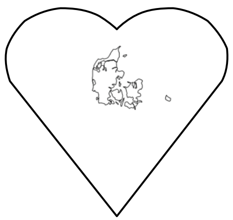
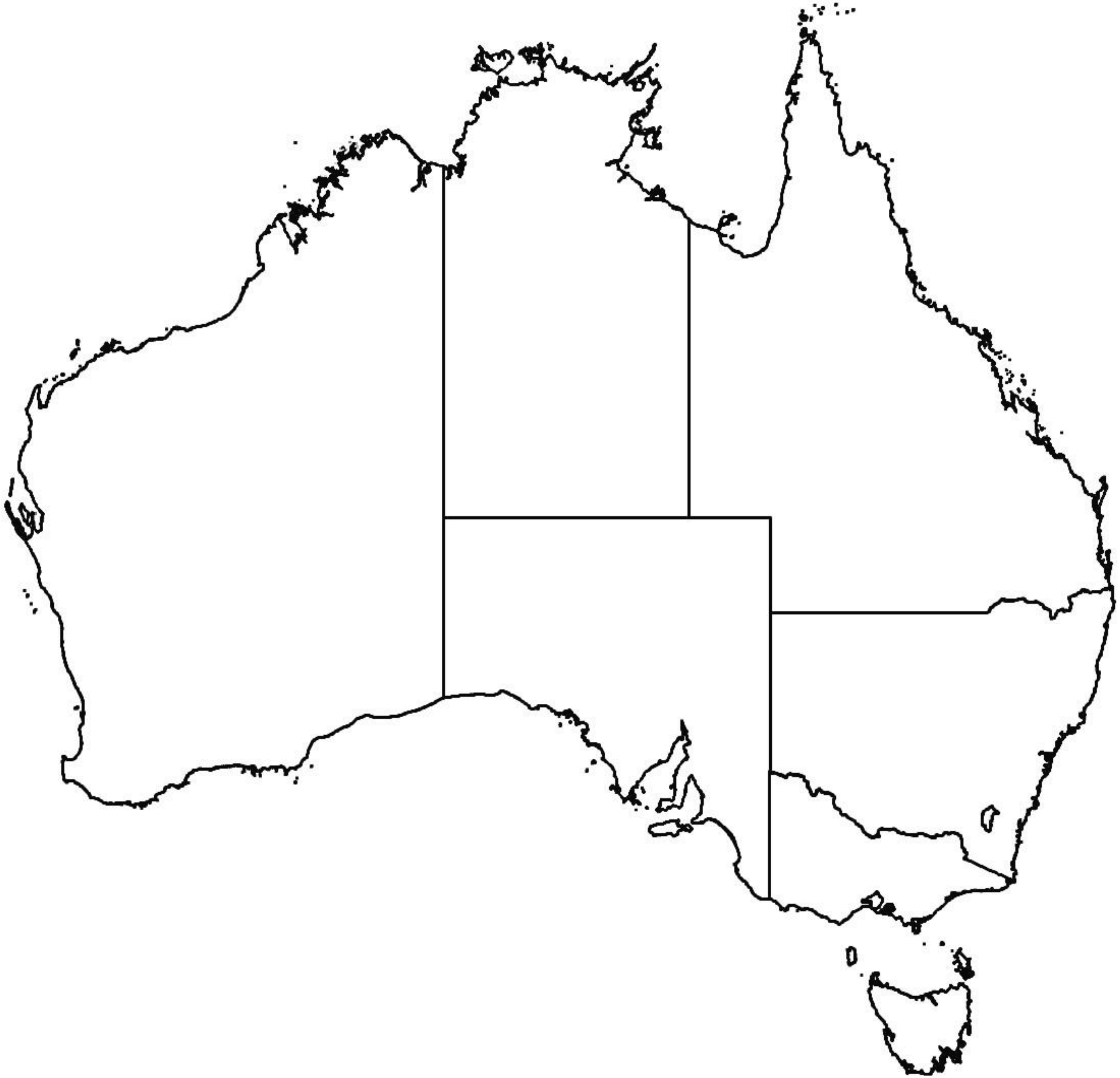
CAS in other places

Dr. Roger Brown

How many Denmark's in Oz?





