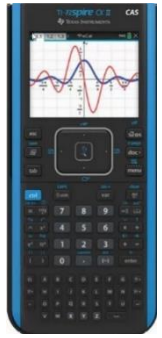
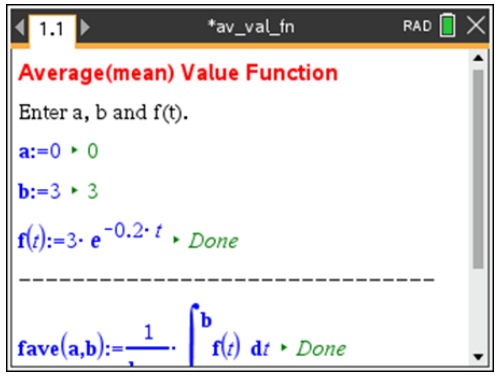
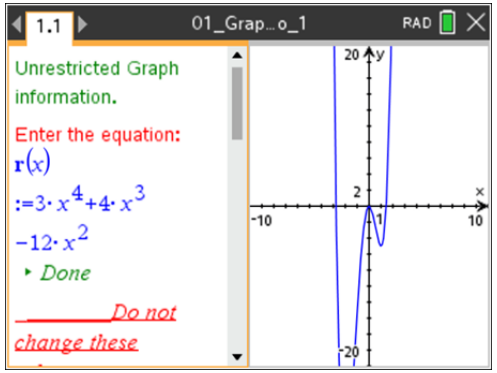
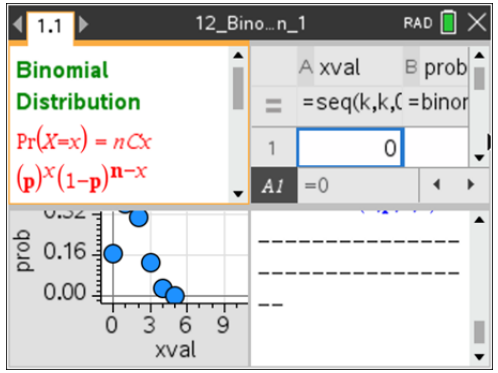
The Notes Page, Widgets and More!









MAV 24 Conference
5-6 December
La Trobe University, Bundoora

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In this session, participants will be shown how to use the functionality of the TI-Nspire™ CX CAS technology and the versatility of the Notes Application to create an amazing easy to use resource known as a Widget. Teachers and students can use Widgets to explore and help understand mathematical concepts and principles. Students can easily pre-prepare their own Widgets to efficiently solve typical exam questions. There will be a discussion about Widget construction and content, and participants will learn how to build and save their own Widgets. Participants will be provided with a number of Widgets to add to their 'MyWidgets' folder on the TI-nspire™ CX or CX II CAS Calculator. This session will open up possibilities in all areas of the mathematics curriculum including VCE General Mathematics, Mathematical Methods and Specialist Mathematics.

How experienced are you with the TI-nspire CX CAS Calculator?

- Beginner
- Regular User
- Expert

What maths subject do you teach?

- General Maths
- Mathematical Methods
- Specialist Maths
- Year 9 or 10 Maths

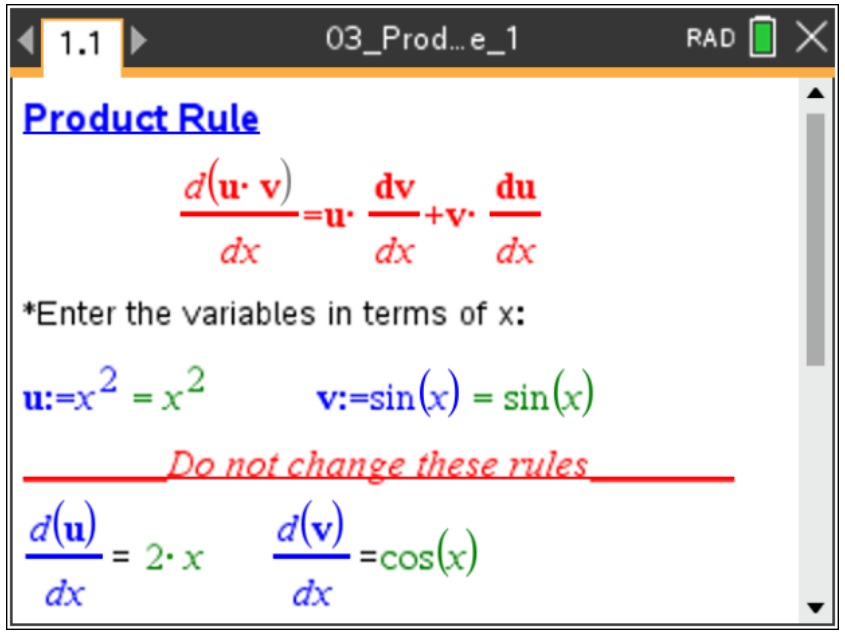
Solve the following Question

- If $P(x) = 3x^3 - ax^2 + bx - 8$, find the values of a and b if the equations have zeros 1 and -2.

Why use a Notes Page?

- A Notes Page may contain text for instructions.

- A Notes Page may contain dynamic equations that are self updating when a variable is modified.



Pythagoras' Theorem 1

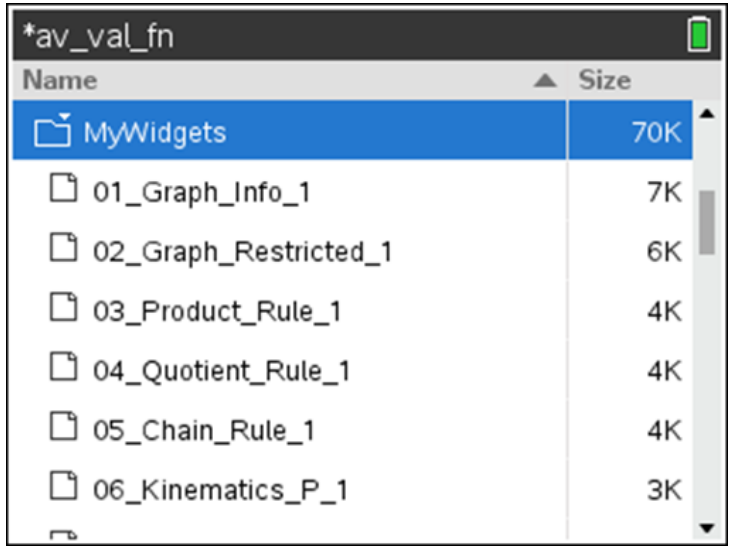
- Using a Notes Page, Find the Hypotenuse of a right angled triangle if a=7 and b=4.

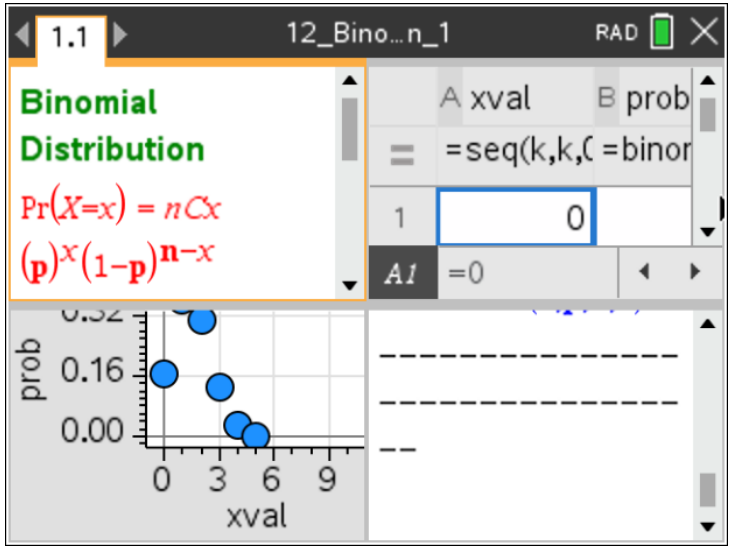
Pythagoras' Theorem 2

- Improve the formula to a general case so that any side of the triangle can be found.

What is a Widget?

- A widget is a tns file that is stored in the “MyWidgets” folder of the CAS Calculator.
- Only the first page of a widget can be imported into an open Document.
- Up to four applications can be stored on the first page of a widget.



