Resources to Support Teachers

(BIRS Workshop)

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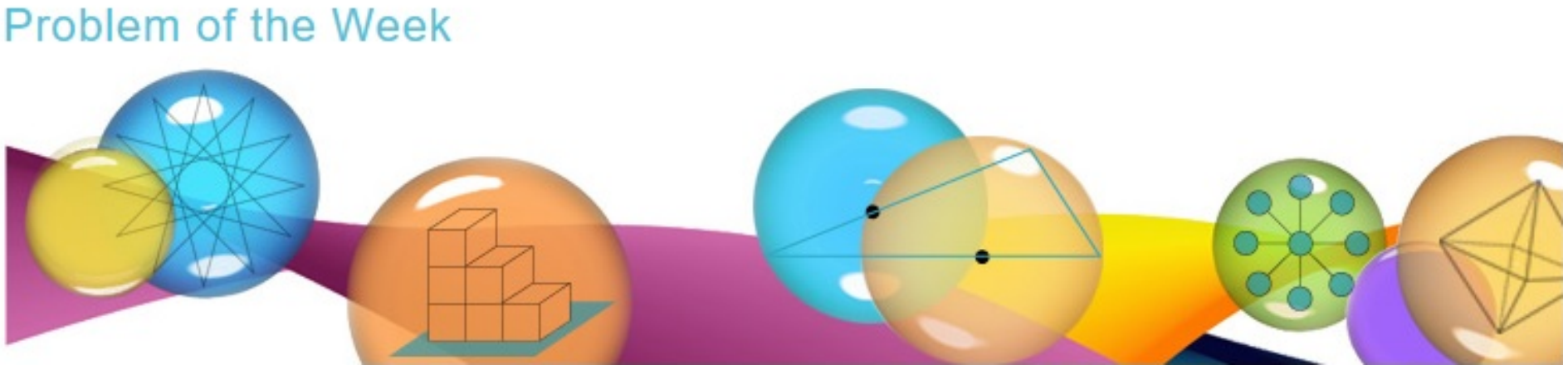
July 2023

Math Problem of the Week



The Problem of the Week is designed to provide students with an ongoing opportunity to solve mathematical problems. Each week, problems from various areas of mathematics will be posted and e-mailed to teachers to use with their students from grades 3 and up.

Reference:
https://www.cemc.uwaterloo.ca/resources/potw.php

Math Problem of the Week

Current Problems

(3/4 Problem A) Recess Randomness	(5/6 Problem B) Powerful Patterns	(7/8 Problem C) Will that be Large or Small?	(9/10 Problem D) Sum Ways	(11/12 Problem E) What is Possible?

Subscribe Now!

Action	◉ Subscribe ○ Unsubscribe					
Grade	☑ All	☐ 3/4 Problem A	☐ 5/6 Problem B	☐ 7/8 Problem C	☐ 9/10 Problem D	☐ 11/12 Problem E
E-mail	MaryJones@HighSchool.ca					

Submit

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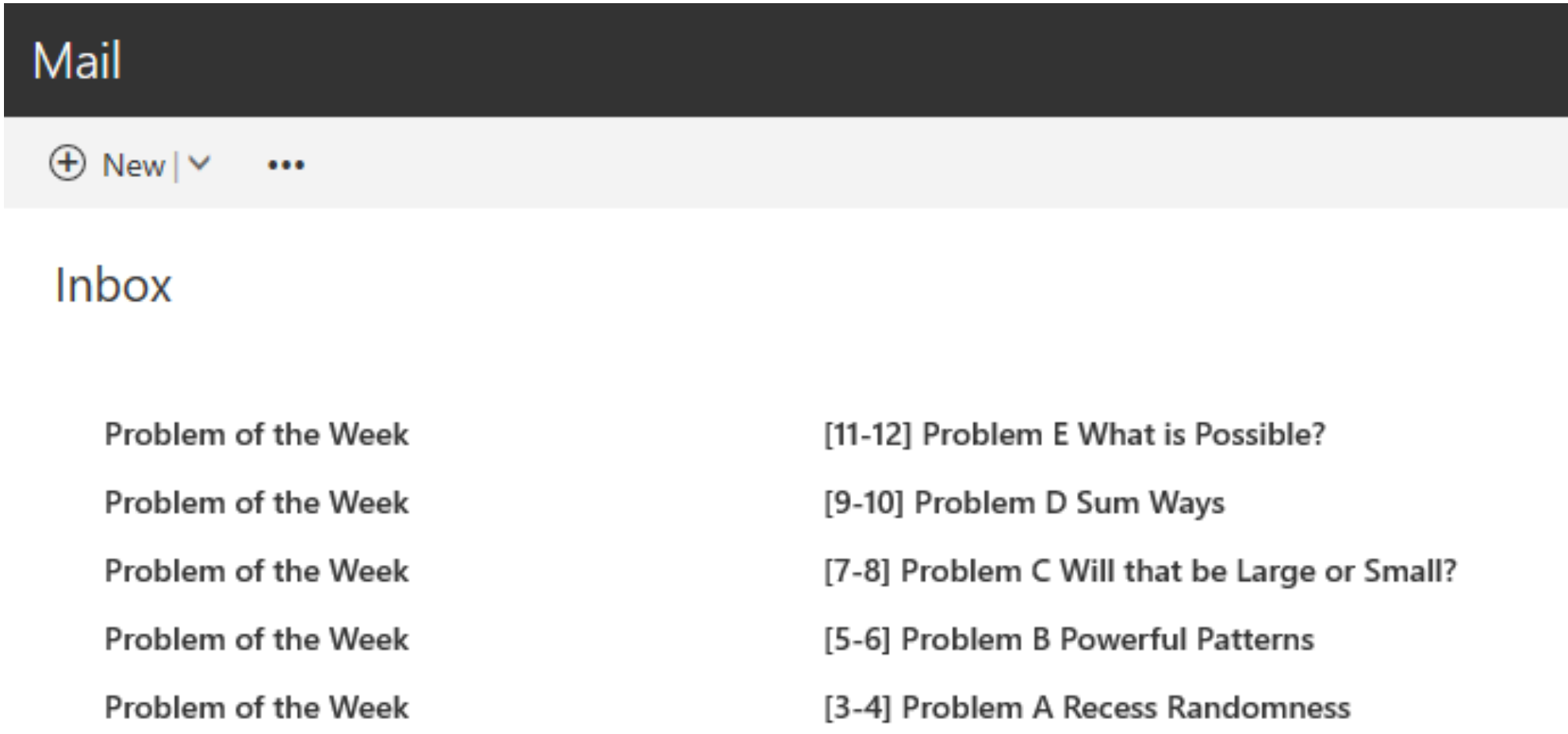
https://www.cemc.uwaterloo.ca/resources/potw.php

Math Problem of the Week



You will receive email messages containing links to the current week's problems [operates September through May each school year; past problems are archived and can be downloaded from the website].

