Handheld Geometry

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Notes for HG061

"Distance from one end of a segment vs distance to the other end"

General
As the point P is moved between A and B, the distance BP is plotted against AP.
What does the graph of points look like?

Student Specific
Use the 'Thought-Sheet' (page 3) to guide you through how to consider the dynamics of this situation, and what sort of relationship it reveals. This task is best done by thinking about it first and <u>then</u> doing it second, in order to see how well formed your thoughts were.

Teacher Specific
The students can either construct this themselves (refer to page 2 of these notes, or HG061's Construction Movie for the process of how to transfer lengths from a diagram to a set of axes within CabriJr), or use a pre-made file. There are obvious benefits to the students' underlying appreciation of the problem if they do construct it themselves.

Acknowledgements
Original source of the idea for this interactive geometry construction came from Mr Eugene Olmstead, Elmira Free Academy (retired), Dundee, New York State, USA.
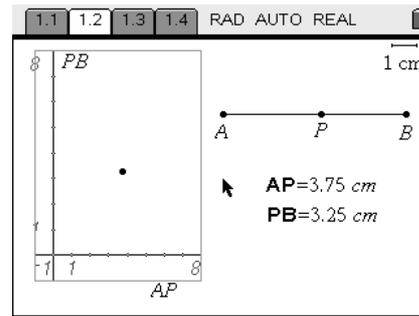
Feedback
Do you have any comments on these notes?
Please get in Contact via the website and help improve them further.
All contributors are acknowledged.

Construction Suggestions for HG061
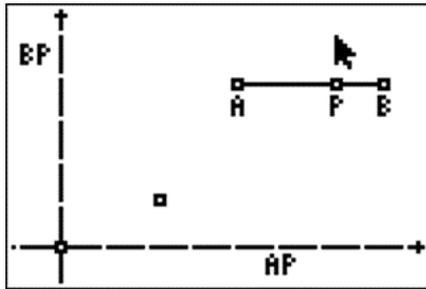
CabriJr Construction

TI-Nspire Construction

Construction Suggestion for CabriJr .8xv file:

F5 > Hide/Show > Axes
Grab and drag origin to bottom left of screen.
Construct the segment AB and place point P on it.
Measure the lengths AP and PB
F3 > Compass to capture length AP and place the generated circle with its centre on the origin.
Draw in perpendicular to x-axis through intersection point of this circle with the x-axis.
F5 > Hide/Show > Object and hide this circle
Repeat the process for length PB against the y-axis
Mark the point of intersection of the two perpendicular lines, and then hide the lines.

Construction Suggestion for TI-Nspire .tns file:

Page 1.2	Add Graphs & Geometry
	Menu > View > Plane Geometry View
	Menu > View > Show Analytic Window
	Ctrl + G to Hide Entry Line
	Resize top and bottom edges of the Analytic Window to the full height of the screen.
	Construct the segment AB and place point P on it.
	Measure the lengths AP and PB
	Move cursor over each numerical measure and press Var > Store Var
	Type in names of Vars to be ap and pb, one at a time.
	Menu > Construction > Measurement Transfer, then click on a Var, then click on an axis.
	Construct Perpendiculars to axes through the respective Measurement Transferred points.
	Plot point at intersection of perpendiculars.
	Hide appropriate items by Ctrl > Menu

|	
Page 1.3	Label columns with ap.c and pb.c [the ".c" bit is a chosen code to mean "the captured value of the variable"]
	Type in capture(ap,1)
	Type in capture(pb,1) [the parameter of "1" means capture automatically. Use "0" for manual capture]

Page 1.4	Click on each axis and select from the variables that end in ".c"
	After some data has been captured, Menu > Window/Zoom > Zoom-Data to automatically scale axes.
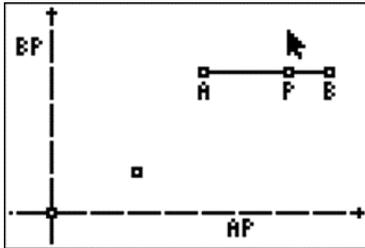
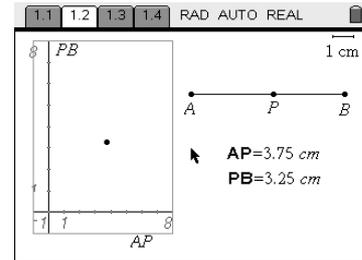As the point P is moved between A and B, the distance BP is plotted against AP.

What does the graph of points look like?

For the geometrical construction detailed above, jot down your answers to the following key questions:

1.   Is the data relationship linear, or non-linear?
     a) If it's linear, what is the slope of the line?
     b) If it's non-linear, is the curve upwards or downwards?

     _____

2.   Is there a direct, or indirect variation?

     _____

3.   Is the data relationship symmetrical in any way?

     _____

4.   Is there a maximum, or a minimum?

     _____

5.   Are there places where it cuts the x-axis (called 'zeros') and, if so, what do they represent?

     _____

6.   Does it cut the y-axis and, if so, what does that point represent?

     _____

7.   Can you now draw the shape of the curve?
     Sketch on it the axes on one of the screenshots at the top of this sheet.

8.   Can you now construct this interactive geometry file, or use the one provided to you, to check all of your thoughts so far?

9.   Can you use algebra to work out the equation of the curve?

     If you are using a TI-Nspire, you can check how good your answer is by plotting your resultant function on Page 1.2's axes. Alternatively, you can fit a regression curve to the captured data that will be displayed on Page 1.4