

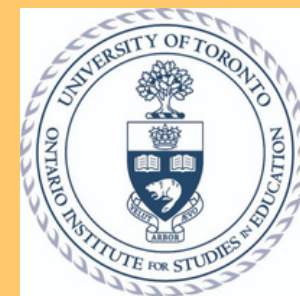
OAME – April 27, 2023

# Empower and Support: Creating Equitable and Interactive Math Lessons for Multilingual Classroom

Emmanuelle Le Pichon (OISE, University of Toronto)

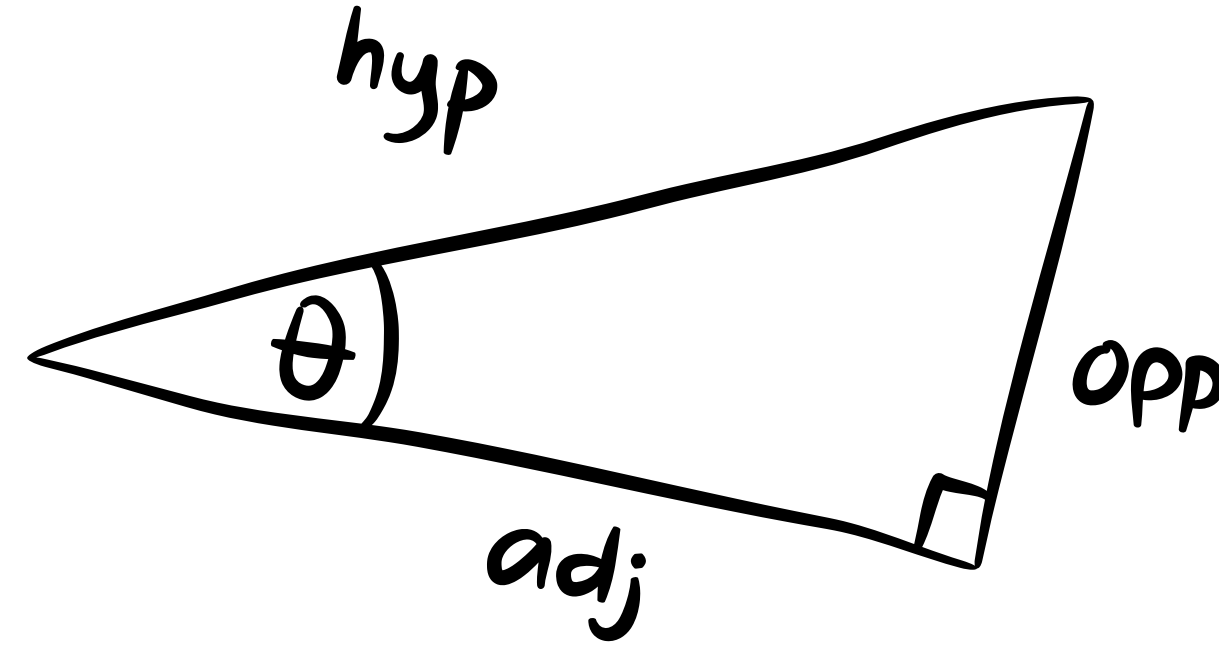
Mai Naji (OISE, University of Toronto)

Sudhashree Girmohanta (OISE, University of Toronto)

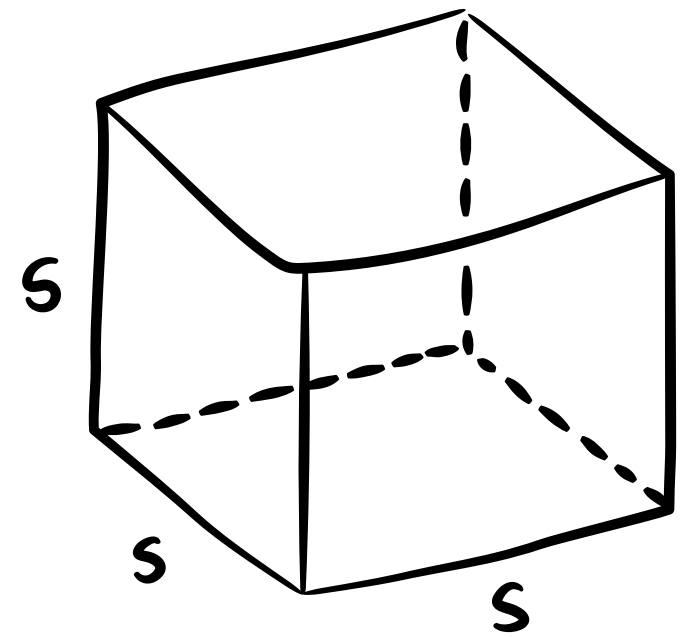


# Our Plan

- Getting to know each other
- Project Overview
- Policy and Curriculum Context
- Teaching Math to Multilingual Learners
- Equitable & Interactive Resources
- Takeaways
- Q & A