Math Problem of the Week: Themes

Grades 3/4 5/6 7/8 9/10 11/12

Number Sense (N)
Numeration
Numbers
Number Theory
Financial Literacy

Geometry & Measurement (G)
Spatial Sense
Shape and Space
Trigonometry

Algebra (A)
Patterning
Relations
Sequences
Functions

Data Management (D)
Probability
Statistics

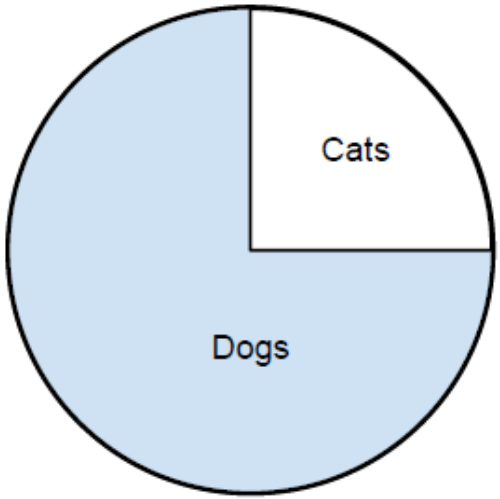
Computational Thinking (C)
Logic
Coding

Math Problem of the Week:

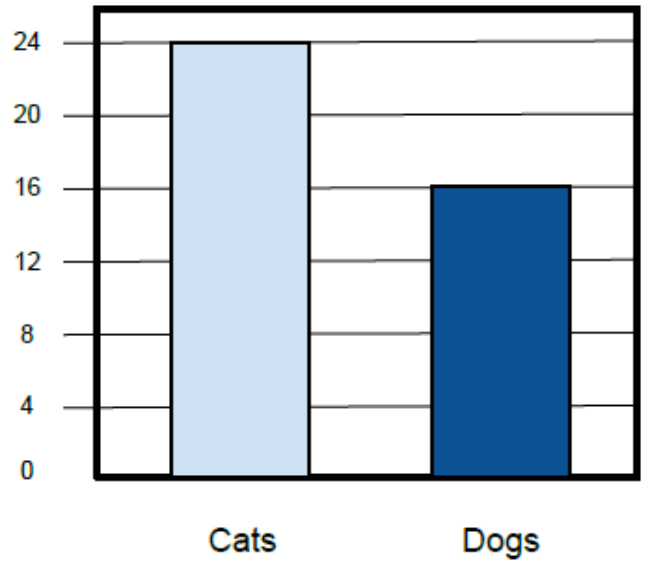
Grade 3/4: Data Management and Number Sense

The graphs below represent the number of cats and dogs in two local animal shelters. Shelter A and Shelter B have the same number of animals.

Shelter A



Shelter B



There are more dogs in Shelter A than in Shelter B. How many more? Justify your answer.

Reference:

https://www.cemc.uwaterloo.ca/resources/potw.php

Math Problem of the Week: Solution

Solution

Looking at Shelter B, we see that there are 24 cats and 16 dogs. This means there is a total of $24 + 16 = 40$ animals in each of the two shelters.

It appears that in Shelter A, $\frac{3}{4}$ of the shelter is filled with dogs, and $\frac{1}{4}$ are cats. If the total number of animals at this shelter is 40, then we need to calculate $\frac{1}{4}$ of 40.

Since $10 + 10 + 10 + 10 = 40$, then $\frac{1}{4}$ of $40 = 10$. So there are 10 cats in Shelter A. This means that there are $40 - 10 = 30$ dogs in Shelter A.

Since there are 30 dogs at Shelter A and 16 dogs at Shelter B, then there are $30 - 16 = 14$ more dogs at Shelter A than Shelter B.

Reference: https://www.cemc.uwaterloo.ca/resources/potw.php

Math Problem of the Week: Notes

Teacher's Notes

Data can be visualized in many ways. A tool like a spreadsheet can automatically convert numeric data into a chart. The same data can be used to generate different styles of charts. Consider the bar chart showing the data for Shelter B. The spreadsheet automatically calculated the maximum value on the y-axis and chose the distance between the horizontal lines in the chart. Most spreadsheeets would give the user the option of changing the maximum value and changing the distance between each of the horizontal lines. Once those decisions are made, the spreadsheet will automatically recalculate the size of the chart and its elements.

If students want to create their own charts, they would need to do all of those calculations themselves. The work to determine the values of regular intervals from the minimum to the maximum as the locations of the horizontal lines is not trivial. Suppose you use graph paper to draw the chart. You need to determine a

⋮

Reference: https://www.cemc.uwaterloo.ca/resources/potw.php

Invitations to Mathematics

"*Invitations to Mathematics*" is a series of 18 free booklets (PDF format) to assist teachers of Grades 4, 5, 6.
The content in these booklets can be used for either individual or group work. Activities, reproducible worksheet masters, and solutions are included in the booklets as well as instructional guidance and suggested assessment strategies for teachers.

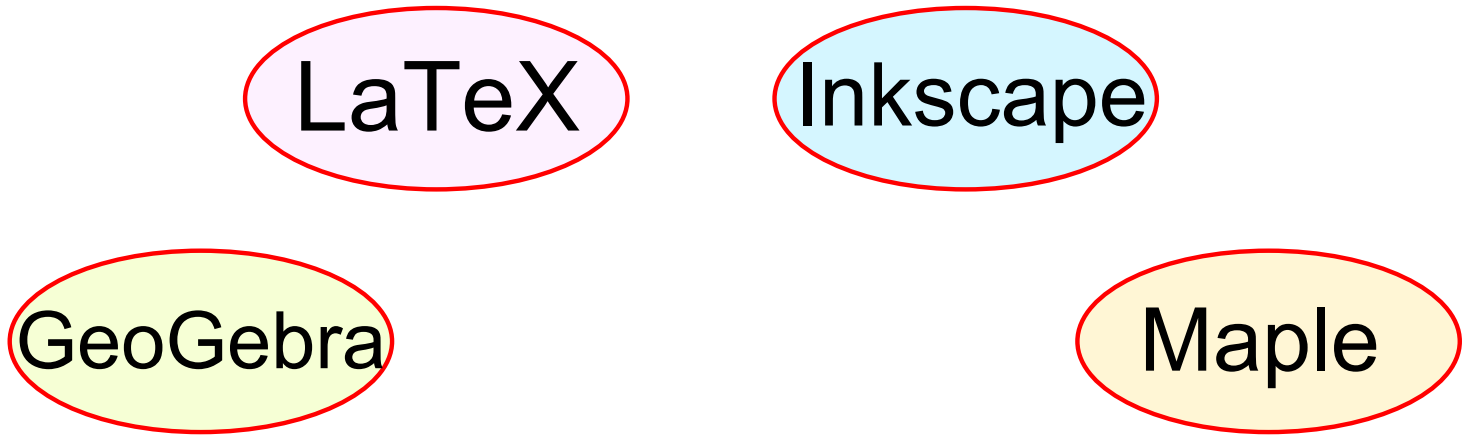
Grades: 4, 5, and 6

TOPICS
Number Sense and Estimation
Geometry
Data Management
Patterns and Algebra
Probability
Measurement

Reference:
https://www.cemc.uwaterloo.ca/resources/invitations-to-math.html

Master of Mathematics for Teachers Degree Program (MMT)

