

EASTERN ONTARIO  
CATHOLIC  
CURRICULUM CORPORATION

*Working Together for Catholic Education*



# M3- Creating a Collaborative Continuum

## *Closing the Gap in Mathematics for the Intermediate Division Grades 7, 8, 9 applied, and 9 academic*

April 2019  
[www.eoccc.org](http://www.eoccc.org)

# Acknowledgements

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## Content Reviewer

# Resource Overview & Rationale

## Rationale:

This resource was created to support the need for improvement in the teaching and learning of mathematics, while continuously embedding Catholic teachings in a variety of ways. It directly links Ontario Math Curriculum expectations with the 2011-2016 released EQAO open response questions. By looking at past EQAO assessments and other rich questions, teachers support teaching and learning Mathematics. Selected grade 9 (applied and academic) EQAO tasks have been modified in order to scaffold math teaching and learning from grade 7-9. This developmental continuum will support the intermediate division in closing the gaps for intermediate grades.

## Outcomes:

- Teachers will gain deeper understanding of the Intermediate EQAO Assessment and the continuum of curriculum expectations
- Students will be exposed to the Intermediate EQAO assessment in grades 7, 8 and 9
- All educators see their role in preparation for Intermediate EQAO, allowing for coherence and a whole division approach. Through collaborative planning and differentiating instruction, educators tailor learning opportunities to the needs of each student.
- This resource will provide many opportunities for assessment. as learning (self-reflection), assessment for learning ( Opportunities for educators to moderate and study student work in order to support students and plan instruction

# Grade 7-9 Mathematics Continuum

In partnership with district school boards and authorities, and in collaboration with educators' professional associations, the Renewed Mathematics Strategy (RMS) provides an integrated approach that is responsive to the mathematics learning and teaching experiences of children, students, and educators.

The following are the four key objectives of the RMS:

1. increased student achievement, well-being and engagement in mathematics;
2. increased educator math knowledge and pedagogical expertise;
3. increased leader use of knowledge of effective mathematics pedagogy to provide the necessary supports and conditions for school and system improvement;
4. increased parent engagement in their children's mathematics learning.

See [A Renewed Math Strategy for Ontario](#) for a full description of Ontario's Renewed Mathematics Strategy.



## RMS Grade 7-9 Continuum

Grades 7/8:	Grade 9 Foundations of Math (Applied)	Grade 9 Principles of Math (Academic)
<ul style="list-style-type: none"><li>• Integers and Fractions with Tools</li><li>• Decimal/Fraction/Percent</li><li>• Represent and Order Integers</li><li>• Add/Subtract/Multiply/Divide Integers with Tools</li><li>• Add/Subtract/Multiply/Divide Simple Fractions with Tools</li><li>• Exponents</li><li>• Order of Operations with Whole Numbers and Decimals</li></ul>	<ul style="list-style-type: none"><li>• Rate, Ratio, Proportions</li><li>• Mixed and Improper Fractions</li><li>• Order of Operations with Integers and Fractions</li><li>• Proportional Reasoning</li></ul>	<ul style="list-style-type: none"><li>• Rate, Ratios, Proportions</li><li>• Mixed and Improper Fractions</li><li>• Order of Operations with Integers and Fractions</li></ul>

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# Catholic Graduate Expectations

Catholic educators continually strive to embed Catholic Expectations in their daily practice. Through the use of the continuum of tasks framework both educators and students have the opportunity to deepen their mathematical learning. This resource provides many opportunities for educators to support and meet the needs of all learners while embracing the dignity of all. The tasks contribute to the building of a supportive community and a focus on excellence for both students and educators. The resource provides multiple opportunities for assessment and allows for ongoing reflection to further guide instructional decisions. Below is a link to a variety of the key Catholic Graduate Expectations reflected in this resource.

In each lesson plan, a Pre-Minds On section is included to help build a classroom community that respects the rights, responsibilities and contributions of self and others. These activities help students adopt a holistic approach to life by integrating learning from various subject areas and experiences.

**A Discerning Believer**  
CGE1h

**An Effective Communicator**  
CGE2a, CGE2c, CGE2c,  
CGE2d

**A Reflective and Creative Thinker**  
CGE3b, CGE3c, CGE3d

**A Self-directed, Responsible, Lifelong Learner**  
CGE4a, CGE4b, CGE4c, CGE4e, CGE4f

**A Collaborative Contributor**  
CGE5a, CGE5b, CGE5c, CGE5d, CGE5e,  
CGE5f, CGE5g

**A Responsible Citizen**  
CGE7b, CGE7j

# How to Use this Resource



Praying together, walking together, working together: this is the way that leads to Christian unity. [#WCC70](#)

7:30 AM - Jun 21, 2018



This resource demonstrates how Catholic teachings and the principles of 'Growing Success' synchronically inform assessment and instructional practises.

The parallel tasks and 3-part lesson plans in this resource, provide opportunities for diagnostic assessments and differentiated, personalized instruction. By viewing Mathematics through the intermediate grades, as a grade 7 to 9 continuum of expectations, educators will meet students where they are on their learning journey, thus respecting the dignity of every learner in their classroom.

We encourage teachers to use this resource as a division or whole school focus, as it can provide opportunities for moderation, rich math discussions and divisional planning.

Each slide is designed to be easily accessible and can be used in a number of ways, including on a SmartBoard, projected on a basic white board, or printed off for group or individual use.

The **Home** icon  takes you back to the top of the Table of Contents.

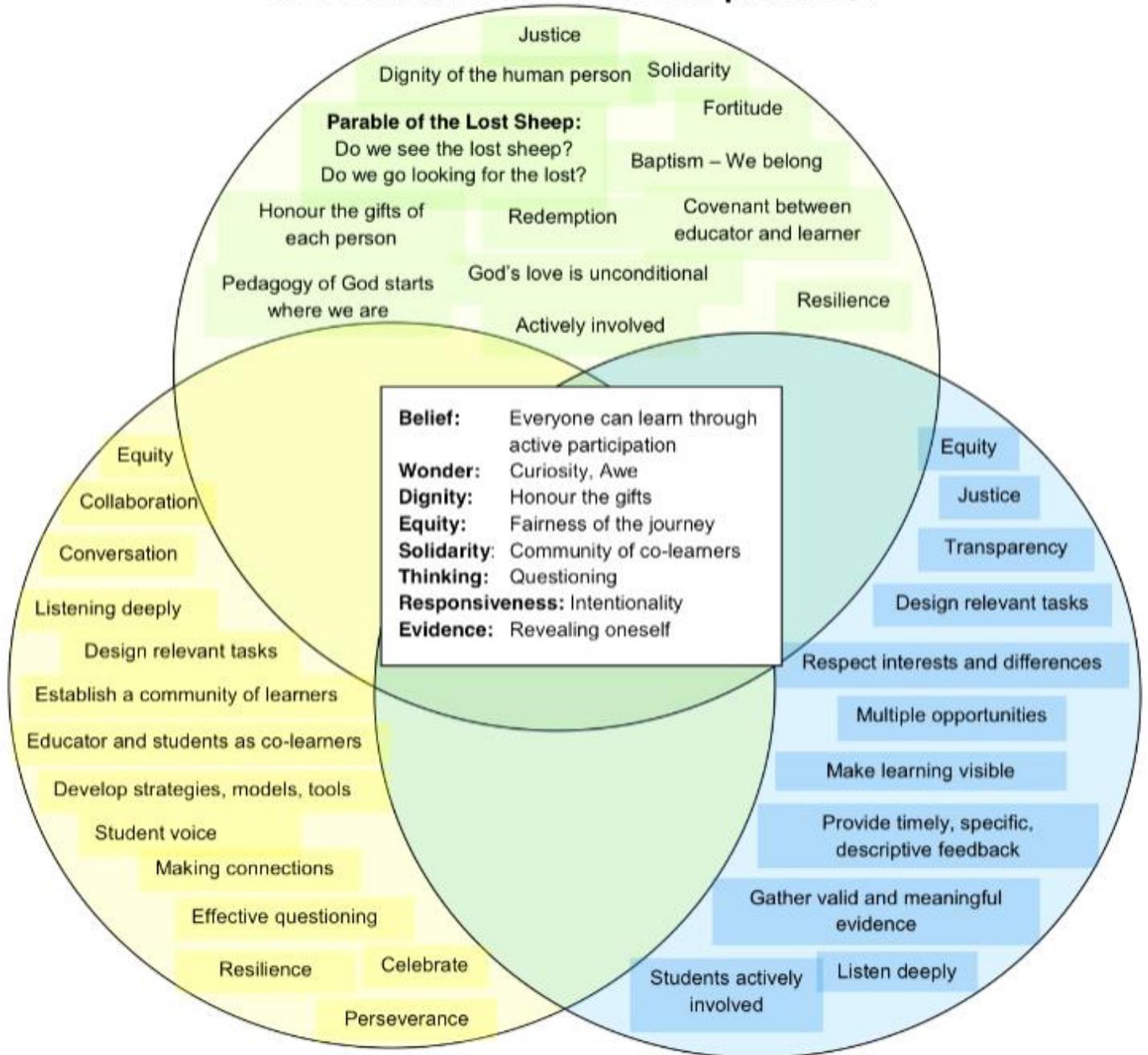
The **Table of Contents** is organized in such a way that every educator can access the questions simply by clicking on the blue links below each of tasks. The blue links will bring you to the specific parts of each task, or you can scroll through the resource to access the lesson plans and differentiated open response questions.

\*Click on the  icon at the top right hand corner of the screen for optimum use of links.

# Learning Journeys

Supporting Every Student's Success in Mathematics

## How do Catholic teachings inform assessment and instructional practices?



**What constitutes effective mathematics instruction?**

**How do the principles of 'Growing Success' inform instructional practices?**

# Assessment & Exemplars

There are some distinct differences between large scale assessments, like EQAO, and classroom assessments.

In the scoring of EQAO, each open-response item on the assessment is scored according to a guide called an “item-specific rubric”. EQAO does not assess for Communication. The exemplars provided by EQAO for each task are selected after field testing and range finding. Scoring levels are identified as 10, 20, 30 ,40.