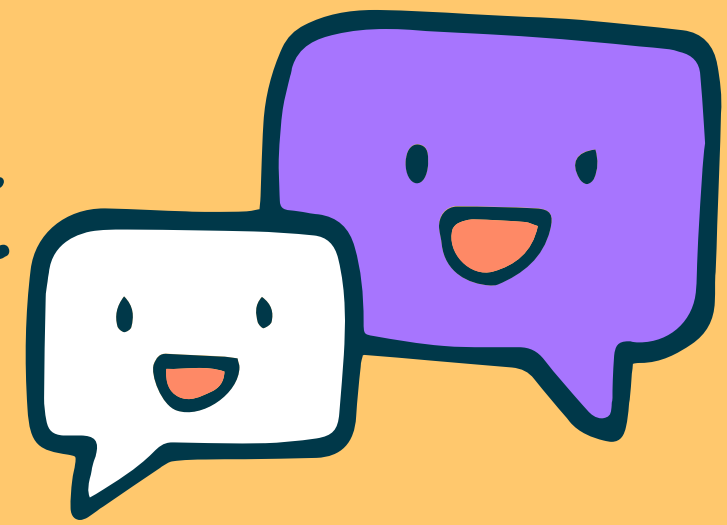


$$\sin(\theta) = \frac{\text{opp}}{\text{hyp}}$$



$$V = s^3$$

# Context, Issues, and Aim of the project



Increase in Newcomers

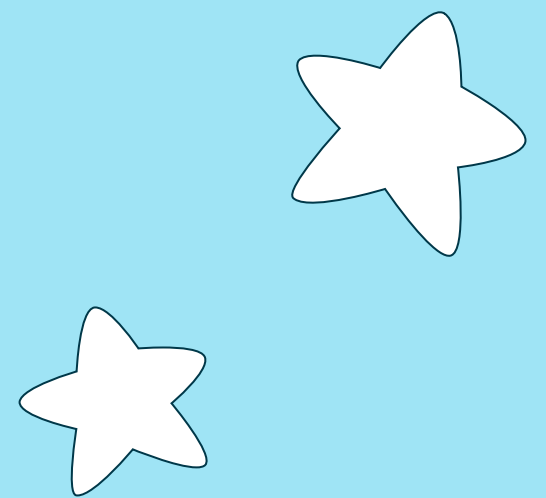
Linguistically and Culturally Diverse Classrooms

Scarcity of Resources and Initiatives

Need for New Skills and Resources

Initiatives needed to support Teachers and Families

**The ESCAPE Projects**  
Introduces approaches for Teachers and Families



# The ESCAPE Projects: Our Goals



01

To support teachers, students and parents in teaching and learning STEM subjects

02

To incorporate multilingual students' first language as an important resource in their learning

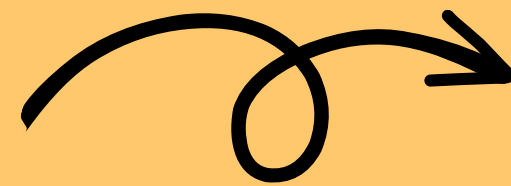
03

To utilize a multilingual online educational platform, Binogi

04

To engage parents and families in their children's learning

# What do curriculum & Ministry documents in Ontario tell us about supporting multilingual students?



Curriculum and Resources

Curriculum Assessment and Evaluation Resources Parents

## Considerations for program planning

- Introduction
- Student Well-Being and Mental Health
- Instructional Approaches
- Planning for Students with Special Education Needs
- Planning for English Language Learners
- Healthy Relationships
- Human Rights, Equity, and Inclusive Education
- The Role of the School Library
- The Role of Information and Communications Technology

In both the elementary and secondary panels, the teacher's comments should include relevant information on the student's demonstrated learning of the modified expectations, as well as next steps for the student's learning in the subject or course.

### Planning for English Language Learners

#### English Language Learners in Ontario Schools

Ontario schools have some of the most multilingual student populations in the world. The first language of approximately 28 per cent of the students in Ontario's English-language schools is a language other than English. In addition, some students use varieties of English – sometimes referred to as dialects – that differ significantly from the English required for success in Ontario schools. Many English language learners were born in Canada and have been raised in families and communities in which languages other than English, or varieties of English that differ from the language used in the classroom, are spoken. Other English language learners arrive in Ontario as newcomers from other countries; they may have experience of highly sophisticated educational systems, or they may have come from regions where access to formal schooling was limited.

When they start school in Ontario, many of these students are entering a new linguistic and cultural environment. All teachers share in the responsibility for these students' English-language development.

As students who are learning English as a second or additional language in English-language schools, English language learners bring a rich diversity of background knowledge and experience to the classroom. These students' linguistic and cultural backgrounds not only support their learning in their new environment but also become a cultural asset in the classroom community. Effective teachers find positive ways to incorporate this diversity into their instructional programs and into the classroom environment.

Most English language learners in Ontario schools have age-appropriate proficiency in their first language, as well as age-appropriate literacy skills. Although they need frequent opportunities to use English at school, they also derive important educational and social benefits from continuing to develop their first language while they are learning English. Teachers should encourage parents to continue to use their own language at home, both to preserve the language as part of their children's heritage and identity and to provide a foundation for their language and literacy development in English. It is also important for teachers to find opportunities to bring students' languages into the classroom, using parents and community members as a resource.

