

Grade 9 Assessment of Mathematics, 2001–2002

# Multiple Choice

**Applied Program**

**Release Items**



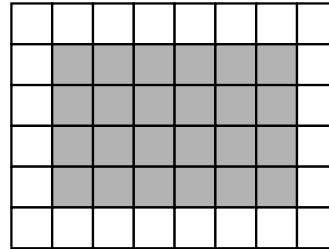
Education  
Quality and  
Accountability  
Office


# Directions to Students About Answering Multiple-Choice Questions

1. 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 or a pen
  - a ruler and a protractor
  - a scientific calculator or graphing calculator
  - some paper for rough work
2. Be sure to read the problem and all four answer choices for each question carefully. When you choose an answer, fill in the appropriate circle on your answer sheet.
3. Always choose the best answer. Mark only one answer for each question.
4. There are 24 questions in *Booklet 1*. Try to answer all of them. Do not spend too much time on any one question.
5. Figures in this section are not drawn to scale.
6. Now do the following sample question. Fill in your choice below the sample question.

## Sample Question

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



 1 square unit

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


1.  A  B  C  D

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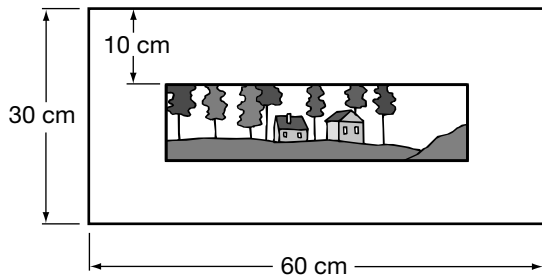
You should have filled in circle  B. If you did not mark the circle that goes with B, put an X through the incorrect answer and fill in the correct answer.

7. You will have **30 min** to do the 24 multiple-choice questions.



8. When you see the  sign, you have completed *Booklet 1*. Check your answers. Then wait quietly for directions from your teacher.

1. The frame of a picture measures 60 cm by 30 cm. The border around the picture is 10 cm wide.



What are the dimensions of the **picture**?

- A 40 cm × 10 cm
- B 50 cm × 20 cm
- C 50 cm × 30 cm
- D 60 cm × 30 cm

2. Tim shows the steps he took in simplifying the following algebraic expression:

$$\frac{(a^2)^3}{a^2 \times a^3}$$

$$= \frac{a^5}{a^2 \times a^3} \quad \text{Step 1}$$

$$= \frac{a^5}{a^{2+3}} \quad \text{Step 2}$$

$$= \frac{a^5}{a^5} \quad \text{Step 3}$$

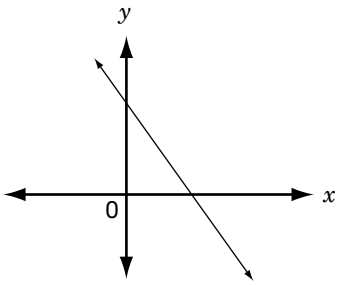
$$= 1 \quad \text{Step 4}$$

In which step did Tim make an **error**?

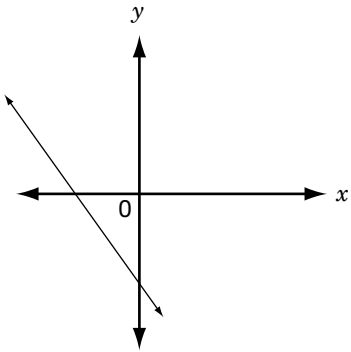
- F Step 1
- G Step 2
- H Step 3
- J Step 4

3. Which graph is the best match to a sketch of  $y = -3x - 4$ ?

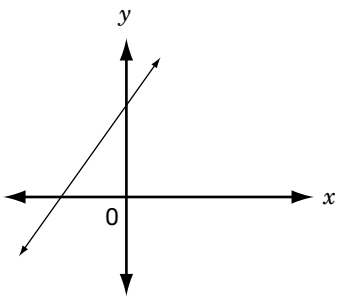
A



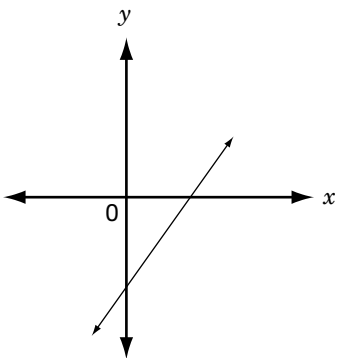
**B**



C



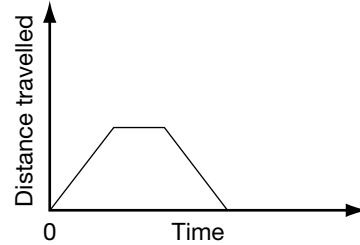
D



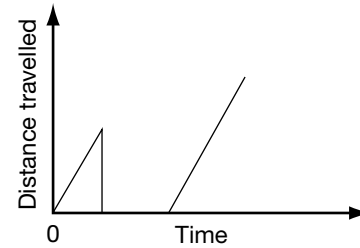
4. Nicole rides her bike to school in the morning. She stops at a store for about 5 min when she is halfway to school. Which graph below best describes this situation?



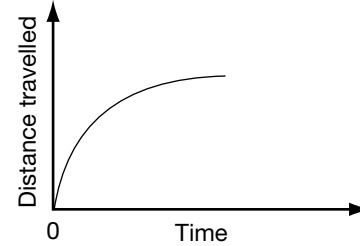
F



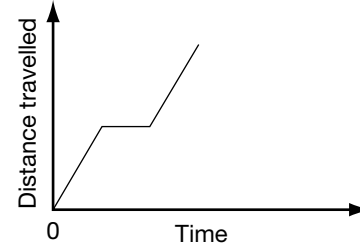
G



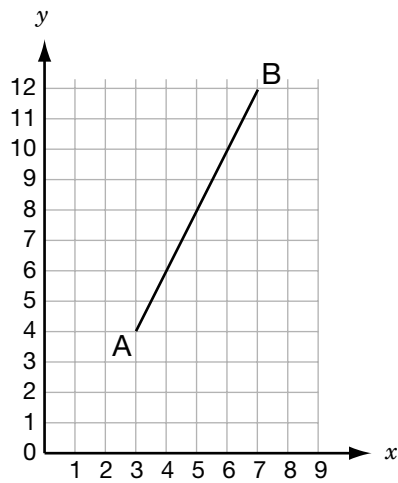
H



**J**

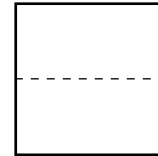


5. If A is (3, 4) and B is (7, 12), which point is on the line segment AB?

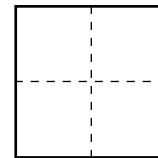


- A (3, 5)
- B (4, 8)
- C (5, 9)
- D (6, 10)**

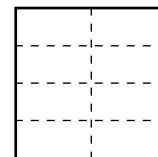
6. Sylvie folds a large piece of paper in half. The fold divides the paper into two equal parts. She folds it in half again. When she unfolds it, the folds divide the paper into four equal parts.



1 fold, 2 parts



2 folds, 4 parts



3 folds, 8 parts

She continues to fold and unfold the paper until the folds divide the paper into 64 equal parts.

How many times altogether has Sylvie folded the paper?

- F 5 times
- G 6 times**
- H 7 times
- J 8 times

7. Which of the following tables of values represents the linear relationship  $y = 2x$ ?

**A**

$x$	$y$
0	1
2	4
5	25

**B**

$x$	$y$
0	1
3	8
4	16

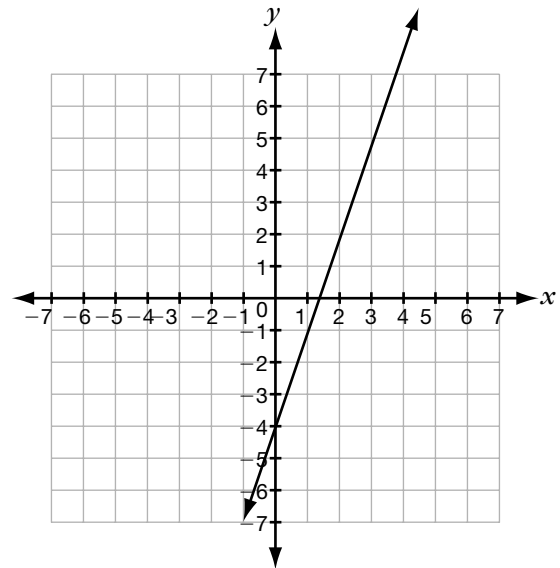
**C**

$x$	$y$
0	0
1	2
3	6

**D**

$x$	$y$
0	0
2	4
6	36

- 8.



