, mark it. If it is rubbed out and not readable, give it a code of u.

Category	Parts	Codes	Descriptions	
KUN	c), d)	1	<ul style="list-style-type: none"> <li>no correct answers</li> </ul>	
		2	<ul style="list-style-type: none"> <li>one correct answer, other answers are incorrect or missing [work may or may not be shown in <b>c)</b>]</li> </ul>	
		3	<ul style="list-style-type: none"> <li>two correct answers, other answer is incorrect or missing [work may or may not be shown in <b>c)</b>]</li> </ul>	
		4	<ul style="list-style-type: none"> <li>three correct answers with no supporting work in <b>c)</b></li> </ul>	
		5	<ul style="list-style-type: none"> <li>three correct answers based on multiplying to find cost and dividing to find proportion [i.e., \$8.80 and \$35.20 in part <b>c)</b> and 4 in part <b>d)</b> with correct supporting work in <b>c)</b></li> <li><b>Note:</b> answers need only be correct based on work in previous sections</li> <li><b>Note:</b> correct units not necessary</li> </ul>	
KUM	a)	1	<ul style="list-style-type: none"> <li>no correct answers</li> </ul>	
		2	<ul style="list-style-type: none"> <li>one correct answer, the other incorrect or missing <b>or</b> correct volume formula used with error(s) in calculations</li> </ul>	
		3	<ul style="list-style-type: none"> <li>correct answers (i.e., 24 000 cm<sup>3</sup>, 192 000 cm<sup>3</sup>)</li> <li><b>Note:</b> correct units not necessary</li> </ul>	
APMN	b)	1	<ul style="list-style-type: none"> <li>both answers incorrect and work shown is not appropriate to the context</li> </ul>	
		2	<ul style="list-style-type: none"> <li>inappropriate selection of formula (e.g., <math>2lw + 2lb + lw</math>) with correct substitution <b>or</b></li> <li>appropriate selection of formula with incorrect substitution</li> </ul>	
		3	<ul style="list-style-type: none"> <li>partially appropriate selection of formula with correct substitution (e.g., calculation does not include bottom of aquarium)</li> </ul>	
		4	<ul style="list-style-type: none"> <li>proper selection of formula for six sides with correct substitution (e.g., includes top of aquarium)</li> </ul>	
		5	<ul style="list-style-type: none"> <li>proper selection of formula for five sides with correct substitution (i.e., correct answers: 4400 cm<sup>2</sup> and 17 600 cm<sup>2</sup>)</li> </ul>	
	N	e)	1	<ul style="list-style-type: none"> <li>answers yes or no, no mention of previous calculations or selling price (e.g., “no it is not appropriate because I paid less for my aquarium”)</li> </ul>
			2	<ul style="list-style-type: none"> <li>answers yes or no, mentions previous calculations, no comparison to selling price (e.g., “no because in all my other calculations the large tank was 4 times bigger”) <b>or</b></li> <li>answers yes or no, mentions selling price, no comparison to previous calculations</li> </ul>
			3	<ul style="list-style-type: none"> <li>answers yes or no, indirect comparison of previous calculations to selling price (e.g., “No because the price is too high, it only costs \$6.40 to make the small one and \$25.60 to make the large one. They need to make a profit but this is too high.”)</li> </ul>
			4	<ul style="list-style-type: none"> <li>answers yes or no, direct comparison to previous calculations, but no proportional comparison made to selling price (e.g., “\$24 × \$8.80 = \$15.30, \$115 × \$35.20 = \$79.80 No this isn’t fair, the companies are making too much profit.”)</li> </ul>
			5	<ul style="list-style-type: none"> <li>answers yes or no, direct proportional comparison between previous calculations and selling price (e.g., “It’s appropriate because the cost of materials for the large aquarium is 4 times the cost of materials for the small aquarium and the selling price of the large aquarium is 4.79 times the selling price of the small aquarium. The rate is almost the same so the selling prices are appropriate.”)</li> <li><b>Note:</b> student work should be scored relative to answers in previous sections</li> </ul>

**Extended Response Coding Guide — Applied Program  
Task #1 — Aquarium**

b – blank: nothing at all is written for the solution

u – unrelated or unengaged: the student has written “I don’t know” or a question mark; the student has simply rewritten the question exactly as posed; the student has offered unrelated comments or drawn pictures; the student has not engaged in the problem solution

Erasures – If it is rubbed out and readable, mark it. If it is rubbed out and not readable, give it a code of u.