Course: Mathematical Software for Teachers



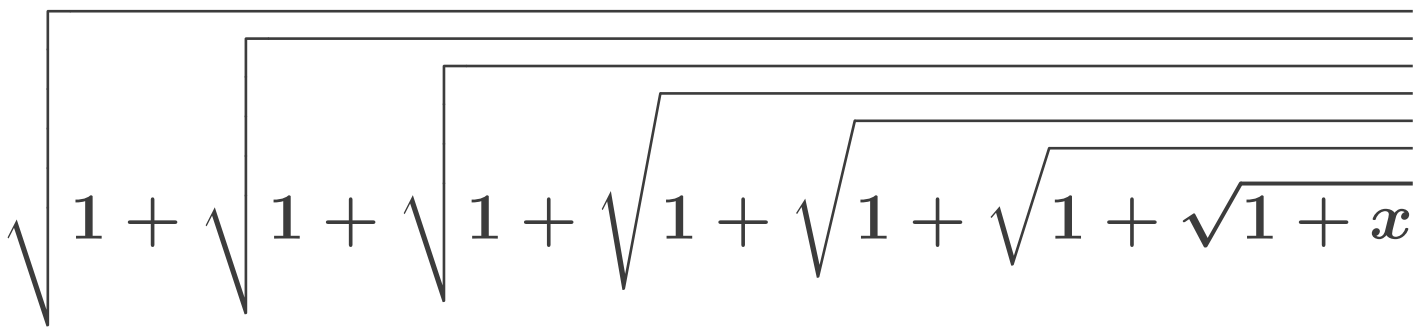
Open Source Software

What is LaTeX?

Open source software that enables the user to create typeset mathematical documents.

“Open source”
= download and use the software for free.

Creating Math Resources from Open Source Software: LaTeX

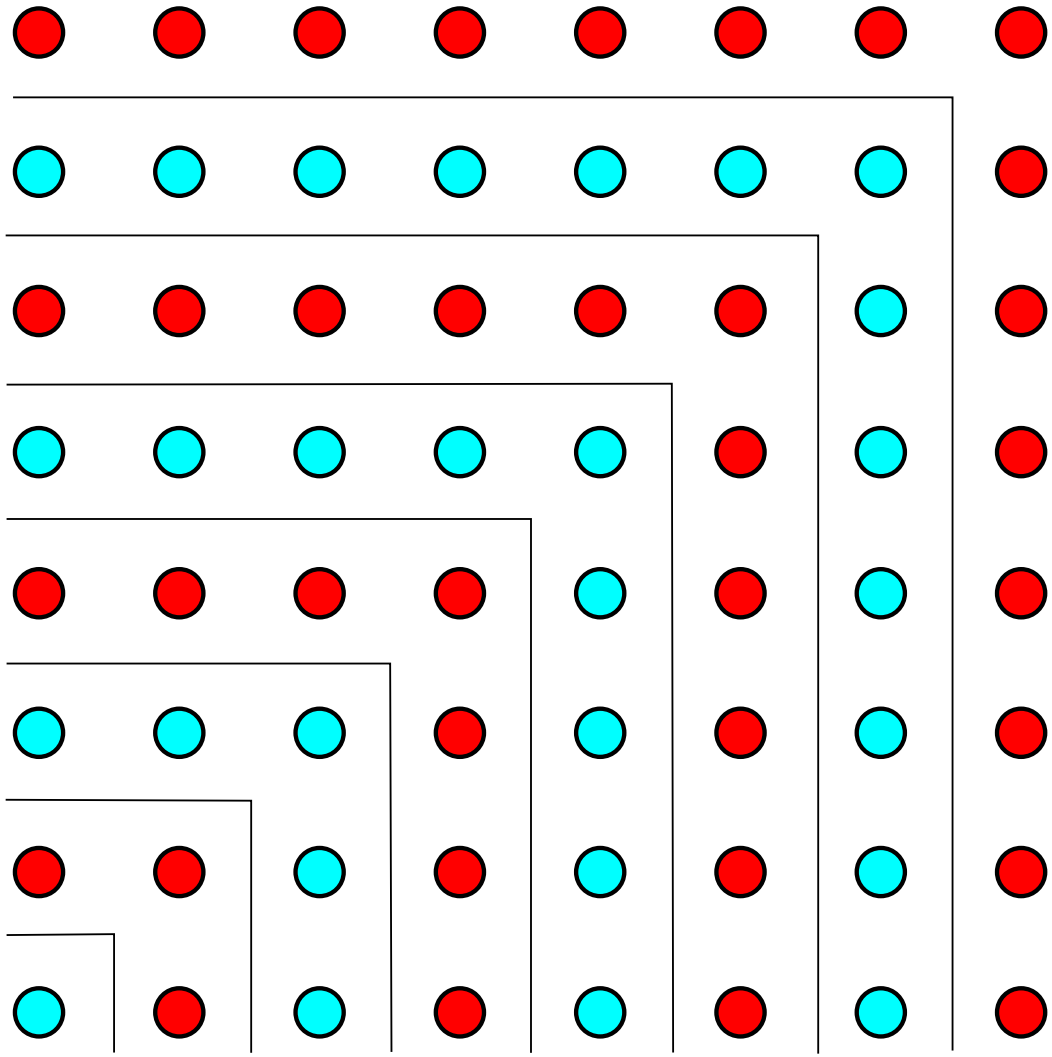


Open Source Software

What is Inkscape?

Free open source software that enables the user to produce professional quality graphics.