Which of the following properties does the above line have?

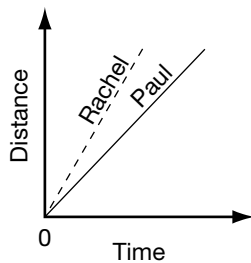
- F** positive slope and positive  $y$ -intercept
- G** positive slope and negative  $y$ -intercept
- H** negative slope and positive  $y$ -intercept
- J** negative slope and negative  $y$ -intercept

9. Paul and Rachel are riding their bikes from their school to the park. They both leave at the same time and from the same location. However, Rachel pedals faster and gets to the park ahead of Paul.

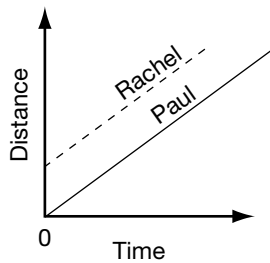


Which distance-time graph best illustrates their bike trips?

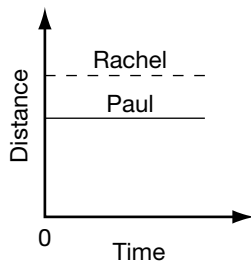
**A**



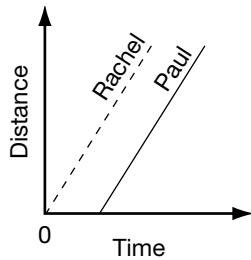
**B**



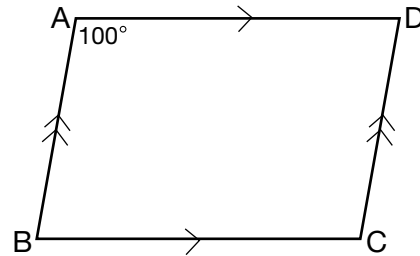
**C**



**D**



10. ABCD is a parallelogram.



If  $\angle BAD = 100^\circ$ , what is the value of  $\angle BCD$ ?

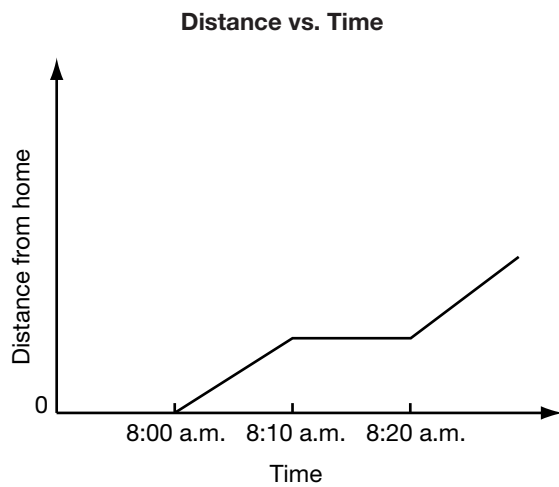
**F**  $80^\circ$

**G**  $90^\circ$

**H**  $100^\circ$

**J**  $110^\circ$

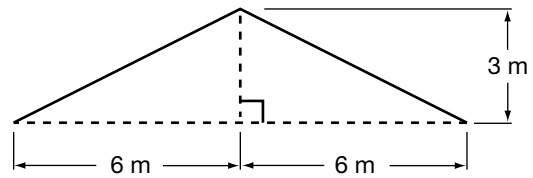
11. Lee goes to school every morning using the same route. The graph below shows the distance she is from home versus time on a given morning.



Which sequence of actions is likely represented by the graph?

- A walks, runs, stops
- B walks, runs, walks
- C runs, walks, runs
- D walks, stops, walks

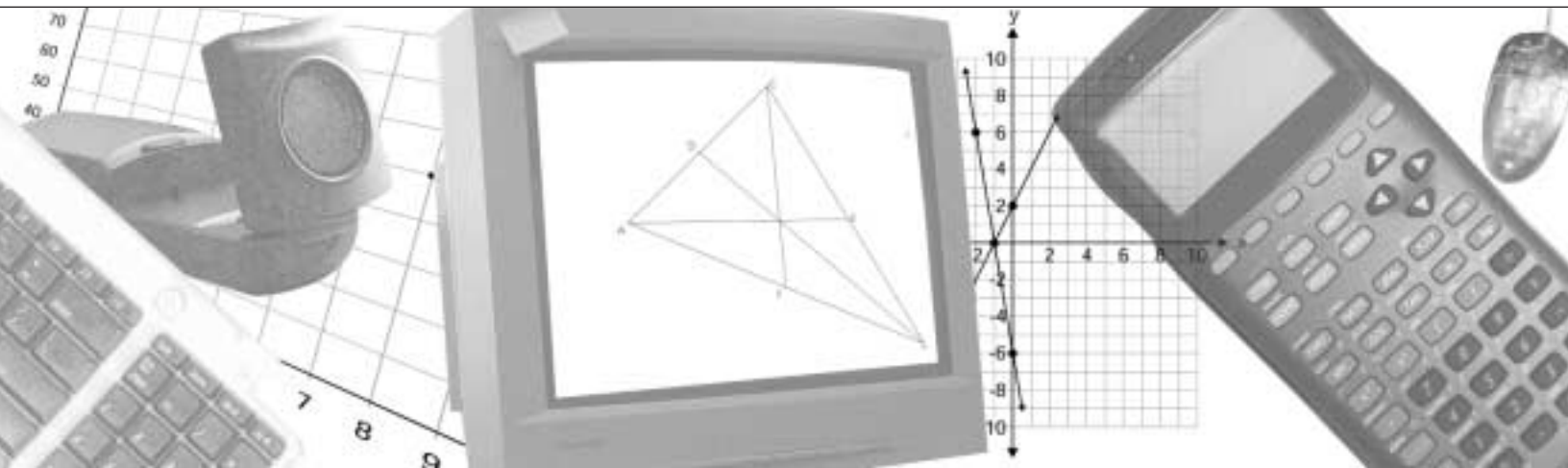
12. The figure below shows the cross-section of a house roof.



What is the slope of the roof?

- F  $\frac{1}{2}$
- G  $\frac{1}{4}$
- H 2
- J 4





Grade 9 Assessment of Mathematics, 2001–2002

# Short Answer

**Applied Program**


**Release Items**



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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 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.

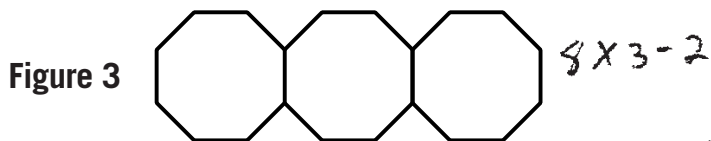
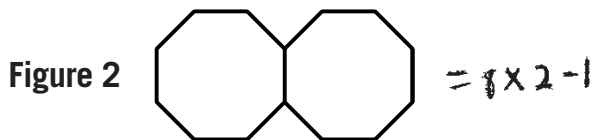
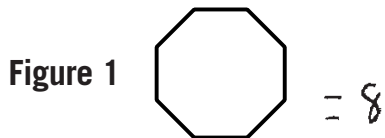
For example, the question might ask you to “**Explain** your answer.” The Key Words and Phrases in Instructions sheet says, “**Explain** means to use words and symbols to make your solutions clear and understandable.” As soon as you can explain a mathematical reason for the answer, do so. You do not 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. The following octagons are constructed with toothpicks.

Paul is going to extend the pattern.

**Determine** how many toothpicks Paul would need to create a figure with 21 octagons.

**Show your work.**



so since theres a pattern of multiplying the number of octagons then subtracting by one less the number of octagons so 21 octagons would be  $8 \times 21 - 20 = 148$  toothpicks

### Coding Guide

#### Applied Program — Short Answer Questions

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 — Do not code erased work.

