

Parallel Lines the Transversals that Cross them!

by – Jessica Kachur

Activity overview

In this activity, students will explore the relationships between angles formed by parallel lines crossed by transversals. While there are other activities that may address similar topics, the questions presented to students in this activity bring a fresh perspective to student discovery.

Concepts

Geometric relationships, algebraic relationships

Teacher preparation

No specific prep is required; however, I recommend that the teacher complete this activity before giving it to students and think about questions that their students will have specifically.

Classroom management tips

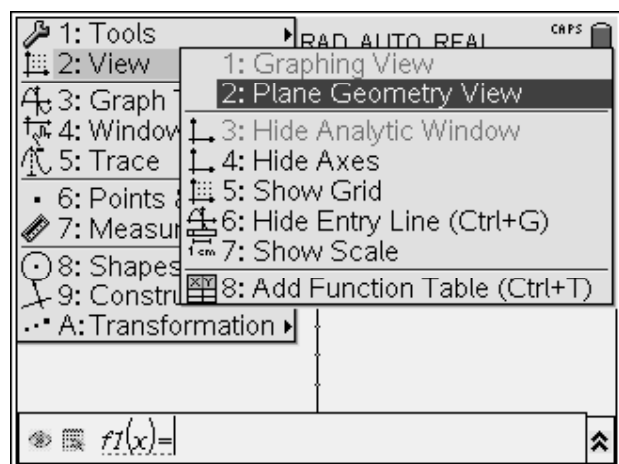
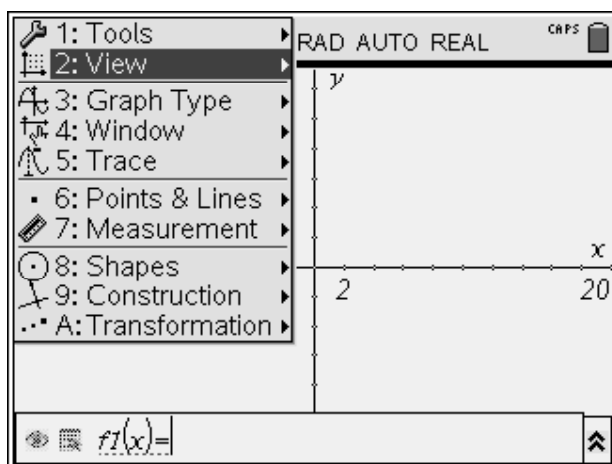
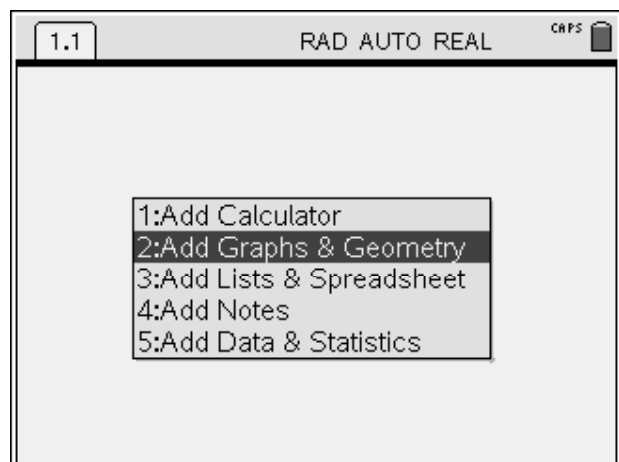
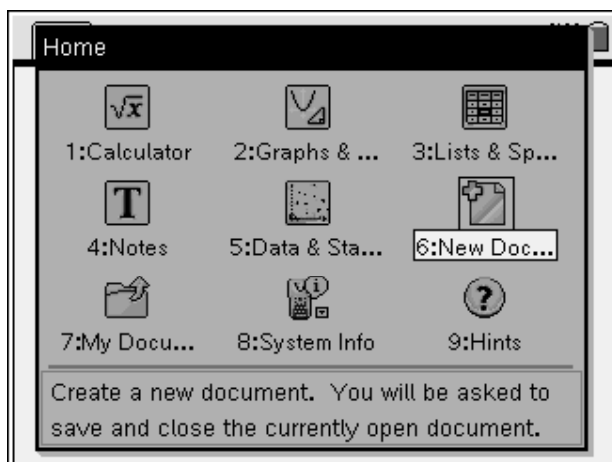
I recommend that students be placed in groups of two to four so that they can compare and contrast their data and graphs in order to draw conclusions.