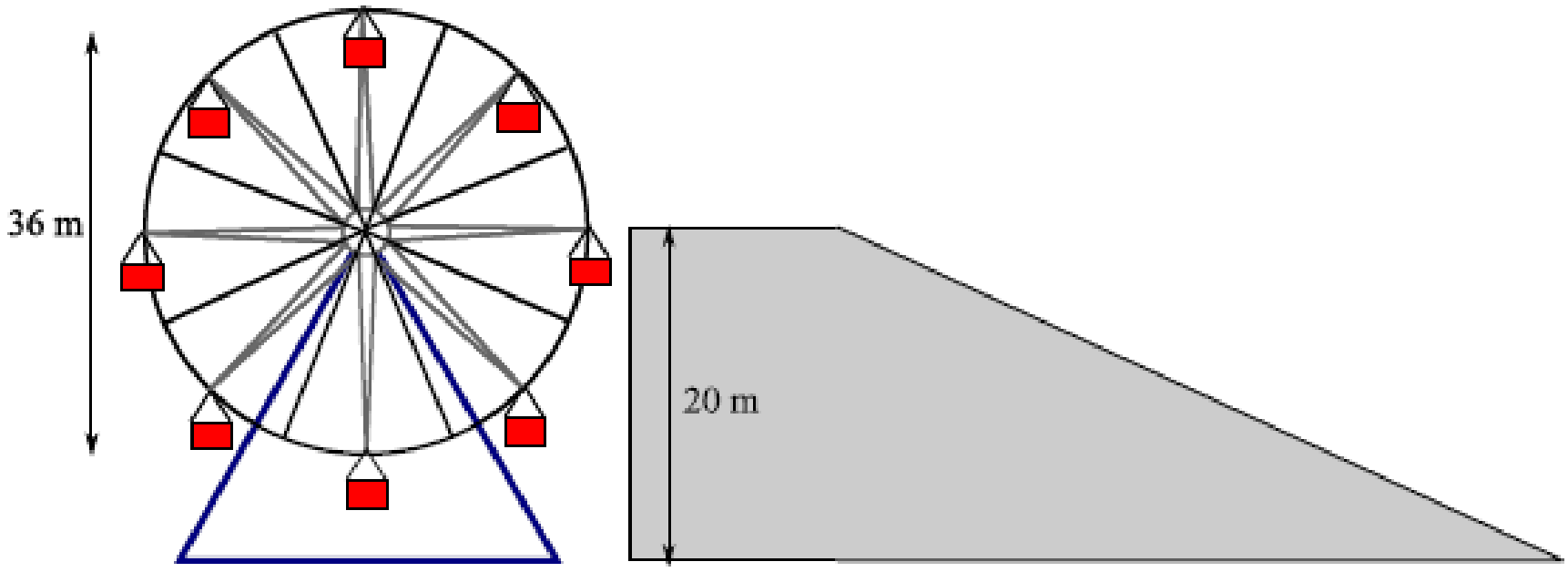
Visual Proofs: Sum of Odd Integers



Sums of Odd Integers
Nicomachus of Gerasa (circa A.D. 100)
$1 + 3 + 5 + \ldots + (2n - 1) = n^2$

Enhancing Assignment Questions

A ferris wheel has a diameter of 36 m and a center which is 20 m above the ground. The wheel rotates once every 32 seconds. A rider uses a platform that is 20 m above the ground to board the ferris wheel. Write a sine function that gives the rider's height h at time t.



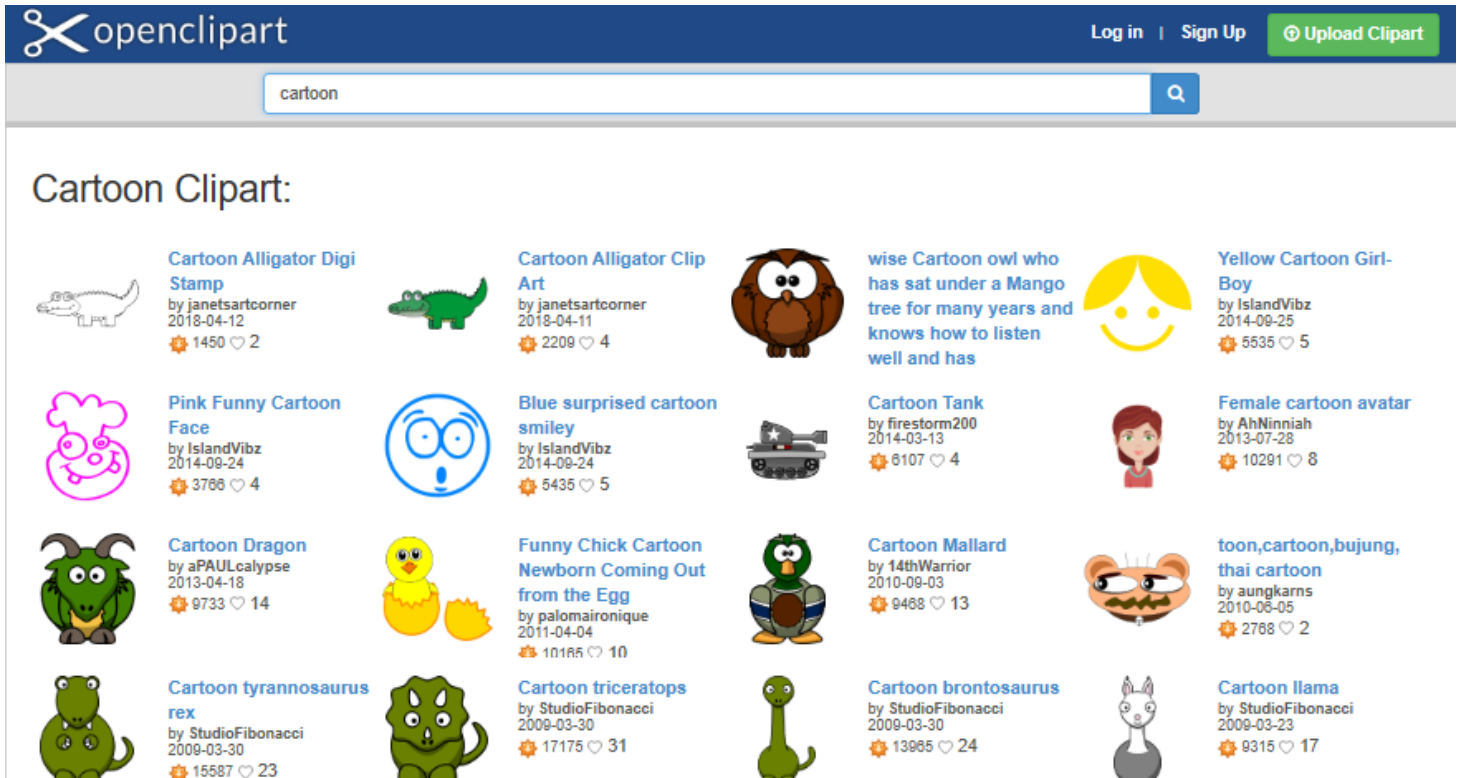
Inkscape's Associated

Open Source Clip Art Library

[currently 175,000 graphics/ updated daily]

Open Clipart is an online media collection of thousands of vectorial graphics, entirely in the public domain.