#### English as a Second Language and English Literacy Development Programs

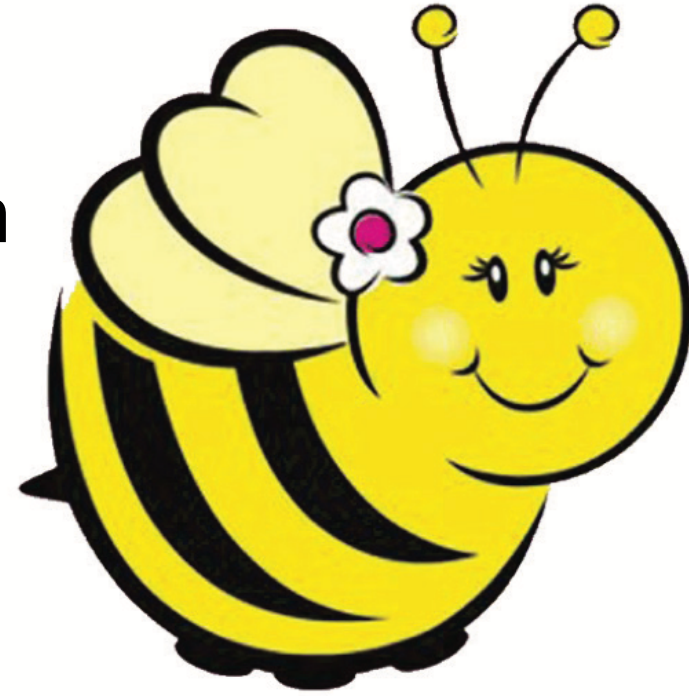
During their first few years in Ontario schools, English language learners may receive support through one of two distinct programs designed to meet their language-learning needs:

THE ONTARIO CURRICULUM  
GRADES 1–8

## Mathematics 2020

# Brain Teaser

From Grade 3 Textbook – Syrian Curriculum



٢. احسب بأسهل طريقة ( ذهنياً ):

$$\dots\dots\dots = 550 + 3000 + 2000$$



$$\dots\dots\dots = 300 - 220 + 7080$$

$$\dots\dots\dots = 500 + 590 - 5590$$

$$\dots\dots\dots = 157 - 5 + 7152$$

$$\dots\dots\dots = 7000 + 25 + 875$$

## Find the answer!

**Hint!!**

٦١										
١٠	٩	٨	٧	٦	٥	٤	٣	٢	١	
10	9	8	7	6	5	4	3	2	1	

# Brain Teaser

٢. احسب بأسهل طريقة ( ذهنيًا ):



$$\dots\dots\dots = 550 + 3000 + 2000$$

$$\dots\dots\dots = 300 - 220 + 7080$$

$$\dots\dots\dots = 500 + 590 - 5590$$

$$\dots\dots\dots = 107 - 5 + 7152$$

$$\dots\dots\dots = 7000 + 25 + 875$$

Share your answer!

١٠	٩	٨	٧	٦	٥	٤	٣	٢	١
10	9	8	7	6	5	4	3	2	1

# Why Multilingual and Digital Resources Matter?

- An effective way to promote inclusion in the classroom and at home
- Ensuring that all students have the opportunity to succeed
- Accommodate students with diverse linguistic backgrounds and create a more welcoming and inclusive environment for students and families
- Teach students to use digital resources in the right way





# Binogi.ca

## Multilingual Online Platform for Math & Science

- Supports equitable classroom instruction
- Supports multilingual students' learning of STEM
- Content for math and science
- Engaging multilingual animated videos
- Quizzes
- Home learning



# Many Languages



The screenshot displays the language selection interface for Binogi. It is divided into two main sections: 'Spoken language' and 'Subtitles'. The 'Spoken language' section includes buttons for English (highlighted with a green border), Dari, French, Somali, Swedish, and Tigrinya. The 'Subtitles' section includes buttons for English, Dari, French, Somali, Swedish, Tigrinya, and 'No subtitles'. A 'Ukrainian (Auto-translation)' option is also visible under the subtitles section. At the bottom of the interface, there is a play button, a progress indicator showing '0:57 / 2:16', a volume icon, a speed control set to '1x', and a 'Change languages' button with a share icon.

Spoken language

English Arabic

Dari Finnish

French German

Somali Spanish

Swedish Thai

Tigrinya

Subtitles

English Arabic

Dari Finnish

French German

Somali Spanish

Swedish Thai

Tigrinya Ukrainian (Auto-translation)

No subtitles

[www.binogi.ca](http://www.binogi.ca)

0:57 / 2:16 1x

Change languages

- Interactive graphics
- Multiple languages
- Engaging storytelling
- Self-paced learning



# Let's try it out

Binogi Research App Hot off the Press Digital Engagement Project Pricing Sign up Login

## Learn with Binogi

Learn faster than ever with content produced for the YouTube generation

Sign up now!

Existing languages

- English
- Arabic
- Tigrinya
- Somali
- Dari
- Swedish
- Finnish
- Thai
- French
- Spanish
- German
- Polish

Auto-translation

- Ukrainian
- Turkish
- Russian

**Binogi.ca**

[binogi.ca](https://binogi.ca)

# Linking Binogi to Curriculum

<https://books.binogi.ca/>

[See books in other subjects](#)



## Ontario Elementary Curriculum: Mathematics - Grade 7

search pages

1

to

[Get a link to this page](#)

### A. Social-Emotional Learning (SEL) Skills in Mathematics and the Mathematical Processes

page  
1

[Is the answer reasonable?](#)

[Problem solving in Mathematics](#)

*This page is not completely covered by Binogi.*

### B. Number

page  
2

[Multiplication and division by 10](#)

[Rounding and estimates](#)

[Powers and exponents](#)

[Scientific notation](#)

[The positional system with base 10](#)

[Introduction to exponents](#)

[Square roots](#)