Question Number	Codes			Category and Strand
	0	1	2	
1	<ul style="list-style-type: none"> <li>answer incorrect, work inappropriate</li> <li>answer incorrect, work not shown</li> </ul>	<ul style="list-style-type: none"> <li>answer correct, work not shown</li> <li>answer incorrect, work shown, one error in logic (e.g., does not include the overlapping toothpick)</li> </ul>	<ul style="list-style-type: none"> <li>answer correct (i.e., 148), work appropriate (e.g., table, equation or graph)</li> </ul>	PS-R

Question	Code	Rationale
1	2	Appropriate work leads to a correct answer of 148 toothpicks.

2. At Store A, a computer is regularly priced at \$1299.00. It is on sale for 20% off the regular price.

**SALE**  
**20% off**

At Store B, the same computer is regularly priced at \$1549.00. It is on sale for 30% off the regular price.

**SALE**  
**30% off**

Write calculations to **explain** why you should buy the computer at Store A.

$$\text{Store A} = \$1299.00 \times 0.20 = \$259.8$$

$$\begin{array}{r} \$1299.00 \\ - 259.80 \\ \hline \end{array}$$

*\$1039.2 = the price of the computer when its on sale*

$$\text{Store B} = \$1549.00 \times 0.30 = \$464.7$$

$$\begin{array}{r} \$1549.00 \\ - 464.70 \\ \hline \end{array}$$

$$\$1084.3$$



*From my calculations at store A it is cheaper to purchase the computer.*

Question Number	Codes			Category and Strand
	0	1	2	
2	<ul style="list-style-type: none"> <li>communicates thinking process unclearly (e.g., "because store A is cheaper")</li> </ul>	<ul style="list-style-type: none"> <li>communicates thinking process somewhat clearly (e.g., <math>1299 - 20\% = 1299 - 64.95 = 1234.05\dots</math>)</li> <li><b>Note:</b> the correctness of the thinking processes used should not be considered.</li> </ul>	<ul style="list-style-type: none"> <li>communicates thinking process clearly</li> <li><b>Note:</b> the correctness of the thinking processes used should not be considered.</li> </ul>	CM-N

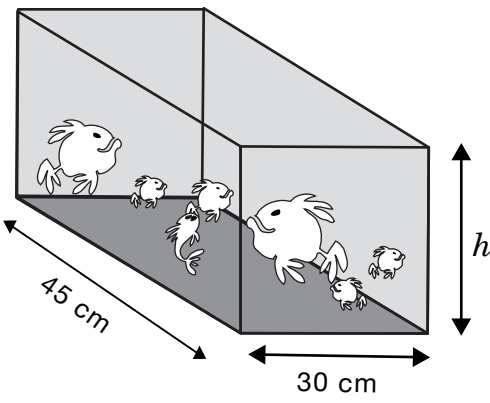
Question	Code	Rationale
2	2	The calculations and writing provided in the student work clearly demonstrate the thinking process.

3. The volume,  $V$ , of an aquarium is  $47\,250\text{ cm}^3$ . Its length,  $l$ , is  $45\text{ cm}$ . Its width,  $w$ , is  $30\text{ cm}$ .

**Substitute** into the formula to find its height,  $h$ .

**Show your work.**

$V = 47\,250\text{ cm}^3$



$V = lwh$

$$47\,250 = 45 \times 30 \times h$$

$$\frac{47\,250}{1350} = \frac{1350h}{1350}$$

$$35 = h$$

checking my answer  
 $V = l \times w \times h$   
 $= 45 \times 30 \times 35$   
 $= 47\,250\text{ cm}^3$

Question Number	Codes			Category and Strand
	0	1	2	
3	<ul style="list-style-type: none"> <li>incorrect substitution <b>or</b> incorrect answer with no work shown</li> </ul>	<ul style="list-style-type: none"> <li>correct substitution with error(s) in numerical calculation <b>or</b></li> <li>correct answer with no work shown</li> </ul>	<ul style="list-style-type: none"> <li>correct substitution and numerical calculation to find <math>h = 35\text{ cm}</math></li> <li><b>Note:</b> Students may mentally rearrange the formula before substituting.</li> </ul>	KU-N

Question	Code	Rationale
3	2	The student correctly substitutes the values $47\,250$ , $45$ and $30$ and performs necessary calculations to find $h = 35$ .

4. Mt. Scott is pictured below.

- The temperature at the bottom of Mt. Scott is  $12^{\circ}\text{C}$ .
- The temperature **drops**  $3^{\circ}\text{C}$  for every 100 m increase in altitude.

**Calculate** the temperature at an altitude of 600 m.

**Show your work.**

$$600 \div 100 = 6$$

$$3 \times 6 = 18^{\circ}\text{C}$$

$$12 - 18 = -6^{\circ}\text{C}$$

• It is  $-6^{\circ}\text{C}$  at 600m on Mt. Scott

Temperature = ?

600 m

**Mt. Scott**



Temperature =  $12^{\circ}\text{C}$

Question Number	Codes			Category and Strand
	0	1	2	
4	<ul style="list-style-type: none"> <li>• incorrect answer, inappropriate or no work shown</li> </ul>	<ul style="list-style-type: none"> <li>• procedural error(s), appropriate work shown <b>or</b></li> <li>• correct answer, inappropriate or no work shown</li> </ul>	<ul style="list-style-type: none"> <li>• correct answer (i.e., <math>-6^{\circ}\text{C}</math>), appropriate work shown</li> </ul>	AP-N

Question	Code	Rationale
4	2	A correct answer of $-6^{\circ}\text{C}$ is stated with supporting calculations.

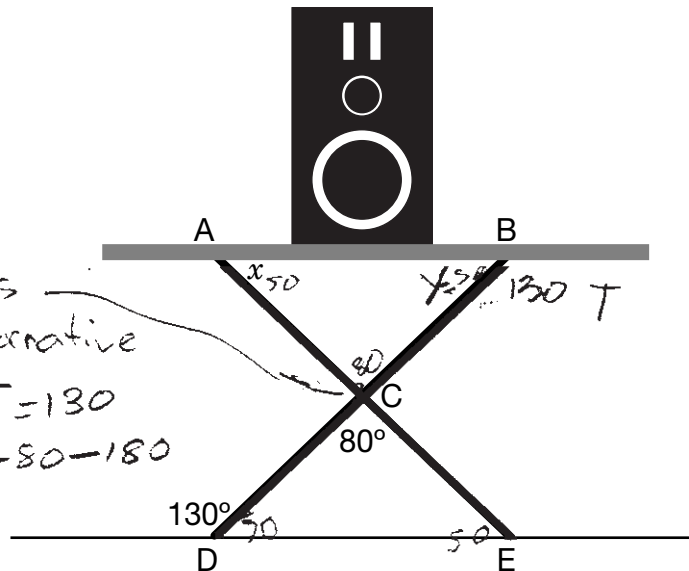
5. A rock band needs the top of a speaker stand to be parallel to the stage floor. They draw a sketch and measure angles.

**State** the value of  $x$  that will make AB parallel to DE.

**Give reasons for your answer.**

The diagram is not drawn to scale.