In classroom assessments, the ministry requires that teachers assess student communication skills. Educators develop their own rubrics and scoring guides that cover all areas the Ontario Performance Standards Achievement Chart- Knowledge, Understanding, Thinking, Communication and Application.

In creating this document, a team of teachers moderated tasks completed by students across three boards. The EQAO item-specific rubrics and Grade 9 exemplars provided guidance in identifying possible leveled exemplars for assessment and discussion purposes.

We encourage educators to collaborate and moderate student work with teachers in their respective schools and/or districts, to identify the their unique continuum of student learning that exists.

We will continue to add exemplars as we collect student samples.

# Mathematical Processes



The seven mathematical process expectations describe the actions of doing mathematics. They support the acquisition and the use of mathematical knowledge and skills. They can be mapped to three of the categories of the Achievement Chart – Thinking, Communication, and Application. The fourth category, Knowledge and Understanding, connects to the content of each course/program. Students apply the mathematical processes as they learn the content for each course/program.

These posters provide prompts to help students understand the Mathematical Processes. Click on the posters below to access the link to a printable version. The communication and problem solving mathematical process are embedded in the five listed below.

Mathematical Processes Posters	“I Can” Statements for Students
<a href="#">Mathematical Processes</a>	
<a href="#">Connecting</a>	I can: <ul style="list-style-type: none"> <li>● see how new concepts and skills build on old ones</li> <li>● apply mathematics to solve problems inside and outside of mathematics class</li> </ul>
<a href="#">Reasoning &amp; Proving</a>	I can: <ul style="list-style-type: none"> <li>● hypothesize and make conjectures</li> <li>● decide how to test my hypothesis</li> <li>● test my conjecture</li> <li>● infer, justify, and conclude</li> </ul>
<a href="#">Representing</a>	I can: <ul style="list-style-type: none"> <li>● mathematize a situation using concrete materials, pictures, diagrams, graphs, tables, numbers, words or symbols</li> </ul>
<a href="#">Reflecting</a>	I can: <ul style="list-style-type: none"> <li>● think about my reasonableness</li> <li>● consider the implications of data collected</li> <li>● self-monitor my progress</li> </ul>
<a href="#">Selecting Tools &amp; Computational Strategies</a>	I can: <ul style="list-style-type: none"> <li>● use manipulatives and/or technology to understand new concepts, to communicate, or to perform tasks</li> <li>● consider the question before I choose my computational strategy</li> </ul>

# Accommodations & Modifications

“The primary purpose of Catholic education is to embrace each student as a child of God worthy of being educated with genuine respect and sensitivity by creating a culture of hope within our classrooms and schools.”

Seeing Through the Eyes of Jesus, pg. 13, 2013

Through our vocation as Catholic educators we recognize the light of God in every student and strive to provide a learning space that celebrates and respects their diversity, while ensuring we maintain the dignity of each learner.

Understanding that every child enters a classroom with different skills, talents and experiences, this resource was developed to meet all students where they are at in their math learning journey.

This resource allows educators to use EQAO questions in a variety of ways that encourage the classroom community to embody the Catholic Graduate Expectations, while continuing to develop their faith. Each EQAO task is accompanied by scaled parallel activities that can be used to enhance learning and comprehension in any intermediate classroom. Teachers can incorporate any of the supplied tasks as needed to help students reach their learning goals in mathematics.

# Additional EQAO Resources by Strand

## Grade 6

Mathematics Resource: Released Assessment Questions by Strand, 2012–2016

These booklets contain multiple-choice and open-response questions from the primary-division assessment. The booklets are sorted by strand and include the category of knowledge and skills and overall expectation each question is mapped to, as well as sample student responses for the open-response questions.

[Number Sense & Numeration](#)

[Measurement](#)

[Geometry & Spatial Sense](#)

[Patterning & Algebra](#)

[Data Management & Probability](#)

**Education Quality and  
Accountability Office**



## Grade 9

Mathematics Resource: Released Assessment Questions organized by strand within the Academic and Applied stream, 2012–2014. Resource compiled and organized by the RCCDSB.

[Grade 9 Academic Questions](#)

[Grade 9 Applied Questions](#)



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## (Lessons, Parallel Tasks & Exemplars)



### 1. Savings on Apples (EQAO-2017)

- [Lesson](#)
- [Grade 9 Applied/Academic Task](#)
- Grade 9 Exemplars
- [Grade 8 Task](#)
- Grade 8 Exemplars
- [Grade 7 Task](#)
- Grade 7 Exemplars

### 2. More Snacks Please (EQAO-2015)

- [Lesson](#)
- [Grade 9 Academic Task](#)
- Grade 9 Exemplars
- [Grade 8 Task](#)
- Grade 8 Exemplars
- [Grade 7 Task](#)
- Grade 7 Exemplars

### 3. Stack It! (EQAO- 2011)

- [Lesson](#)
- [Grade 9 Academic Task](#)
- Grade 9 Exemplars
- [Grade 8 Task](#)
- Grade 8 Exemplars
- [Grade 7 Task](#)
- Grade 7 Exemplars

### 4. T-Shirt Problem (EQAO-2006)

- [Lesson](#)
- [Grade 9 Academic Task](#)
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### 5. What's the Price? (EQAO-2017)

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- [Grade 9 Academic Task](#)
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- Grade 9 Exemplars
- [Grade 8 Task](#)
- Grade 8 Exemplars
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### 6. Hot Air Balloon (EQAO- 2014)

- [Lesson](#)
- [Grade 9 Academic task](#)
- [Grade 9 Applied Task](#)
- Grade 9 Exemplars
- [Grade 8 Task](#)
- Grade 8 Exemplars
- [Grade 7 Task](#)
- Grade 7 Exemplars

### 7. Skate On (EQAO-2015)

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### 8. Designing a Flag (EQAO-2011)

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- Grade 7 Exemplars

### 9. Six and Five Sides (EQAO 2016)

- [Lesson](#)
- [Grade 9 Academic Task](#)
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### 10. Diamond Cut (EQAO-2013)

- [Lesson](#)
- [Grade 9 Applied Task](#)
- Grade 9 Exemplars
- [Grade 8 Task](#)
- Grade 8 Exemplars
- [Grade 7 Task](#)
- Grade 7 Exemplars

# Task 1: Savings on Apples

**Strand:** Number Sense & Numeration (7 & 8), Numbers & Algebra (9)

## Overall Expectations

- **Grade 7**- demonstrate an understanding of addition and subtraction of fractions and integers, and apply a variety of computational strategies to solve problems involving whole numbers and decimal numbers (NS & N)
- **Grade 8**- solve problems involving whole numbers, decimal numbers, fractions, and integers, using a variety of computational strategies (NS & N)
- **Grade 9 Applied**- solve problems involving proportional reasoning (NS & Algebra)

## Specific Expectations:

- **Grade 7 & 8**- solve multi-step problems arising from real-life contexts and involving whole numbers and decimals, using a variety of tools (e.g., concrete materials, drawings, calculators, graphs) and strategies (e.g., estimation, algorithms) (NS & N)
- **Grade 9 Applied**
  - make comparisons using unit rates (e.g., if 500 mL of juice costs \$2.29, the unit rate is 0.458¢/mL; this unit rate is less than for 750 mL of juice at \$3.59, which has a unit rate of 0.479¢/mL)
  - solve problems involving ratios, rates, and directly proportional relationships in various contexts (e.g., currency conversions, scale drawings, measurement), using a variety of methods (e.g., using algebraic reasoning, equivalent ratios, a constant of proportionality; using dynamic geometry software to construct and measure scale drawings) (Sample problem: Simple interest is directly proportional to the amount invested. If Luis invests \$84 for one year and earns \$1.26 in interest, how much would he earn in interest if he invested \$235 for one year?)



## 3-Part Lesson for Savings on Apples



**Grade 9 (Applied/Academic)**

**Task: Savings on Apples**

Janice and Irene buy apples at different stores. Both stores sell apples by the kilogram.

- Janice pays \$6.00 for 3.75 kg of apples.
- Irene pays \$5.25 for 3 kg of apples.

How much more will Irene pay than Janice if they had each bought 9 kg of apples?

Show your work.

## Grade 8

### Task: Savings on Apples

Janice and Irene buy apples at different stores. Both stores sell apples by the kilogram.

-Janice pays \$6.00 for 3.75 kg of apples.

-Irene pays \$5.25 for 3 kg of apples.

What is the most economical way to purchase 9 kg of apples?

Show your work.

## Grade 7

### Task: Savings on Apples

Janice and Irene buy apples at different stores. Both stores sell apples by the kilogram.

- Janice pays \$6.00 for 3.75 kg of apples.
- Irene pays \$5.25 for 3 kg of apples.

Which is the better deal?

Justify your answer.

# Task 2: More Snacks Please

Strand: Number Sense & Numeration (7 & 8), Number Sense (9)

## Overall Expectations

- **Grade 7**
  - demonstrate an understanding of proportional relationships using percent, ratio, and rate (NS & N)
- **Grade 8**
  - solve problems by using proportional reasoning in a variety of meaningful contexts (NS & N)
- **Grade 9 Academic**
  - manipulate numerical and polynomial expressions, and solve first-degree equations 9 (NS)

## Specific Expectations:

- **Grade 7**
  - Determine, through investigation, the relationships among fractions, decimals, percents, and ratios
  - Demonstrate an understanding of rate as a comparison, or ratio, of two measurements with different units (e.g. speed is a rate that compares distance to time and that can be expressed as kilometres per hour)
- **Grade 8**
  - Identify and describe real-life situations involving two quantities that are directly proportional (e.g. the number of servings and the quantities in a recipe, mass and volume of a substance, circumference and diameter of a circle)
  - Solve problems involving proportions using concrete materials, drawings, and variables
- **Grade 9 Academic**
  - solve problems requiring the manipulation of expressions arising from applications of percent, ratio, rate, and proportion



More Snack, Please!  
Grade 9 Academic

Raisins and sunflower seeds are sold in packages of 250g. The ratio of raisins to the mass of sunflower seeds is 3 to 5.

Determine the mass of raisins in a package.

Show your work.

More Snack, Please!  
Grade 8

Raisins and sunflower seeds are sold in packages of 250g. The ratio of raisins to the mass of sunflower seeds is 3 to 5.

Determine the percentage of raisins in a package.

Show your work.