How many Denmark’s in Victoria?

Victoria, Australia

- Australia
  - Area: 7 741 220 km²
  - Population: 21 260 000
- Victoria
  - Area: 237 629 km²
  - Population: 5 205 200
- Denmark
  - Area: 43 094 km²
  - Population: 5 475 791
  - Greenland
    - Area: 2 166 086 km²
    - Population: 60 000

Looking at our neighbours
(courtesy P Drijvers)

Country	Technology allowed?	Technological restrictions?	Technology awarded?	Remarks
Germany (NRW)	Two versions: GraphCalc or CASCalc	no communication, no internet	Yes	Reasoning required, not just IT answers
Luxembourg	Subject depend. CASCalc or SciCalc	empty memory, no communication, no internet	Yes	Also by-hand calculations required
France	CASCalc	no communication, no internet no printing		Notation on exam paper allows ICT or not
UK	GraphCalc	no CAS, no communication, no internet	Not really, GraphCalc 'neutral'	Different examination developers
Netherlands	GraphCalc	no CAS, no communication, no internet	Yes, mandat. But by-hand may be asked	Brands and types specified
Denmark	All or nothing (two parts)	no communication, no internet	Yes, mandatory in part 2 of	Two-part examination session
Norway	All or nothing (two parts)	no communication, no internet	Yes	Two-part examination session

Further a field

Country	Technology Allowed	Restrict	Tech Award?	Remarks
Victoria (Australia)	Two versions 1.GC 2. CAS	No comm, no keyboard	One yes One No	MCQ, short and extended response questions
USA (AP Calc)	GC or CAS	No comm, no keyboard	One yes One No	As above
IBO (worldwide)	GC	No comm, no CAS	One yes One No	Short and extended response questions

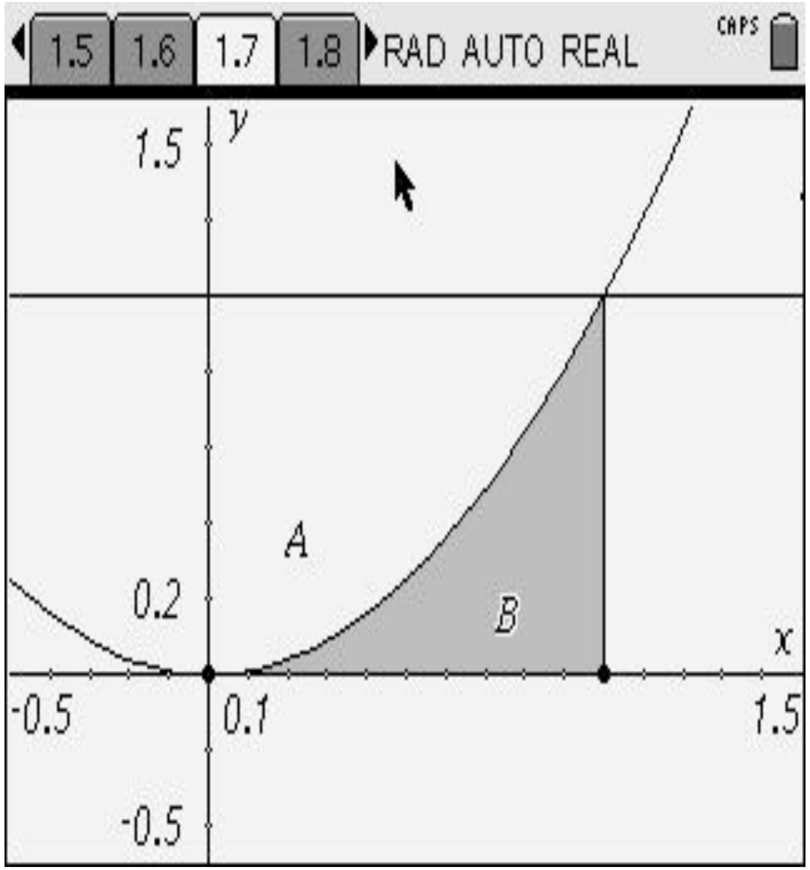
Examples across the systems

- International Baccalaureate Portfolio:
  - Ratios
- Victoria:
  - Rex's Soap
  - Yarra River and Cycling