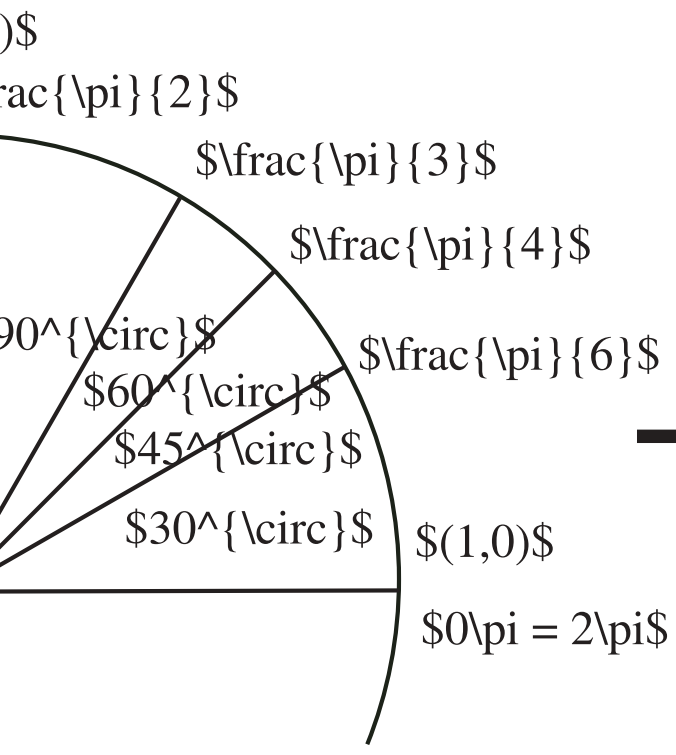
https://openclipart.org

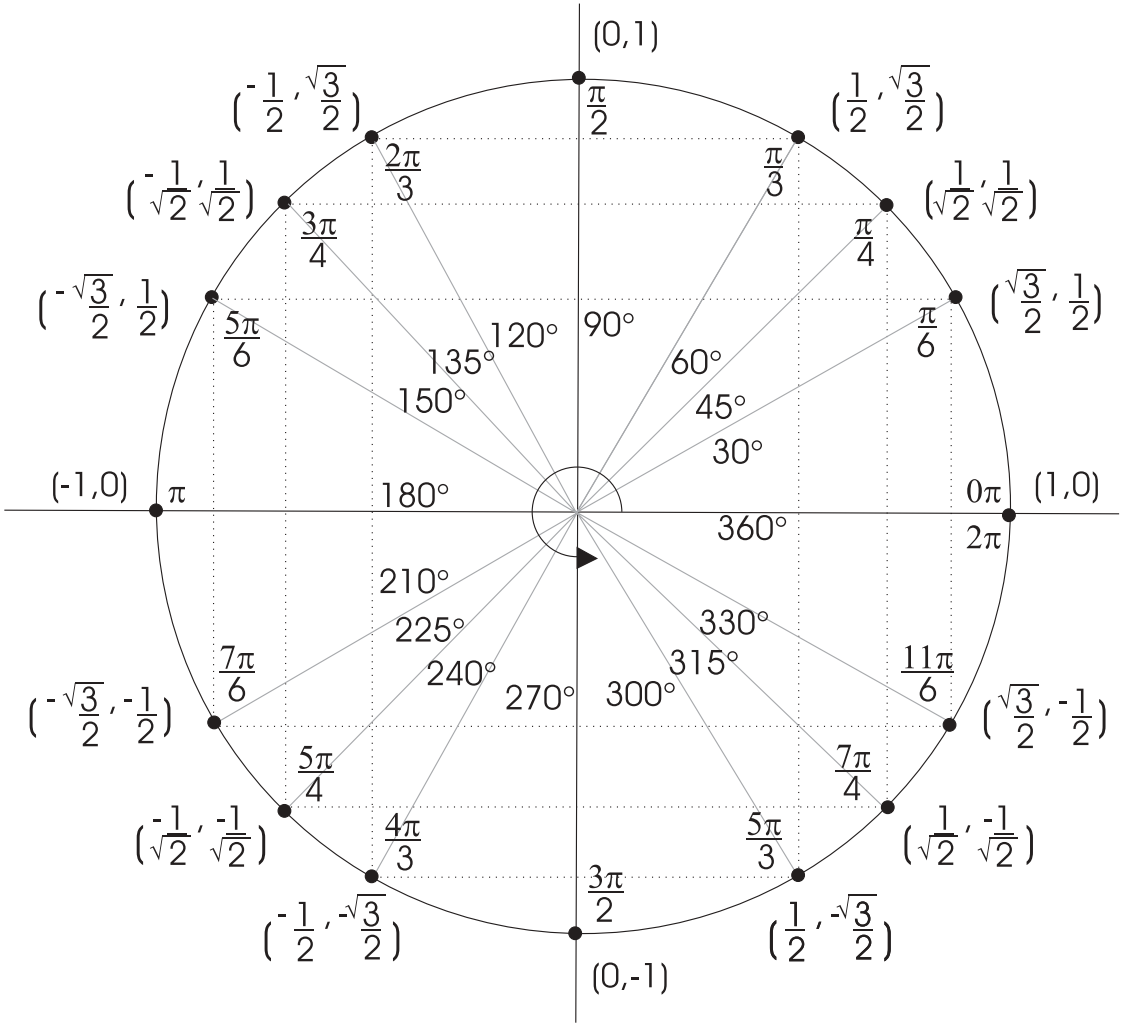


Creating Math Resources:
Inkscape + Clip Art Library

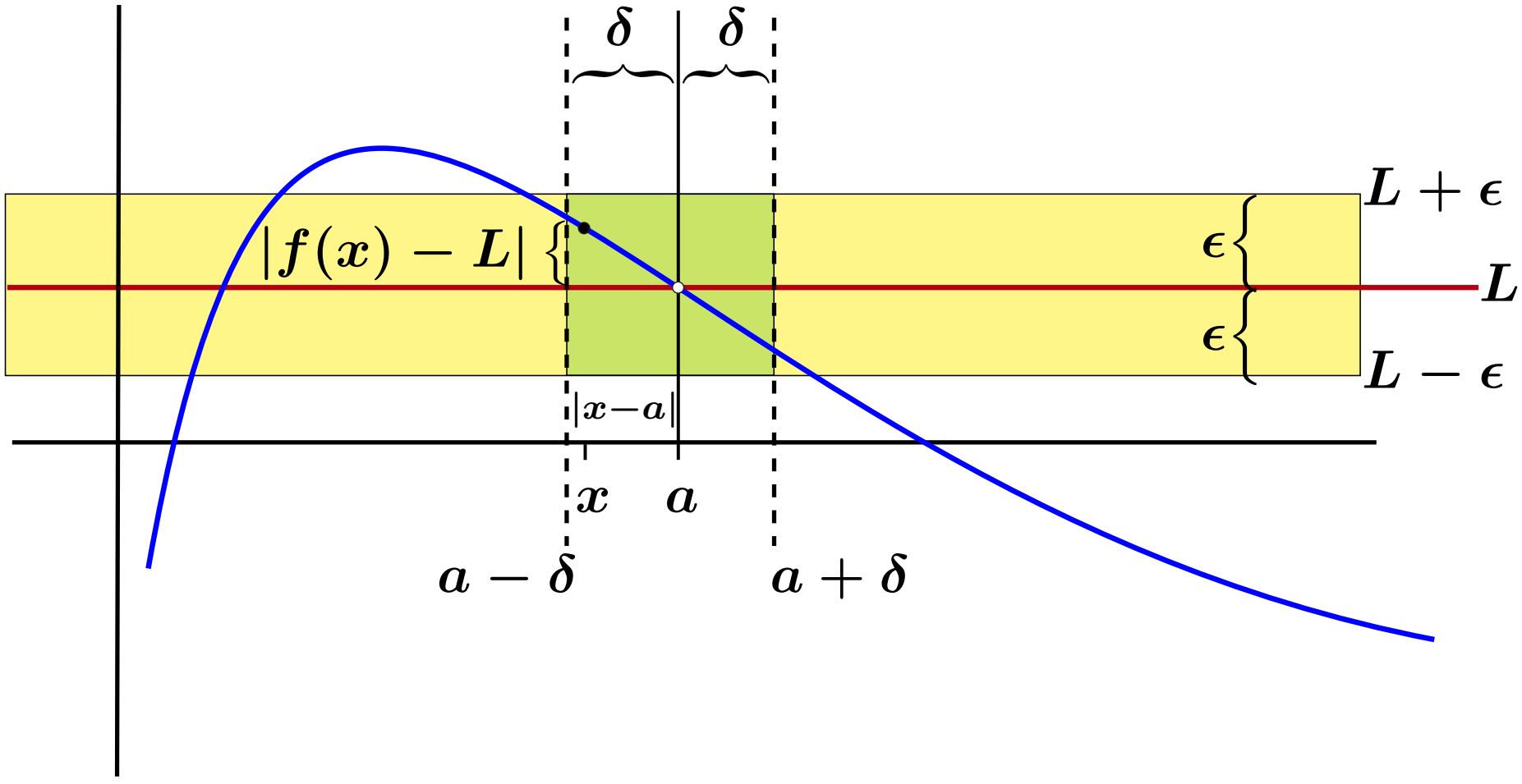
*Accessed from https://openclipart.org
Search: cartoon elk