TI-Nspire Applications

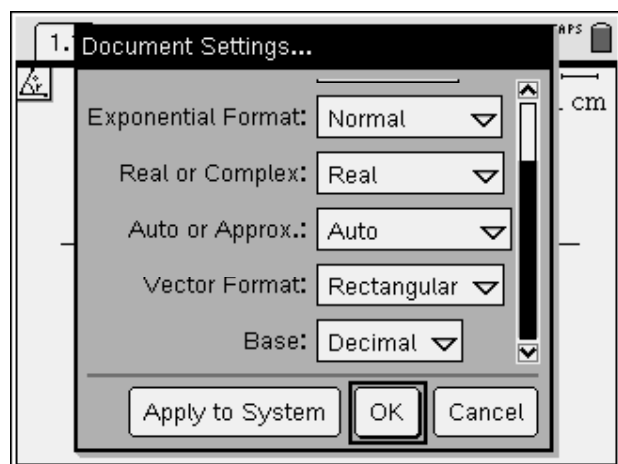
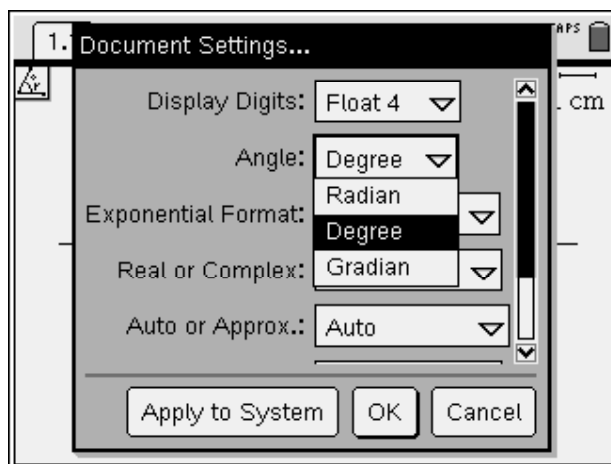
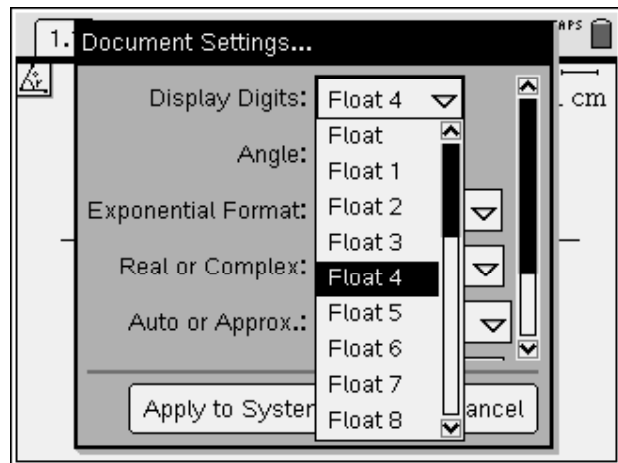
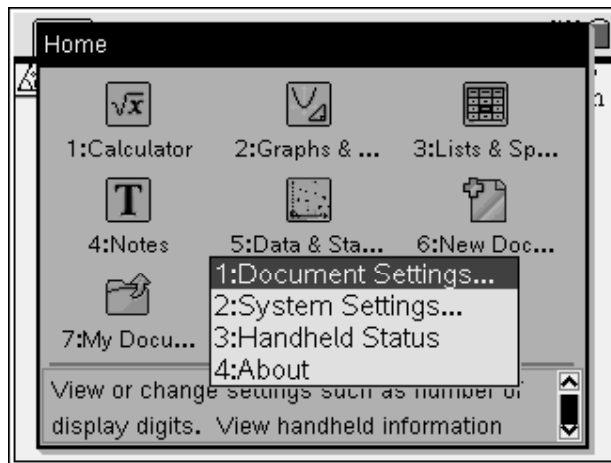
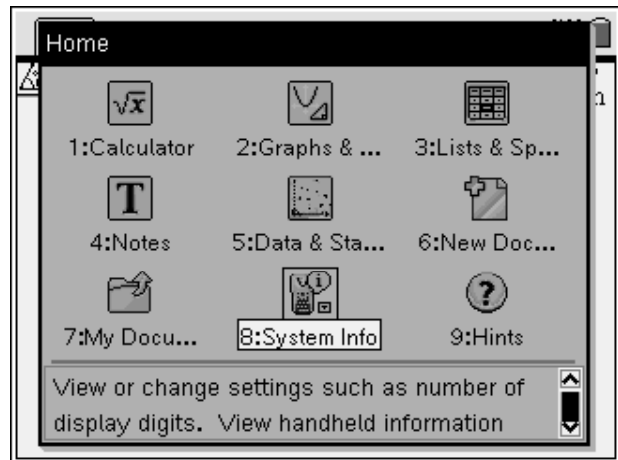
Graphs and Geometry, and Calculator. This activity can be done on the TI-Nspire or TI-Nspire CAS technology.

Step-by-step directions

1. Press the 2nd Key.
2. Select 6 : New Document.
3. Select 2 : Add Graphs and Geometry.
4. Press the Menu key, and select 2 : View.
5. Select 2 : Plane Geometry View this will get rid of the x and y axes.