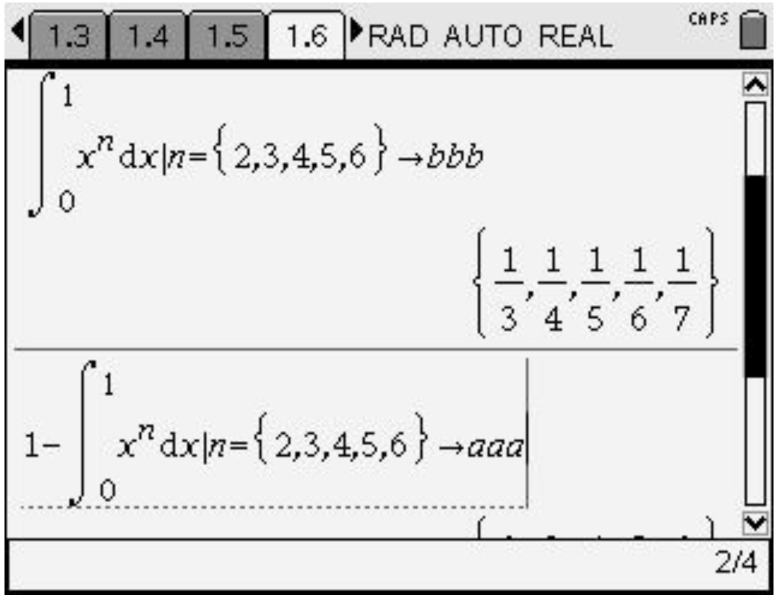
  USA:
  - Consistent equations
  - System of equations
  - One problem leads to another
- UK
  - Cones

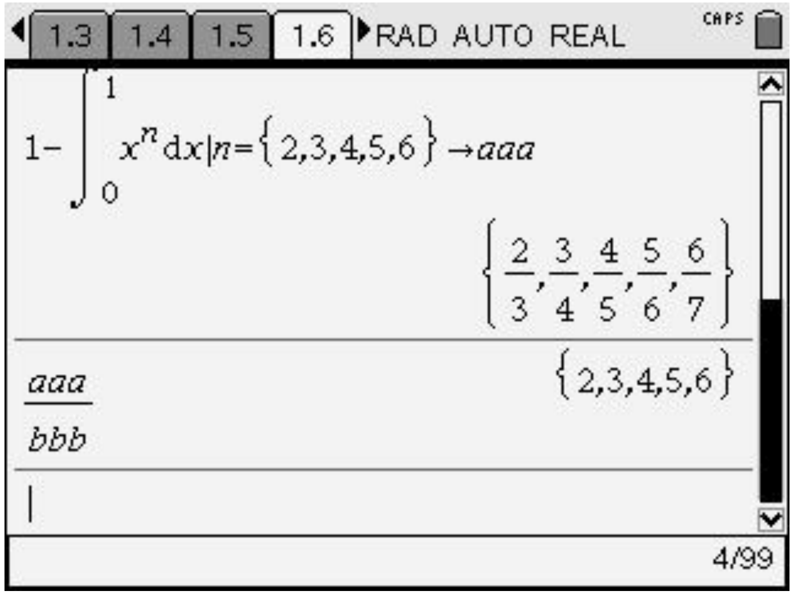
International Baccalaureate

- Investigate the ratio of the areas formed when $y = x^n$ is graphed between 2 arbitrary points $x = a$ and $x = b$ such that $a < b$.
- Given $y = x^2$ consider the region formed by this function and $x = 0$ and $x = 1$ and the x *axis.* Label this B and label the region from $y = 0$ and $y = 1$ and the y axis as A

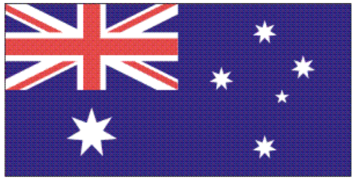


International Baccalaureate





- The ratio of the areas in this case increases as the exponent increases.
- What is the effect when the limits are *0* and *2?*
- … when the limits are *1* and *2?*