Creating Math Resources from Open Source Software: Inkscape + LaTeX





Creating Math Resources from Open Source Software: Inkscape + LaTeX



Creating Math Resources from Open Source Software: Course Notes

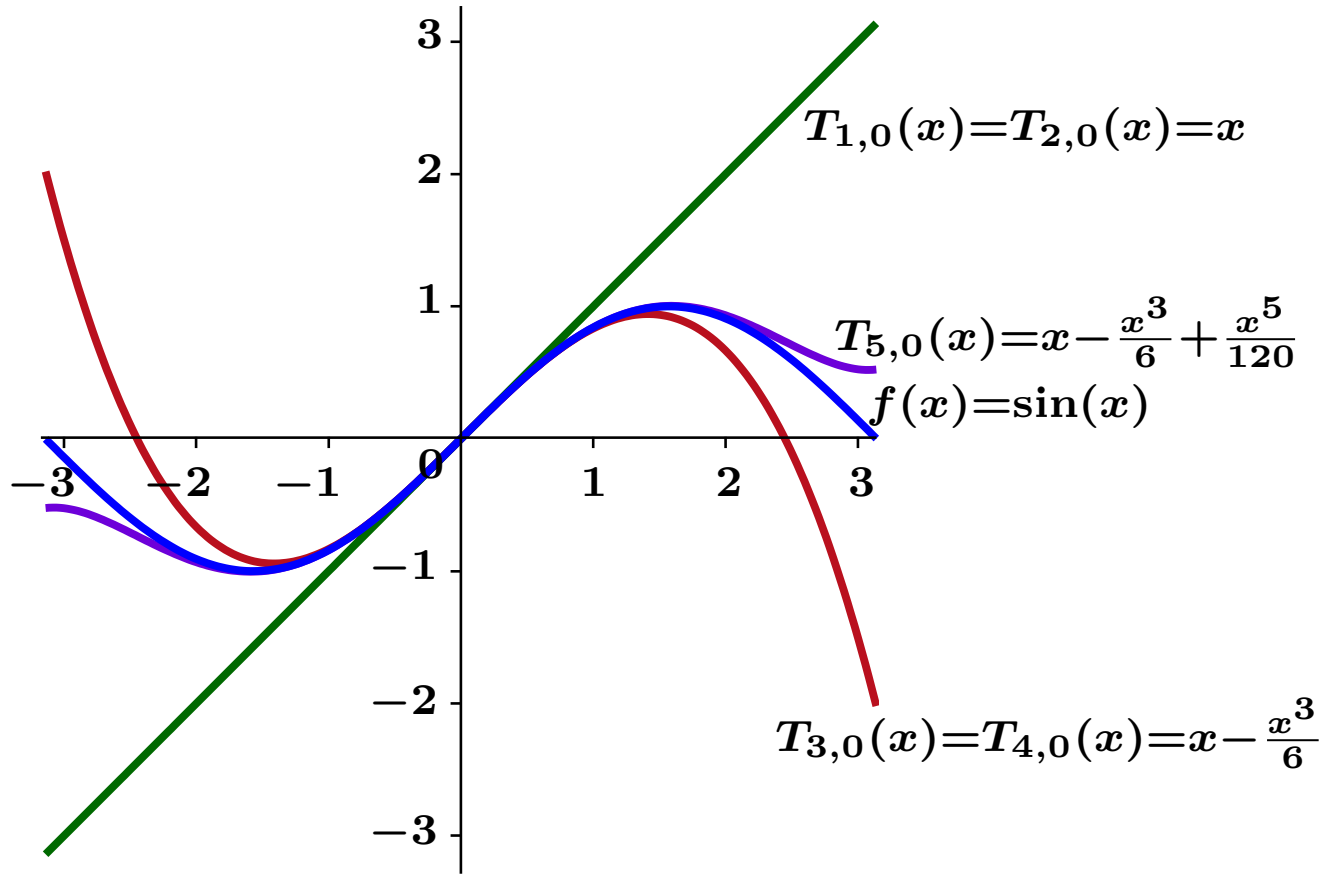
The University of Waterloo has moved toward replacing publisher's textbooks in first year math core classes by free* downloadable pdf course notes.

Math 137 Calculus 1 for Honours Math
Math 138 Calculus 2 for Honours Math
Math 135 Algebra for Honours Math
Math 136 Linear Algebra for Honours Math

* free = free downloadable PDF copy or
for cost of printing at the UW Bookstore

Classroom Demos and Lectures:

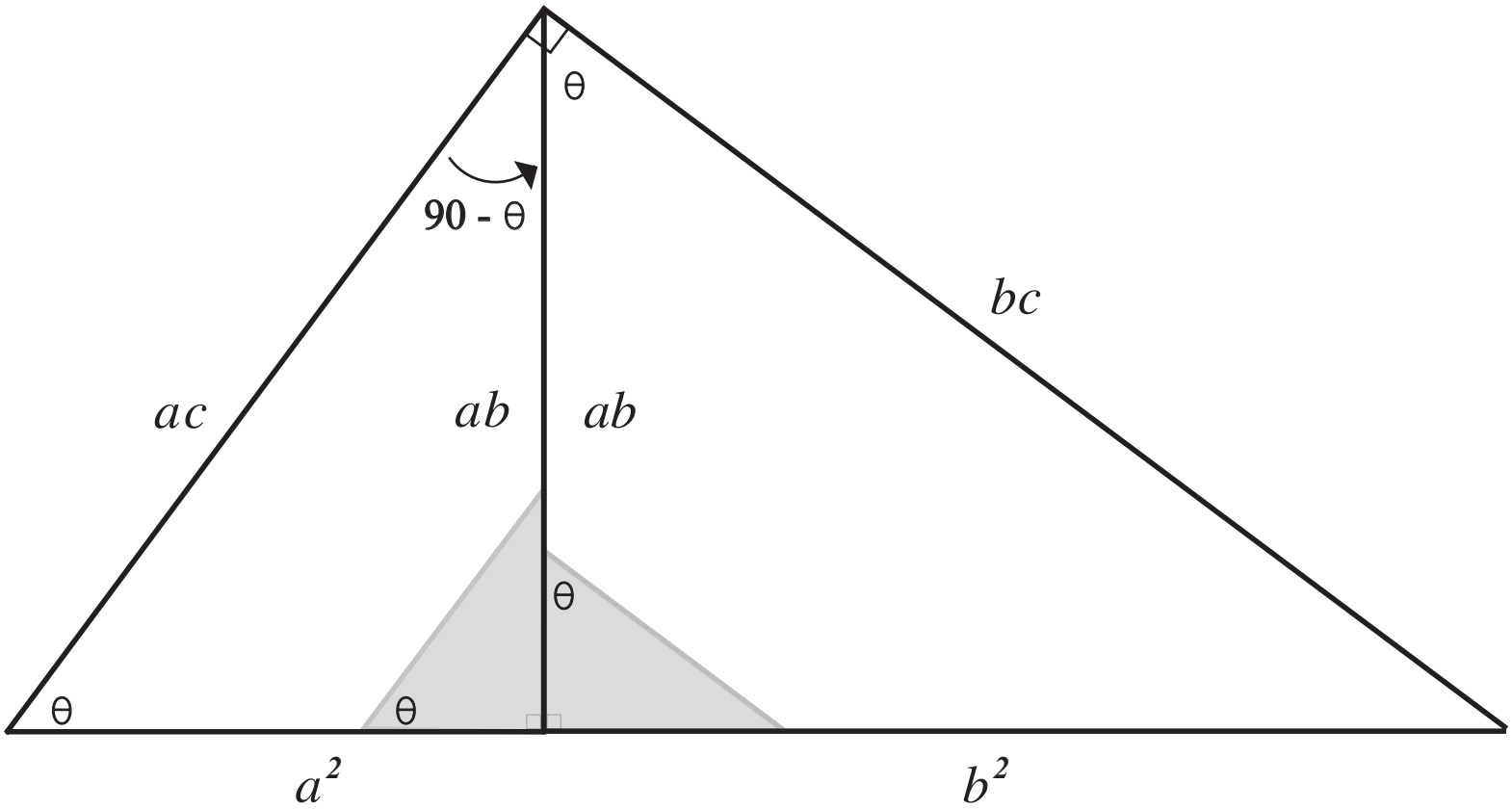
Taylor Polynomials for $\sin(x)$



The display of the graph of $\sin(x)$ with its Taylor Polynomials up to degree 5 (excluding $T_{0,0}(x)$ since its graph is the x-axis). For $k \geq 0$,

$$T_{2k+1,0}(x) = T_{2k+2,0}(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} + \cdots + (-1)^{k-1}\frac{x^{2k+1}}{(2k+1)!}$$

Outreach Resources: Visual Proof of the Pythagorean Theorem



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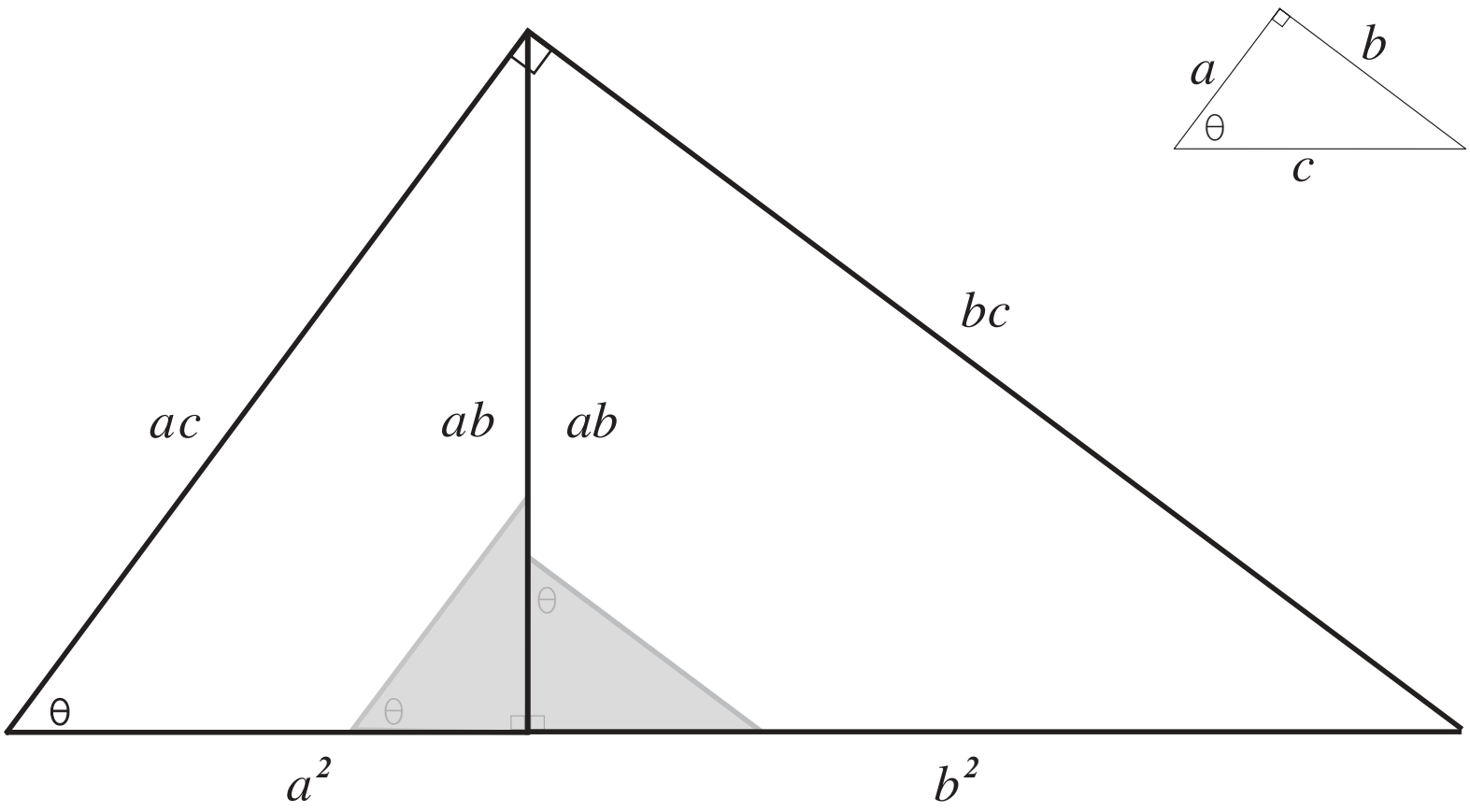