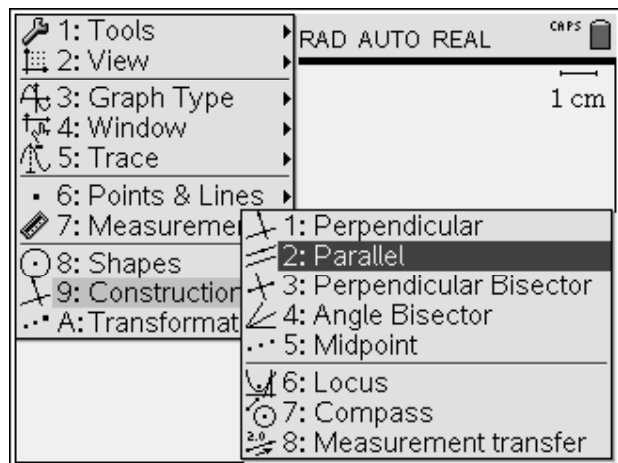
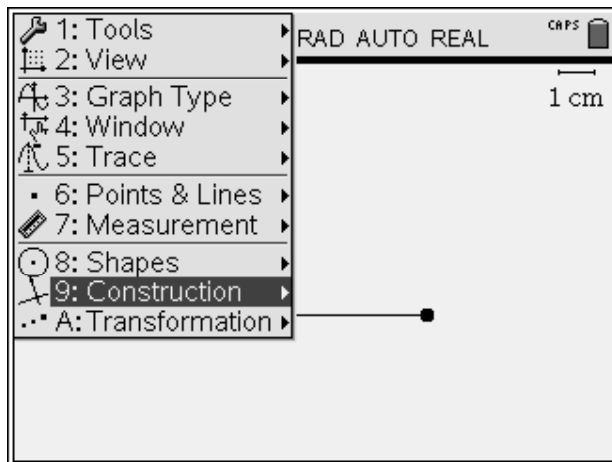
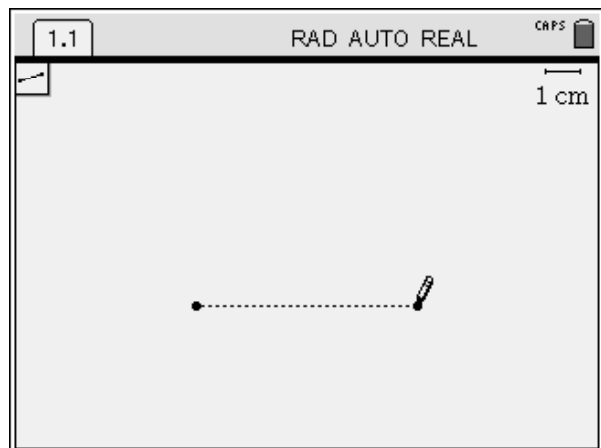
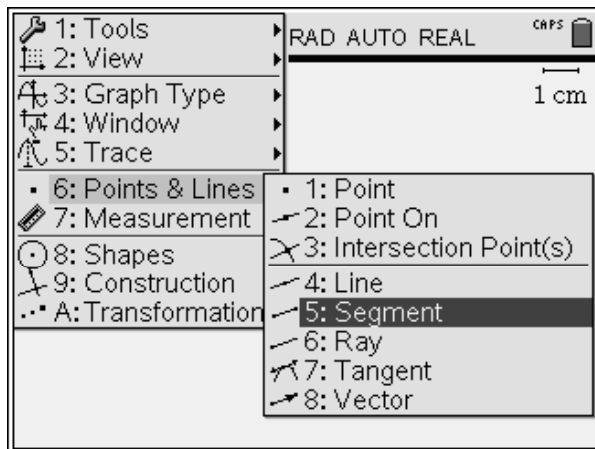
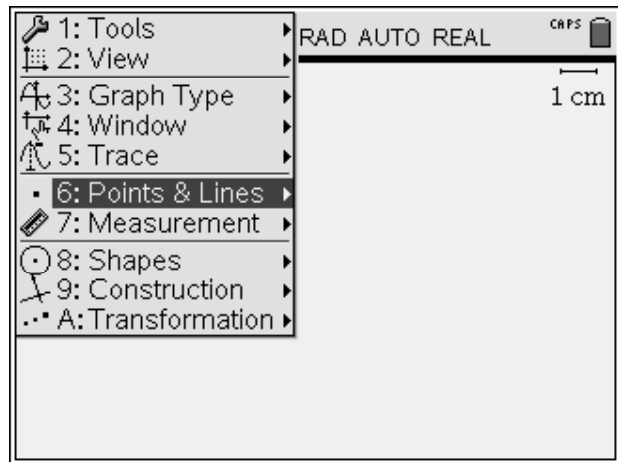
6. From the Home screen, choose $\left[\text{8}\right]$: System Info.
7. Choose $\left[\text{1}\right]$: Document Settings.
8. Set the Display digits to *Float 4*. Tab to the Angle section.
9. Set Angle to Degree.
10. Tab down until the *OK* icon is highlighted and press enter.



11. Press the $\left[\text{6}\right]$ key and select $\left[\text{6}\right]$: Points & Lines.
12. Select $\left[\text{5}\right]$: Segment. You will see in the

upper left hand corner that you have the segment tool selected.