More Snack, Please!  
Grade 7

Raisins and sunflower seeds are sold in packages of 250g. The ratio of raisins to the mass of sunflower seeds is 3 to 5.

Determine the fraction of raisins in a package.

Show your work.

Now that we know the fraction of raisins, determine the percent of raisins per package.

Show your work.

# Task 3: Stack It!

**Strand:** Patterning and Algebra (7 & 8), Linear Relations (9)

## Overall Expectations

- **Grade 7 & 8** - represent linear growing patterns (where the terms are whole numbers) using graphs, algebraic expressions, and equations
- **Grade 9 Applied**
  - *Demonstrate an understanding of constant rate of change and its connection to linear relations*
  - *Connect various representations of a linear relation, and solve problems using the representations*

## Specific Expectations:

- **Grade 7**
  - *Represent linear growing patterns, using a variety of tools and strategies*
  - *Develop and represent the general term of a linear growing pattern, using algebraic expressions involving one operation*
  - *Make connections between evaluating algebraic expressions and determining the term in a pattern using the general term*
- **Grade 8**
  - *represent, through investigation with concrete materials, the general term of a linear pattern, using one or more algebraic expressions*
  - *Represent linear patterns graphically, using a variety of tools*
  - *Determine a term, given its term number, in a linear pattern that is represented by a graph or an algebraic equation*
- **Grade 9 Applied**
  - Construct tables of values and graphs, using a variety of tools, to represent linear relations derived from descriptions of realistic situations
  - Determine, through investigation, connections among the representations of a constant rate of change of a linear relation
  - Determine other representations of a linear relation arising from a realistic situation, given one representation



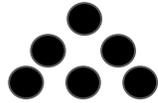
## Grade 9 (Applied/Academic)

### Task: Stack It!

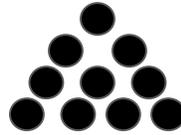
Juan draws the first three terms of a pattern as shown below.



Term 1



Term 2



Term 3

The pattern continues to grow in the same way. Complete the following table according to the pattern.

Create an equation to represent the pattern.

Show your work.

Term number, n	Number of dots, N
1	3
2	6
3	
4	
5	
6	

Graph the data from the table on the grid above. Add a scale for N-axis.

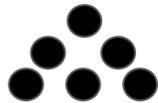
# Grade 8

## Task: Stack It

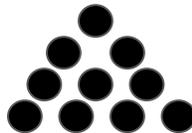
Juan draws the first three terms of a pattern as shown below.



Term 1



Term 2



Term 3

The pattern continues to grow in the same way. Complete the following table according to the pattern.

How many dots will there be at Term 6? Term 10?

Justify your answer.

Term number, $n$	Number of dots, $N$
1	3
2	6
3	
4	
5	
6	

Graph the data from the table on the grid above. Don't forget to label your X and Y axis!

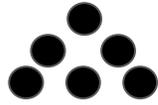
# Grade 7

## Task: Stack It

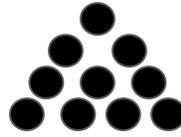
Juan draws the first three terms of a pattern as shown below.



Term 1



Term 2



Term 3

The pattern continues to grow in the same way. Complete the following table according to the pattern.

How many dots will there be at Term 5? Term 6?

Justify your answer.

Term number, $n$	Number of dots, $N$
1	3
2	6
3	
4	
5	
6	

Graph the data from the table on the grid above. Don't forget to label your X and Y axis!

# Task 4: Terrific Ts

**Strand:** Patterning and Algebra (7 & 8), Number Sense and Algebra (9)

## Overall Expectations

- **Grade 7**
  - Model real-life linear relationships graphically and algebraically, and solve simple algebraic equations using a variety of strategies, including inspection and guess and check
- **Grade 8**
  - Model linear relationships graphically and algebraically, and solve and verify algebraic equations, using a variety of strategies, including inspection guess and check, and using a “balance” method
- **Grade 9 Applied**
  - Simplify numerical and polynomial expressions in one variable, and solve simple first-degree equations

## Specific Expectations:

- **Grade 7**
  - Model real-life relationships involving constant rates, using algebraic equations with variables to represent the changing quantities in the relationship
  - Translate phrases describing simple mathematical relationships into algebraic expressions, using concrete materials
  - Evaluate algebraic expressions by substituting natural numbers for the variables
  - Make connections between evaluating algebraic expressions and determining the term in a pattern using the general term
- **Grade 8**
  - Describe different ways in which algebra can be used in real-life situations
  - Translate statements describing mathematical relationships into algebraic expressions and equations
  - Evaluate algebraic expressions with up to three terms by substituting fractions, decimals, and integers for the variables
  - Make connections between solving equations and determining the term number in a pattern, using the general term
- **Grade 9 Applied**
  - Add and subtract polynomials involving the same variable up to degree three
  - Multiply a polynomial by a monomial involving the same variable to give results up to degree three, using a variety of tools
  - Solve first-degree equations with non-fractional coefficients, using a variety of tools and strategies
  - Substitute into algebraic equations and solve for one variable in the first degree



## Grade 9 (Applied/Academic)

### Task: Terrific Ts

A school orders T-shirts from Terrific Ts. The total cost is made up of a set-up fee of \$115 and a cost of \$3 per T-shirt.

Terrific Ts requires a minimum order of 25 T-shirts. The school can spend a maximum of \$800.

Determine all the possible values of the total cost,  $C$ , and the number of T-shirts,  $n$ , for this situation.

Show your work.

## Grade 8

### Task: Terrific Ts

A school orders T-shirts from Terrific Ts. The total cost is made up of a set-up fee of \$115 and a cost of \$3 per T-shirt.

The school can spend a maximum of \$800.

Determine the number of T-shirts,  $n$ , the school would order for \$800.

Show your work.

## Grade 7

### Task: Terrific Ts

A school orders T-shirts from Terrific Ts. The total cost is made up of a set-up fee of \$115 and a cost of \$3 per T-shirt.

The school would like to place an order for 250 T-shirts.

Determine the total cost,  $C$ , of the schools order.

Show your work.

# Task 5: What's the Price?

Strand: Patterning and Algebra, Data Management, Linear Relations

## Overall Expectations

- *Grade 7*
  - model real-life linear relationships graphically and algebraically, and solve simple algebraic equations using a variety of strategies, including inspection and guess and check.
- *Grade 8*
  - represent linear growing patterns (where the terms are whole numbers) using graphs, algebraic expressions, and equations;
  - model linear relationships graphically and algebraically, and solve and verify algebraic equations, using a variety of strategies, including inspection, guess and check, and using a “balance” model.
- *Grade 9 Applied*
  - determine the characteristics of linear relations;
  - demonstrate an understanding of constant rate of change and its connection to linear relations;
  - connect various representations of a linear relation, and solve problems using the representations.
- *Grade 9 Academic*
  - determine, through investigation, the properties of the slope and y-intercept of a linear relation;
  - solve problems involving linear relations.



# Task 5 Continued

## Specific Expectations:

- **Grade 7**
  - represent linear growing patterns, using a variety of tools and strategies
  - develop and represent the general term of a linear growing pattern, using algebraic expressions involving one operation
  - evaluate algebraic expressions by substituting natural numbers for the variables;
  - make connections between evaluating algebraic expressions and determining the term in a pattern using the general term
  - solve linear equations of the form  $ax = c$  or  $c = ax$  and  $ax + b = c$  or variations such as  $b + ax = c$  and  $c = bx + a$  (where  $a$ ,  $b$ , and  $c$  are natural numbers) by modelling with concrete materials, by inspection, or by guess and check, with and without the aid of a calculator (e.g., I solved  $x + 7 = 15$  by using guess and check. First I tried 6 for  $x$ . Since I knew that 6 plus 7 equals 13 and 13, is less than 15, then I knew that  $x$  must be greater than 6.”).
- **Grade 8**
  - translate statements describing mathematical relationships into algebraic expressions and equations (e.g., for a collection of triangles, the total number of sides is equal to three times the number of triangles or  $s = 3n$ );
  - solve and verify linear equations involving a one-variable term and having solutions that are integers, by using inspection, guess and check, and a “balance” model



# Task 5 Continued

## Specific Expectations:

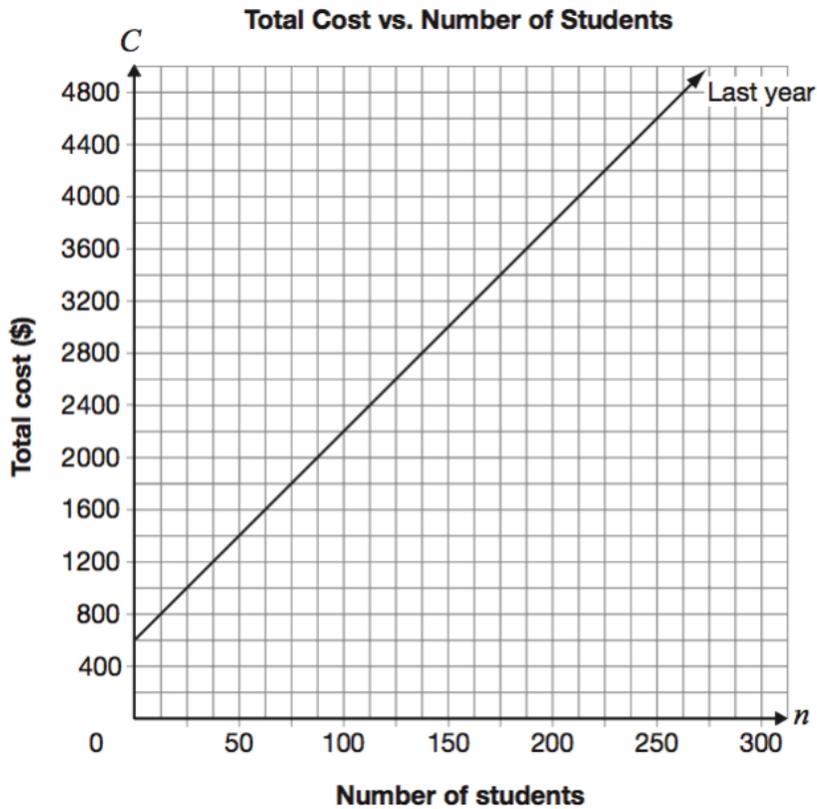
- **Grade 9 Applied**
  - describe the meaning of the rate of change and the initial value for a linear relation arising from a realistic situation (e.g., the cost to rent the community gym is \$40 per evening, plus \$2 per person for equipment rental; the vertical intercept, 40, represents the \$40 cost of renting the gym; the value of the rate of change, 2, represents the \$2 cost per person), and describe a situation that could be modelled by a given linear equation (e.g., the linear equation  $M = 50 + 6d$  could model the mass of a shipping package, including 50 g for the packaging material, plus 6 g per flyer added to the package).
  - determine other representations of a linear relation arising from a realistic situation, given one representation (e.g., given a numeric model, determine a graphical model and an algebraic model; given a graph, determine some points on the graph and determine an algebraic model);
- **Grade 9 Academic**
  - determine, through investigation, connections among the representations of a constant rate of change of a linear relation (e.g., the cost of producing a book of photographs is \$50, plus \$5 per book, so an equation is  $C = 50 + 5p$ ; a table of values provides the first difference of 5; the rate of change has a value of 5, which is also the slope of the corresponding line; and 5 is the coefficient of the independent variable,  $p$ , in this equation)



3-Part Lesson for What's the Price?