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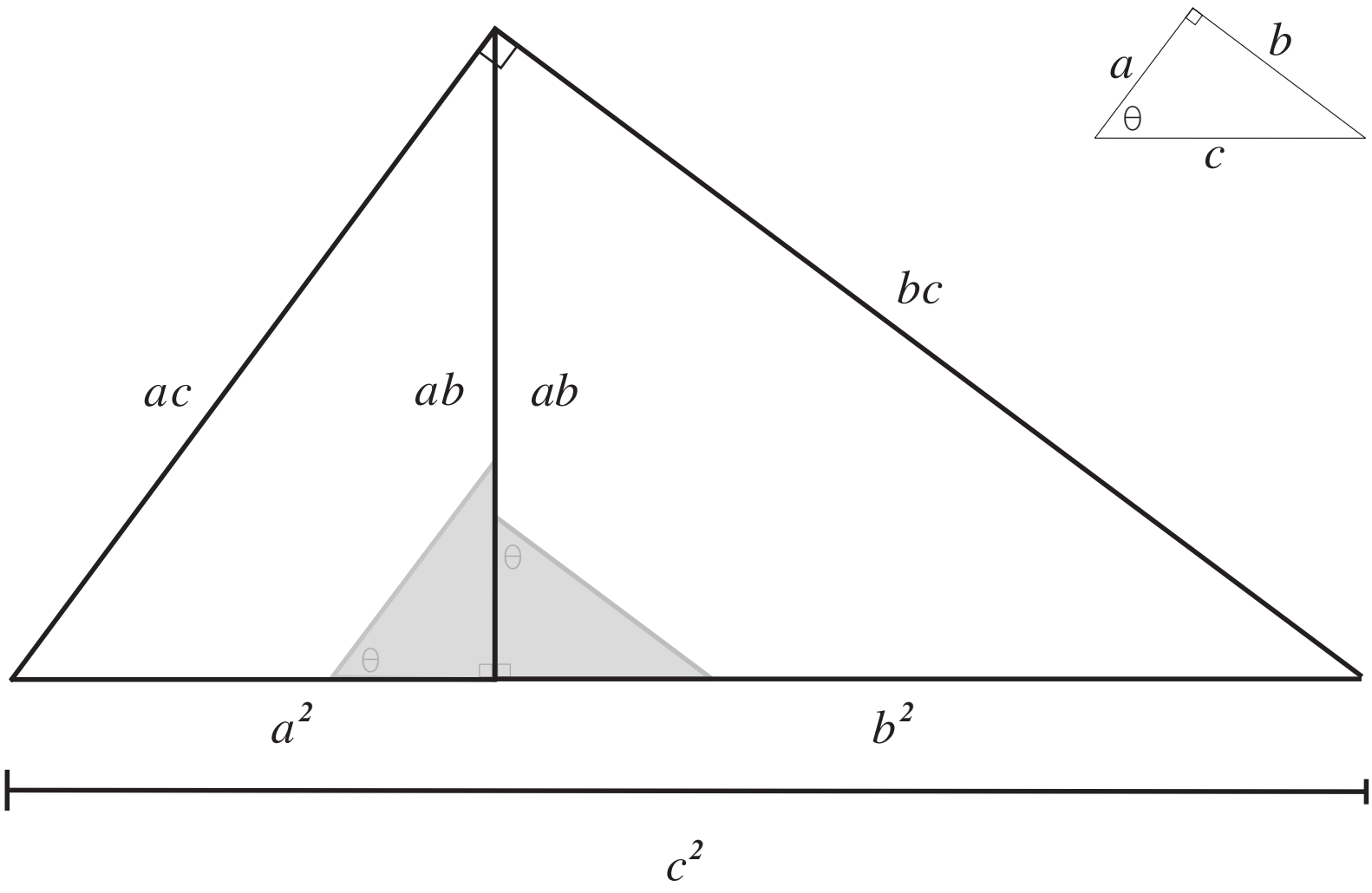

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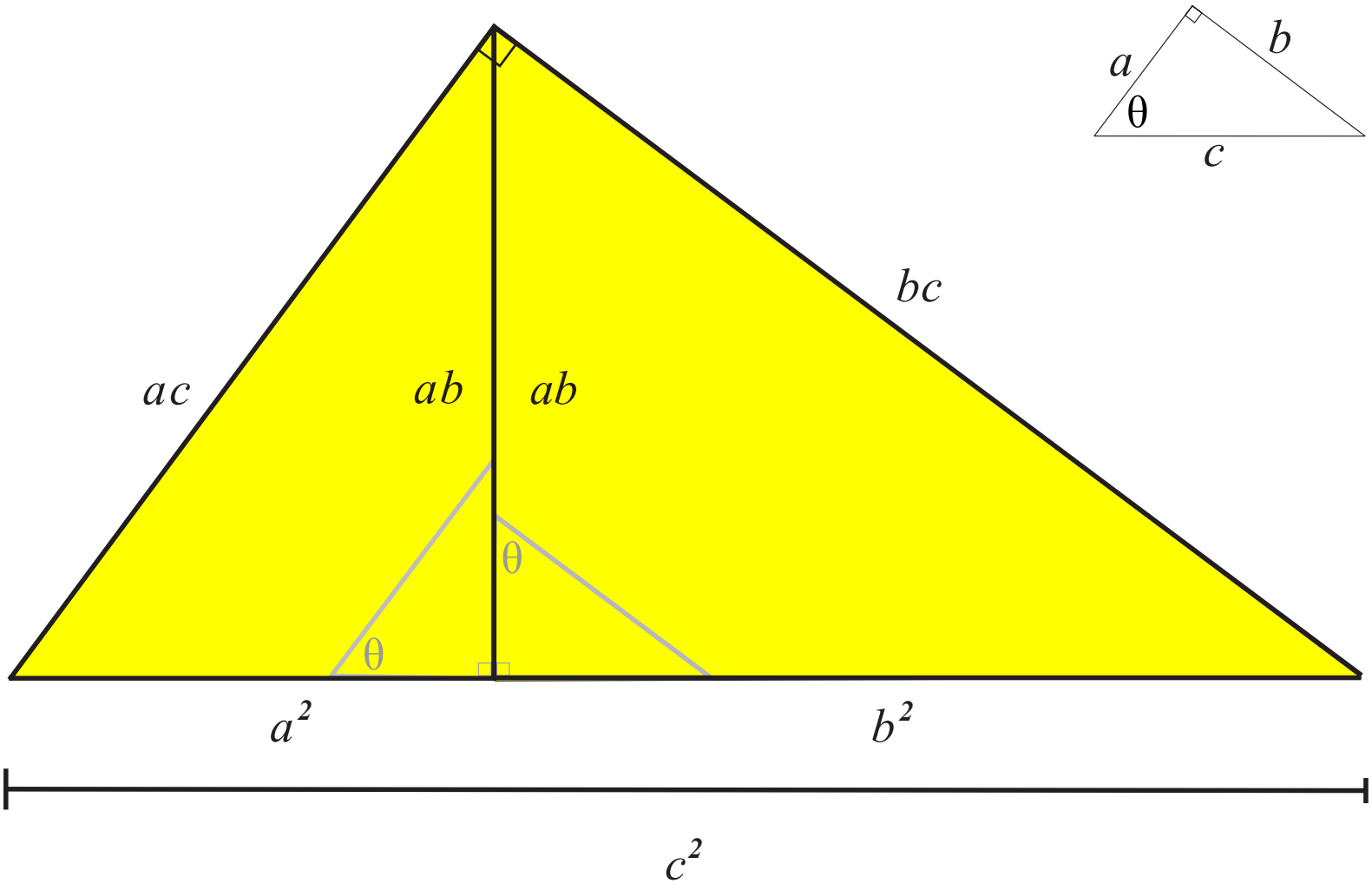

Free No-Login Access

- Math Problem of the Week
  -math problems with solutions and teacher notes
- Invitations to Mathematics
  -free booklets with activites, worksheets, solutions and teacher notes
- LaTeX Tutorial ($\sim$ 8 hours)
  -document preparation including math typesetting
- Inkscape Tutorial ($\sim$ 6 hours)
  -learn to draw pictures for use in other documents
- Clip Art Library ($\sim$ 175,000; new art added daily)
  -free public domain downloadable clip art
- Calculus 1 and 2 Course Notes and Lectures
  -for first- and second-term undergraduate Calculus

Access At:

http://www.math.uwaterloo.ca/$\sim$baforres/BIRS2023.html