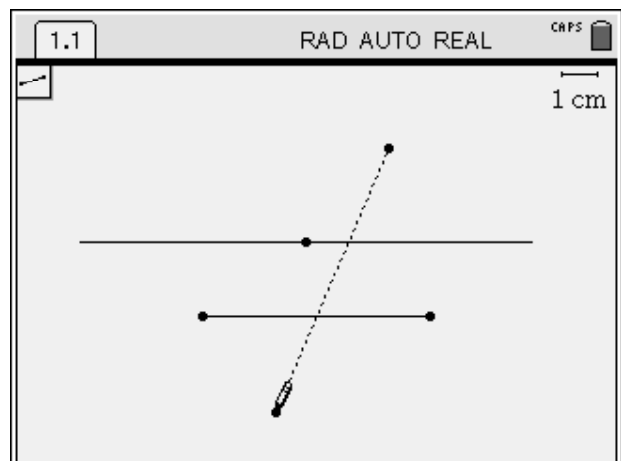
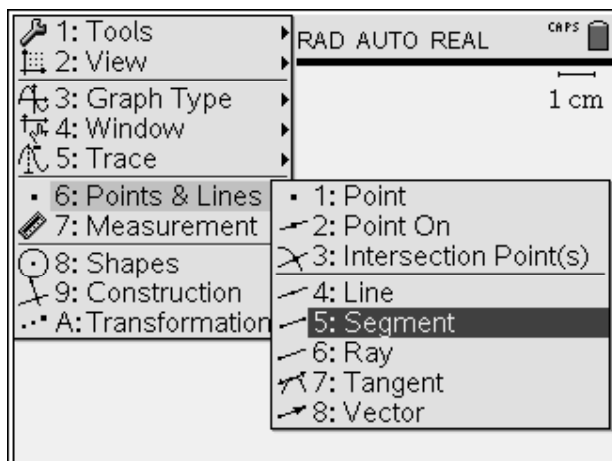
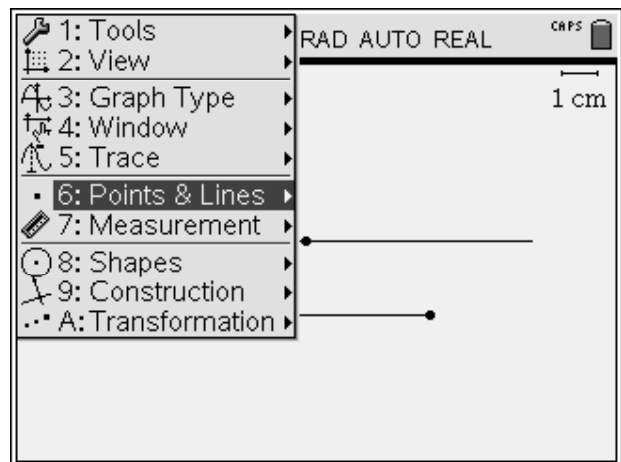
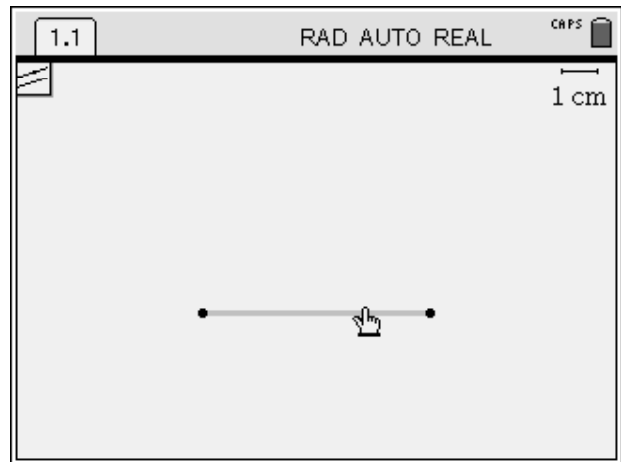
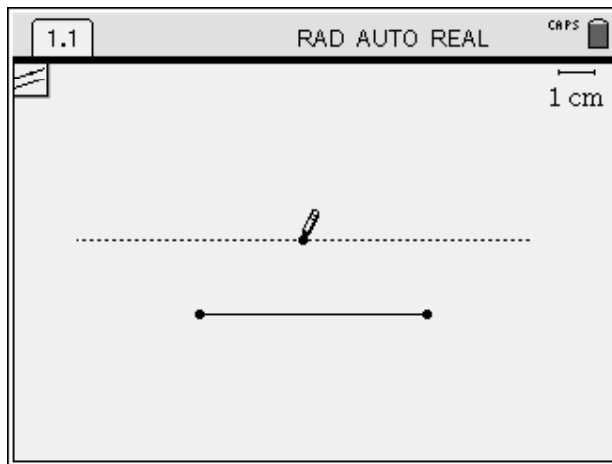
13. Move to a spot in the lower left part of the screen. Press enter to set one end of your segment. Move to the right, and press enter to set the other end of the segment at the desired length.
14. Press , select : Construction and select 2: Parallel to start the construction of the parallel line to your first line.



QUESTION 1: Why does the calculator command called “Construct” in order for you to get a parallel line? Is it possible to draw two lines that will be parallel without using this command?

15. Move your icon on your screen and press enter to select the line segment that is already drawn on the screen. Move the cursor upwards on the screen and press enter to set your parallel line.