Category	Parts	Codes	Descriptions
PS N	f)	1	<ul style="list-style-type: none"> <li>no explanation provided (e.g., “Mohammed is wrong” <b>or</b> “Mohammed is right”)</li> </ul>
		2	<ul style="list-style-type: none"> <li>provides explanation with errors or inconsistencies (e.g., “Mohammed is right, the large aquarium should cost twice as much”; “In part <b>e</b>) I saw that the large aquarium was priced too high, so Mohammed is right, it should cost less.”)</li> </ul>
		3	<ul style="list-style-type: none"> <li>provides correct explanation limited to the context of this problem, which follows from answer given in part <b>b</b>), <b>c</b>) or <b>d</b>) (e.g., “I calculated that it takes 4 times as much material to make the large aquarium, so it should cost 4 times as much.”)</li> </ul>
		4	<ul style="list-style-type: none"> <li>provides correct explanation of the error in Mohammed’s reasoning with reference to wider mathematical context (e.g., “The dimensions may be twice as large, but since the SA formula multiplies two dimensions together, this means the SA will be 4 times as large, so it will take 4 times as much material to make the large aquarium.”)</li> </ul> <p><b>Note:</b> the work is to be scored based on the answer in <b>d</b>)</p>
CM	e), f) (presentation of thinking)	1	<ul style="list-style-type: none"> <li>communication of thinking is rarely clear and does not reveal processes (e.g., work shown and explanations given in <b>e</b>) and <b>f</b>) reveal little of the thinking process and are unclear)</li> </ul>
		2	<ul style="list-style-type: none"> <li>communication is somewhat clear and reveals some processes (e.g., work shown and explanations given in <b>e</b>) and <b>f</b>) reveal some of the thinking process and are somewhat clear)</li> </ul>
		3	<ul style="list-style-type: none"> <li>communication is clear and reveals processes (e.g., work shown and explanations given in <b>e</b>) and <b>f</b>) reveal the thinking process and are clear)</li> </ul>
	a), b), c), e) (mathematical conventions)	1	<ul style="list-style-type: none"> <li>mathematical conventions are rarely used properly when required [e.g., does not include proper units (\$, cm<sup>2</sup>, cm<sup>3</sup>) in <b>a</b>), <b>b</b>), <b>c</b>) and <b>e</b>) where appropriate]</li> </ul>
		2	<ul style="list-style-type: none"> <li>mathematical conventions are often used properly when required (e.g., includes units where appropriate and misuses equal signs consistently)</li> </ul>
		3	<ul style="list-style-type: none"> <li>mathematical conventions [use of symbols (+, =, etc.), units (\$, cm<sup>2</sup>, cm<sup>3</sup>) and mathematical form] are used properly when required</li> </ul>

**Task #1 — Aquarium**  
**Assigned Codes and Rationale for Student Work**

Category and Strands	Portion of Task	Code	Rationale
KU N	c), d)	5	<ul style="list-style-type: none"> <li>Proper use of multiplication and division to arrive at three correct answers for parts <b>c)</b> and <b>d)</b>.</li> </ul>
KU M	a)	3	<ul style="list-style-type: none"> <li>Correct answers of 24 000 and 192 000 for the volume of the two aquariums.  <b>Note:</b> proper units are assessed under communication of mathematical conventions</li> </ul>
AP M	b)	5	<ul style="list-style-type: none"> <li>Appropriate selection of a formula to determine the surface area for five sides of each aquarium. Correct substitutions are made into these formulas.</li> </ul>
AP N	e)	5	<ul style="list-style-type: none"> <li>A direct proportional comparison has been made by the student to arrive at a decision based on previous calculations.</li> </ul>
PS N	f)	4	<ul style="list-style-type: none"> <li>The student explains the mathematical error using an appropriate model and provides justification to support his/her stated conclusion.</li> </ul>
CM	e), f)	3	<ul style="list-style-type: none"> <li>The student's written explanations for parts <b>e)</b> and <b>f)</b> are clear, logical and succinct.</li> </ul>
CM	a), b), c), e)	3	<ul style="list-style-type: none"> <li>Proper mathematical form and correct units are used as required throughout these parts of the task.</li> </ul>

## Task 2: Working for a Photographer

Sabine works for her mother who is a photographer. Each day she works she is paid a flat rate of \$10.00, plus an additional amount for each roll of film she develops.