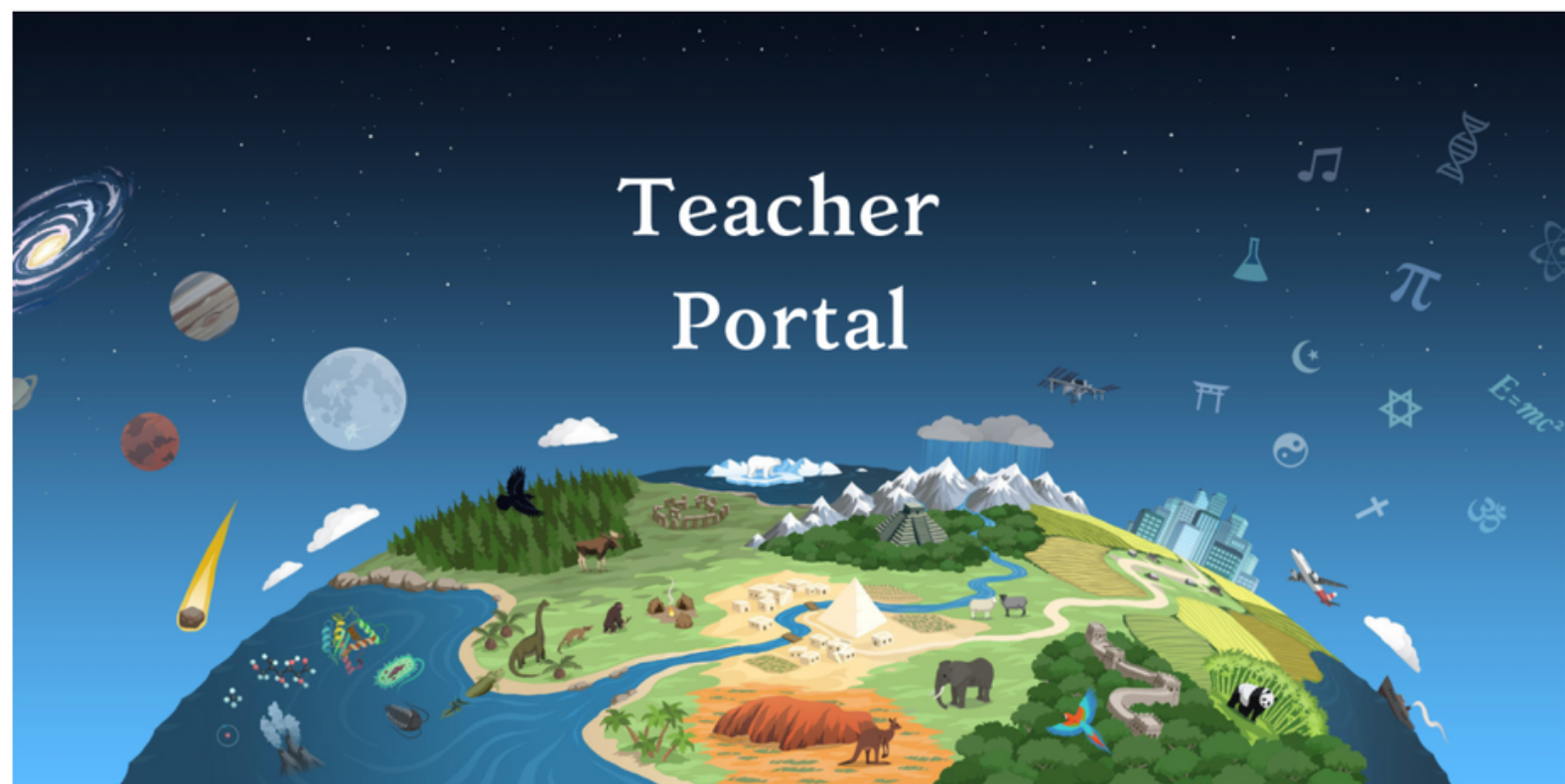
[Prime numbers: Rectangular numbers](#)

[Introduction to negative numbers](#)

[Rational numbers](#)

[Fractions and decimals](#)

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# Teacher Portal

Join our escape cafés!

[CLICK HERE TO REGISTER](#)



### Administrative Resources

Find Consent Letters, Surveys, and more

[CLICK HERE](#)



### E-Learning Resources

Check out videos to learn how to implement Binogi in your classroom

[CLICK HERE](#)



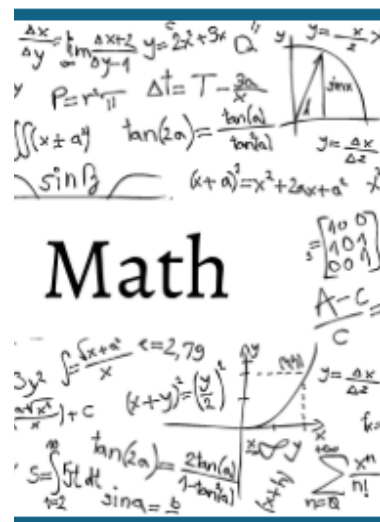
### Teaching Resources

Find interactive teaching resources here

[CLICK HERE](#)