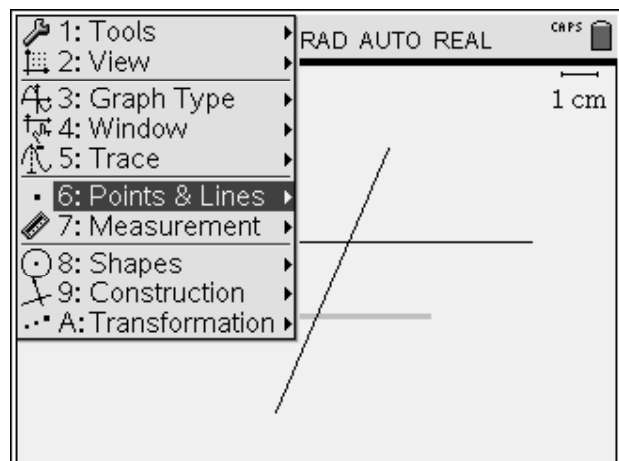
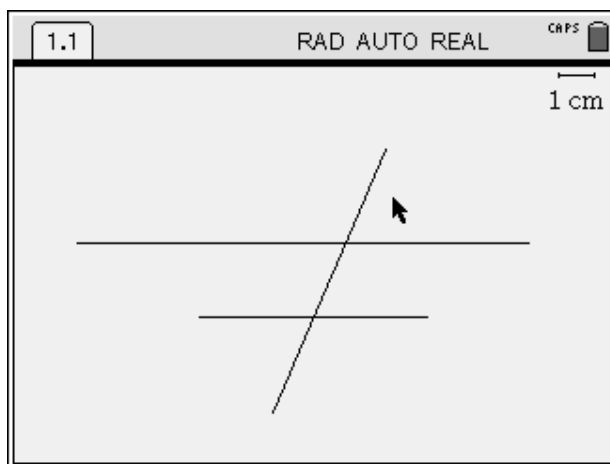
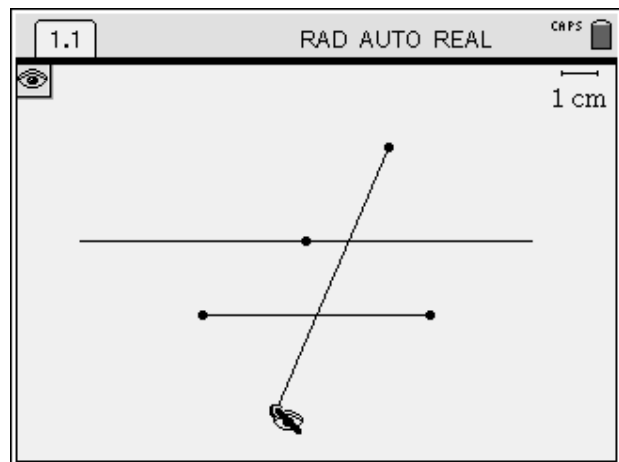
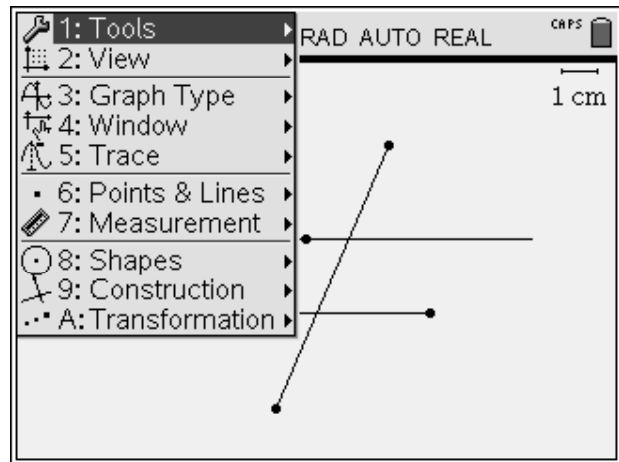
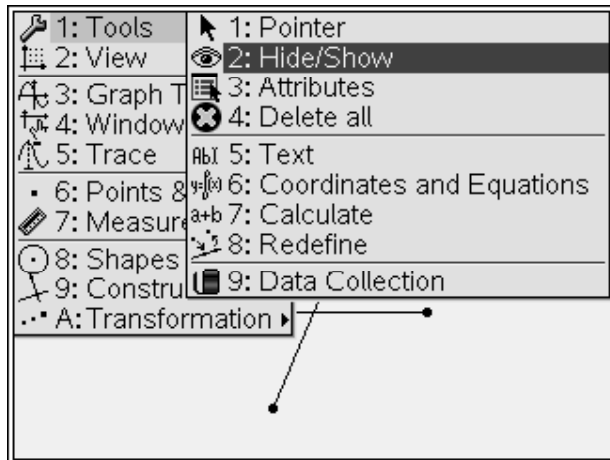
16. Press Menu, select $\langle 6 \rangle$: Points & Lines and the $\langle 5 \rangle$: Segment. When you do this you will be back at the screen and able to draw a segment. Move below your two lines and draw a line that will cross both of the parallel lines.