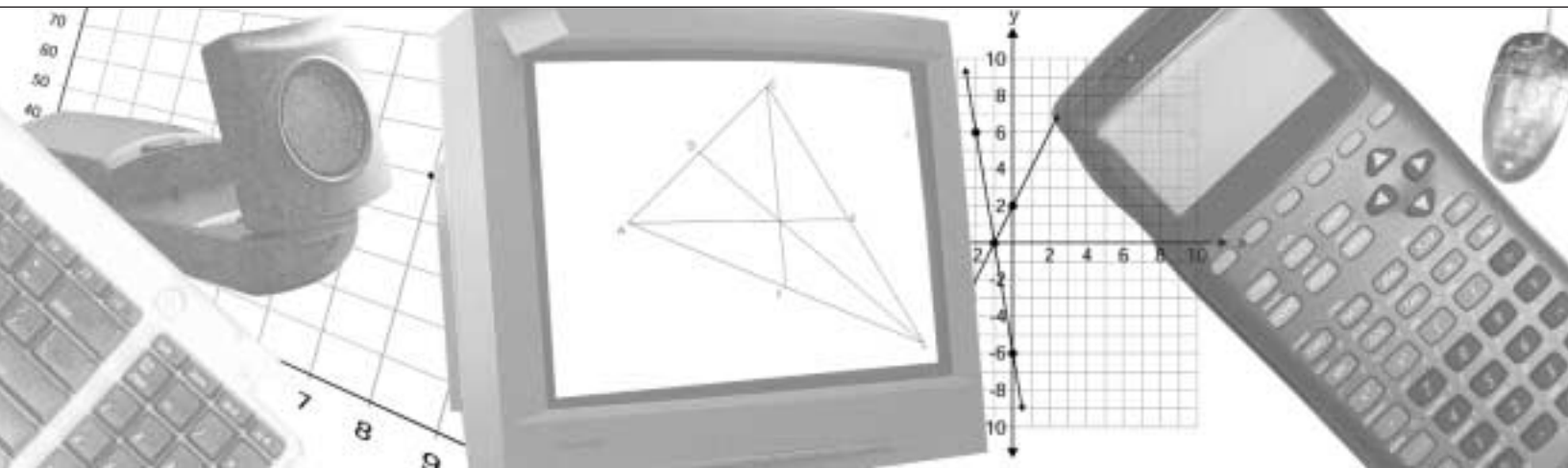
*x = 50 because the opposite of  $80^\circ$  is  $80^\circ$  and the alternative form is  $\angle 50^\circ = 130^\circ$   
 $130^\circ = 50^\circ + 80^\circ - 180^\circ = 50^\circ$   
 so  $x = 50^\circ$*



Question Number	Codes			Category and Strand
	0	1	2	
5	<ul style="list-style-type: none"> <li>inappropriate reasoning (e.g., 2 or more errors in work shown) <b>or</b></li> <li>incorrect answer with no work shown</li> </ul>	<ul style="list-style-type: none"> <li>partially appropriate reasoning (e.g., correctly shows degree measures in the diagram) <b>or</b></li> <li>correct answer with inappropriate or no reasoning (e.g., measures the angles)</li> </ul>	<ul style="list-style-type: none"> <li>correct answer (i.e., <math>x = 50^\circ</math>) with appropriate reasoning (e.g., refers to angles' sum in a triangle, opposite angles, supplementary angles and properties of parallel lines)</li> </ul>	PS-M

Question	Code	Rationale
5	2	Values on the diagram and written work provide appropriate reasoning to arrive at a correct answer ( $x = 50^\circ$ ).





Grade 9 Assessment of Mathematics, 2001–2002

# Tasks

**Applied Program**

**Release Items**




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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 graphing calculator
  - a ruler and a protractor
2. Do all of your work (even your rough work) in *Booklet 2*.
3. You will work in the booklet on two different days. Each day you will have 40 min to do 3 tasks. Allow about 15 min for each of the first two tasks and about 10 min for the third. 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.

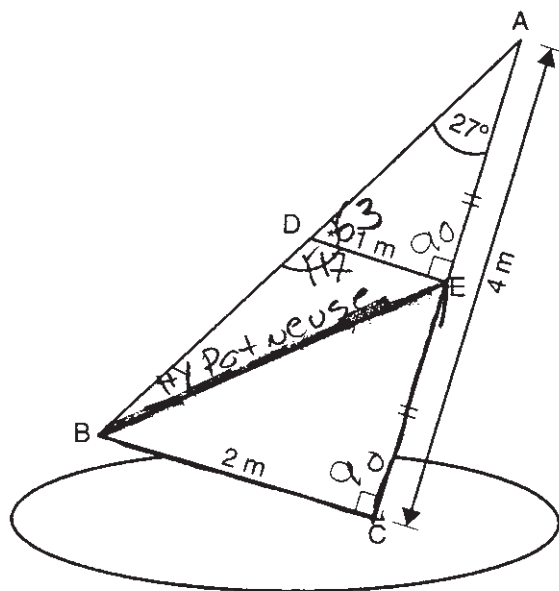
For example: Find the area of a circle with a diameter of 7 cm.

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: The Sailboard

Jonathan likes to windsurf. He wants a three-colour sail for his sailboard.

- a) Complete the chart below by
- **determining** the measures of  $\angle ADE$  and  $\angle BDE$
  - **giving reasons for your answers.**



$$\begin{aligned} \angle ADE \\ 27 + 90 = \\ 160 - 117 = 63 \end{aligned}$$

Angle	Measure	Reasons
$\angle ADE$ (✓)	$\angle ADE = 63$	Because $\triangle ADE$ is a right angle triangle which equals 180 and I know a right angle is equal to $90^\circ$ (E) $A = 27^\circ$ then I add that up and subtract it to give me the remaining amount.
$\angle BDE$ (✓)	$\angle BDE = 117$	If $\angle D$ equals 63 I know the formula of a straight line = 180 so I took $180 - 63$ to give me the unknown angle of $\angle BDE$ .

- b) Jonathan wants coloured trim along the segment BE of the sail.

Calculate the length of trim he will need.

Show your work.

$$\begin{aligned} H^2 &= 5^2 + 5^2 \\ H^2 &= 2m^2 + 2m^2 \\ H^2 &= 4 + 4 \\ \sqrt{H^2} &= \sqrt{8} \\ H &= 2.828 \\ H &= 2.83 \end{aligned}$$

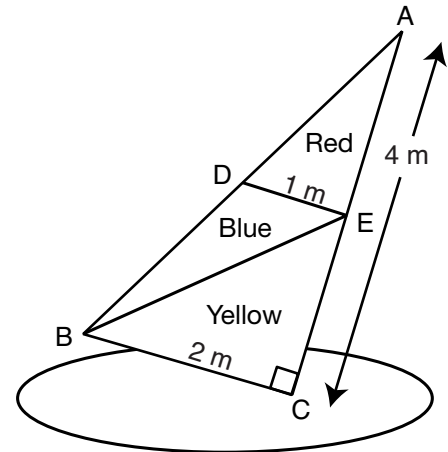
Hint:

BC = 2 m  
CA = 4 m  
CE = EA

c) Jonathan wants a sail with three colours.

The table below shows the colours of material available and the cost.

Complete the table.



Colour	Cost of material (\$/m <sup>2</sup> )	Area of section (m <sup>2</sup> )	Cost of section (\$)
Yellow	5.10	2 m <sup>2</sup>	10.20
Blue	4.40	1	4.40
Red	4.50	1 m <sup>2</sup>	4.50
Total			\$ 19.1

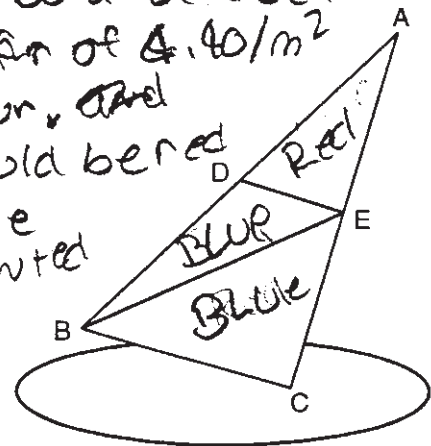
d) Jonathan decides to make the three sections of the sail, using only **two** colours.

**Identify** and record on the diagram which colour should be used for each section of the sail so that the total cost is as **low** as possible.

**Give reasons for your answer.**

For  $\angle EBC$  and  $\angle BDE$  Blue should be used because it's the lowest cost at of  $4.40/m^2$  so it would be the cheapest colour. and for the second colour it should be red for  $\angle ADE$  because it's the second lowest price and he wanted 2 colours.

$\therefore$  Blue being the cheapest should be used for the largest amount of area and Red for the remaining sum.



# Extended Response Coding Guide Applied Program

## Task #1 – The Sailboard

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 — Do not code erased work.