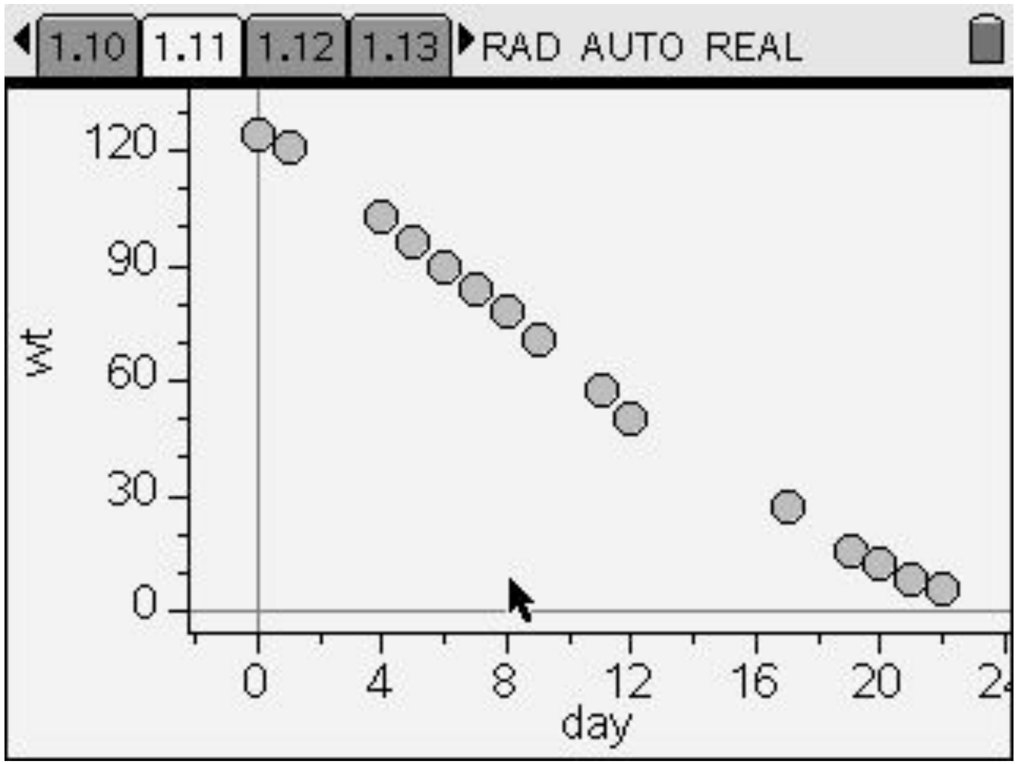


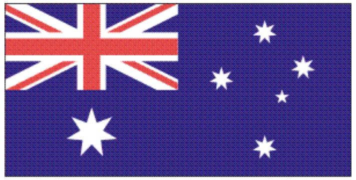
Rex’s Soap

- Rex had a hypothesis that the daily weight of his soap in the shower wasn't a linear function, the reason being that the tiny little bar of soap at the end of its life seemed to hang around for just about ever. I wanted to throw it out, but I felt I shouldn't do so until it became unusable. And that seemed to take weeks.
- Also he some digital kitchen scales and he hypothesised that the daily weight of a bar of soap might be dependent upon surface area, and hence would be a quadratic function.
- He kept records for three weeks (the life of the bar)