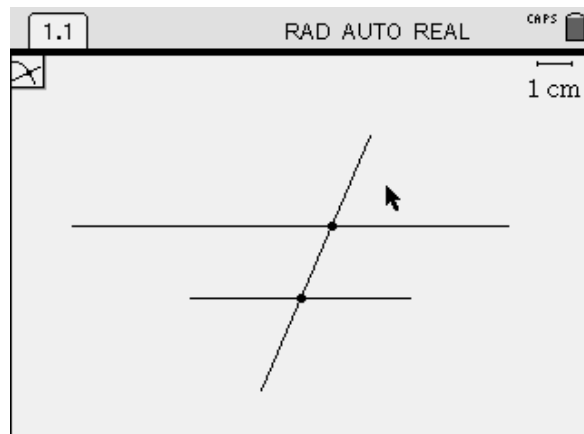
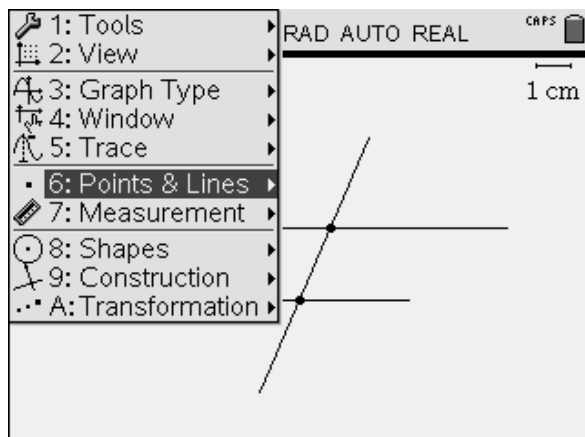
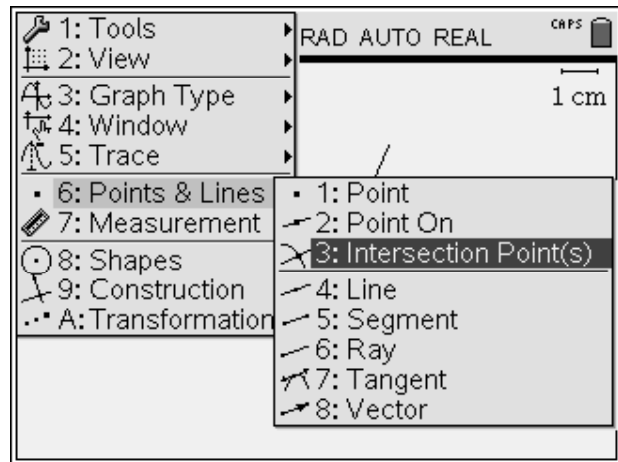
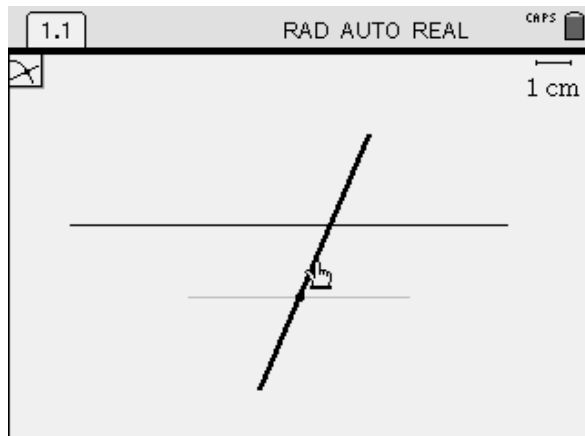
QUESTION 2: Could you draw a transversal that goes through the point that was used to construct the parallel line?

17. Press $\langle \text{Menu} \rangle$, then $\langle 1 \rangle$: Tools and $\langle 2 \rangle$: Hide/Show.
18. Move to each of the points on your screen and when the point is highlighted, press enter and hide the points. (You are hiding these points and creating new points in order to decrease confusion in later steps.)

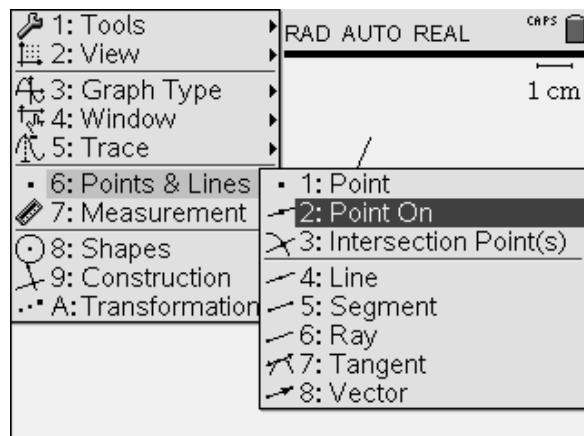
19. Now Press [6] and [6] : Points and Lines, and then [3] : Intersection Points.