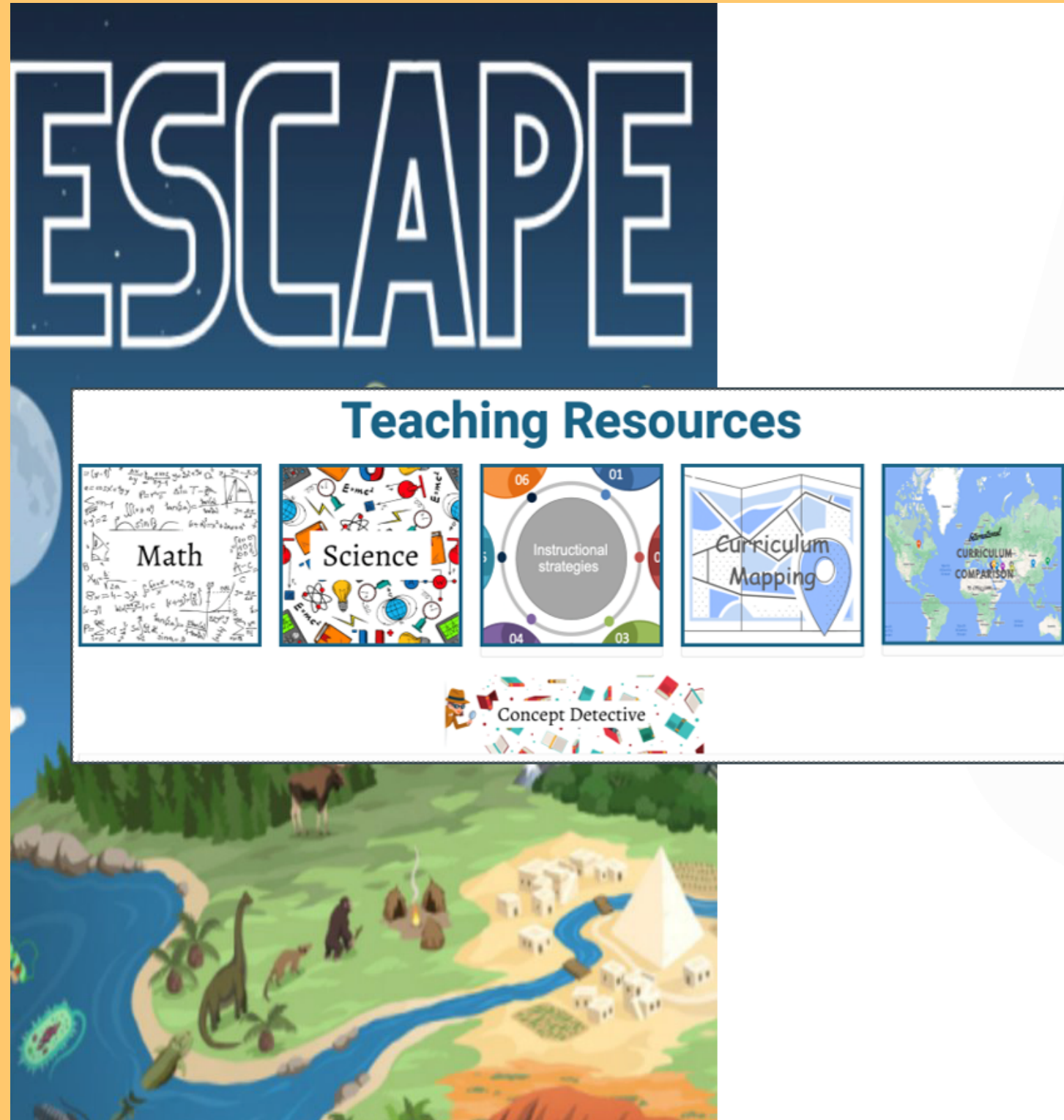
# THE ESCAPE PROJECT WEBSITE

## Teaching Resources



Create a Free Teacher Account  
<https://escapeprojects.ca/register/>

# ESCAPE Projects Website: Resources



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Science & Math Lesson Plans/Activities

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Science & Math Bilingual Concept Lists

---

Instructional Strategies


---

Curriculum Mapping

---

International Curriculum Comparison

# ESCAPE Projects Website: Resources



## Order of Operations

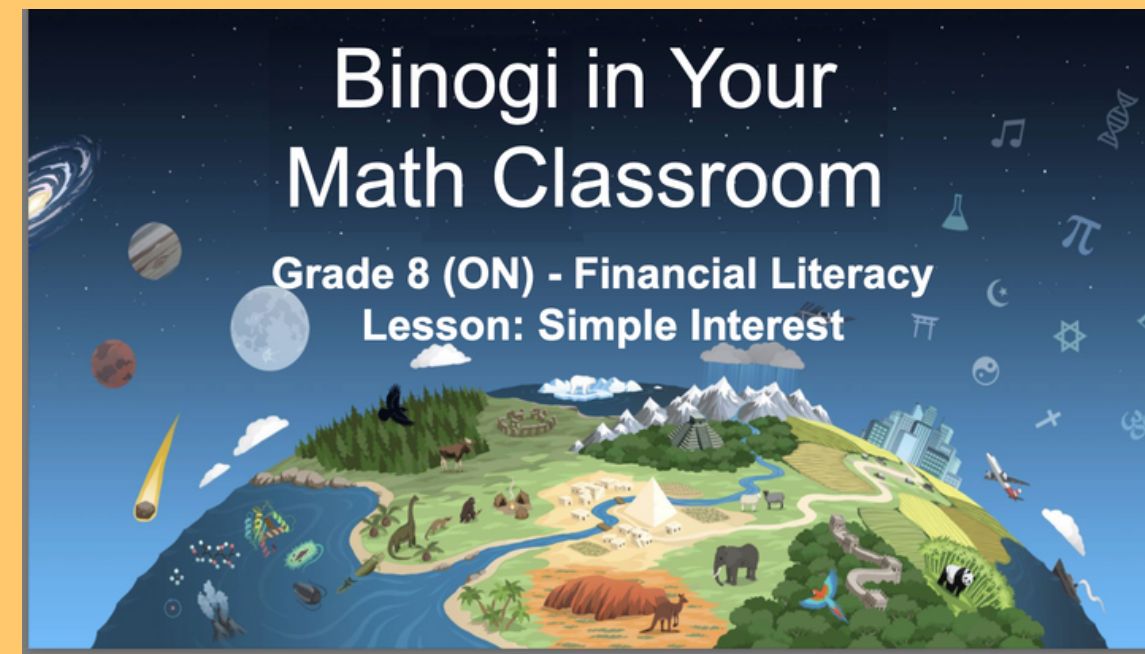
Create. Empower. Support.