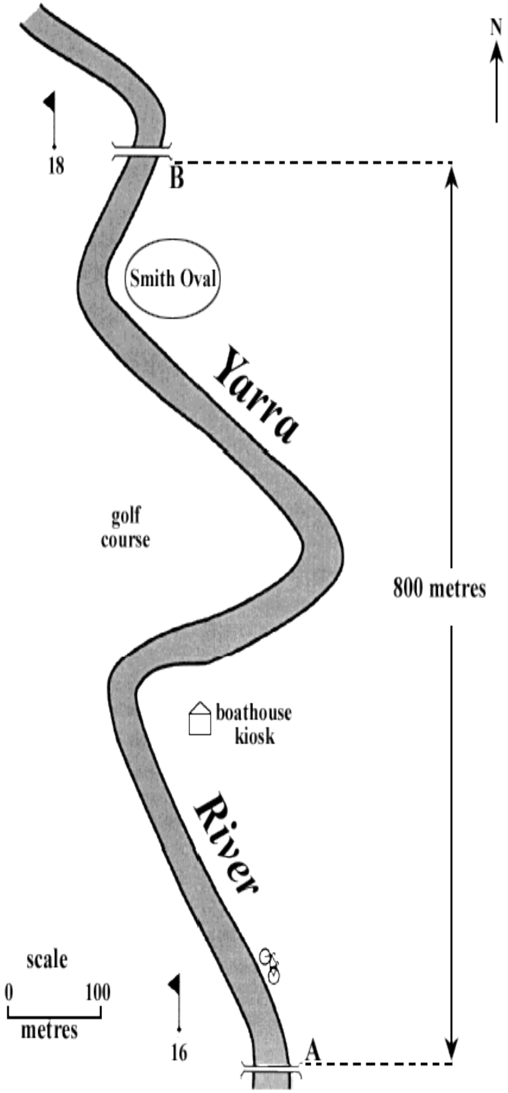
Day	Weight (gm)
0	124
1	121
4	103
5	96
6	90
7	84
8	78
9	71
11	58
12	50
17	27
19	16
20	12
21	8
22	6

Graphically



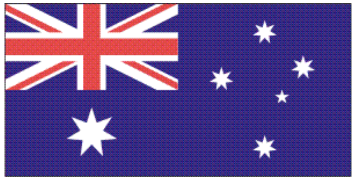


Victoria



Cycling the Yarra

- A(1, 4), B(2, 2) and C(4, *k*) where *k* is an arbitrary real constant.
- With *k* = 0, determine the function and sketch it on a suitable domain now vary *k* and describe the effect of *k* on the behaviour of the quadratic.



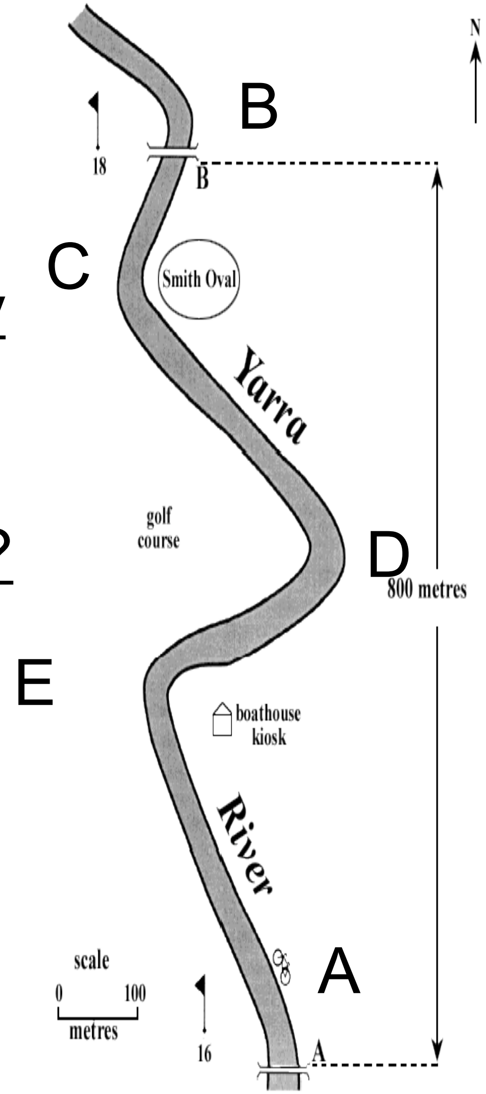
Quadratics

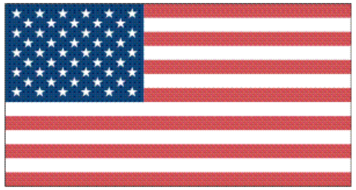
<u>Calculation</u>

- Explore how a model can be developed between A and B using a series of <u>smoothly joined</u> quadratic functions.
- Assume A(8, 1.5), B(0, 0), C(1, -1), D(3, 2) and E(5.6, 0)