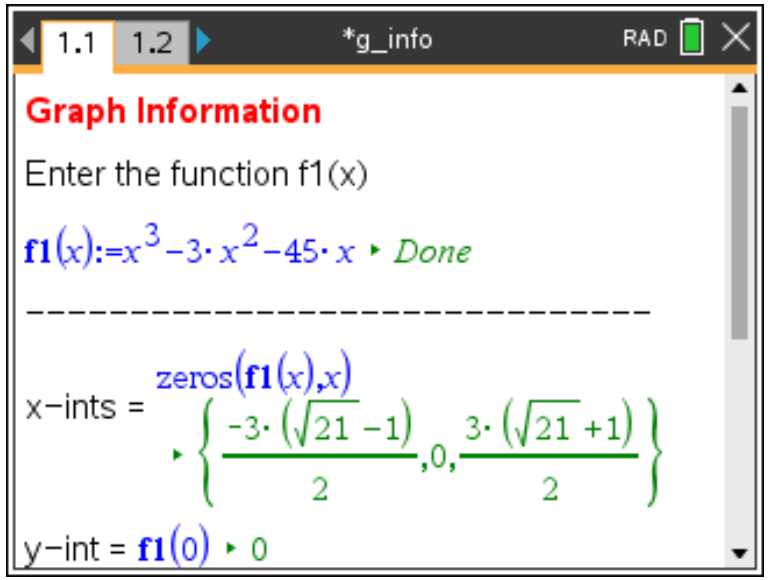


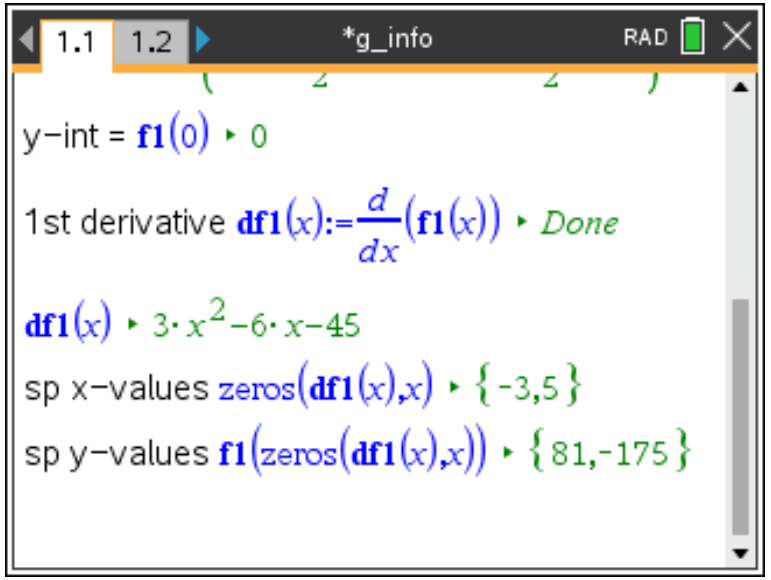
Steps to make and use a Widget

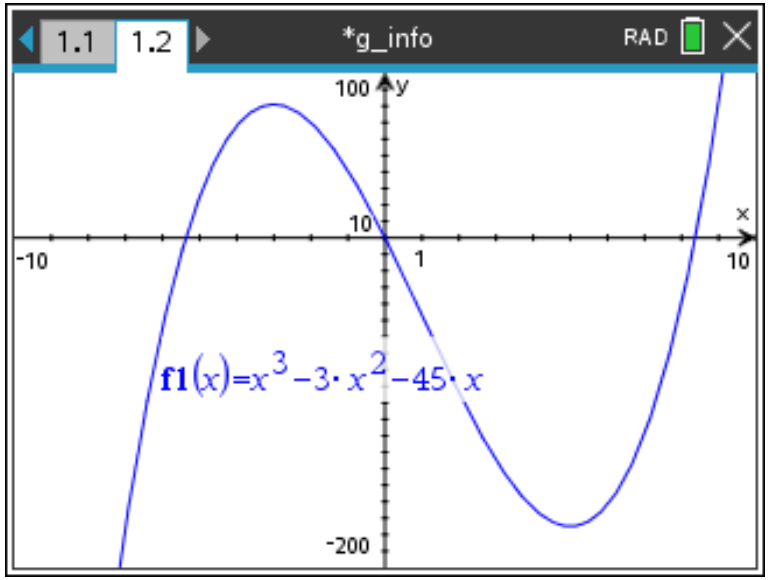
- Open a New Document and insert a Page, such as a Notes Page
- Use Ctrl + M to add a Math Box on a Notes Page and add formulae
- Add other Pages to the Document, such as a Graphs Page
- Maximum of 4 Pages in the Document
- Group all the Pages onto one screen, doc > 5:Page Layout > 7:Group (Ctrl + 4)
- Save the document to the MyWidgets Folder
- Open a New Document, 8:Add Widget and select a Widget
- Ungroup the Pages if required, doc > 5:Page Layout > 8:Ungroup (Ctrl + 6)
- For a Notes Page with several select the whole Page, Ctrl + A and activate all the Math Boxes Menu > 1:Actions > 1:Evaluate
- Edit the Widget, updating appropriate variables

Graph Information Example – MM and SM

- Create a tns file for finding information about a function that needs to be graphed.







Note: Syntax can be hidden by changing the Math Box Attributes to make the Notes Page output clearer.

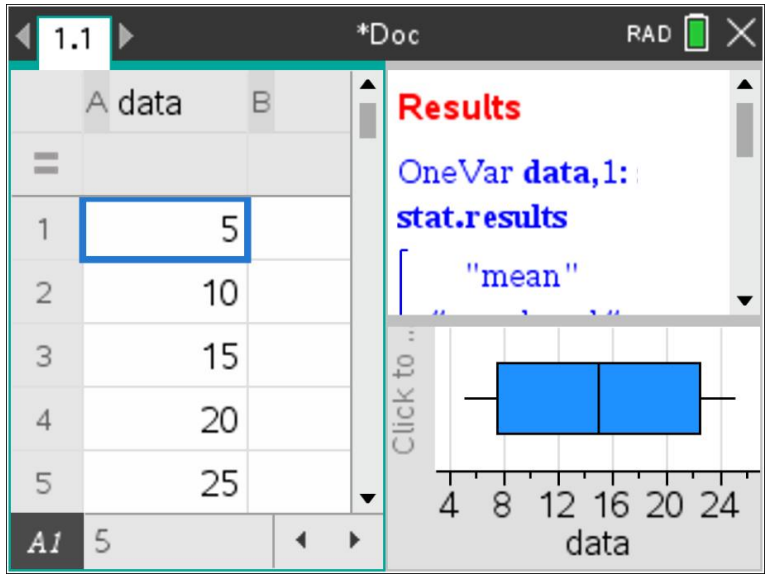
Pages 1.1 and 1.2 need to be Grouped, ctrl+4, before saving in the “MyWidgets” folder.

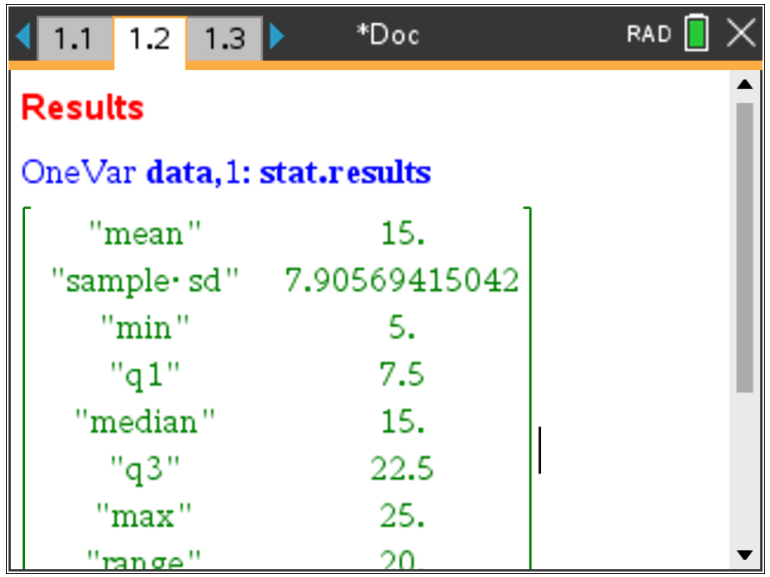
Notes Page - Commands to remember

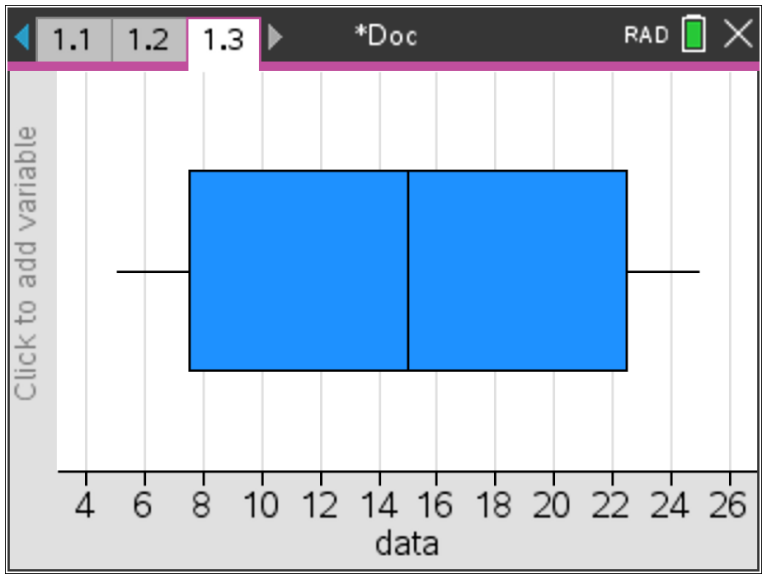
ctrl+M - insert a Math box
ctrl+A - select all
menu > 1 Actions >1 Evaluate - Activates Math box
ctrl+4/6 – Group/Ungroup
ctrl+7/1 - move to top/bottom of page
ctrl+9/3 - PgUp/PgDn

General Mathematics

- Create a tns file for univariate data.
- Include the list of data, univariate statistics and a boxplot.