### Category Definitions

<b>KU</b>	<b>The knowledge of concepts and the ability to carry out procedures (e.g., operations, algorithms) to solve problems.</b>			
<b>AP</b>	<b>The selection of concepts, procedures, algorithms, tools and prior knowledge and fitting them into the context and the information in the problem.</b>			
<b>PS</b>	<b>The processes of using reasoning to pull together information in a problem, manipulating and transforming the information in a problem in order to see a solution, and reflecting on the solution to see restrictions and judge how well the solution answers the problem.</b>			
<b>Cat</b>	<b>Parts/Strand</b>	<b>Codes</b>	<b>Descriptions</b>	
KU	a)	M	1	• both answers incorrect
			2	• one answer correct with no reasons given, the other incorrect
			3	• both answers correct, no reasons given
			4	• one answer correct with appropriate reasons given, the other incorrect
			5	• both answers correct with appropriate reasons given
AP	b)	N	1	• incorrect answer, no apparent strategy
			2	• incorrect answer, inappropriate strategy
			3	• appropriate strategy (e.g., Pythagorean theorem, line lengths) with incorrect answer due to major error in fitting to the context (e.g., uses 4 m for CA)
			4	• appropriate strategy (e.g., Pythagorean theorem, line lengths) leading to correct answer with little or no work shown
			5	• appropriate strategy (e.g., Pythagorean theorem, line lengths) leading to correct answer (e.g., $\approx 2.8$ ) with all work shown • <b>Note:</b> ignore minor calculation error(s)
KU	c)	N	1	• all entries in table are incorrect
			2	• 1 correct entry in table [note: total is correct if consistent with previous error(s)]
			3	• 2 correct entries in table [note: total is correct if consistent with previous error(s)]
			4	• 3 correct entries in table [note: total is correct if consistent with previous error(s)]
			5	• 4 of 5 correct entries in table (note: total is correct if consistent with previous error)
			6	• all entries in table correct (i.e., 2, 1, 4.40, 4.50, 19.10)
PS	d)	N	1	• incorrect solution with illogical or no reasoning
			2	• incorrect solution with work that shows partially logical reasoning
			3	• correct solution with illogical or no reasoning
			4	• correct solution (e.g., $\triangle ADE$ and $\triangle EBC$ are labelled “blue”, $\triangle DBE$ is labelled “red”, total cost is \$17.70) with work that shows partially logical reasoning (e.g., does not give reasons for colours for all three triangles)
			5	• calculation error(s) in solution with work that shows logical reasoning that supports the answer
			6	• correct solution (e.g., $\triangle ADE$ and $\triangle EBC$ are labelled “blue”, $\triangle DBE$ is labelled “red”, total cost is \$17.70) with work that shows logical reasoning that supports the answer (e.g., work shows that $\triangle EBC$ is blue since its area is the largest and blue is the cheapest colour; the other 2 triangles can be any combination of blue and red, since they are equal in area and red is the next cheapest colour) • <b>Note:</b> Other solutions are possible and total cost is not required.
CM	d)	(th)	<b>Presentation of thinking: The consistency, quality and language of solutions and explanations of reasoning</b>	
			1	• communication is unclear, incomplete and does not reveal the thinking process
			2	• communication is somewhat clear and complete and reveals some of the thinking process
			3	• communication is mostly clear and complete and reveals most of the thinking process
			4	• communication is clear and complete and reveals the thinking process
CM	all	(co)	<b>Mathematical conventions: The consistency, quality, selection and integration of symbols, vocabulary and mathematical forms used</b>	
			1	• mathematical conventions are rarely used properly
			2	• mathematical conventions are sometimes used properly
			3	• mathematical conventions are mostly used properly
			4	• mathematical conventions [e.g., proper units (i.e., \$, °), complete equations] are used properly

## TASK #1 – The Sailboard

Category	Portion of Task	Code	Rationale
KU	a)	5	Identifies $\angle ADE$ and $\angle BDE$ as $63^\circ$ and $117^\circ$ respectively and provides appropriate reasons for each.
AP	b)	5	The student uses the Pythagorean theorem to determine the length of trim $\doteq 2.83$ m and provides supporting work.
KU	c)	6	All entries in the table are correct (i.e., 2, 1, 4.40, 4.50, 19.10).
PS	d)	6	Conclusion correctly identifies that $\triangle EBC$ should be blue since its area is the largest and blue is the cheapest colour; the other 2 triangles can be any combination of blue and red, since they are equal in area and red is the next cheapest colour.
CM	d)	4	Communication is clear and complete and reveals the thinking process in part d).
CM	all	4	Mathematical conventions are used properly throughout the task.

## Task 2: The Mechanic



Troy works as a mechanic at Quick Lube. He does oil changes on cars. He is paid a flat rate every day **plus** a certain amount for each oil change he does.

His total pay for the day,  $T$ , in dollars, is given by the formula

$$T = 5c + 25$$

where  $c$  is the number of oil changes he does that day.

- a) One day Troy does 10 oil changes. Use the formula to **calculate** his total pay. **Show your work.**

$$\begin{aligned} T &= 5c + 25 \\ T &= 5(10) + 25 \\ T &= 50 + 25 \\ T &= 75 \$ \end{aligned}$$

- b) **Complete** the chart.

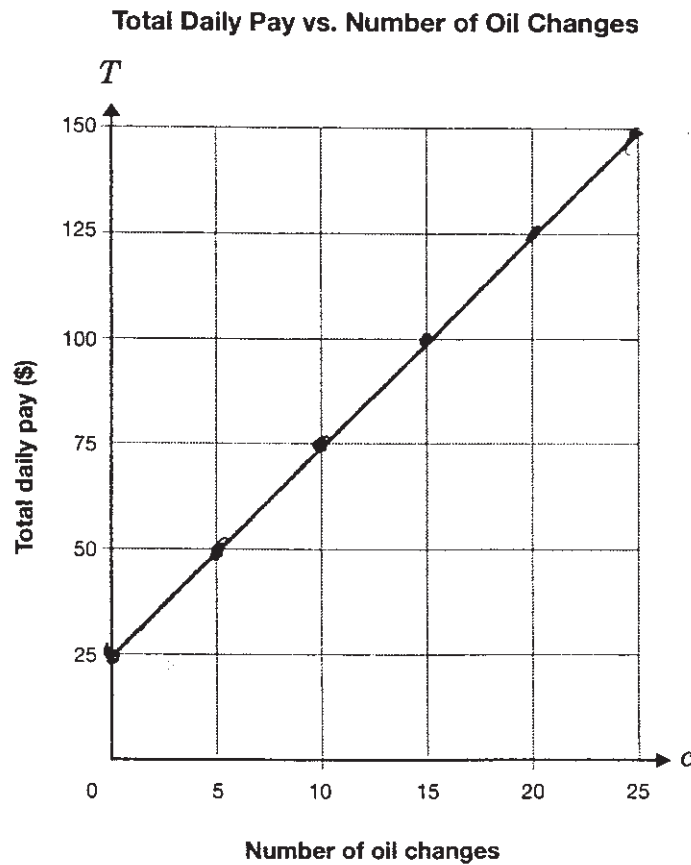
Number of oil changes, $c$	Total pay, $T$ (\$)
0	25
5	50
10	75
15	100
20	125

$$\begin{aligned} T &= 5c + 25 \\ T &= 5(20) + 25 \\ T &= 100 + 25 \\ T &= 125 \$ \end{aligned}$$

c) **Explain** what the numbers 5 and 25 in the formula  $T = 5c + 25$  tell you about how Troy is paid.

This tells me that he is paid 5\$ for every oil change and a base rate of 25\$ for each day

d) **Graph** the relationship between  $T$  and  $c$ .



- e) With his pay for today Troy needs to pay his phone bill, which is \$85. Use the formula  $T = 5c + 25$  to determine how many oil changes he must do to have enough money to pay the phone bill.  
**Show your work.**

$$T = 5c + 25$$

$$85 = 5c + 25$$

$$85 - 25 = 5c$$

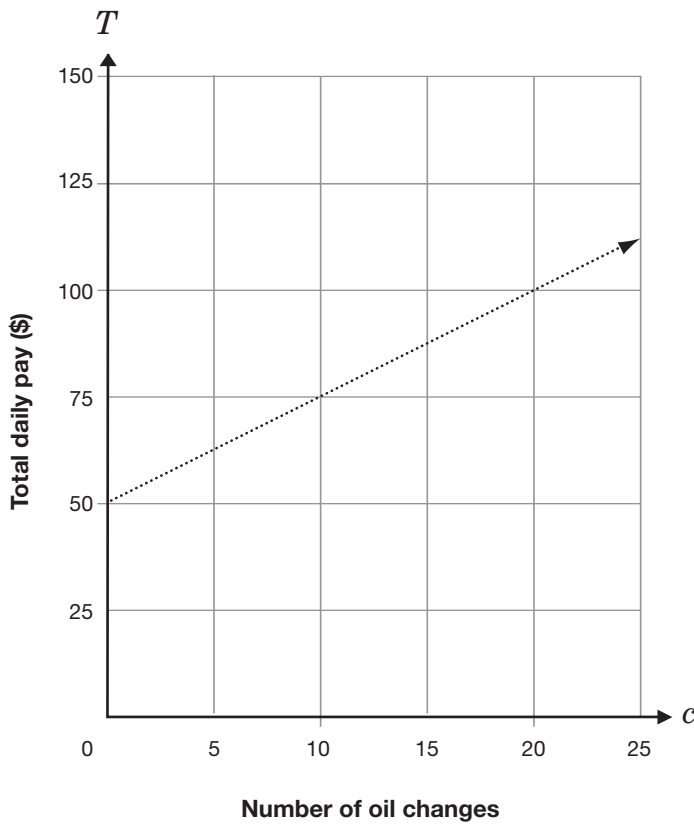
$$\frac{60}{5} = \frac{5c}{5}$$

$$12 = c$$

Troy will need to make 12 oil changes today to pay his phone bill.