<u>Reasoning</u>

- How do you define <u>smoothly joined?</u>
- How do you define <u>good fit?</u>



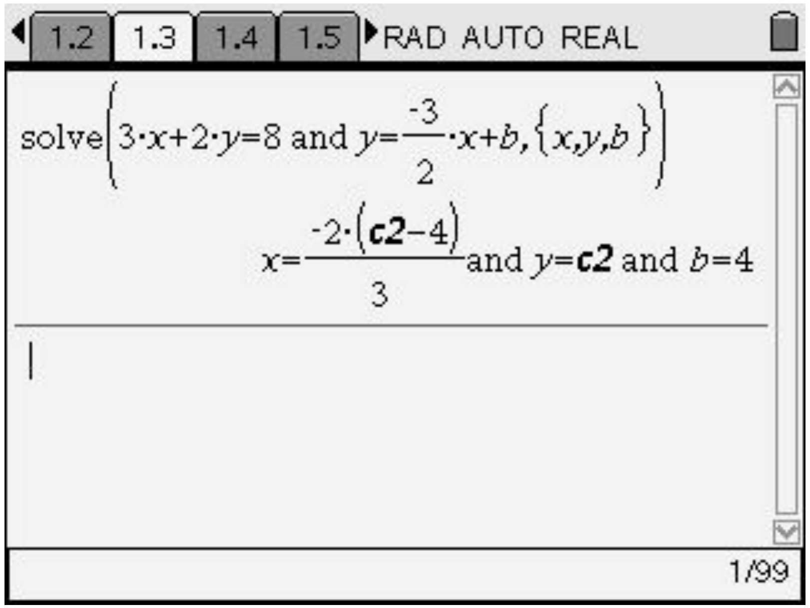


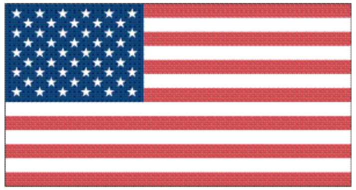
Consistent equations

- Find a value for *b* that makes the system of equations consistent.

  $3x + 2y = 8$

  $y = -3/2\ x + b$





System of equations

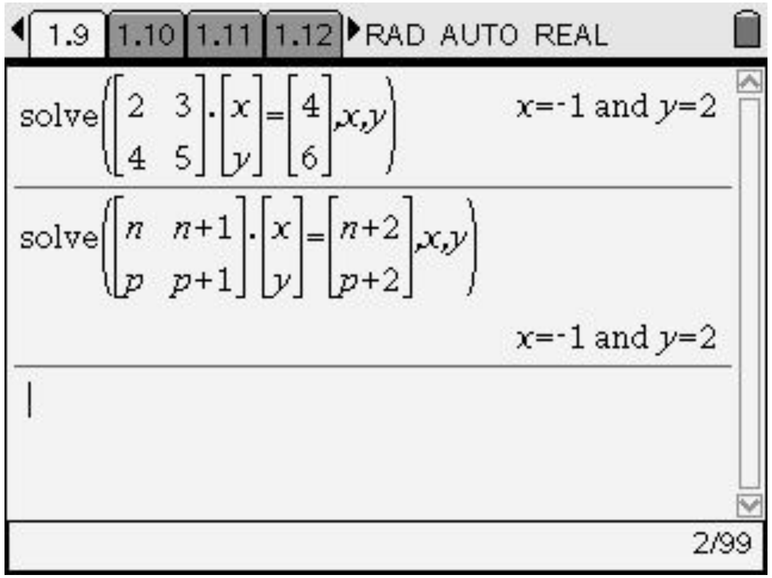
Solve the system of equations for *x* and *y*