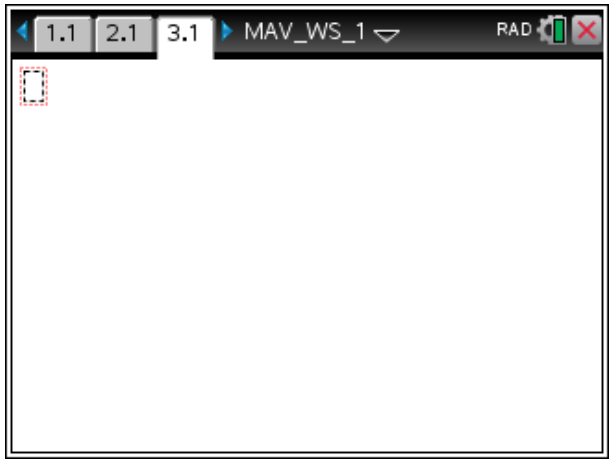


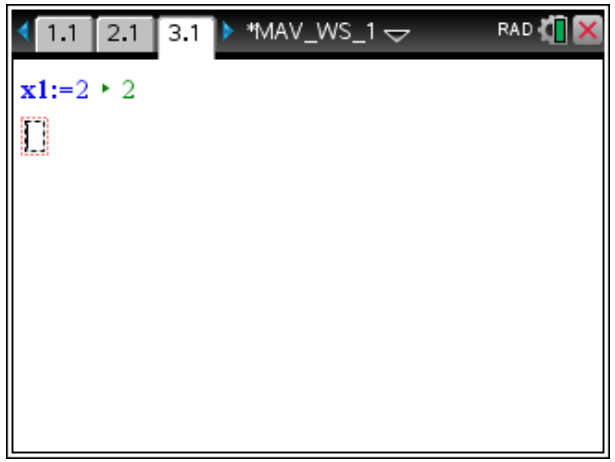


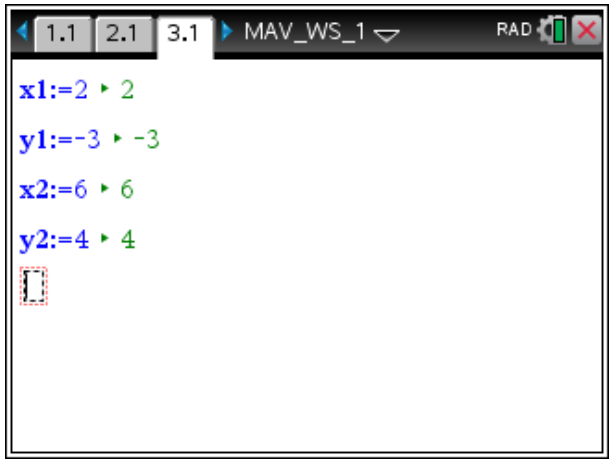
Creating a Notes Page and Widget – Follow instructions

- Create a Notes Page to find the distance between (x_1, y_1) and (x_2, y_2).
- Find the distance between the points $(2, -3)$ and $(6,4)$.

- Insert a new Problem (doc > 4:Insert > 1:Problem) and add a Notes Page (6:Add Notes). Insert a Math Box, menu > 3:Insert > 1:Math Box or select ctrl+M.
- Make sure the cursor is inside the Math Box and type $x1 := 2$, select enter and a new Math Box is automatically added. Notice the output as soon as enter is selected.
- Repeat for $y1$,x2 and $y2$, assigning the values $-3, 6$ and 4.

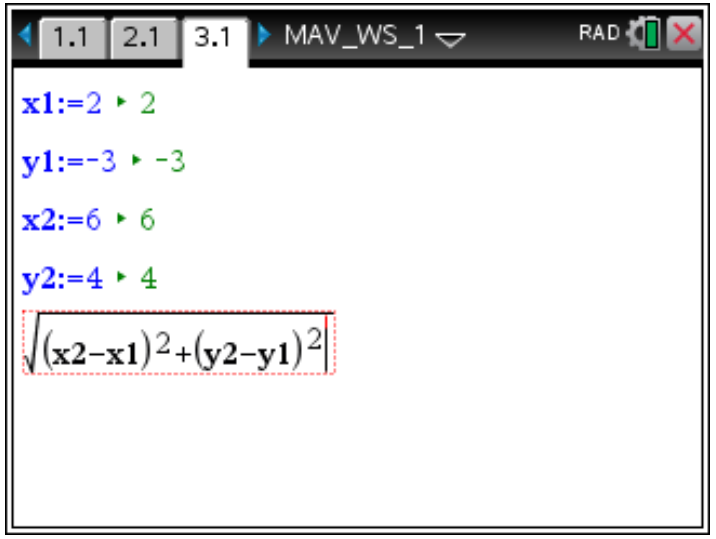


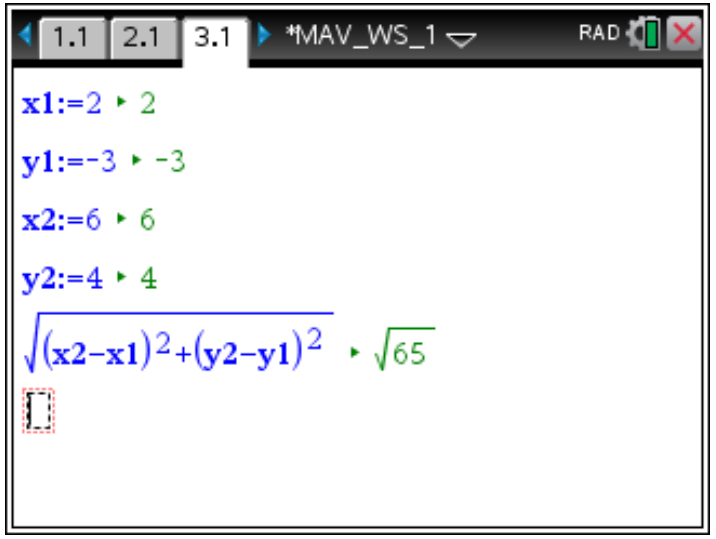




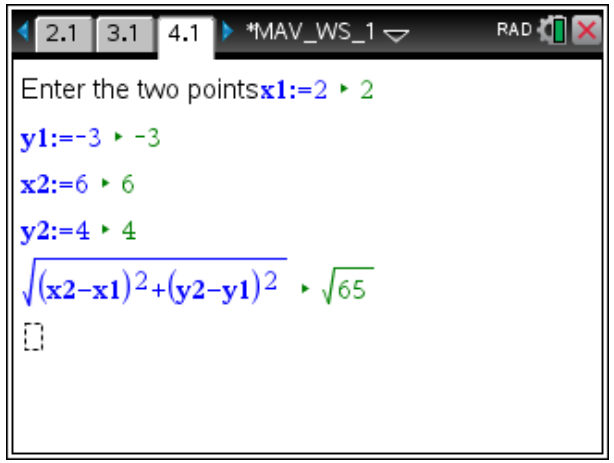
Assign symbol ":=" – ctrl+

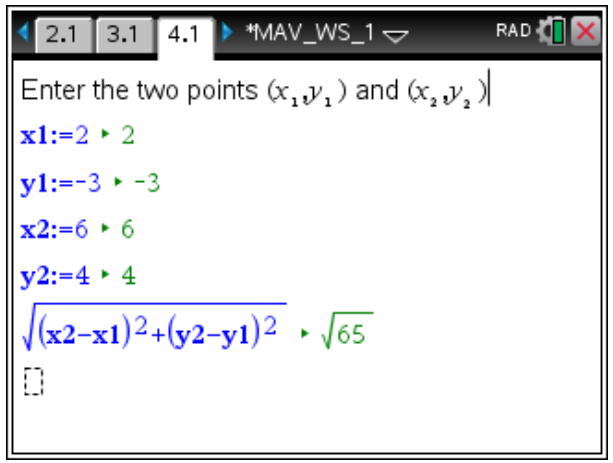
- Enter the formula for finding the distance between (x_1, y_1) and (x_2, y_2),
- Notice that the formula is not activated until enter is selected.

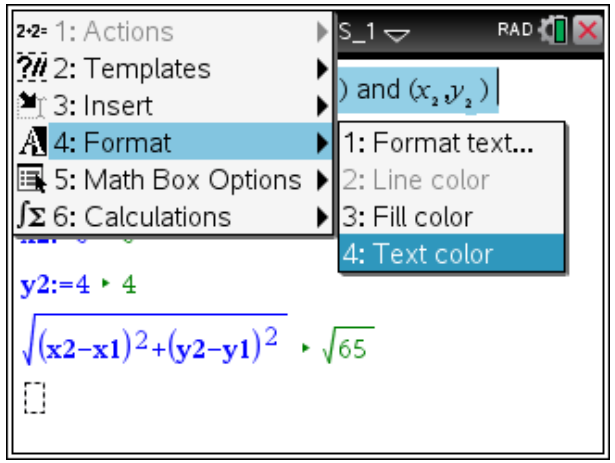




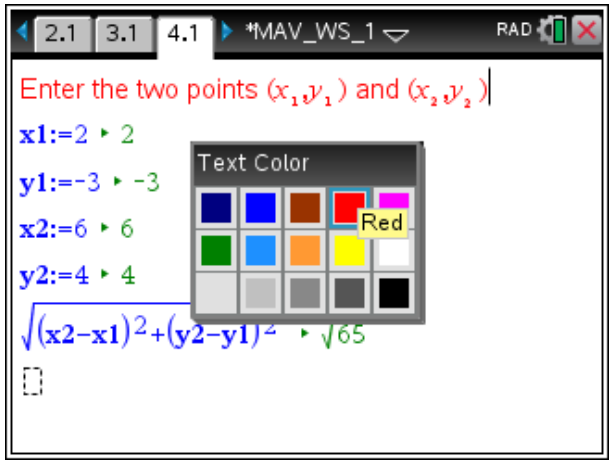
- You can add text to make the Notes Page more readable. The Notes Page works like a word processor. Move the cursor to the left of the Math Box at x1:=2 ▸ 2.
- Make sure you are not in a Math Box and add some instructions.
- The colour of the text can be changed by highlighting the text, hold down ⇧shift + ▸ or ◂, select menu > 4:Format > 4:Text Color or ctrl+menu > 6:Color > 3:Text Color and then select a colour by clicking one ↖. Change the colour of the title and instructions.