- ✓ Curriculum Expectation
- 🌟 Learning Objectives/ Big Idea
- 📍 Binogi Related Resources
- 📖 Additional Resources: Lesson Plan Template
- 📖 Vocabulary
- 🎮 Interactive Game Booklet
- 🔄 Flipped Classroom Activity
- 🗣️ Language Friendly Pedagogy Activity
- 🏠 Parent and Community Connection

### Curriculum Expectation

**Overall Expectation**  
Use knowledge of numbers and operations to solve mathematical problems encountered in everyday life




Mathematics 2020




## Binogi in Your Math Classroom

### Grade 8 (ON) - Financial Literacy Lesson: Simple Interest

Supported by

Resource Guide for Teachers  
© 2020  
All rights reserved. This resource is intended for personal and classroom use only.  
All of the materials in this guide may be downloaded and printed for non-commercial use in educational contexts. No part of the guide may be copied, reproduced, distributed or transmitted in whole or in part for commercial uses without the prior written consent of Dr. Emmanuelle Le Pichon.  
Please visit: <https://escapeprojects.ca/> for additional resources and information.  
Prepared by:  
Dr. Emmanuelle Le Pichon  
Dr. Dania Wattar  
Rosalia Cha



## Concept Lists' Posters

Create. Empower. Support.


**CHOOSE A TOPIC – YOU CAN DOWNLOAD/PRINT POSTERS IN MANY LANGUAGES OR PRINT "ADD A LANGUAGE" POSTERS.....Great for in class activities or to send home with your students**

- ✓ Geometry
- ✓ Order of Operation
- ✓ Financial Literacy
- ✓ Fractions
- ✓ Measurement

### Geometry

#### Three-dimensional Figures

- EN/ADD A LANGUAGE POSTER
- ENGLISH/URDU POSTER
- ENGLISH/MANDARIN POSTER



# ESCAPE Projects Website: Resources



## Binogi Video: Simple Interest English-Arabic Bilingual Concept List The Escape Projects

<b>Interest</b> The price paid for borrowing money by the person who borrows the money.	<b>الفائدة</b> الثمن المدفوع لاقتراض المال من قبل الشخص الذي يقرض المال.	
<b>Percentage (Percent)</b> Refers to the share of something measured in points per hundred. For example, if half the students in a class are females, then the percentage of females in the class is fifty.	<b>النسبة المئوية (%)</b> تشير إلى جزء أو حصة من شيء تقاس بالنقاط لكل مائة. على سبيل المثال، إذا كان نصف الطلاب في الفصل من الإناث، فإن نسبة الإناث في الفصل هي خمسون.	
<b>Principal</b> The original amount of a loan or an investment before any interest is added.	<b>المبلغ الأصلي</b> المبلغ الأصلي للقرض أو الاستثمار، قبل إضافة أي فائدة.	
<b>Simple Interest</b> Interest calculated on the principal amount of the loan.	<b>الفائدة بسيطة</b> الفائدة المحسوبة على المبلغ الأساسي للقرض.	



## Binogi Video: Compound Interests English-Urdu Bilingual Concept List The Escape Projects

<b>Percentage (percent, percentages)</b> Refers to the share of something measured in points per hundred. For example, if half the students in a class are females then the percentage of females in the class is fifty.	<b>فیصد</b> جب کسی چیز کی کل تعداد کو 100 کا اصطلاح دے کر اس کے حصوں کو 100 کی نسبت سے دیا جاتا ہے۔ مثلاً، اگر کلاس میں نصف طلباء خواتین ہیں تو کلاس کے پچاس فیصد طلباء خواتین ہیں۔	
<b>Change factor</b> The number that you multiply by the original amount to get the amount after a change.	<b>تبدیلی کا عنصر</b> وہ عدد جسے آپ اصل رقم کو ضرب دیتے ہیں تاکہ تبدیلی کے بعد رقم حاصل کی جاسکے۔	
<b>Interest</b> The price paid for borrowing money by the person who borrows the money.	<b>سود</b> ایک ادائیگی جو ایک قرض دار رقم قرض لینے کے بدلے میں بھرتا ہے۔	
<b>Compound interest</b> The sum of the interest, calculated on all previous interests as well as the starting sum.	<b>مرکب سود</b> مقررہ دورانیہ تک جمع ہونے والے سود کو اصل رقم میں شامل کر کے حاصل ہونے والی رقم جس کو پھر اگلے دورانیہ کی اصل رقم سمجھا جاتا ہے۔	
<b>Principal</b> The original amount of a loan or an investment, before any interest is added.	<b>اصل رقم</b> قرض یا سرمایہ کاری میں ادا کی گئی اصل رقم، اس سے پہلے کہ کوئی سود شامل کیا گیا ہو۔	
<b>Exponential expression</b> A term that is made up of a number and a smaller number in the top right corner. The small number tells you how many times to multiply the larger number by itself.	<b>کافیٹی اصطلاح</b> ایک اصطلاح جو ایک عدد اور اس کے اوپری دائیں کونے میں ایک اور چھوٹے عدد پر مشتمل ہوتا ہے۔ یہ چھوٹا عدد بتاتا ہے کہ بڑے عدد کو کتنی دفعہ اپنے آپ سے ضرب دینا چاہیے۔	
<b>Debt (debts)</b> An amount of money that you owe to someone or something.	<b>قرض</b> کوئی رقم جو کسی انسان یا ادارے پر واجب الادا ہے۔	