The total amount she is paid for a day is represented by  $A$ .  
The number of rolls of film she develops is represented by  $r$ .

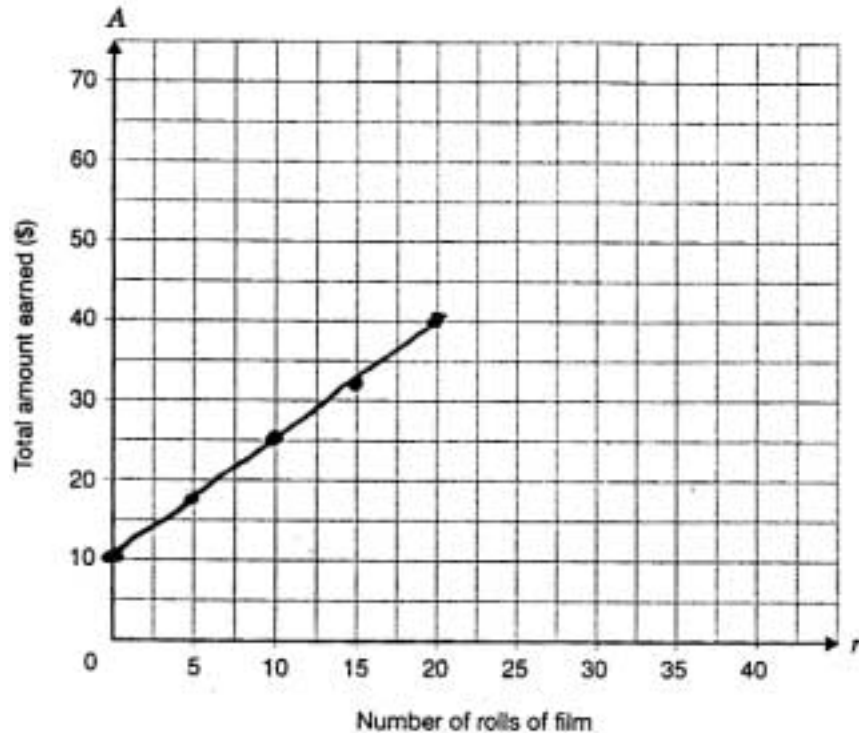


Number of rolls of films, $r$	Total amount paid, $A$ (in dollars)	First differences
5	17.50	7.50
10	25.00	7.50
15	32.50	7.50
20	40.00	

- a) **Calculate** the first differences in the table. **Explain** what these first differences tell you about the way Sabine is paid.

For every 5 rolls she develops she gets \$7.50

b) **Graph** the relationship below.



c) One day Sabine earns \$37.00.

How many rolls of film does she develop that day?

**Give reasons for your answer.**

$\approx$  18 rolls  $\therefore$  Because she gets paid 1.5 per roll and each roll costs 1.50 so  $3 \times 1.50 = 4.50$  and  $37 - 32.5 = 4.50$

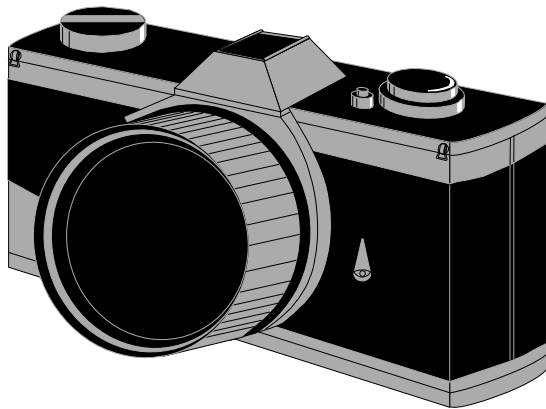
d) **Describe** how the graph in question b) would change if Sabine were paid **only** for the rolls of film she developed. She would receive no flat rate.