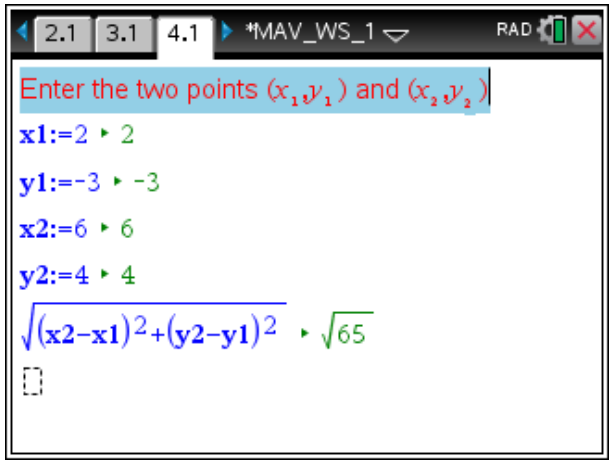




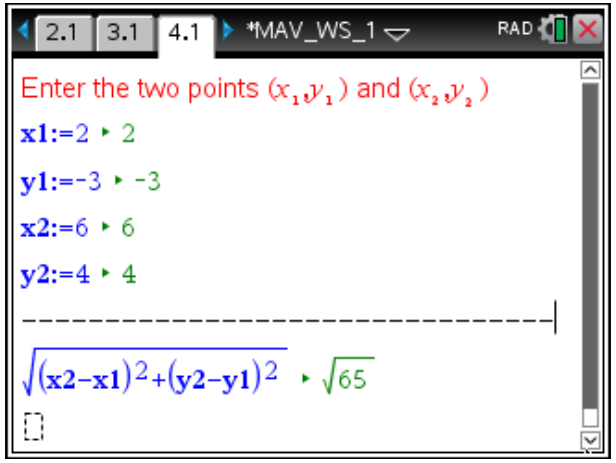


Subscript – select and





- A dashed line can be added to separate input from output sections of the Notes Page.

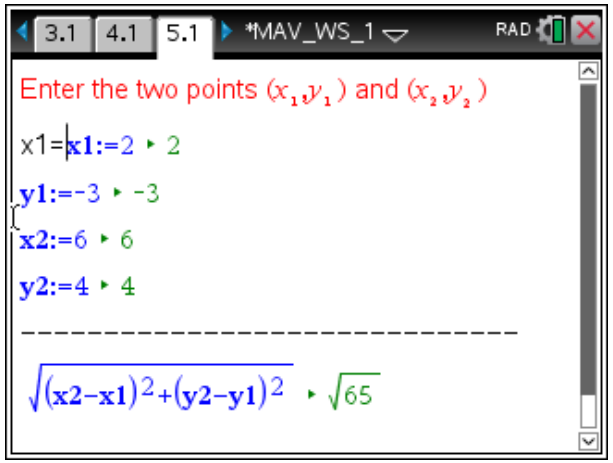


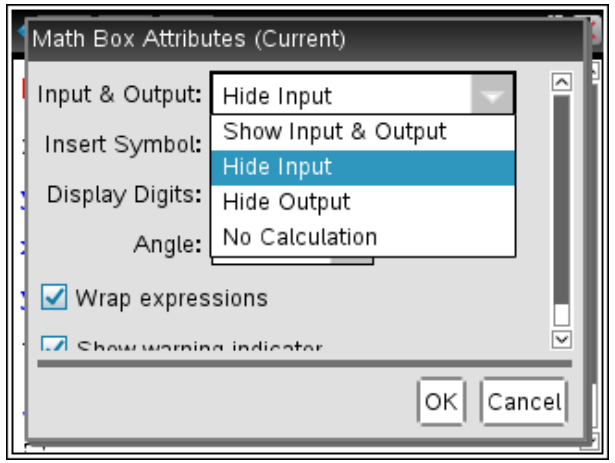
- The Notes Page can be made more readable by adding more text and changing the attributes of the Math Boxes.
- Before the “x1:=2” Math Box add “x1=“.
- Move the cursor inside the Math Box and select

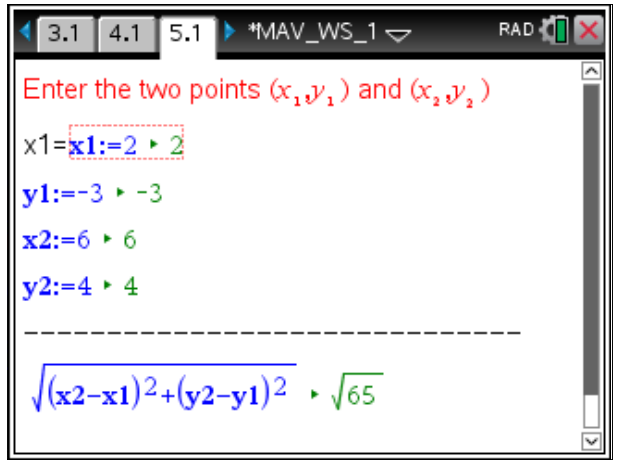
  menu > 5:Math Box Options > 1:Math Box Attributes…

  or ctrl menu > 8:Math Box Attributes…

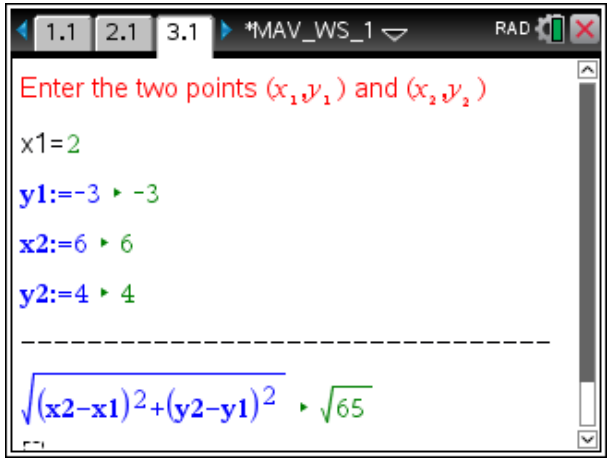
  Select Hide Input and select OK or enter.

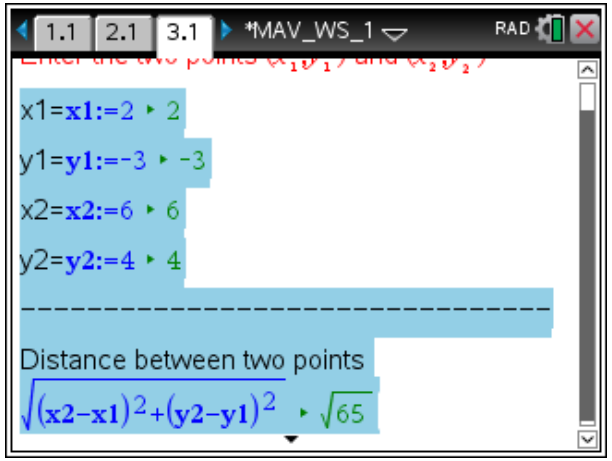


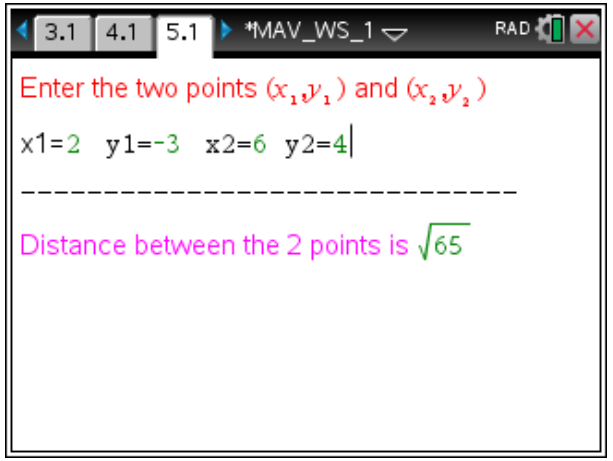




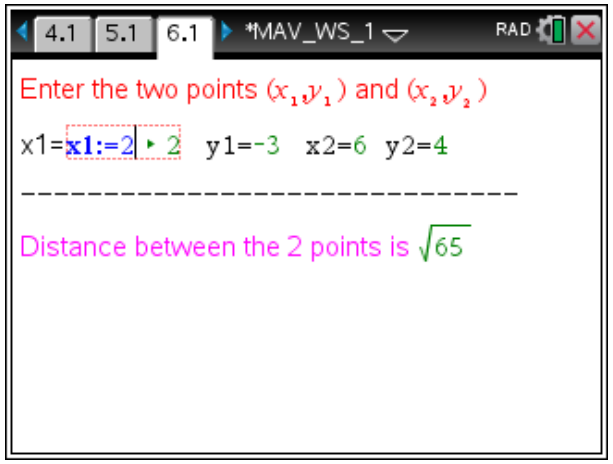
- Once you click/move outside the Math Box the Input is hidden.
- Repeat for other Math Boxes, but this time highlight all the Math Boxes to change them all in one step.
- Add comments where necessary and rearrange Math Boxes to make the Notes Page easier to view.
- Save the Document regularly, doc > 1:File > 4:Save or ctrl+S.