## Grade 9 Academic: What's the New Price?



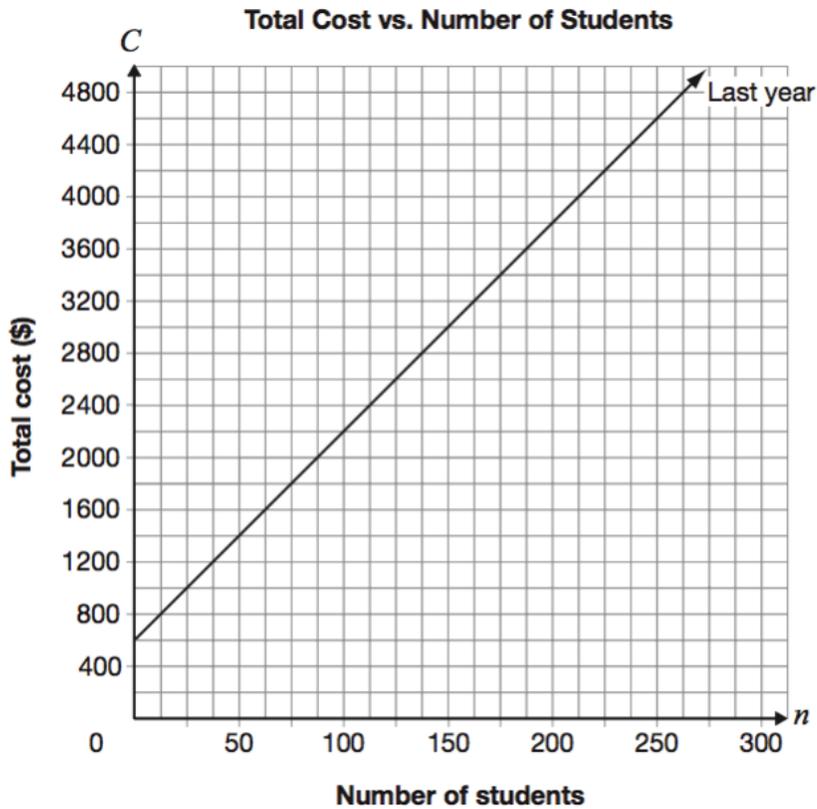
The cost per person has decreased by \$5, but the initial fee has doubled. Write an equation to represent the cost,  $C$ , for **this year**.

$$C = \underline{\hspace{10em}}$$

Show your work.

Describe two ways the graph for total cost for this year will be different from the graph for total cost for last year. Justify your answer.

## Grade 9 Applied: What's the New Price?



**This year** the cost per person has decreased by \$5, but the initial fee has doubled. State the cost per person and initial value for **this year**

Cost per person = \_\_\_\_\_

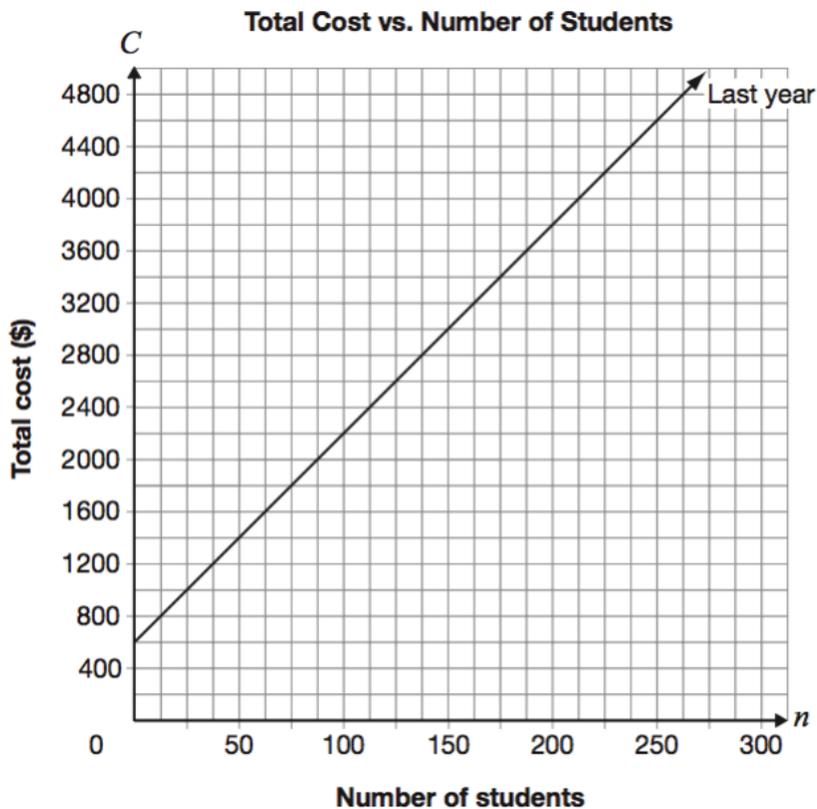
Initial Value = \_\_\_\_\_

\_\_\_\_\_

Show your work.

Describe two ways the graph for total cost for this year will be different from the graph for total cost for last year. Justify your answer.

## Grade 8: What's the New Price?



The graph above represents the cost,  $C$ , of the number of students,  $n$ , to go on their year end trip **last year**.

The rental cost for the bus was \$600, plus \$16 per student.  
Write an equation to represent the cost,  $C$ , for **last year**.

$$C = \underline{\hspace{10em}}$$

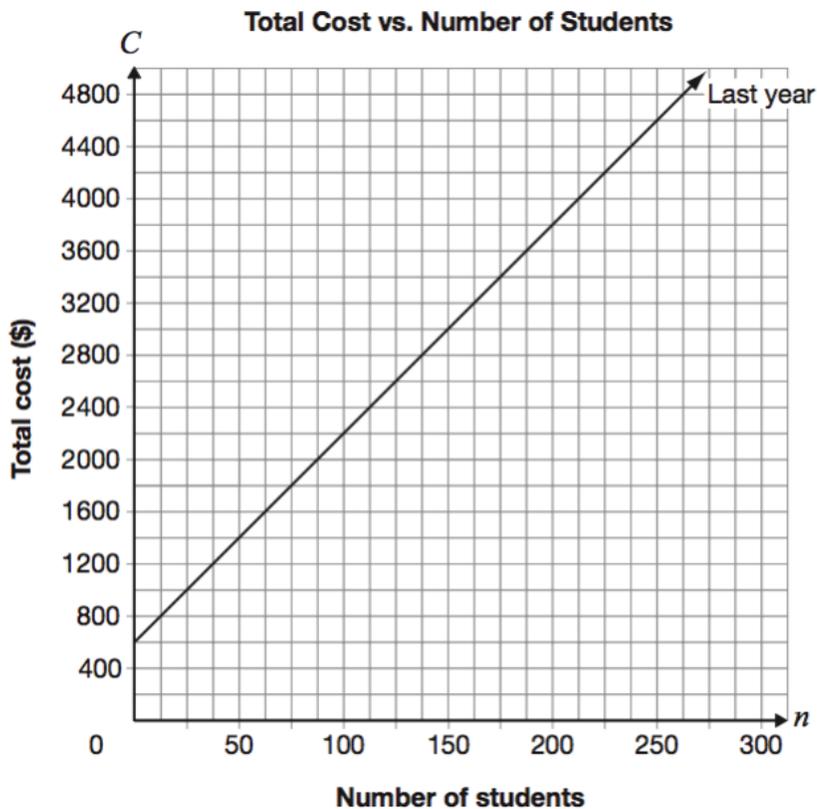
The cost per student has decreased by \$5, but the bus rental has doubled.

Write an equation to represent the cost,  $C$ , for **this year**.

$$C = \underline{\hspace{10em}}$$

If the school can afford \$5000 **this year**, how many students can they send?

## Grade 7: What's the New Price?



The above graph shows that for **last years** school trip the cost to rent the bus was \$600. The cost per student was \$16.

**This year** the cost of the bus has doubled and the cost per student has decreased by \$6.

Complete the following table for up to 300 students for **This Year**:

Number of Students ( $n$ )	50	100	150	200	250	300
Total Cost of Trip ( $C$ ) in dollars						

Write an equation that could be used to determine how many students could go on the trip if the school could afford \$5000 **this year**.

# Task 6: Hot Air Balloon

Strand: Patterning and Algebra, Data Management, Linear Relations

## Overall Expectations

- *Grade 7*
  - model real-life linear relationships graphically and algebraically, and solve simple algebraic equations using a variety of strategies, including inspection and guess and check.
- *Grade 8*
  - represent linear growing patterns (where the terms are whole numbers) using graphs, algebraic expressions, and equations;
  - model linear relationships graphically and algebraically, and solve and verify algebraic equations, using a variety of strategies, including inspection, guess and check, and using a “balance” model.
- *Grade 9 Applied*
  - determine the characteristics of linear relations;
  - demonstrate an understanding of constant rate of change and its connection to linear relations;
  - connect various representations of a linear relation, and solve problems using the representations.
- *Grade 9 Academic*
  - determine, through investigation, the properties of the slope and y-intercept of a linear relation;
  - solve problems involving linear relations.