It would start at 0 and she wouldn't get paid as much.

- e) Her mother suggests that Sabine be paid a flat rate of \$50.00 for each day's work. She will earn the same amount no matter how many rolls she develops.

Should Sabine accept this offer? **Give reasons for your answer.**

Yes because she might not  
develop anything and  
she still gets paid  
and its better then  
she regularly makes.



**Extended Response .— Applied Program  
Task #2 — Working for a Photographer**

b – blank: nothing at all is written for the solution

u – unrelated or unengaged: the student has written “I don’t know” or a question mark; the student has simply rewritten the question exactly as posed; the student has offered unrelated comments or drawn pictures; the student has not engaged in the problem solution

Erasures – If it is rubbed out and readable, mark it. If it is rubbed out and not readable, give it a code of u.

Category	Parts	Codes	Descriptions
KUR	a)	1	<ul style="list-style-type: none"> <li>first differences are calculated incorrectly with incorrect or missing interpretation of the first differences as representing the rate</li> </ul>
		2	<ul style="list-style-type: none"> <li>first differences are calculated correctly with incorrect interpretation of the first difference (e.g., \$7.50/roll) as representing the rate</li> </ul>
		3	<ul style="list-style-type: none"> <li>first differences are calculated correctly with incomplete or partially correct interpretation of the first differences as representing the rate (e.g., “linear” without reference to the change in number of rolls, \$7.50 for 5 hours of work)</li> <li>2 of 3 first differences calculated correctly with correct interpretation of first difference</li> </ul>
		4	<ul style="list-style-type: none"> <li>first differences are calculated correctly (i.e., 7.5) with correct interpretation of the first differences as representing the rate (e.g., \$7.50 for 5 rolls, \$1.50/roll)</li> </ul>
R	b)	1	<ul style="list-style-type: none"> <li>ordered pairs from the table of values plotted incorrectly</li> </ul>
		2	<ul style="list-style-type: none"> <li>1 ordered pair from the table of values plotted correctly</li> </ul>
		3	<ul style="list-style-type: none"> <li>2 ordered pairs from table of values plotted correctly</li> </ul>
		4	<ul style="list-style-type: none"> <li>3 or 4 ordered pairs from table of values plotted correctly</li> </ul>
APR	c)	1	<ul style="list-style-type: none"> <li>inappropriate or no choice of tool(s) (e.g., 65 rolls of film by reading the wrong axis or \$16.50)</li> </ul>
		2	<ul style="list-style-type: none"> <li>proper choice of tool(s) (e.g., graph, table, words, equation) fitted inappropriately to the context (e.g., <math>(37 / 7.5) 5 = 24</math> or 25 rolls of film)</li> </ul>
		3	<ul style="list-style-type: none"> <li>proper choice of tool(s) (e.g., graph, table, words, equation) partially fitted to the context (e.g., “she developed about 16 rolls of film”)</li> </ul>
		4	<ul style="list-style-type: none"> <li>proper choice of tool(s) (e.g., graph, table, words, equation) fitted appropriately to the context [e.g., <math>(37 - 10) / 1.5 = 18</math> or she develops 17 rolls of film because for each film she gets around \$1.50]</li> </ul>
R	d)	1	<ul style="list-style-type: none"> <li>inappropriate choice of tool (e.g., “she would be paid less, you would have to subtract \$10 for each amount paid”)</li> </ul>
		2	<ul style="list-style-type: none"> <li>appropriate choice of tool (e.g., graph or words) fitted inappropriately to the context (e.g., the line will be horizontal or will decrease or the slope of the line will be steeper or selection of appropriate tool evident on graph without specific description)</li> </ul>
		3	<ul style="list-style-type: none"> <li>appropriate choice of tool (e.g., graph or words) fitted appropriately to the context (e.g., the A-intercept will be 0)</li> </ul>
PSR	e)	1	<ul style="list-style-type: none"> <li>response is “yes” or “no” with no reasoning</li> </ul>
		2	<ul style="list-style-type: none"> <li>response is “yes” or “no” with incomplete or incorrect reasoning (e.g., “she should because she is making more money this way”)</li> </ul>
		3	<ul style="list-style-type: none"> <li>response is correct with reasoning not connected to previous work (e.g., “she would get paid \$50.00 for doing no work”)</li> </ul>
		4	<ul style="list-style-type: none"> <li>response is correct, with reasoning connected to the graph or chart with no reference to the point of intersection (e.g., “she should take the first plan because in the end the graph is higher so she makes more money” or “yes because she could do 1 roll and get \$50 instead of \$17.50”)</li> </ul>
		5	<ul style="list-style-type: none"> <li>response is correct, with complete reasoning connected to the graph and reference to the point of intersection (e.g., “she should take it if she develops fewer than 27 rolls of film each day”)</li> </ul>