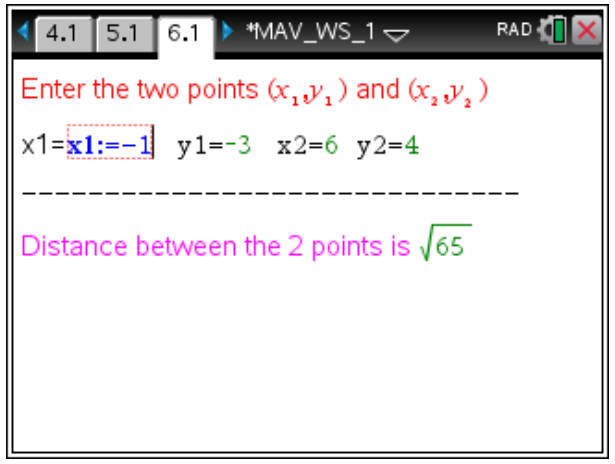


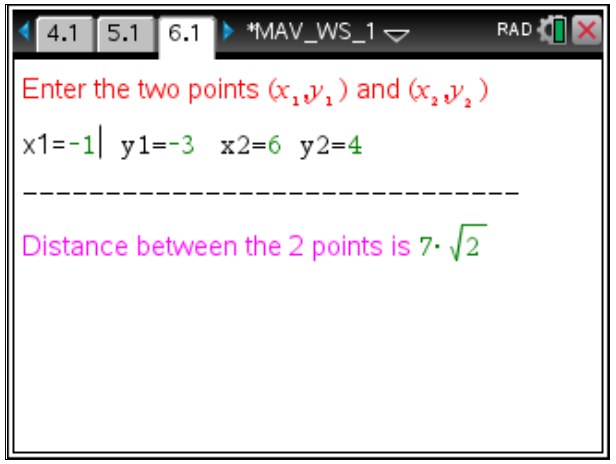




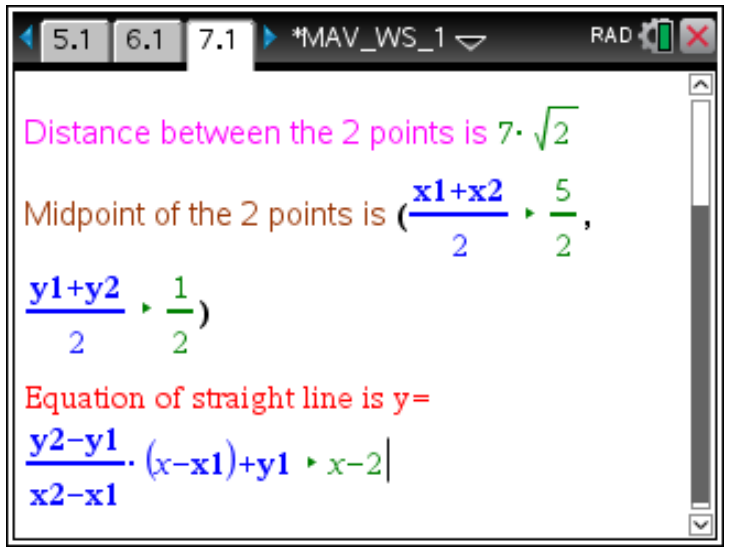
- What happens if a value is changed for a variable?
- Select the Math Box for $x1$ by clicking the 2 or using tab. Change $x1$ to -1.
- The value of $x1$ is not updated until enter is pressed and any variable associated with $x1$ is also updated.

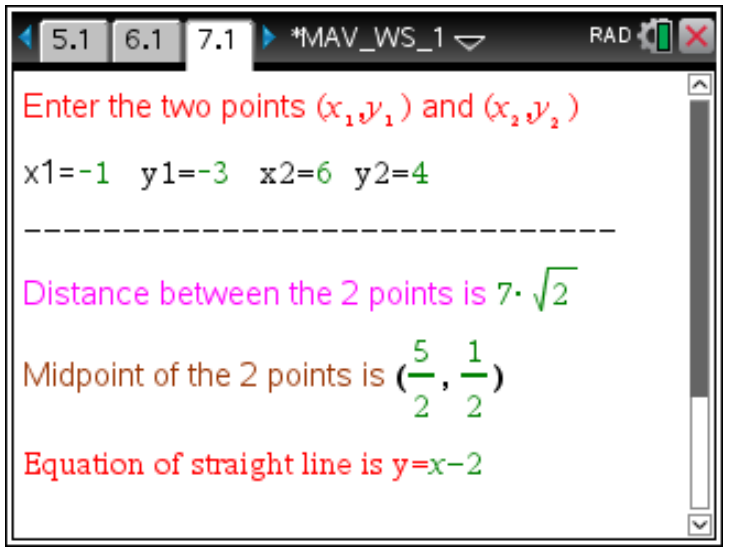






- Add to the Notes Page User Defined Functions(UDFs) to calculate:
  - the coordinates of the midpoint between two points.
  - the equation of the straight line between two points in the form $y = mx + c$.





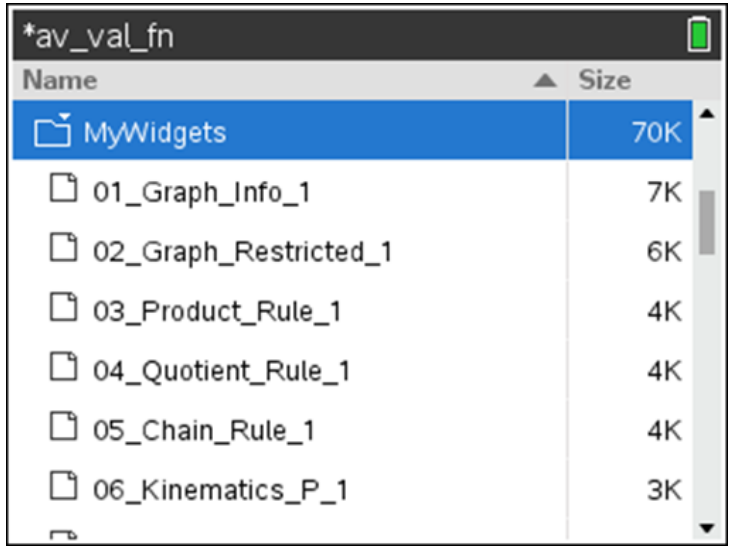
- This type of Notes Page only works in the Document and Problem that it has been created in.

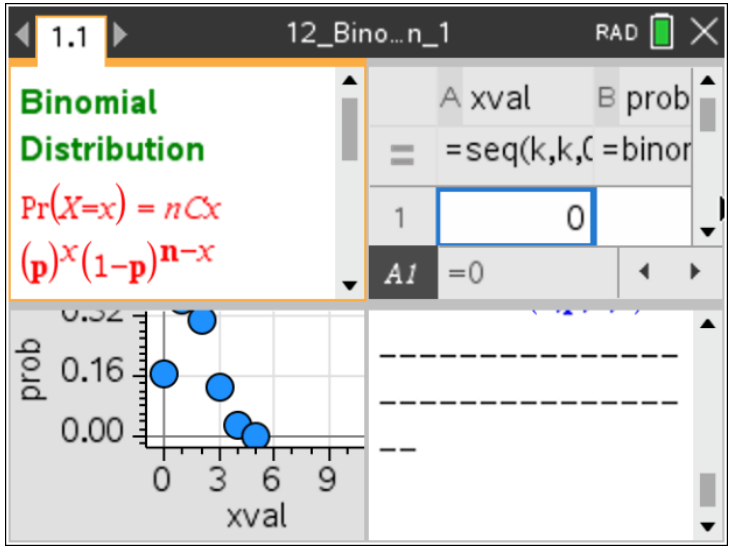
What other concepts could you add to the Notes Page or Document about two points?

- gradient of the straight line connecting the two points
- x-intercept of the straight line
- y-intercept of the straight line
- angle that the straight line between the two points makes with the positive direction of the X-axis
- gradient of the perpendicular line to straight line connecting the two points
- graph of the straight line

What is a Widget?

- A widget is a tns file that is stored in the “MyWidgets” folder of the CAS Calculator.
- Only the first page of a widget can be imported into an open Document.
- Up to four applications can be stored on the first page of a widget.