# Task 6 Continued

## Specific Expectations:

- **Grade 7**
  - represent linear growing patterns, using a variety of tools (e.g., concrete materials, paper and pencil, calculators, spreadsheets) and strategies
- **Grade 8**
  - translate statements describing mathematical relationships into algebraic expressions and equations
    - solve and verify linear equations involving a one-variable term and having solutions that are integers, by using inspection, guess and check, and a “balance” model
- **Grade 9 Applied**
  - describe the meaning of the rate of change and the initial value for a linear relation arising from a realistic situation and describe a situation that could be modelled by a given linear equation.
    - determine other representations of a linear relation arising from a realistic situation, given one representation
- **Grade 9 Academic**
  - determine, through investigation, connections among the representations of a constant rate of change of a linear relation



3-Part Lesson for Hot Air Balloon!



## Grade 9 Academic

A green hot air balloon is rising at a constant rate.

- After 2 minutes, it is at a height of 30 metres.
- After 6 minutes, it is at a height of 75 metres.

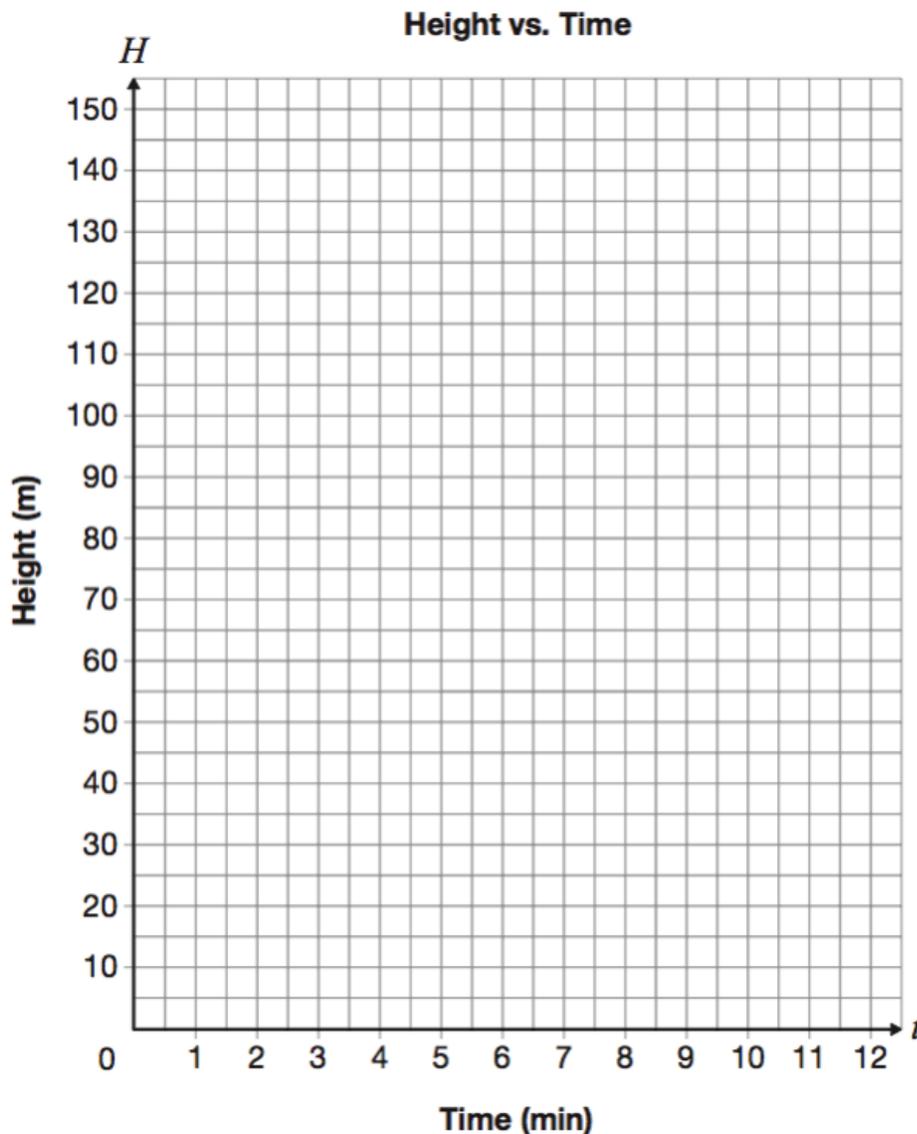
A blue hot air balloon is rising twice as fast as the green balloon.

Determine the rate in metres per minute at which the blue balloon is rising.

Determine an equation to relate height and time for each balloon.

Compare the two equations.

Show your work. You may use the grid if you wish.



## Grade 9 Applied

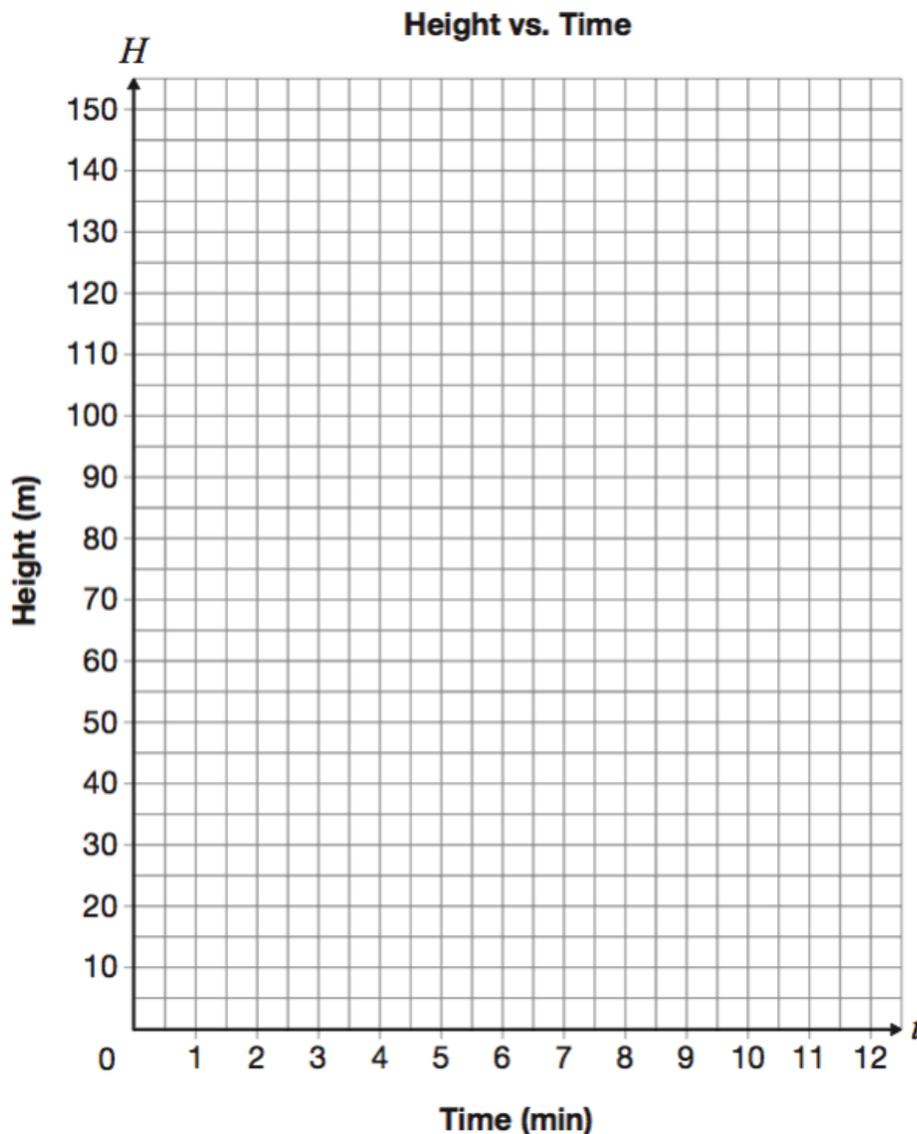
A green hot air balloon is rising at a constant rate.

- After 2 minutes, it is at a height of 30 metres.
- After 6 minutes, it is at a height of 75 metres.

A blue hot air balloon is rising twice as fast as the green balloon.

Determine the rate in metres per minute at which the blue balloon is rising.

Show your work. You may use the grid if you wish.



## Grade 8

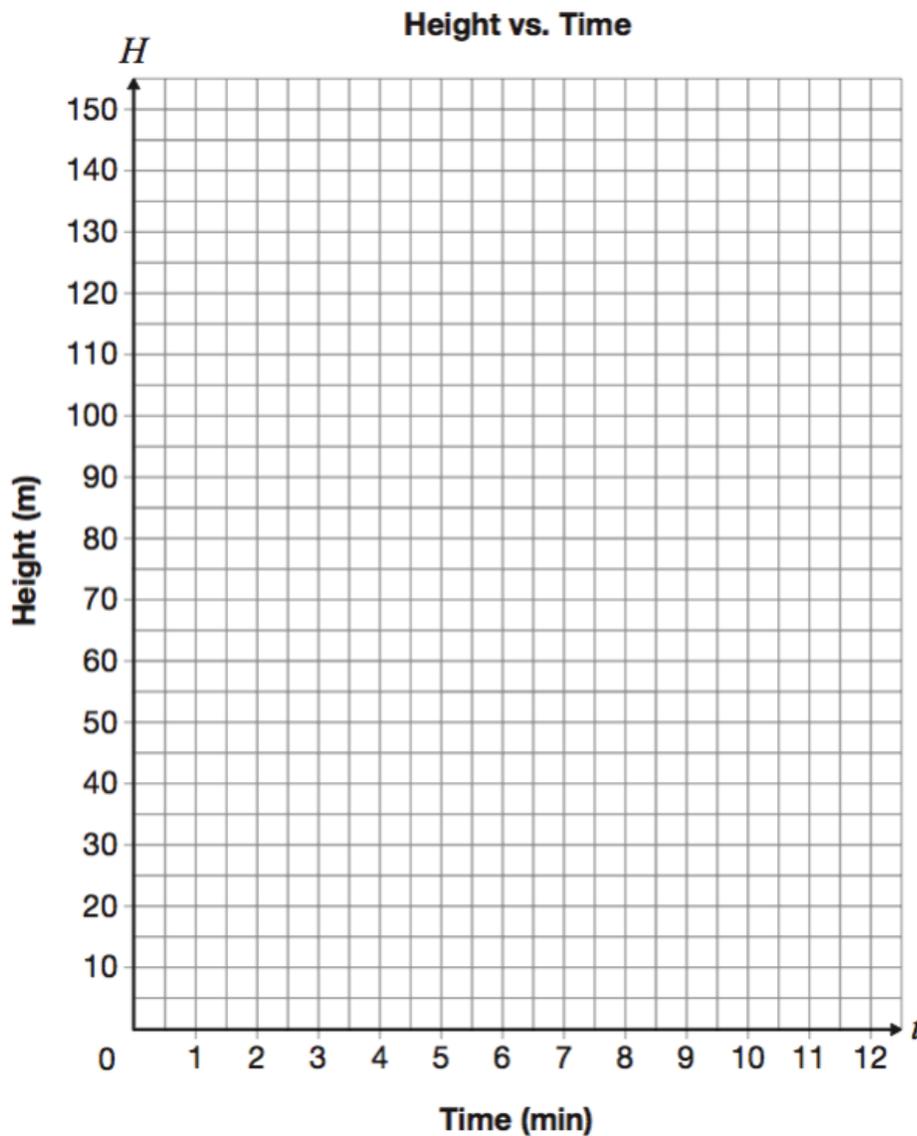
A green hot air balloon is rising at a constant rate.