- f) Surjit does oil changes at a different shop. This graph shows her total daily pay. Determine who earns more per oil change, Troy or Surjit.  
**Show your work or give reasons for your answer.**

Total Daily Pay vs. Number of Oil Changes



Troy earns more per oil change. She only gets 25\$ for every 10 but Troy gets 50\$ for every 10 oil changes.

# Extended Response Coding Guide Applied Program

## Task #2 – The Mechanic

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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 — Do not code erased work.

### Category Definitions

<b>KU</b>	<b>The knowledge of concepts and the ability to carry out procedures (e.g., operations, algorithms) to solve problems.</b>			
<b>AP</b>	<b>The selection of concepts, procedures, algorithms, tools and prior knowledge and fitting them into the context and the information in the problem.</b>			
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<b>Cat</b>	<b>Parts/Strand</b>	<b>Codes</b>	<b>Descriptions</b>	
KU	a)	N	1	<ul style="list-style-type: none"> <li>incorrect answer with little or no work shown</li> </ul>
			2	<ul style="list-style-type: none"> <li>correct answer with little or no work shown <b>or</b></li> <li>one calculation or procedural error with appropriate work shown</li> </ul>
			3	<ul style="list-style-type: none"> <li>correct answer (i.e., \$75) with appropriate work shown</li> </ul>
KU	b)	N	1	<ul style="list-style-type: none"> <li>both entries incorrect</li> </ul>
			2	<ul style="list-style-type: none"> <li>one entry correct, the other incorrect or missing</li> </ul>
			3	<ul style="list-style-type: none"> <li>both table entries correct (i.e., 75, 125)</li> </ul>
AP	c)	N	1	<ul style="list-style-type: none"> <li>explanation for one number is incorrect or missing <b>or</b></li> <li>both explanations incorrect</li> </ul>
			2	<ul style="list-style-type: none"> <li>correctly explains the significance of one number, the explanation for the other number is incorrect or missing</li> </ul>
			3	<ul style="list-style-type: none"> <li>correctly explains the significance of both numbers (e.g., “The \$5 is what Troy is paid per oil change, and the \$25 is the flat rate that Troy is paid.”)</li> </ul>
KU	d)	G	1	<ul style="list-style-type: none"> <li>more than 2 errors in plotting or joining points</li> </ul>
			2	<ul style="list-style-type: none"> <li>two errors in plotting or joining points</li> </ul>
			3	<ul style="list-style-type: none"> <li>points plotted correctly, no line drawn</li> </ul>
			4	<ul style="list-style-type: none"> <li>one error in plotting or joining points</li> </ul>
			5	<ul style="list-style-type: none"> <li>ordered pairs plotted correctly based on table in <b>b)</b>, appropriate line drawn</li> </ul>
AP	e)	N	1	<ul style="list-style-type: none"> <li>uses inappropriate tool (e.g., graph) not fitted appropriately to the context, answer incorrect</li> </ul>
			2	<ul style="list-style-type: none"> <li>uses inappropriate tool (e.g., graph) fitted appropriately to the context, answer correct or incorrect</li> </ul>
			3	<ul style="list-style-type: none"> <li>appropriate choice of tool (e.g., rearranging the formula) with incorrect answer because of incorrect substitution</li> </ul>
			4	<ul style="list-style-type: none"> <li>appropriate choice of tool (e.g., rearranging the formula) with incorrect answer because of procedural error in solving</li> </ul>
			5	<ul style="list-style-type: none"> <li>appropriate choice of tool (e.g., rearranging the formula) fitted correctly to the context (e.g., correct substitution), correct answer (i.e., 12)</li> </ul>
PS	f)	G	1	<ul style="list-style-type: none"> <li>incorrect or no conclusion stated with or without reasoning (e.g., “Troy makes \$25 and Surjit makes \$50, so Surjit makes more.”)</li> </ul>
			2	<ul style="list-style-type: none"> <li>correct conclusion stated with no reasoning or illogical reasoning</li> </ul>
			3	<ul style="list-style-type: none"> <li>correct conclusion stated with limited reasoning (e.g., “Troy makes \$5 per oil change and Surjit probably makes less.”)</li> </ul>
			4	<ul style="list-style-type: none"> <li>correct conclusion stated and supported by partially logical reasoning that refers to the graph (e.g., “Troy’s line is steeper and so he earns more per oil change.”)</li> </ul>
			5	<ul style="list-style-type: none"> <li>correct conclusion stated and supported by logical reasoning that refers to the graph (e.g., “Troy’s line is steeper and so the slope is higher. The slope gives the pay earned per oil change, so Troy earns more per oil change.”)</li> <li><b>Note:</b> If information from <b>d)</b> is used in the answer, conclusions are assessed based on the answer given by the student in <b>d)</b>.</li> </ul>
<b>Presentation of thinking: The consistency, quality and language of solutions and explanations of reasoning</b>				
CM	c), f)	th	1	<ul style="list-style-type: none"> <li>communication is unclear and incomplete and does not reveal the thinking process</li> </ul>
			2	<ul style="list-style-type: none"> <li>communication is somewhat clear and complete and reveals some of the thinking process</li> </ul>
			3	<ul style="list-style-type: none"> <li>communication is mostly clear and complete and reveals most of the thinking process</li> </ul>
			4	<ul style="list-style-type: none"> <li>communication is clear and complete and reveals the thinking process</li> </ul>

# Extended Response Coding Guide Applied Program

## Task #2 — The Mechanic

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Erasures — Do not code erased work.

Mathematical conventions: The consistency, quality, selection and integration of symbols, vocabulary and mathematical forms used				
CM	all	co	1	<ul style="list-style-type: none"> <li>• mathematical conventions are rarely used properly</li> </ul>
			2	<ul style="list-style-type: none"> <li>• mathematical conventions are sometimes used properly</li> </ul>
			3	<ul style="list-style-type: none"> <li>• mathematical conventions are mostly used properly</li> </ul>
			4	<ul style="list-style-type: none"> <li>• mathematical conventions are used properly</li> </ul>

Category	Portion of Task	Code	Rationale
KU	a)	3	Determines the correct value for Troy’s total pay as \$75 with appropriate work shown.
KU	b)	3	Both entries in the table are correct (i.e., 75 and 125).
AP	c)	3	The student identifies the base rate as \$25 and the cost of every oil change as \$5.
KU	d)	5	The ordered pairs from the table in b) are plotted correctly.
AP	e)	5	An appropriate choice of tool (rearranging the formula), fitted correctly to the context (correct substitution of \$85 for total cost), leads to a correct answer of 12.
PS	f)	3	Correctly states that Troy earns more per oil change. The reasoning is limited in that there is a comparison of 10 oil changes vs. per oil change.
CM	c) f)	3	Communication is mostly clear and complete and reveals most of the thinking process in c) and f).
CM	all	4	Mathematical conventions are used properly throughout the task.

## Task 3: Car Capers

Use a **ruler**, **protractor** and **geometry rules** to do this task.