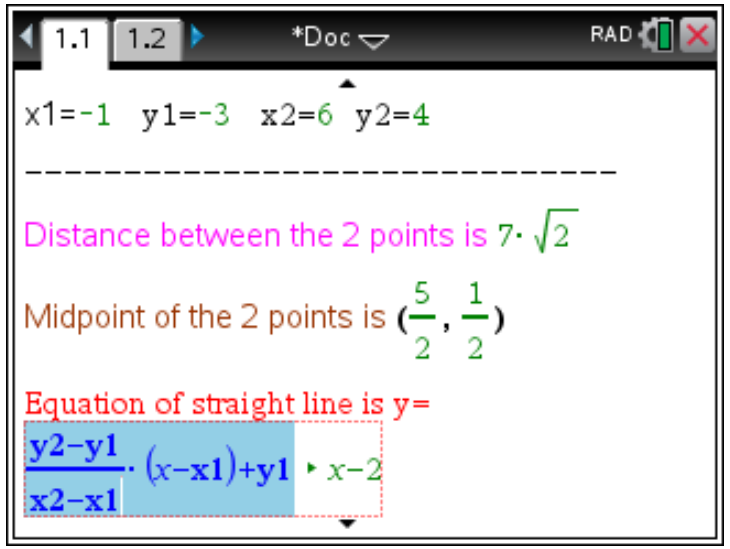


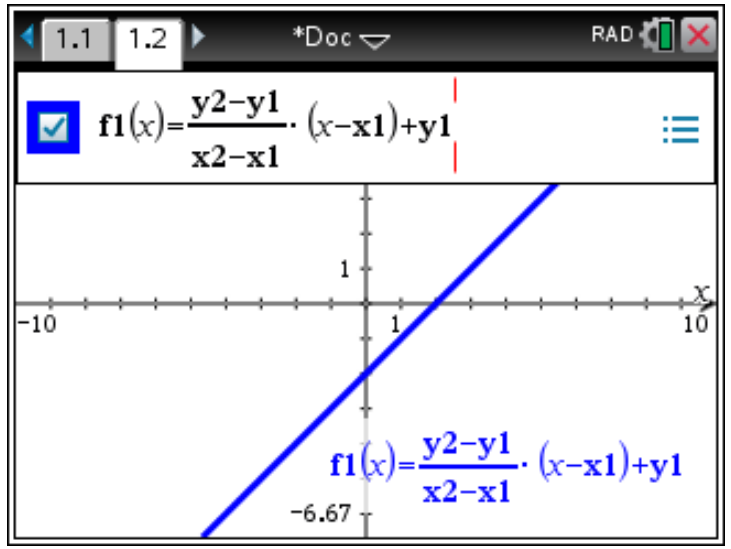
Steps to make and use a Widget

- Open a New Document and insert a Page, such as a Notes Page
- Use Ctrl + M to add a Math Box on a Notes Page and add formulae
- Add other Pages to the Document, such as a Graphs Page
- Maximum of 4 Pages in the Document
- Group all the Pages onto one screen, doc > 5:Page Layout > 7:Group (Ctrl + 4)
- Save the document to the MyWidgets Folder
- Open a New Document, 8:Add Widget and select a Widget
- Ungroup the Pages if required, doc > 5:Page Layout > 8:Ungroup (Ctrl + 6)
- For a Notes Page with several formulae, select the whole Page, Ctrl + A and activate all the Math Boxes Menu > 1:Actions > 1:Evaluate
- Edit the Widget, updating appropriate variables

Revisit the Coordinate Geometry Notes Page

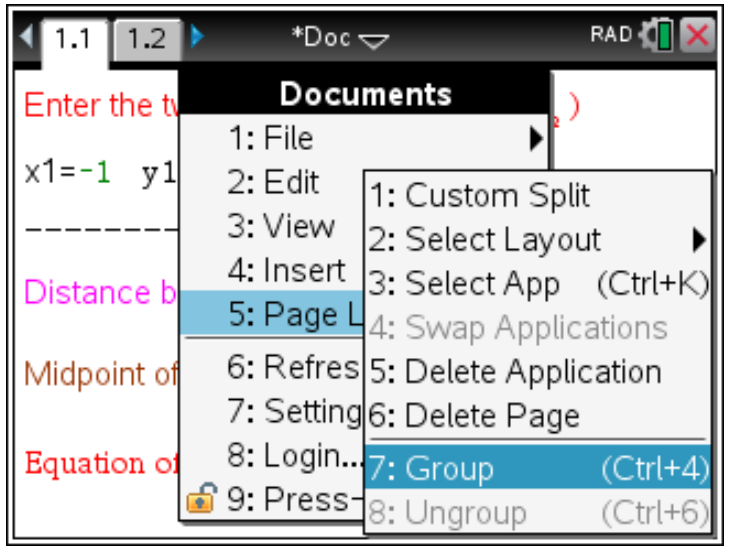
- Add a Graphs Page and sketch the straight line

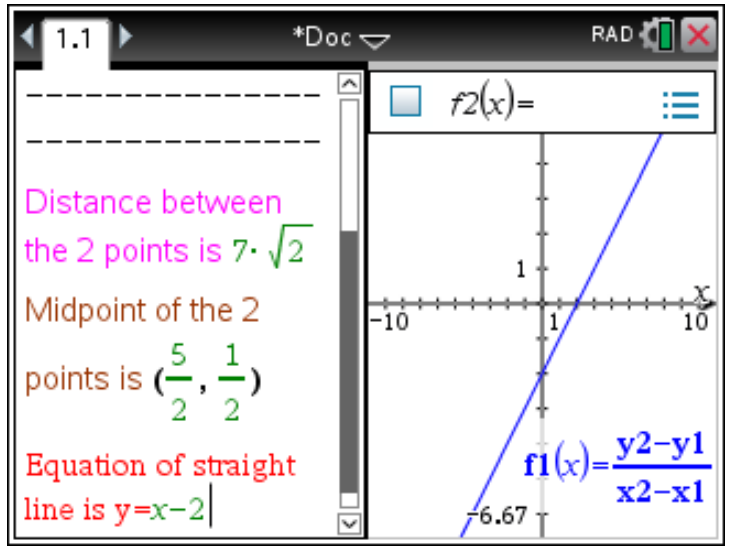




Group the two Pages on one screen

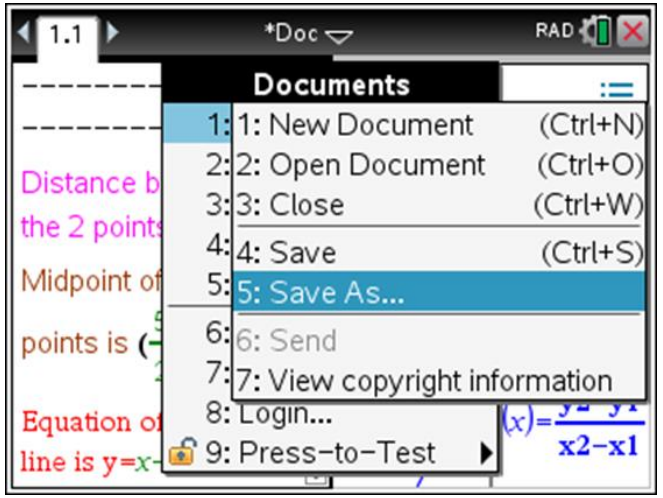
- Go to Page 1.1 and select doc > 5:Page Layout > 7:Group
- Repeat as required