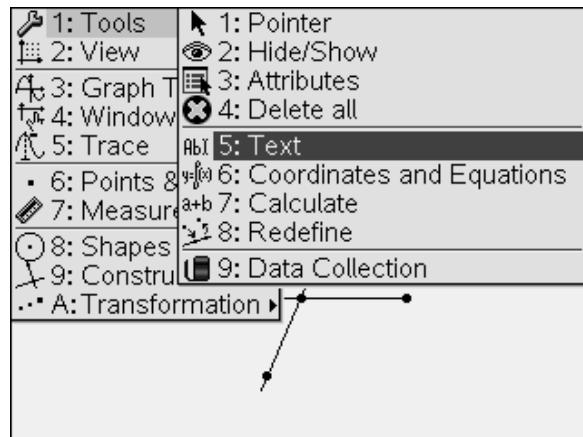
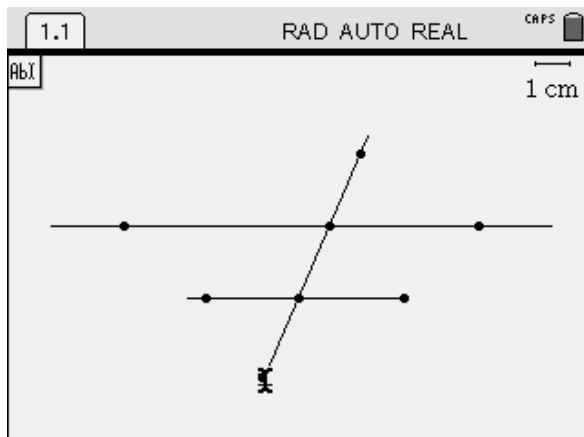
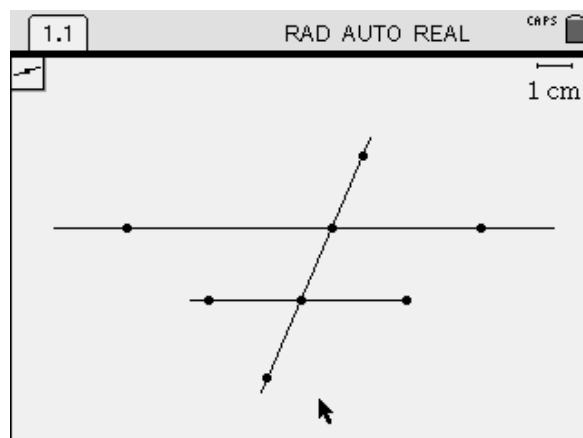
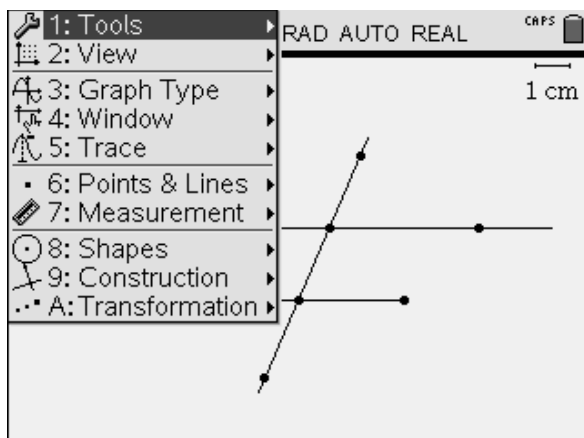


20. Move your cursor over one of the parallel lines to highlight that line. Press enter. Then move over the transversal and press enter to set the intersecting point of those lines. Repeat this process to mark the intersection of the other parallel line and the transversal.
21. Press [6] , then [6] : Points & Lines and then [2] : Points On. Place a point at the ends of each of the parallel lines and the ends of the transversal.



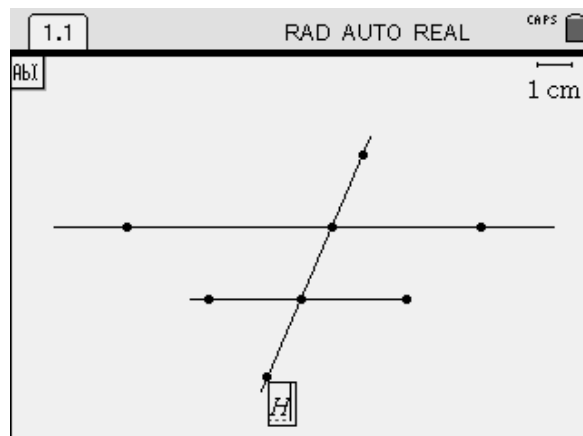
22. Press 2ND , 1 : Tools and then 5 : Text.
23. Move the Cursor over each point, press either to open a text box and label each point (I labeled min alphabetically from top to bottom).

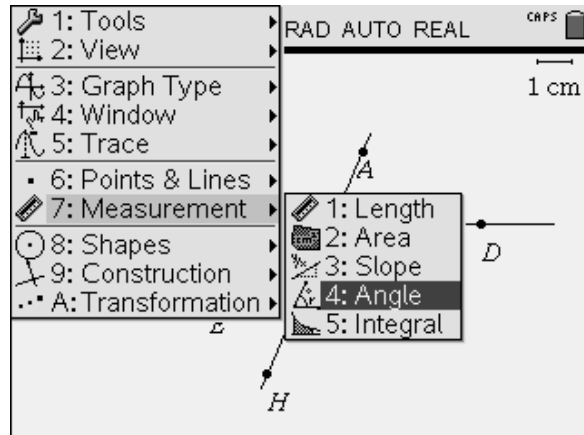
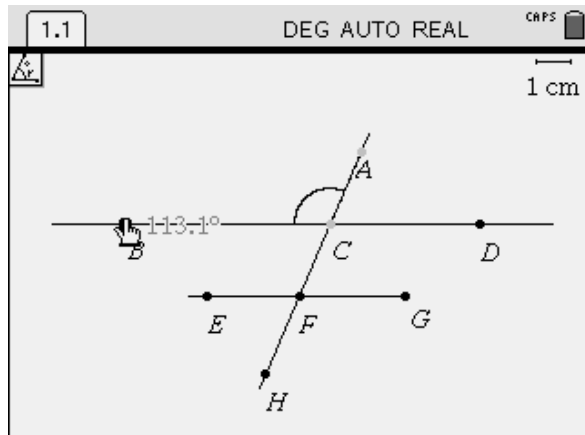
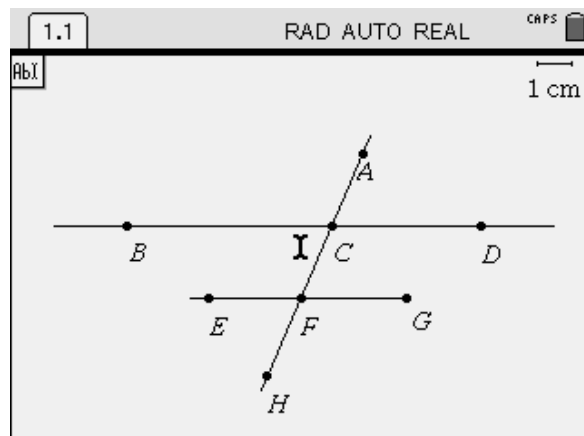
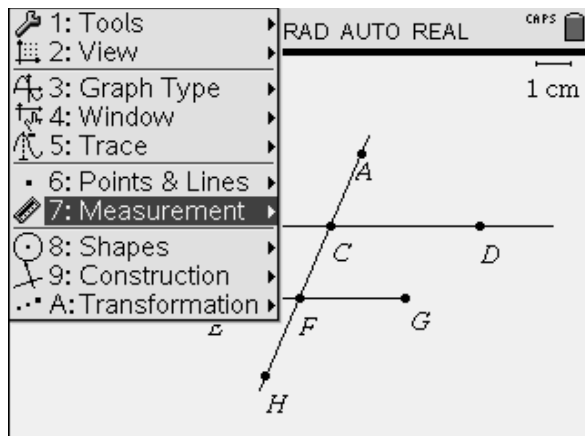