$2x + 3y = 4$

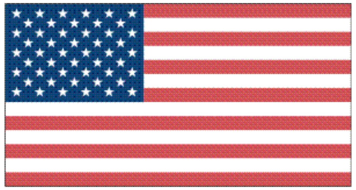
$8x + 9y = 10$

$6x + 7y = 8$

$11x + 12y = 13$

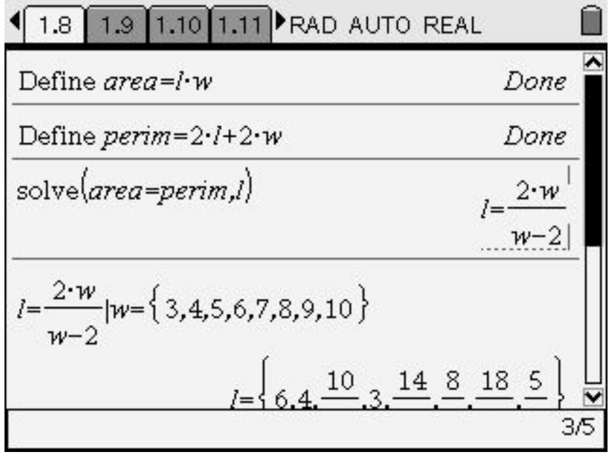


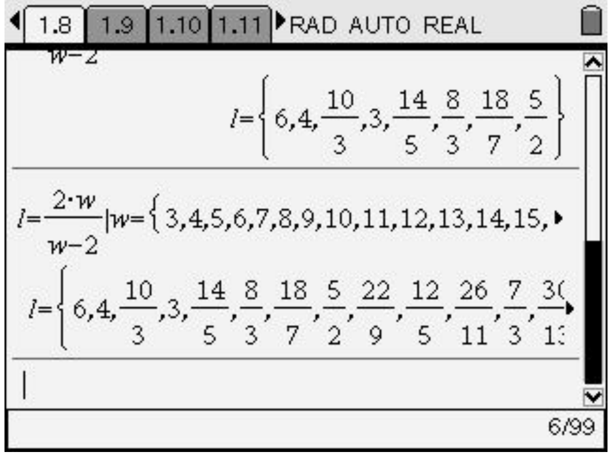
Describe and explain.



One problem leads to another

- Find all rectangles with integral dimensions whose area (A) and Perimeter (P) are numerically equal.





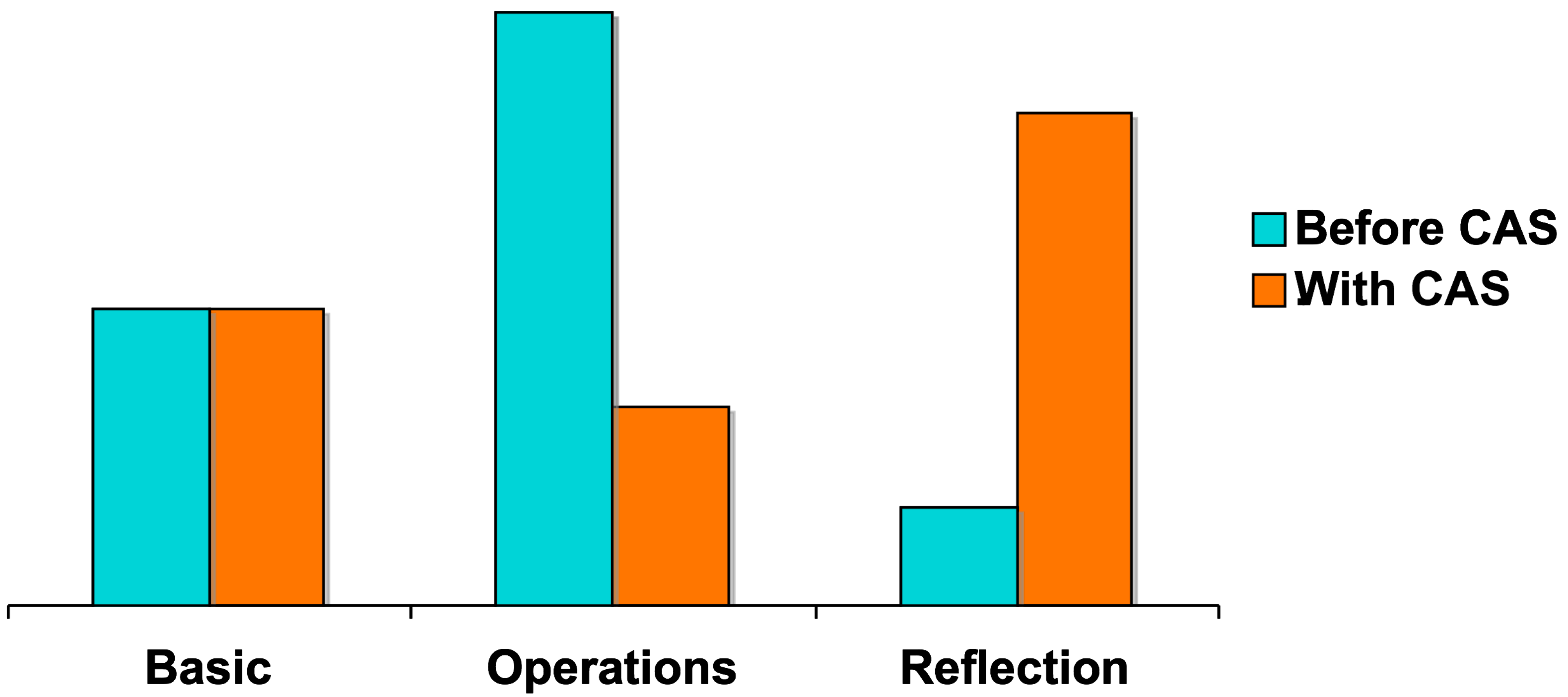
- Find all cubes with integral dimensions whose Volume is the same as the Surface Area