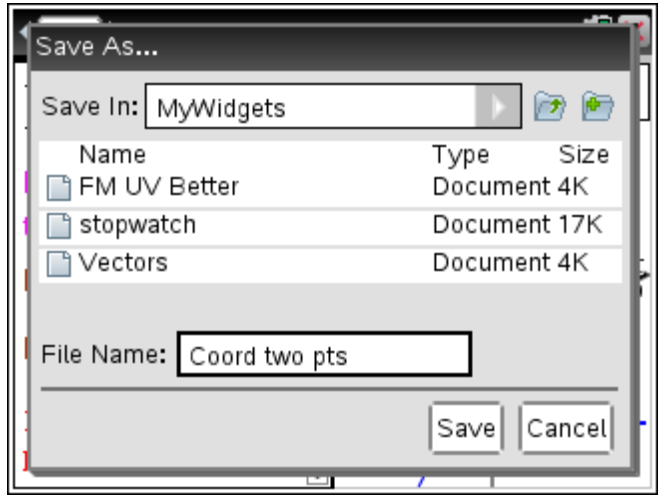


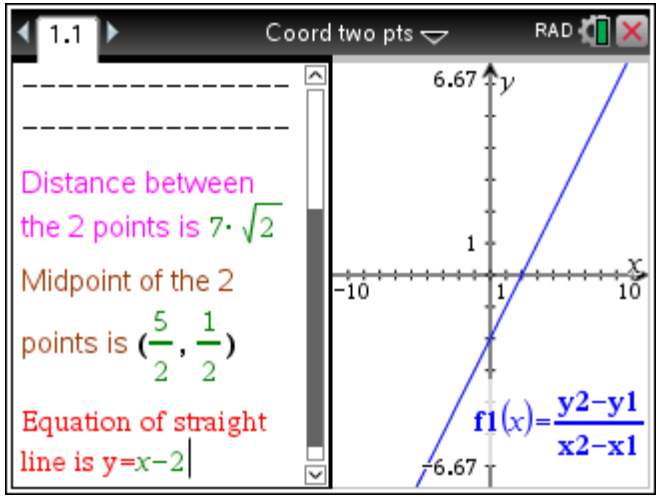


Group the two Pages on one screen

- Save the document to the MyWidgets Folder giving it an appropriate name

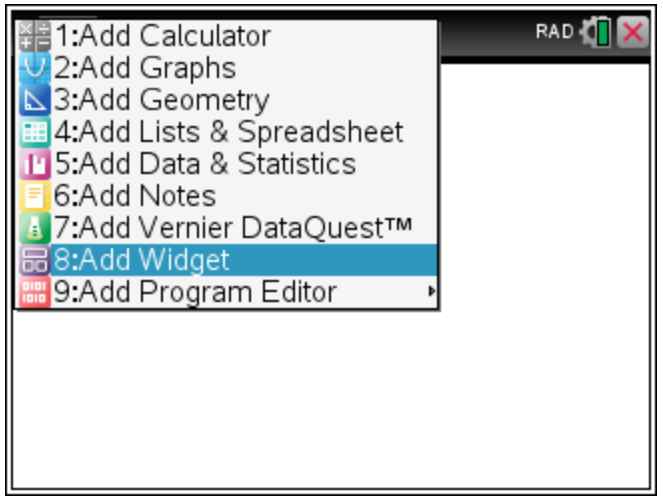


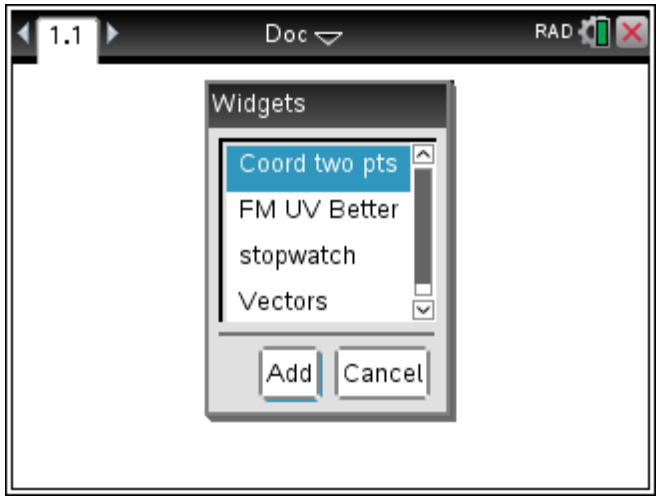


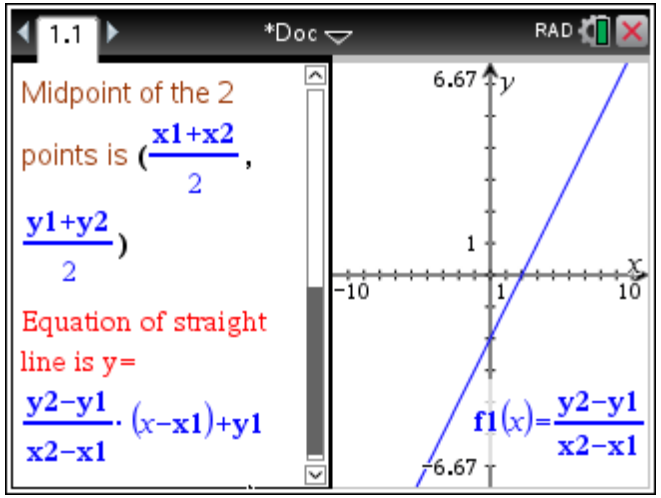


Importing a Widget into a Document

- Open a New Document and insert a Widget, 8:Add Widget
- Select the “Coord two pts” Widget and select, Add
- If inserting another Widget into the same problem, be careful there is no conflict with the variables



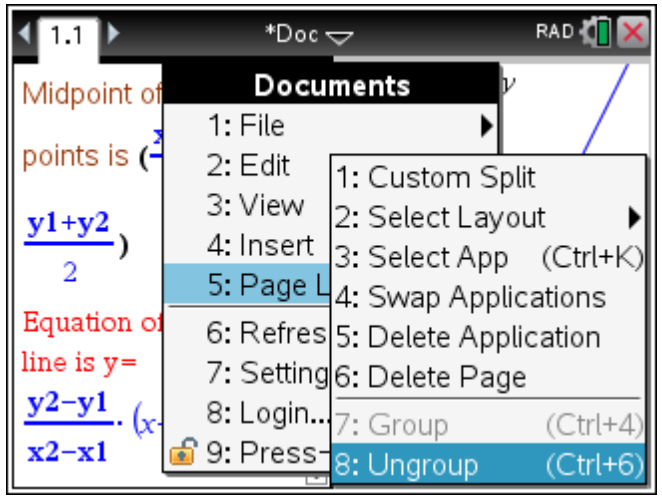


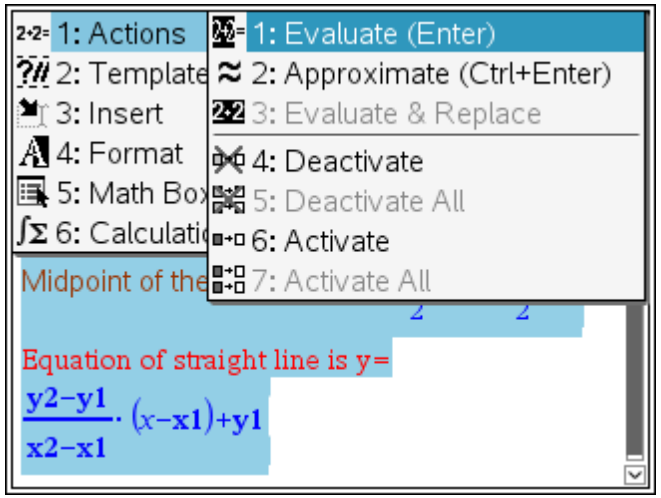


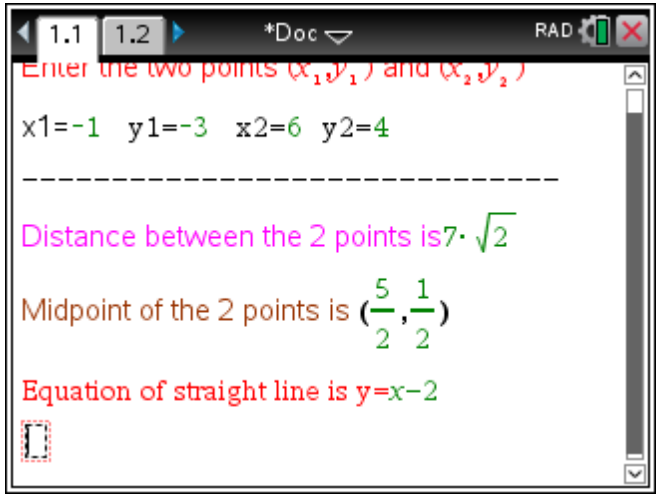
On the Notes Page, the Math Boxes are deactivated

Ungroup the two Pages

- Ungroup the Pages, doc > 5:Page Layout > 8:Ungroup
- On the Notes Page, select the whole page ctrl+A
- Activate the Math Boxes, Menu > 1:Actions > 1:Evaluate
- Notice that an extra Math Box is added to the Notes Page
- Edit the variables as required





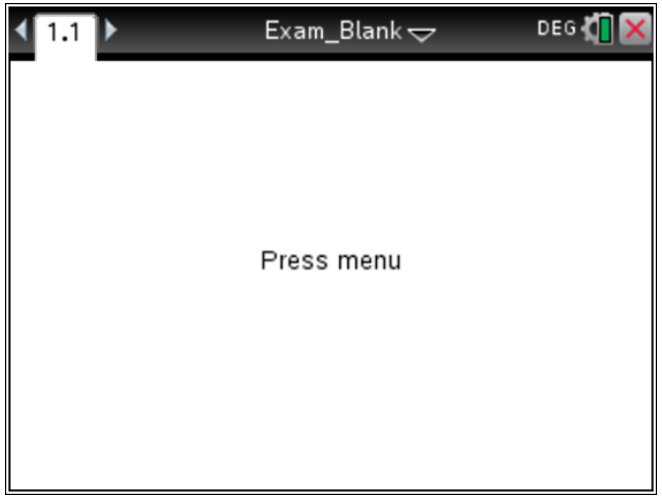


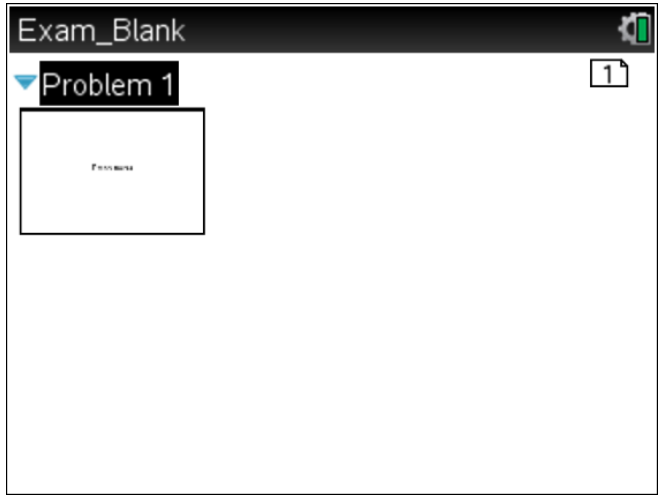
Notes Page - Commands to remember

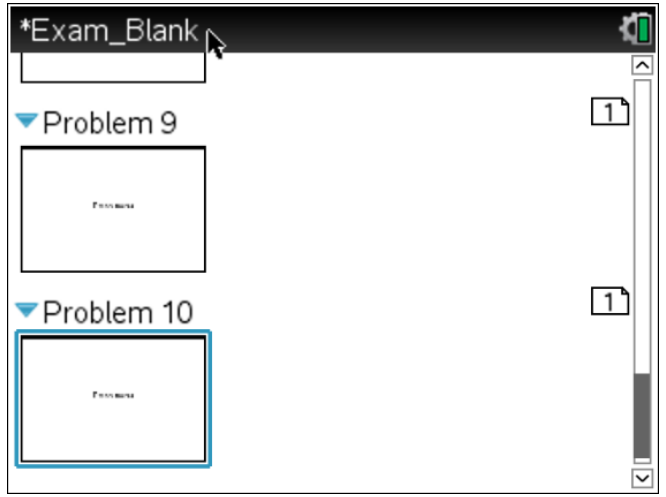
ctrl+M - insert a Math box
ctrl+A - select all
menu > 1 Actions >1 Evaluate - Activates Math box
ctrl+4/6 – Group/Ungroup
ctrl+7/1 - move to top/bottom of page
ctrl+9/3 - PgUp/PgDn

Before an Assessment Task

- To save time during an Assessment Task, set up a blank Document that contains several Problems and save it with an appropriate file name.
  - Open a New Document, press esc and save the file.
  - Open the Page Sorter and highlight Problem 1.
  - Use copy(ctrl+C) and paste(ctrl+V) to copy and paste Problem 1 several times.
  - In the Assessment Task, use the Assessment Task Question Number to correspond to the CAS Calculator Problem Number.
  - Press menu and insert a Calculator Page, Notes Page, Widget, etc.