**Extended Response Coding Guide — Applied Program**  
**Task #2 — Working for a Photographer**

b – blank: nothing at all is written for the solution

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Erasures – If it is rubbed out and readable, mark it. If it is rubbed out and not readable, give it a code of u.

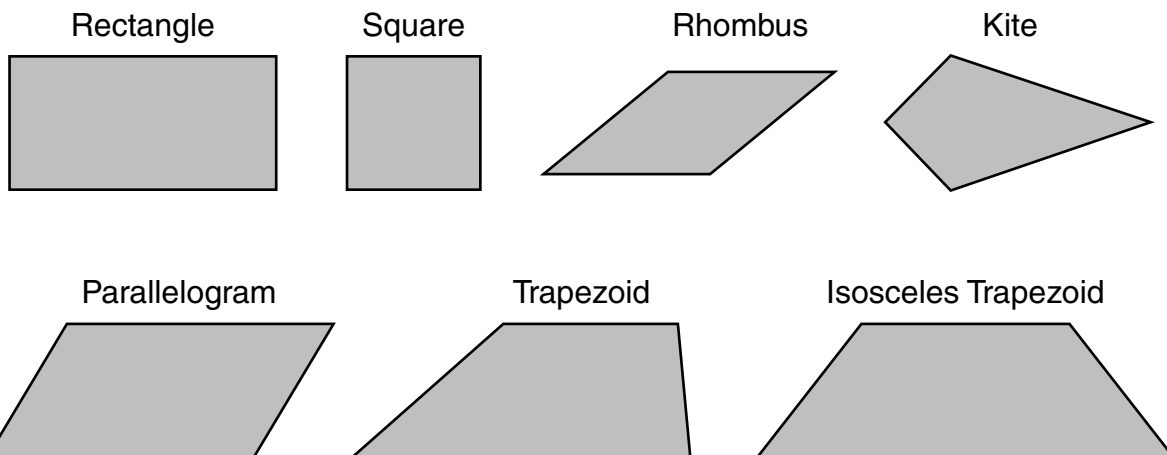
Category	Parts	Codes	Descriptions
CM	a), c), d), e) (presentation of thinking)	1	<ul style="list-style-type: none"> <li>communication is unclear and does not reveal the thinking process</li> </ul>
		2	<ul style="list-style-type: none"> <li>communication is partially clear and reveals some of the thinking process</li> </ul>
		3	<ul style="list-style-type: none"> <li>communication is clear and reveals the thinking process</li> </ul>
	a), c), d), e) (mathematical conventions)	1	<ul style="list-style-type: none"> <li>mathematical conventions are rarely used properly when required</li> </ul>
		2	<ul style="list-style-type: none"> <li>mathematical conventions are sometimes used properly when required</li> </ul>
		3	<ul style="list-style-type: none"> <li>mathematical conventions are used properly when required [e.g., proper units (e.g., dollars/roll), symbols (e.g., \$, =) and words (e.g., parallel, A-intercept) used properly throughout]</li> </ul>