Cones

- Investigate the size of the sector that must be cut from a circular piece of paper that will give a cone of maximum volume.

- How should the circle be divided so that the sum of the volumes of the two cones is as large as possible?

CAS affords different emphases



Key Pedagogic Issues

- Expression of generality
- Flexibility (Andresen, 2007)
  - Multiple Solutions, multiple choices
  - Student or teacher choice
  - Acceptable solutions
- Intuition and Interpretation
- Algebraic insight

The Danish flag

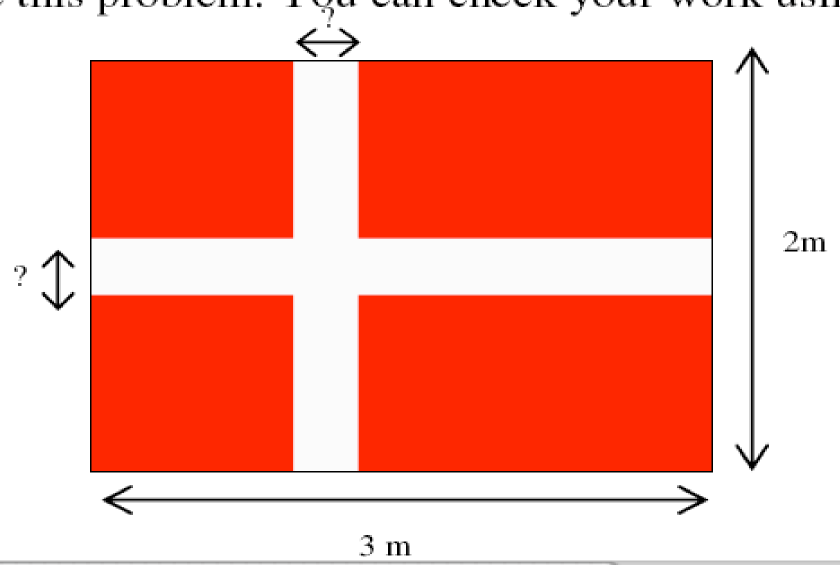
Question 1 – The princess' birthday

The Danish flag has a white cross over a red background. Both stripes of the white cross always have the same width.

For the official celebration of Princess Alexandra's birthday on June 30th, the royal family ordered a special flag that should obey the following requirements:

(1) The flag should measure 3m by 2m.
(2) The area of the white cross is equal to the area of the red surface.

How wide should the stripes be to meet the above requirements? This page helps you solve this problem. You can check your work using the GSP file.



Thank you

rogergb@mac.com

www.aussiemath.net