- a) Name the building located at  $\angle HGB$ . Courthouse
- b) Name a building located under line segment CF. McDonald Farm
- c) Name two parallel lines. AD is parallel to HE.
- d) Measure  $\angle ABG$  and write its measure here:  $87^\circ$
- e) Name an angle that measures  $96^\circ$ .  $\angle C$
- f) Around the points D and E, the angles are numbered 1 to 8.  
**Name** sets of these angles that are **equal to each other** according to each geometry rule.

i) Opposite angles:

2, 4    8, 6  
1, 3  
5, 7

ii) Corresponding angles (F pattern):

3, 7  
6, 2  
5, 1  
8, 4

iii) Alternate angles (Z pattern):

5, 3  
3, 5

g) Look at the same angles numbered 1 to 8.

**Name** sets of these angles that are **supplementary** according to each geometry rule.

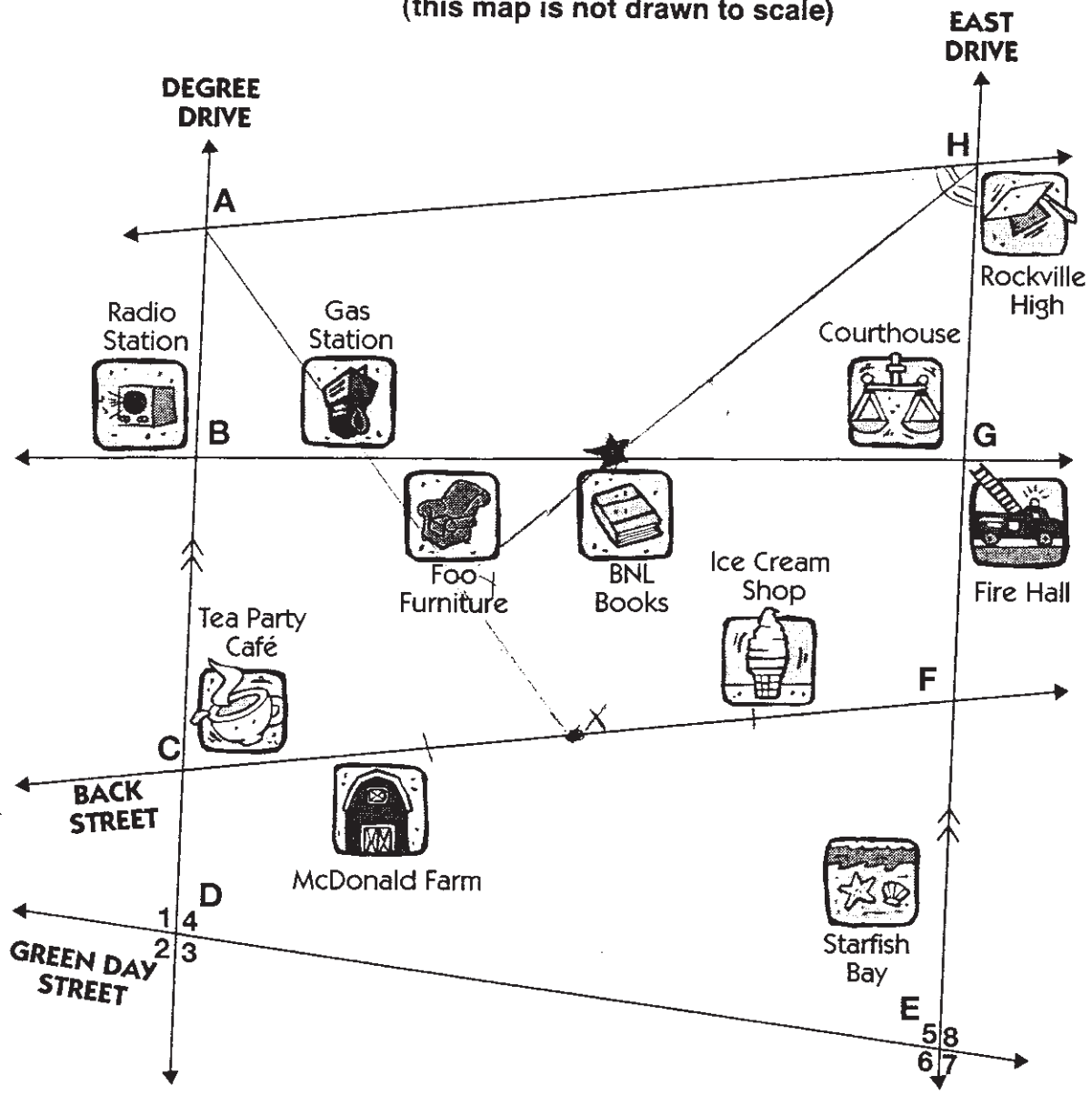
i) Supplementary angles (C pattern):

6, 3  
5, 4

ii) Supplementary angles (straight angle):

8, 7    1, 4  
5, 6    5, 8  
4, 3    2, 3  
1, 2    6, 7

**Town of Rockville**  
(this map is not drawn to scale)



Done on Other Map

- h) A radio station has hidden a new car in Rockville. The first listener to locate the car will win it. The radio station has released the following clues.

Use the clues and the map of Rockville to find the location of the hidden car.

Show all of your work on the map and label equal angles and equal line segments with symbols.

**Clue 1:**

- X is along BACK STREET at the **midpoint** of the block (the midpoint of CF).
- Mark** this midpoint X.
- Use symbols to **mark equal line segments**.

**Clue 2:**

- Join** point A to point X with a straight line.

**Clue 3:**

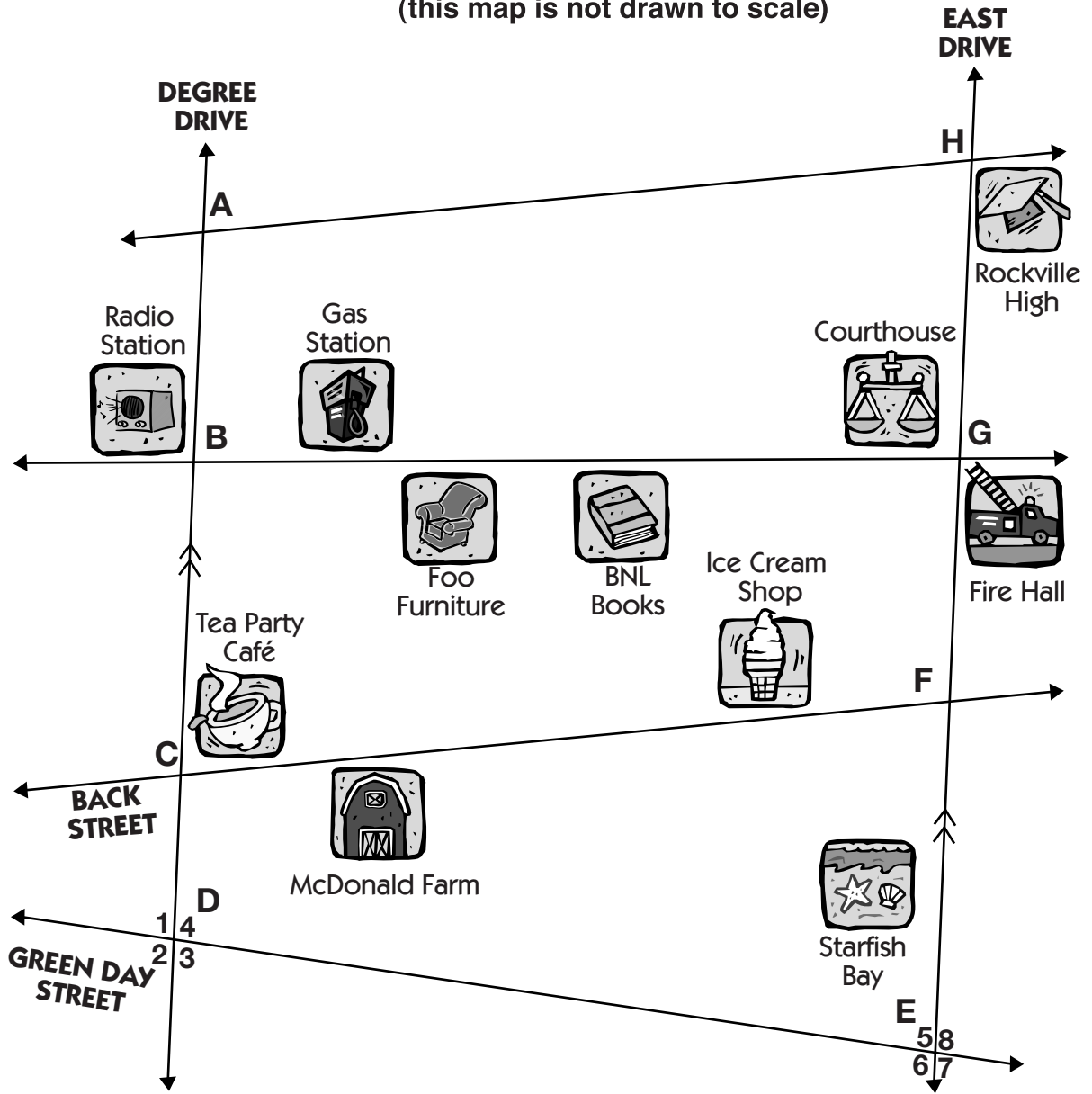
- Bisect** the angle at the Rockville High intersection called  $\angle AHG$ .
- Draw** the angle bisector and **extend** the line to meet AX.
- Mark** Y on the line segment AX where the two lines meet.
- Mark** the equal angles with symbols.