- After 2 minutes, it is at a height of 30 metres.
- After 6 minutes, it is at a height of 90 metres.

A blue hot air balloon is rising twice as fast as the green balloon.  
How fast is the blue hot air rising in m/min?

Did the balloons start on the ground? Justify your answer.

Show your work. You may use the grid if you wish.



## Grade 7

A green hot air balloon is rising at a constant rate.

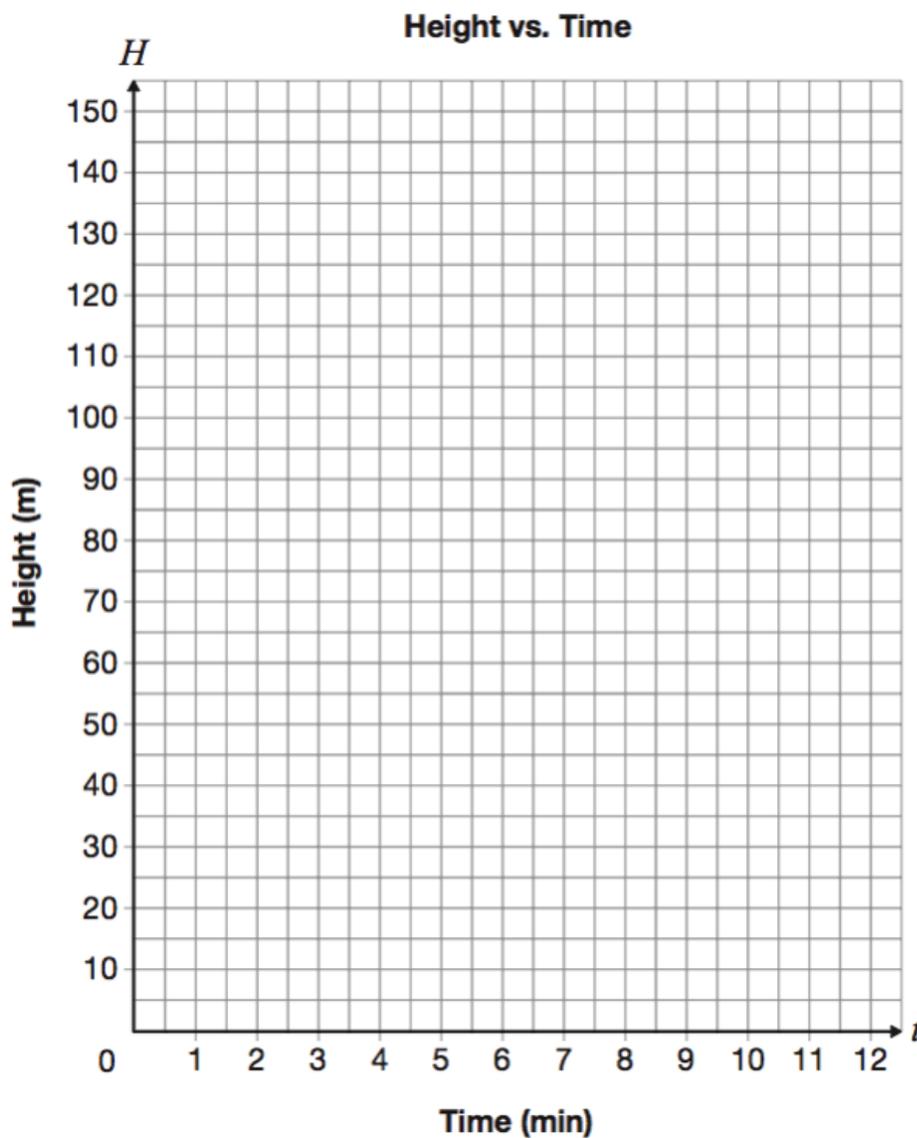
- After 2 minutes, it is at a height of 30 metres.
- After 6 minutes, it is at a height of 90 metres.

How high will it be after 9 minutes?

How high was it after 1 minute?

Did the balloon start on the ground? Justify your answer.

Show your work. You may use the grid if you wish.



# Task 7: Skate On!

**Strand:** Measurement (7 & 8), Measurement (9)

## Overall Expectations

- *Grade 7*
  - determine the relationships among units and measurable attributes, including the area of a trapezoid and the volume of a right prism.
- *Grade 8*
  - determine the relationships among units and measurable attributes, including the area of a circle and the volume of a cylinder
- *Grade 9 Applied*
  - solve problems involving the measurements of two-dimensional shapes and the surface areas and volumes of three-dimensional figures

## Specific Expectations:

- *Grade 7*
  - solve problems involving the estimation and calculation of the area of a trapezoid;
  - estimate and calculate the area of composite two-dimensional shapes by decomposing into shapes with known area relationships
- *Grade 8*
  - determine, through investigation using a variety of tools and strategies, the relationships for calculating the circumference and the area of a circle, and generalize to develop the formulas
  - solve problems involving the estimation and calculation of the circumference and the area of a circle;
- *Grade 9 Applied*
  - solve problems involving the areas and perimeters of composite two-dimensional shapes

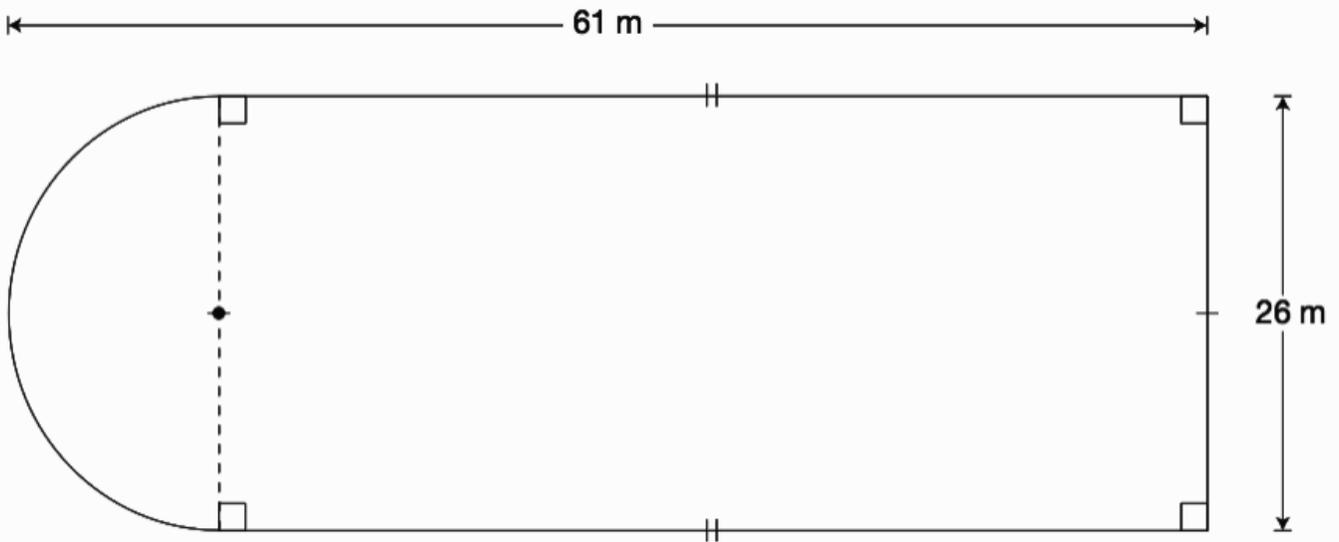


[3-Part Lesson for Skate On!](#)



Skate On!  
Grade 9 Academic

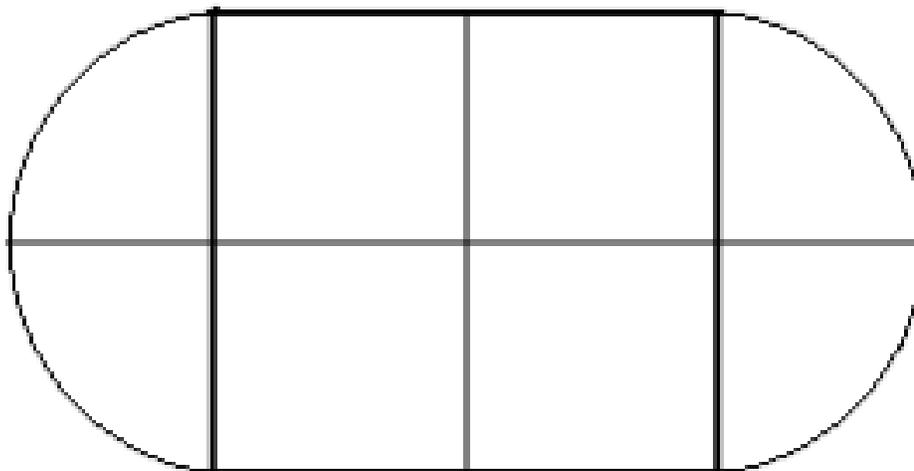
A diagram of a community ice rink is shown below.