## Binogi Video: Expanding and reducing fractions: Introduction Bilingual Concept List The Escape Projects

<b>Ratio</b> The relationship in number or quantity between two or more things.	<b>Add your own language!</b>	
<b>Quotient</b> The answer you get when you divide one number by another number.		
<b>Decimal point (decimal comma)</b> The dot that separates a whole number from tenths, hundredth, thousandths etc.		
<b>Factor (factors)</b> Any of the numbers that when multiplied together form a product. Or a number that evenly divides a larger number.		
<b>Expand (expanded, expanding)</b> When you multiply both the numerator and denominator of a fraction by the same amount.		
<b>Simplify (simplified)</b> When you divide both the numerator and denominator of a fraction by the same amount.		



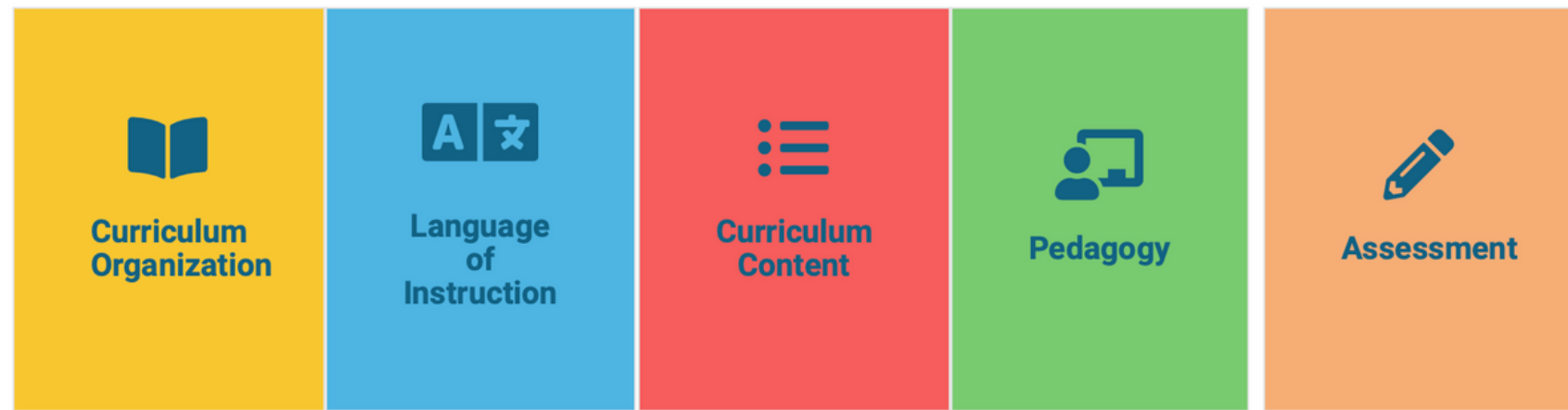


# Curriculum comparison between countries

**Example: Ontario & Syria**

*How could teachers use this information?*

## How Do Countries Compare?



*Discover more about your students' prior learning & funds of knowledge!*

Ontario | New Brunswick | Afghanistan | China  
Egypt | India | Iraq | Iran | Jordan | South Korea  
Lebanon | Pakistan | Syria

# Exploring Curricula of Different Countries


## AFGHANISTAN

Two education systems exist in parallel in Afghanistan. Religious education is the responsibility of clerics at mosques, while the government provides free academic education at state schools. From age 7 to age 13, pupils attend primary schools where they learn the basics of reading, writing, arithmetic and their national culture. Three years of middle school follow where academic-style education continues. Students must pass an examination at the end of this phase if they wish to study further. At secondary school, students have a choice between continuing with an academic path for 3 years that could perhaps lead on to university, or study subjects such as applied agriculture, aeronautics, arts, commerce, and teacher training instead. Both programs culminate in a *bacilluria* examination. The Ministry of Education (MoE) is responsible for the administration of primary education, secondary education, vocational education, and religious education, including funding, policy development, curriculum design, evaluation, and basic teacher education. Primary education runs from grades 1 to 6. Children typically begin school between the ages of six and eight. The primary curriculum is consistent nationwide; however, teachers can tailor it to the local content.

[Read More](#)

Primary education is divided into two cycles. The first cycle covers grades 1 to 3, and the curriculum includes subjects such as religious studies, first language (Dari or Pashtu, depending on the region), mathematics, arts, and physical education. The second cycle includes grades 4 to 6. The curriculum covers the same subjects as the first cycle, plus additional subjects such as natural sciences, history, geography, and a secondary language (Dari or Pashtu, depending on the region). At the end of grade 6, students must pass an examination to gain admission to lower secondary education [Maktabeh Motevasteh]. At this point, they may opt to pursue a religious studies track, or a more general education track. The vast majority of students pursue the latter. Secondary education includes two three-year cycles. The first cycle, from grades 7 to 9, is referred to as lower secondary education, and the second cycle, from grades 10 to 12, is referred to as higher secondary education. The curriculum of the first cycle includes subjects such as religious studies, local languages, mathematics, natural sciences, social studies, foreign languages (English, German, French and Russian), and physical education. Students who pass the examination at the end of grade 9 can continue to higher secondary education. (Upon completion of grade 9, students may opt to pursue technical and secondary vocational education, rather than higher secondary education.) The curriculum of higher secondary education is determined by whether the students choose to focus on natural sciences stream or social studies stream, although the subjects taken are largely the same, and duplicate most of the subjects taken in lower secondary education. No matter which streams the students take, they need to pass the graduation exam to be awarded the 12<sup>th</sup> grade graduation certificate.