**Clue 4:**

- The car is hidden **3 cm from Y along the line segment YH**. Find this point.
- Mark it with an asterisk or a big star ★.

In which building is the new car hidden? BNL Books

Town of Rockville  
(this map is not drawn to scale)



# Extended Response Coding Guide Applied Program

## Task #3 – Car Capers

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Category Definitions				
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PS	<b>The processes of using reasoning to pull together information in a problem, manipulating and transforming the information in a problem in order to see a solution, and reflecting on the solution to see restrictions and judge how well the solution answers the problem.</b>			
Cat	Parts/Strand	Codes	Descriptions	
KU	a), b), c), d), e)	M	1	<ul style="list-style-type: none"> <li>no answers correct</li> </ul>
			2	<ul style="list-style-type: none"> <li>one answer correct</li> </ul>
			3	<ul style="list-style-type: none"> <li>two or three answers correct</li> </ul>
			4	<ul style="list-style-type: none"> <li>four or five answers correct [i.e., Courthouse, McDonald Farm, AD is parallel to HE or AH is parallel to CF, <math>88^\circ</math> (answers may vary between <math>87^\circ</math> and <math>89^\circ</math>), <math>\angle ADE</math> or <math>\angle HAB</math> or <math>\angle BCF</math> or <math>\angle CFG</math> or <math>\angle 6</math> or <math>\angle 8</math>]</li> </ul>
AP	f i)	M	1	<ul style="list-style-type: none"> <li>no selection of correct answers</li> </ul>
			2	<ul style="list-style-type: none"> <li>one or two answers correct</li> </ul>
			3	<ul style="list-style-type: none"> <li>three or four answers correct (i.e., 1 and 3, 2 and 4, 5 and 7, 6 and 8)</li> </ul>
AP	f ii)	M	1	<ul style="list-style-type: none"> <li>no selection of correct answers</li> </ul>
			2	<ul style="list-style-type: none"> <li>one or two answers correct</li> </ul>
			3	<ul style="list-style-type: none"> <li>three or four answers correct (i.e., 1 and 5, 4 and 8, 2 and 6, 3 and 7)</li> </ul>
AP	f iii)	M	1	<ul style="list-style-type: none"> <li>no selection of correct answers</li> </ul>
			2	<ul style="list-style-type: none"> <li>one answer correct</li> </ul>
			3	<ul style="list-style-type: none"> <li>both answers correct (i.e., 4 and 6, 3 and 5)</li> </ul>
AP	g i)	M	1	<ul style="list-style-type: none"> <li>no selection of correct answers</li> </ul>
			2	<ul style="list-style-type: none"> <li>one answer correct</li> </ul>
			3	<ul style="list-style-type: none"> <li>both answers correct (i.e., 4 and 5, 3 and 6)</li> </ul>
AP	g ii)	M	1	<ul style="list-style-type: none"> <li>no selection of correct answers</li> </ul>
			2	<ul style="list-style-type: none"> <li>one or two answers correct</li> </ul>
			3	<ul style="list-style-type: none"> <li>three, four or five answers correct</li> </ul>
			4	<ul style="list-style-type: none"> <li>six, seven or eight answers correct (i.e., 1 and 4, 3 and 4, 2 and 3, 1 and 2, 5 and 6, 6 and 7, 7 and 8, 5 and 8)</li> </ul>
PS	h) clue 1	M	1	<ul style="list-style-type: none"> <li>locates a point other than those listed below</li> </ul>
			2	<ul style="list-style-type: none"> <li>locates a point close to the midpoint of CF (within 5 mm) <b>or</b></li> <li>locates the midpoint of another line segment (e.g., GF) <b>or</b></li> <li>bisects the line CF from arrow to arrow</li> </ul>
			3	<ul style="list-style-type: none"> <li>locates the midpoint of CF (within 1 or 2 mm)</li> <li>(label may be missing, diagram indicates that correct point was chosen)</li> </ul>
PS	h) clues 2 and 3	M	1	<ul style="list-style-type: none"> <li>joins incorrect points, draws incorrect bisector and does not extend the line</li> </ul>
			2	<ul style="list-style-type: none"> <li>joins point A to X, no indication of a bisector of <math>\angle AHG</math></li> </ul>
			3	<ul style="list-style-type: none"> <li>joins point A to X, draws incorrect bisector of <math>\angle AHG</math>, extends the line <b>or</b></li> <li>joins incorrect points, draws correct angle bisector, does not extend the line</li> </ul>
			4	<ul style="list-style-type: none"> <li>joins point A to X, draws bisector of <math>\angle AHG</math>, extends the line to meet AX, based on response from Clue 1</li> </ul>
PS	h) clue 4	M	1	<ul style="list-style-type: none"> <li>locates a point other than that listed below</li> </ul>
			2	<ul style="list-style-type: none"> <li>locates a point approximately 3 cm from Y (but not on line segment YH) based on response from Clue 3 (label may be missing, diagram indicates that correct point was chosen)</li> </ul>
			3	<ul style="list-style-type: none"> <li>locates a point 3 cm (within 1 or 2 mm) from Y on line segment YH based on response from Clue 3 (label may be missing, diagram indicates that correct point was chosen)</li> </ul>

# Extended Response Coding Guide Applied Program

## Task #3 – Car Capers

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Erasures — Do not code erased work.

Mathematical conventions: The consistency, quality, selection and integration of symbols, vocabulary, conventions and mathematical forms used			
CM	all	co	1
			2
			3
			<ul style="list-style-type: none"> <li>• mathematical conventions are rarely used properly when required</li> <li>• mathematical conventions are sometimes used properly when required</li> <li>• mathematical conventions are usually used properly when required [i.e., degree symbol in <b>d</b>]; equal angles marked properly and equal line segments marked properly in <b>h</b>); points X and Y labelled properly in <b>h</b>) and location of car marked properly with an asterisk or a star or its location named; clearly indicated pairs of angles in <b>f</b>) and <b>g</b>)]</li> </ul>

Category	Portion of Task	Code	Rationale
KU	a), b), c), d), e)	4	Answers for a), b), c) and d) are correct.
AP	f i)	3	Correctly identifies four pairs of opposite angles.
AP	f ii)	3	Correctly identifies four pairs of corresponding angles.
AP	f iii)	2	One pair of alternate angles is stated correctly.
AP	g i)	3	Both pairs of supplementary angles (C pattern) are provided.
AP	g) ii)	4	Lists eight pairs of supplementary angles (straight angle).
PS	h) clue 1	3	Locates the midpoint of CF, as indicated by “X” on the map.
PS	h) clues 2 and 3	4	The student joins point A to X, draws bisector of $\angle AHG$ and extends the line to meet AX.
PS	h) clue 4	3	Identifies BNL Books as the building located at a point 3 cm from Y on line segment YH, as supported by previous work.
CM	all	3	Mathematical conventions are usually used properly when required [i.e., degree symbol in <b>d</b> ]; equal angles and equal line segments marked properly in <b>h</b> ); points X and Y labelled properly in <b>h</b> ); location of car marked properly with an asterisk or a star or its location named; clearly indicated pairs of angles in <b>f</b> ) and <b>g</b> )].