The rink is being enclosed with fencing that costs \$6.20/m. Determine the total cost of fencing for the rink.  
Show your work.

Skate On!  
Grade 8

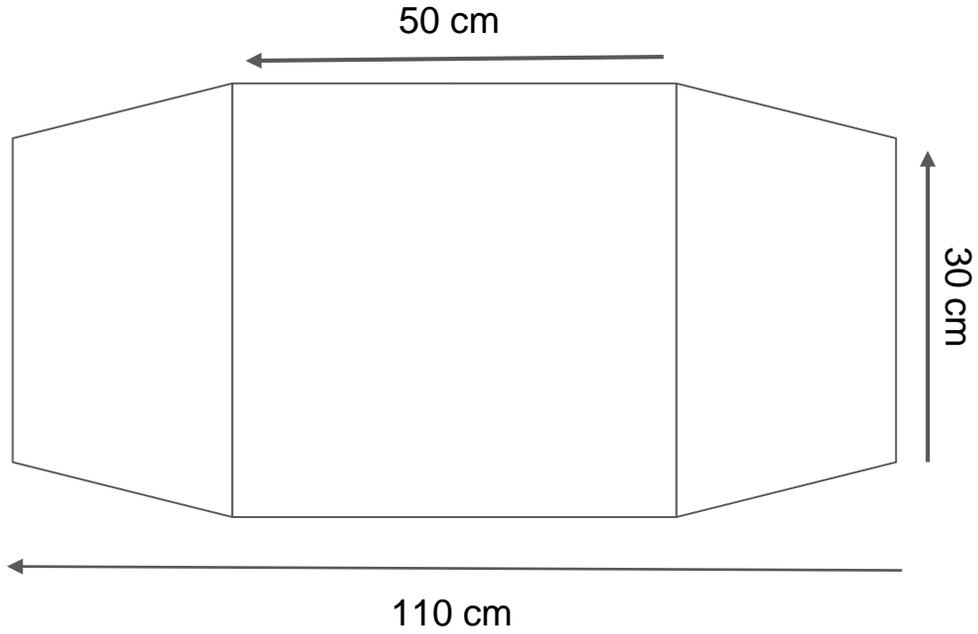
The local arena is made up of 4 squares and 2 semicircles as shown below. Each small square has an area of 4 square meters. Find the total area of the arena floor..



Show your work.

Skate On!  
Grade 7

The local arena is made up of 2 congruent trapezoids and 1 square as shown below. Use the measurements to calculate the total area of the arena floor..



Show your work.

# Task 8: Designing A Flag

**Strand:** Measurement (7 & 8), Measurement (9)

## Overall Expectations

- *Grade 7*
  - determine the relationships among units and measurable attributes, including the area of a trapezoid and the volume of a right prism.
- *Grade 8*
  - determine the relationships among units and measurable attributes, including the area of a circle and the volume of a cylinder
- *Grade 9 Applied*
  - solve problems involving the measurements of two-dimensional shapes and the surface areas and volumes of three-dimensional figures

## Specific Expectations:

- *Grade 7*
  - solve problems involving the estimation and calculation of the area of a trapezoid;
  - estimate and calculate the area of composite two-dimensional shapes by decomposing into shapes with known area relationships
- *Grade 8*
  - determine, through investigation using a variety of tools and strategies, the relationships for calculating the circumference and the area of a circle, and generalize to develop the formulas
  - solve problems involving the estimation and calculation of the circumference and the area of a circle
- *Grade 9 Applied*
  - solve problems involving the areas and perimeters of composite two-dimensional shapes



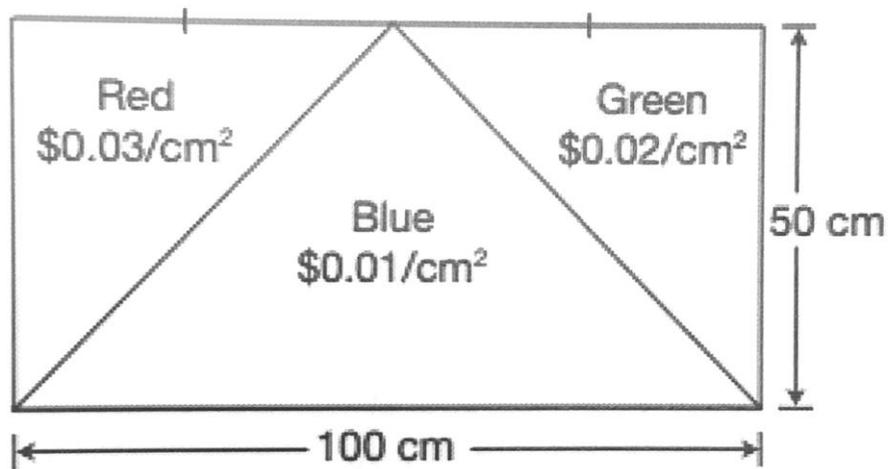
[3-Part Lesson for Skate On!](#)



**Task: Flags**  
**Grade 9 Academic**

Pablo is designing a rectangular flag that consists of three coloured triangles.

The picture below shows the colours of the triangles and the cost of each colour of material.

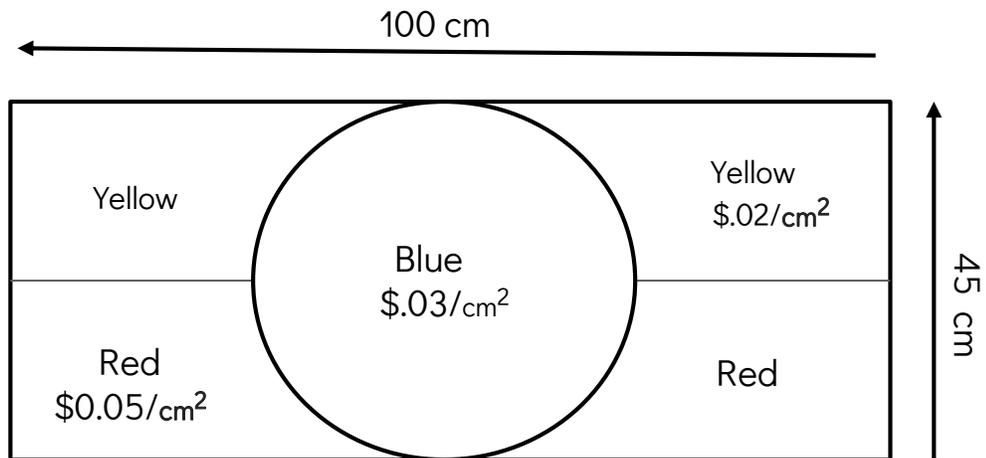


What is the total cost of the material needed to create this design?  
Show your work.

## Task: Flags Grade 8

Pablo is designing a rectangular flag that consists of different shapes and colours.

The picture below shows the colours of the shapes and the cost of each colour of material.



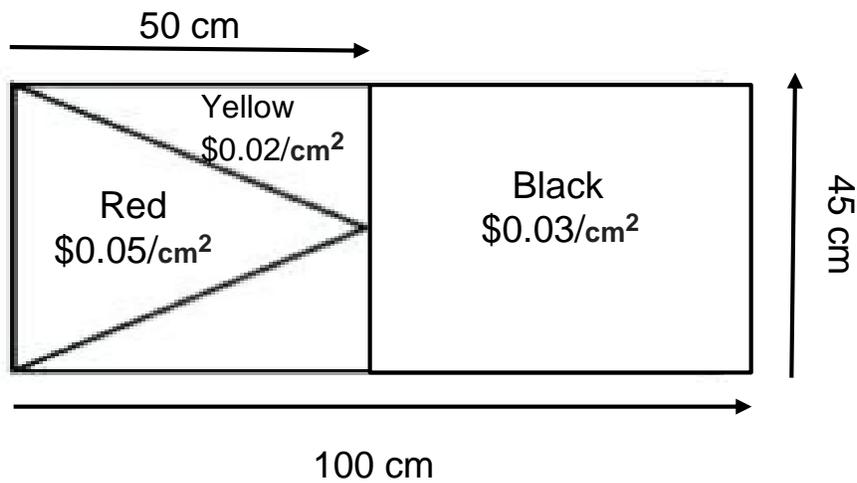
What is the total cost of the material needed to create this design?

Show your work.

**Task: Flags**  
**Grade 7**

Pablo is designing a rectangular flag that consists of different shapes and colours.

The picture below shows the colours of each section and the cost of each colour of material



What is the total cost of the material needed to create this design?

Show your work.

# Task 9: Six and Five Sides

Strands: Geometry & Spatial Sense (7 & 8); Measurement & Geometry (9)

## Overall Expectations

- **Grade 7**- construct related lines, and classify triangles, quadrilaterals, and prisms (G & SS)
- **Grade 8**- develop geometric relationships involving lines, triangles, and polyhedra, and solve problems involving lines and triangles (G & SS)
- **Grade 9 Academic**:- verify, through investigation facilitated by dynamic geometry software, geometric properties and relationships involving two-dimensional shapes, and apply the results to solving problems (M & G)

## Specific Expectations:

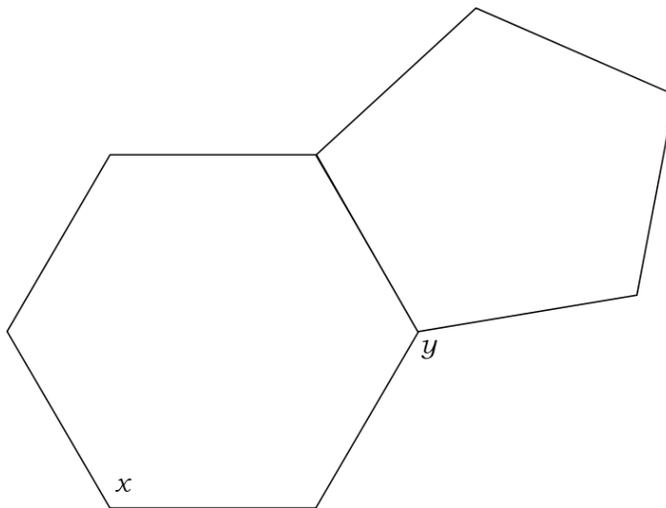
- **Grade 7**
  - construct related lines (i.e., parallel; perpendicular; intersecting), using angle properties and a variety of tools and strategies (G & SS)
- **Grade 8**
  - solve angle-relationship problems involving triangles, intersecting lines and parallel lines and transversals (G & SS)
- **Grade 9 Academic**
  - determine, through investigation using a variety of tools and describe the properties and relationships of the interior and exterior angles of triangles, quadrilaterals, and other polygons, and apply the results to problems involving the angles of polygons (M&G)
  - determine, through investigation using a variety of tools and describe some properties of polygons and apply the results in problem solving (M & G)
  - pose questions about geometric relationships, investigate them, and present their findings, using a variety of mathematical forms (M&G)



Grade 9

Task: Six and Five Sides

A regular hexagon and a regular pentagon are joined as shown below.