**Task #2 — Working for a Photographer**  
**Assigned Codes and Rationale for Student Work**

Category and Strands	Portion of Task	Code	Rationale
KU R	a)	4	<ul style="list-style-type: none"> <li>The first differences are calculated correctly in the table and the interpretation of these in relation to the context is accurate.</li> </ul>
KU R	b)	4	<ul style="list-style-type: none"> <li>All ordered pairs are plotted correctly, based on the table of values in <b>a</b>).</li> </ul>
AP R	c)	4	<ul style="list-style-type: none"> <li>Words and equations are used appropriately to determine the number of rolls of film.</li> </ul>
AP R	d)	3	<ul style="list-style-type: none"> <li>The student recognizes that the graph will start at 0. This response indicates that the student understands that the A-intercept is 0.</li> </ul>
PS R	e)	3	<ul style="list-style-type: none"> <li>Reasoning is evident in the student's response, yet does not consider the full scope of the context of the question.</li> </ul>
CM	a), c), d), e)	3	<ul style="list-style-type: none"> <li>Clear and well-organized explanations reveal the student's thinking process.</li> </ul>
CM	a), c), d), e)	3	<ul style="list-style-type: none"> <li>Proper mathematical form is used as required. Units and symbols are displayed where appropriate.</li> </ul>

## Task 3: What Shape Am I?

To do this task, imagine you are working with a box of toothpicks. Look at the following quadrilaterals. Refer to these pictures as you solve the toothpick puzzles.



Use drawings of toothpicks to help you solve each puzzle.

Draw a straight line for each toothpick.

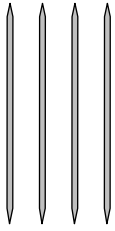
Do **not** draw overlapping toothpicks.

Do **not** draw broken toothpicks.

Name the quadrilateral described by the clues.



**a) Puzzle 1:**



Clue 1: *I am a quadrilateral that can be made with four toothpicks.*

Draw and name all the possible shapes I could be.

**HINT:**

All your toothpicks must be the same length.



square



rhombus

Clue 2: *I contain no 90° angles.*

Use your answers from Clue 1 and re-draw a quadrilateral for the new clue.

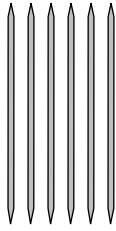


rhombus

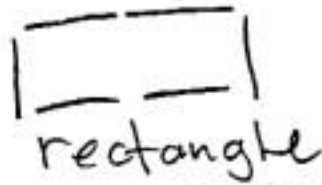
What shape am I?

rhombus

**b) Puzzle 2:**



Clue 1: *I am a quadrilateral that can be made with exactly six toothpicks.*  
Draw and name all the possible shapes I could be.



**HINT:**

All your toothpicks must be the same length. You can place toothpicks end to end.

Clue 2: *Not all of my angles are 90°.*

Use your answers from Clue 1 and **circle** the quadrilateral(s) that fit the new clue.

Clue 3: *My diagonals intersect at 90°.*

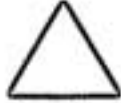
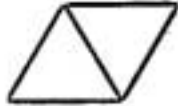
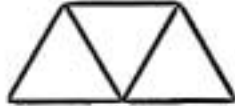
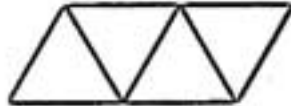
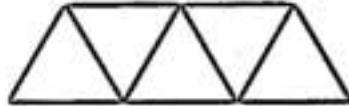
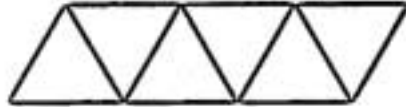
Use your answers from Clue 2 and **re-draw** the quadrilateral(s) that fit this new clue.



What shape am I?

rectangle.

- c) Marylou used three toothpicks to form a triangle. In each new row of the table, she used two more toothpicks to form one new triangle. For each row in the table, name the shape of the border formed by the toothpicks.

Number of Triangles	Shape	Name of the Shape of the Border
1		equilateral triangle
2		rhombus or parallelogram
3		Isosceles Trapezoid
4		Parallelogram
5		Isosceles Trapezoid
6		Parallelogram.

- d) Complete the following sentence.

*If you have more than two triangles in a row, the shape of the border will be*

a Parallelogram or a Isosceles trapezoid.



**Extended Response Coding Guide — Applied Program**  
**Task #3 — What Shape Am I?**

b – blank: nothing at all is written for the solution

u – unrelated or unengaged: the student has written “I don’t know” or a question mark; the student has simply rewritten the question exactly as posed; the student has offered unrelated comments or drawn pictures; the student has not engaged in the problem solution

Erasures – If it is rubbed out and readable, mark it. If it is rubbed out and not readable, give it a code of u.