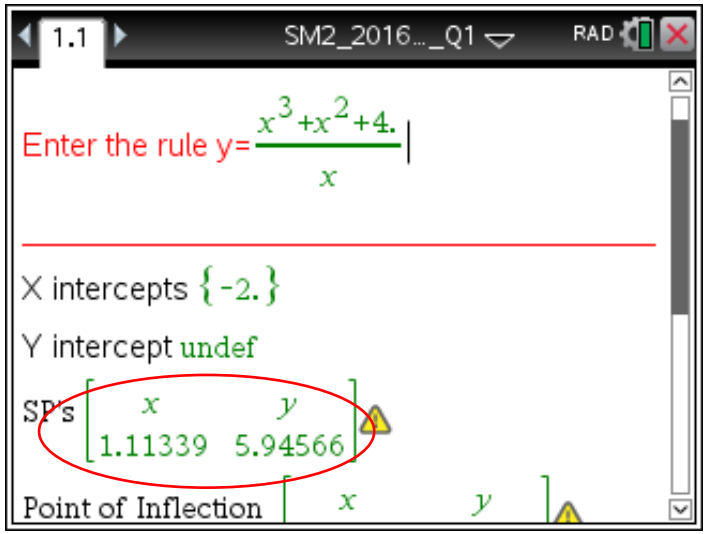
Some of the Widgets for your use

- 01_Graph_Info_1
- 02_Graph_Restricted_1
- 03_Product_Rule_1
- 04_Quotient_Rule_1
- 05_Chain_Rule_1
- 06_Kinematics_P_1
- 07_Kinematics_V_1
- 08_Kinematics_A_1
- 09_Average_Value_ Fn_1
- 10_1st_Derivative_Test_SP's_1
- 11_Strictly_(De)Increasing_1
- 12_Binomial_Distribution_1

Examples of using Widgets for Specialist Mathematics

VCAA 2016 VCE Specialist Maths Exam 2 - Section B Question 1a

a. Find the stationary point of the graph of $f(x)=\dfrac{4+x^2+x^3}{x}$, $x \in R \setminus \{0\}$. Express your answer in coordinate form, giving values correct to two decimal places. 1 mark



Notice the decimal point is included after the 4 so that decimals are displayed

Answer: (1.11,5.95)

Question 1a.

Marks	0	1	Average
%	7	93	1

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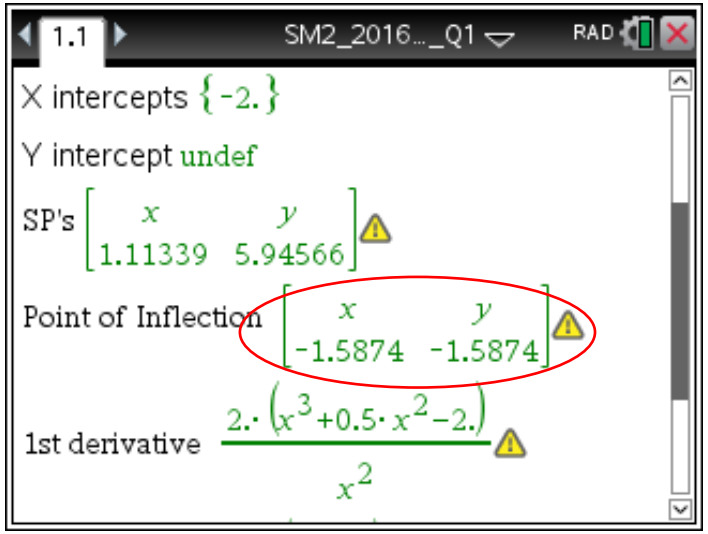
VCAA 2016 VCE Specialist Maths Exam 2 - Section B Question 1b

b. Find the point of inflection of the graph given in **part a.** Express your answer in coordinate form, giving values correct to two decimal places. 2 marks



Scroll down in Widget from 1a

Answer: (-1.59, -1.59)

Question 1b.

Marks	0	1	2	Average
%	7	15	78	1.7

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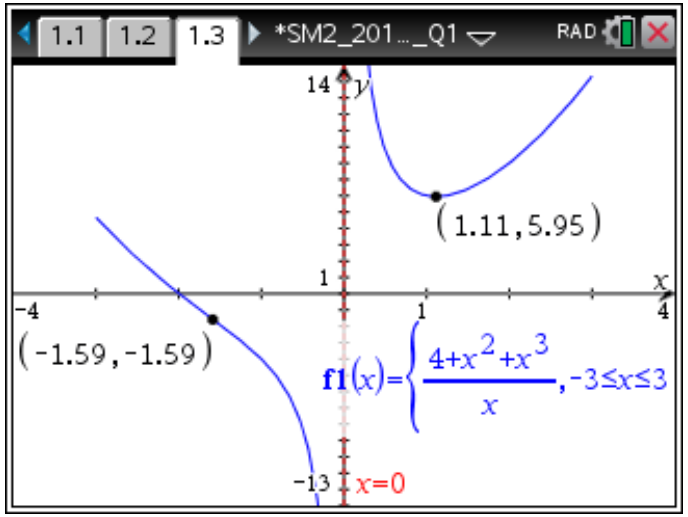
VCAA 2016 VCE Specialist Maths Exam 2 - Section B Question 1c

c. Sketch the graph of $f(x) = \dfrac{4 + x^2 + x^3}{x}$ for $x \in [-3, 3]$ on the axes below, labelling the turning point and the point of inflection with their coordinates, correct to two decimal places. 3 marks



Asymptote
$y = x + x^2$ not effective in domain

Question 1c.

Marks	0	1	2	3	Average
%	6	19	29	46	2.2

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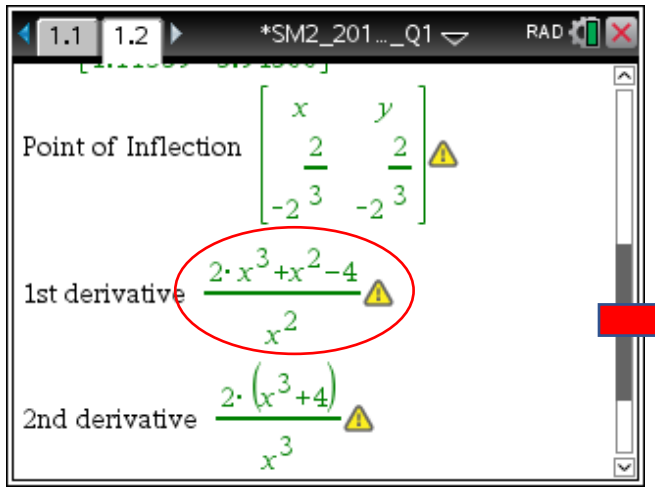
VCAA 2016 VCE Specialist Maths Exam 2 - Section B Question 1di

A glass is to be modelled by rotating the curve that is the part of the graph where $x \in [-3, -0.5]$ about the y-axis, to form a solid of revolution.

d. **i.** Write down a definite integral, in terms of x, which gives the length of the curve to be rotated. 1 mark



Eq'n re-entered for exact – decimal point removed

$$\int_a^b \sqrt{1+\left(f'(x)\right)^2}\,dx$$

$$= \int_{-3}^{-0.5} \sqrt{1+\left(\frac{2x^3+x^2-4}{x^2}\right)^2}\,dx$$

Question 1di.

Marks	0	1	Average
%	27	73	0.8

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VCAA 2016 VCE Specialist Maths Exam 2 - Section A Question 19

Question 19

A random sample of 100 bananas from a given area has a mean mass of 210 grams and a standard deviation of 16 grams.

Assuming the standard deviation obtained from the sample is a sufficiently accurate estimate of the population standard deviation, an approximate 95% confidence interval for the mean mass of bananas produced in this locality is given by

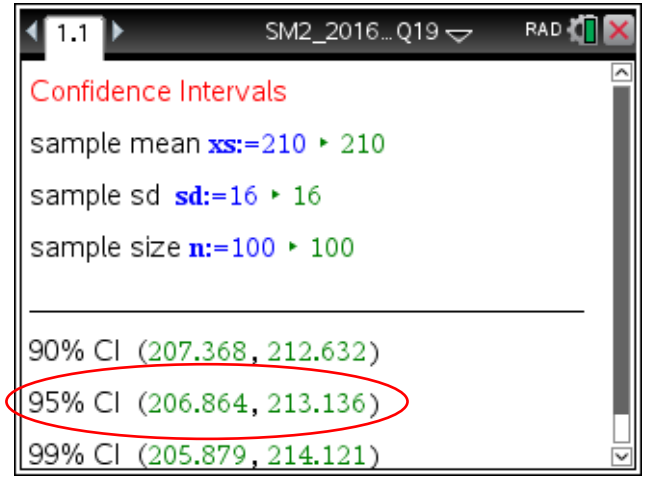
A. (178.7, 241.3)

B. (206.9, 213.1)

C. (209.2, 210.8)

D. (205.2, 214.8)

E. (194, 226)



Question	% A	% B	% C	% D	% E	% No Answer	Comments
19	7	78	9	4	2	1	$\left(210-1.96\times\frac{16}{\sqrt{100}}, 210+1.96\times\frac{16}{\sqrt{100}}\right)$

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