 Curriculum Link

 Click on the link read about Afghanistan Curricula's Guide to Publication Year of Student Textbooks and Teacher Handbooks

Textbooks

Math Strands & Topics

Science Strands & Topics

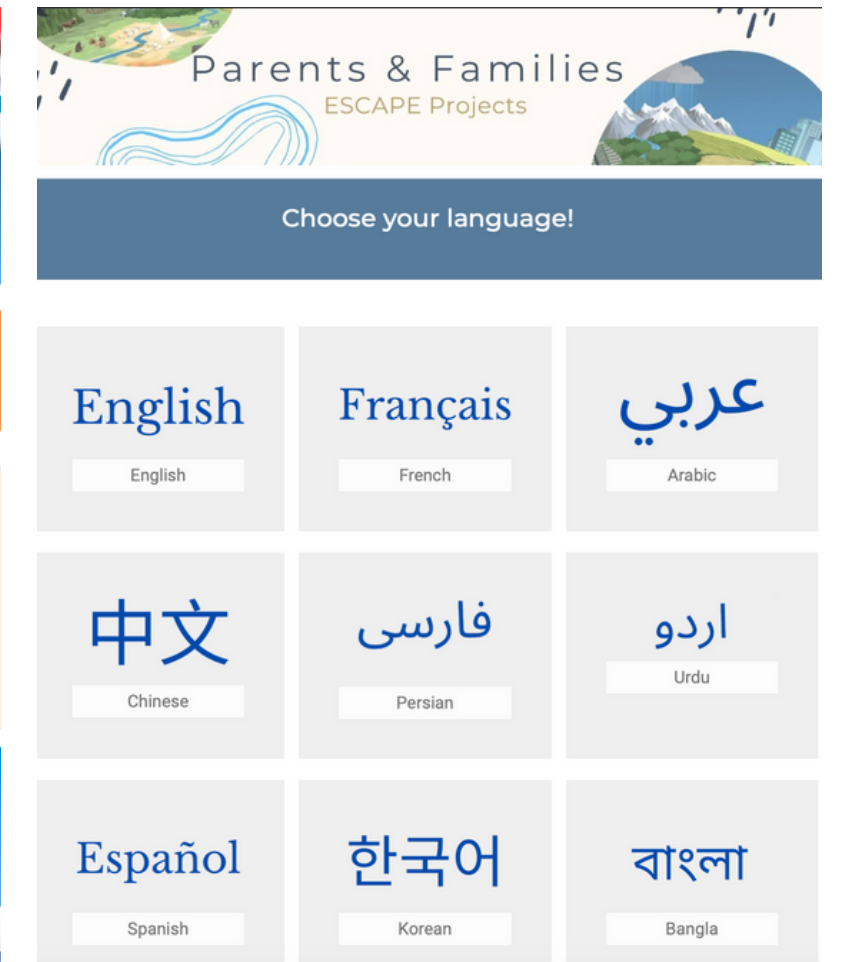
Pedagogy

Assessment



# Family Page in Home Language

- Create language bridges and increase access to curriculum content
  - Leads to improved communication between school and home
- Provide families with resources and strategies to support their child's learning
  - Boosts parental involvement and supports students at home
  - Fosters a welcoming and inclusive environment



# Takeaway

Use a variety of strategies and resources to support students with different learning needs and backgrounds

Appreciate the steps required to solve a "simple question" in a different language (which might include direction!)

take the time to learn about your students and their funds of knowledge

Accommodate learners with translation tools



# Activity: Concept Detective



Question:

Malik has 3 new rolls of fabric to sell in his clothing store, one red, one blue and one green. He measures the fabric using lengths of his body. His first customer buys 2 gaz of red fabric and 3 gaz and 2.5 baalisht of blue fabric. His second customer buys 6 gaz and 1.5 baalisht of red fabric and 8 gaz of green fabric. If each roll of fabric is 4000 cm long initially, how much fabric is left on each of the rolls, in cm, after the second customer's purchase.

The width of Malik's hand is 17.5 cm, the length of his arm (from shoulder to wrist) is 32.96 cm and the width of his shoulders is 40 cm.



# EQAO Gr. 9 Sample Question

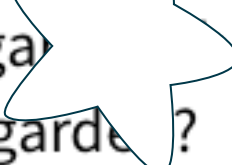
## Question 5

🚩 Flag this question.



A landscaper uses boot length to estimate distances.

The length of the boot is about **32** cm long.

If the landscaper makes a garden  that has a width of 3.5 m, approximately how many boot lengths is the width of the garden?

1 boot length

9 boot lengths

11 boot lengths

36 boot lengths



# Possible difficulties Multilingual and multicultural learners could face

Imperial vs. Metric system

landscaper? gardener?

Boot? Is it a name of a tool?

different ways of measuring  
: arm  
: handspan

# Lessons from this short introduction to our projects!



- Math is incredibly verbal;
- There are no languages in which one cannot learn;
- Being **equitable** means providing equitable (language) tools to our multilingual students;
- Being **inclusive** means involving students and their families in the content,
- and seeking the support of our students and their families in creating that content.



# THANK YOU!

Need more information? Please reach out to us at [apprendreenligne@outlook.com](mailto:apprendreenligne@outlook.com)