Category	Parts	Codes	Descriptions
<b>Ignore any shapes that are not quadrilaterals</b>			
KU M	a) Clue 1	1	<ul style="list-style-type: none"> <li>no correct geometric figures identified or many given shapes copied</li> </ul>
	b) Clue 1	2	<ul style="list-style-type: none"> <li>one, two or three geometric figures correctly identified</li> </ul>
	c)	3	<ul style="list-style-type: none"> <li>four or five geometric figures correctly identified</li> </ul>
		4	<ul style="list-style-type: none"> <li>six, seven or eight geometric figures correctly identified</li> </ul>
		5	<ul style="list-style-type: none"> <li>nine geometric figures correctly identified (i.e., in part <b>a</b>), square and rhombus; in part <b>b</b>), rectangle, parallelogram and kite; in part <b>c</b>), trapezoid/isosceles trapezoid, parallelogram, trapezoid/isosceles trapezoid, parallelogram)</li> <li><b>Note:</b> label and/or diagram should be counted; in part <b>a</b>), accept rectangle instead of square and parallelogram or diamond instead of rhombus</li> </ul>
AP M	a) Clue 2	1	<ul style="list-style-type: none"> <li>no correct selections</li> </ul>
	b) Clue 2	2	<ul style="list-style-type: none"> <li>one or two selections correct based on available choices from previous clue</li> </ul>
	b) Clue 3	3	<ul style="list-style-type: none"> <li>three selections correct based on available choices from previous clue</li> </ul>
		4	<ul style="list-style-type: none"> <li>four selections are correct (e.g., in part <b>a</b>), rhombus; in part <b>b</b>), clue 2, parallelogram and kite; in part <b>b</b>), clue 3, kite)</li> </ul>
PS M	d)	1	<ul style="list-style-type: none"> <li>conclusion incorrect based on table</li> </ul>
		2	<ul style="list-style-type: none"> <li>conclusion is “quadrilateral”</li> </ul>
		3	<ul style="list-style-type: none"> <li>conclusion partially correct and/or incomplete based on table (e.g., names one of trapezoid/isosceles trapezoid or parallelogram)</li> </ul>
		4	<ul style="list-style-type: none"> <li>conclusion correct and complete based on table (e.g., trapezoid/isosceles trapezoid alternating with a parallelogram)</li> </ul>
CM	all (presentation of thinking)	1	<ul style="list-style-type: none"> <li>communication is unclear and does not reveal the thinking process (e.g., diagrams are not representative or are absent)</li> </ul>
		2	<ul style="list-style-type: none"> <li>communication is somewhat clear and reveals some of the thinking process (e.g., diagrams are somewhat representative)</li> </ul>
		3	<ul style="list-style-type: none"> <li>communication is clear and complete and reveals the thinking process (e.g., diagrams are representative)</li> <li><b>Note:</b> a representative diagram “looks like” the name provided</li> </ul>

**Task #3 — What Shape Am I?  
Assigned Codes and Rationale for Student Work**

Category and Strands	Portion of Task	Code	Rationale
KU M	a), b), c)	5	<ul style="list-style-type: none"> <li>The student correctly identifies nine geometric figures in clue 1 of part <b>a)</b>, clue 1 of part <b>b)</b> and part <b>c)</b>.</li> </ul>
AP M	a), b)	3	<ul style="list-style-type: none"> <li>Selection for clue 2 in part <b>a)</b> is correct. Clue 2 in part <b>b)</b> leads the student to circle the kite and the parallelogram. Response for clue 3 in part <b>b)</b> should lead to a kite rather than a rectangle as the selected geometric figure.</li> </ul>
PS M	d)	3	<ul style="list-style-type: none"> <li>The student correctly concludes that the shape of the border will be either an isosceles trapezoid or a parallelogram. The response lacks specificity about the alternating pattern.</li> </ul>
CM	all	3	<ul style="list-style-type: none"> <li>The diagrams constructed by the student clearly reflect the intended geometric figures.</li> </ul>