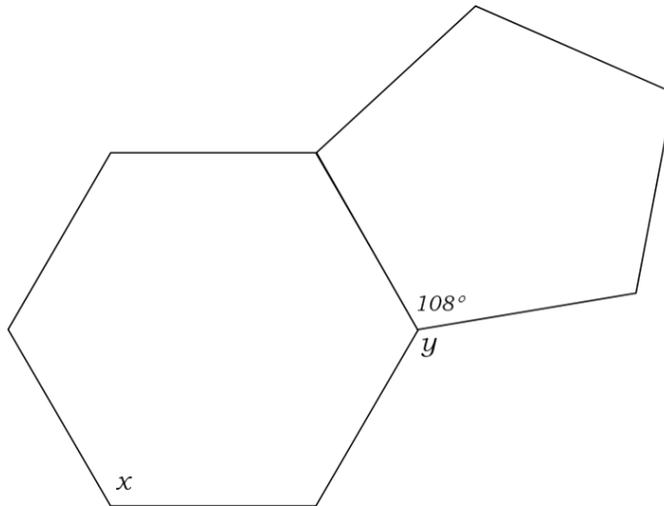
Complete the table below with the values of  $x$  and  $y$ . Justify your answer using geometric properties.

Value	Justification using geometric properties
$x = \underline{\hspace{2cm}}$	
$y = \underline{\hspace{2cm}}$	

## Grade 8

### Task: Six and Five Sides

A regular hexagon and a regular pentagon are joined as shown below.



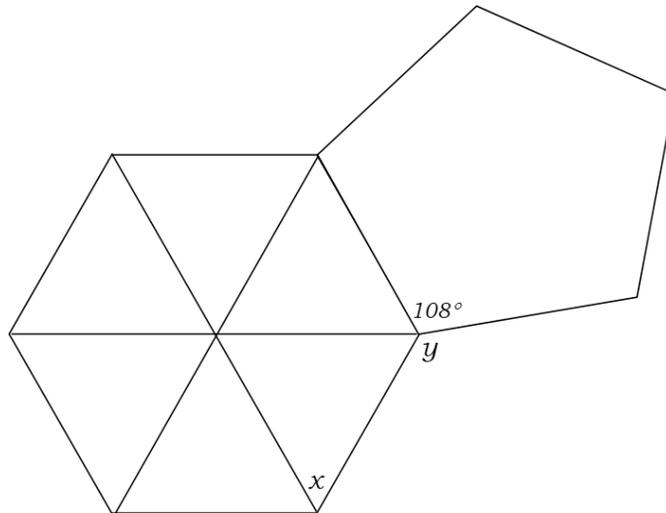
Complete the table below with the values of  $x$  and  $y$ . Justify your answer using geometric properties.

Value	Justification using geometric properties
$x = \underline{\hspace{2cm}}$	
$y = \underline{\hspace{2cm}}$	

Grade 7

Task: Six and Five Sides

A **regular** hexagon and a **regular** pentagon are joined as shown below.



Complete the table below with the values of  $x$  and  $y$ . Justify your answer using geometric properties.

Value	Justification using geometric properties
$x = \underline{\hspace{2cm}}$	
$y = \underline{\hspace{2cm}}$	

# Task 10: Diamond Cut

**Strand:** Geometry & Spatial Sense (7 & 8); Measurement & Geometry (9)

## Overall Expectations

- **Grade 7**- construct related lines, and classify triangles, quadrilaterals, and prisms (G & SS)
- **Grade 8**- develop geometric relationships involving lines, triangles, and polyhedra, and solve problems involving lines and triangles; (G & SS)
- **Grade 9 Applied**:- determine, through investigation facilitated by dynamic geometry software, geometric properties and relationships involving two-dimensional shapes, and apply the results to solving problems (M & G)

## Specific Expectations:

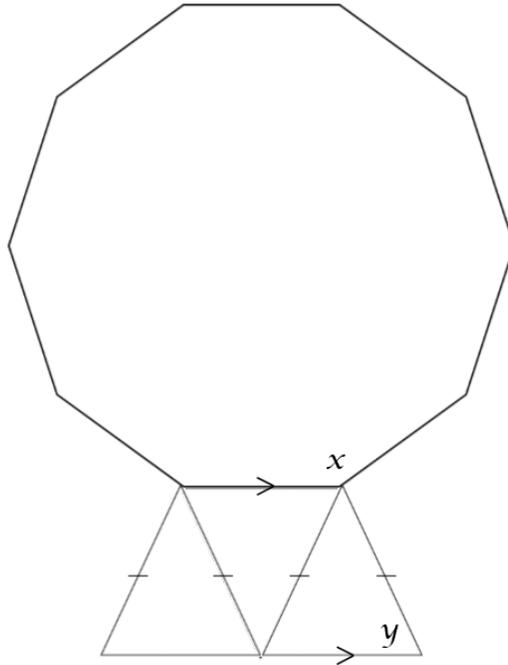
- **Grade 7**
  - construct related lines (i.e., parallel; perpendicular; intersecting), using angle properties and a variety of tools and strategies (G & SS);
- **Grade 8**
  - solve angle-relationship problems involving triangles, intersecting lines, and parallel lines and transversals (G & SS)
- **Grade 9 Applied**
  - determine, through investigation using a variety of tools and describe the properties and relationships of the interior and exterior angles of triangles, quadrilaterals, and other polygons, and apply the results to problems involving the angles of polygons (M&G)
  - determine, through investigation using a variety of tools and describe the properties and relationships of the interior and exterior angles of triangles, quadrilaterals, and other polygons, and apply the results to problems involving the angles of polygons (M&G)



Grade 9

Task: Diamond Cut

The diagram below shows a regular decagon and three isosceles triangles.



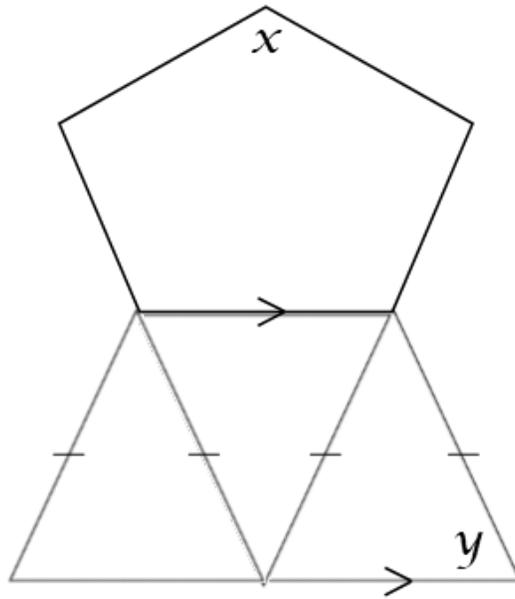
Determine the values of  $x$  and  $y$ . Justify your answers using geometric properties.

Value	Justification using geometric properties
$x =$ _____	
$y =$ _____	

Grade 8

Task: Diamond Cut

The diagram below shows a regular pentagon and three isosceles triangles.



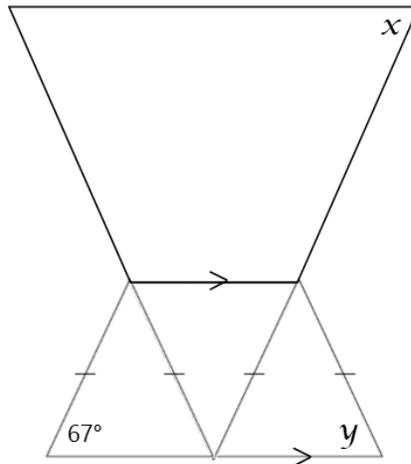
Determine the values of  $x$  and  $y$ . Justify your answers using geometric properties.

Value	Justification using geometric properties
$x = \underline{\hspace{2cm}}$	
$y = \underline{\hspace{2cm}}$	

## Grade 7

### Task: Diamond Cut

The diagram below shows a trapezoid and three isosceles triangles.



Determine the values of  $x$  and  $y$ . Justify your answers using geometric properties.

Value	Justification using geometric properties
$x =$ _____	
$y =$ _____	

# Additional Resources to Support Mathematics Instruction

## Key Ministry Resources

[Link to Ontario Math Curriculum](#) - provided by the Government of Ontario

[Sample Tasks from the Ontario Curriculum](#)

[Link to Overview of Math Processes](#) - by EduGains

[Guides to Effective Instruction in Mathematics](#)

**Math Continuum** - Continuum Grade 1 - 3 (Coming Soon!)

[Growing Success](#)

[“Yes, I Can”~ Capacity Building Series K-12 \(Jan. 2018\)](#) - provided by the Ministry of Education

## EOCCC Resources

[M3 Creating a Collaborative Continuum Closing the Gaps in Mathematics for Primary Grades](#)

[M3 Creating a Collaborative Continuum Closing the Gaps in Mathematics for Junior Grades](#)

[EOCCC Math Inquiry Project](#)

[Learning Journeys- Supporting Every Student's Success in Mathematics](#)

## EQAO Resources

[EQAO Website](#) - collection of math problem samples (multiple choice, open response)

[EQAO Classroom Posters](#)

[Wikispace EQAO Questions](#)

[Mighty Math](#) - website which contains EQAO question from 2006 - 2015