QUESTION 3: What is another way that you could label the points?

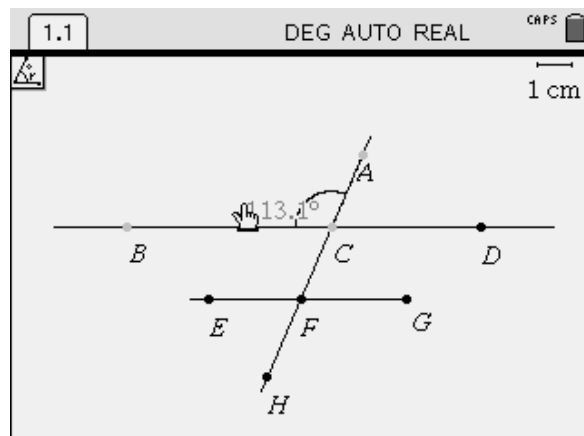
24. Press [M] , the [7] : Measurement, and then [4] : Angle. Select each angle by selecting the three points that form the angle with the vertex of the angle being selected second. Immediately upon creating the measurement the measurement will be grey. At this point you can move it to where you want it on the screen. I recommend putting it close to the “mouth” of the angle.

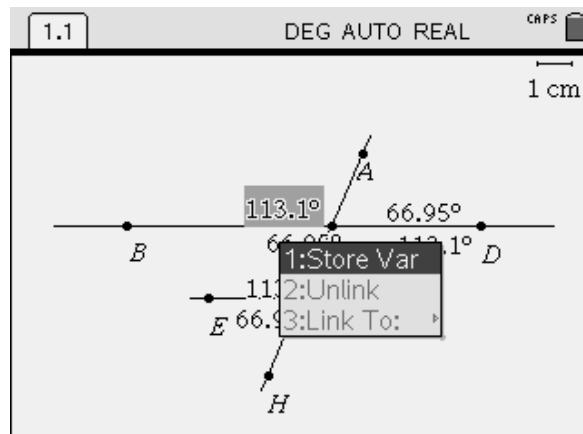
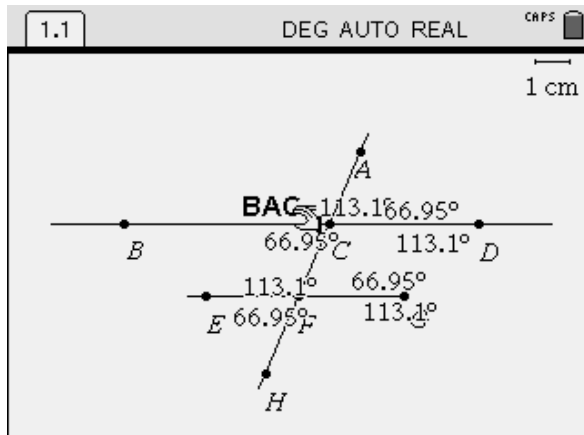
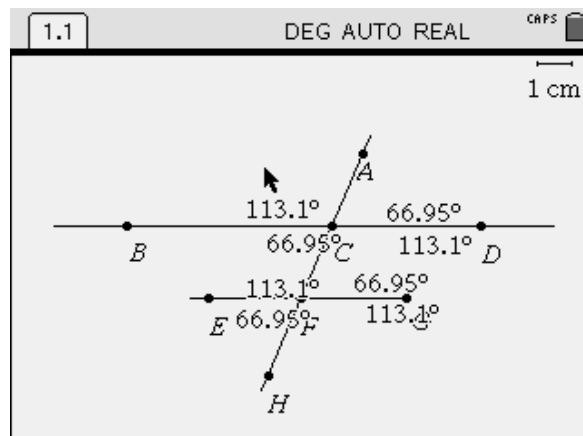
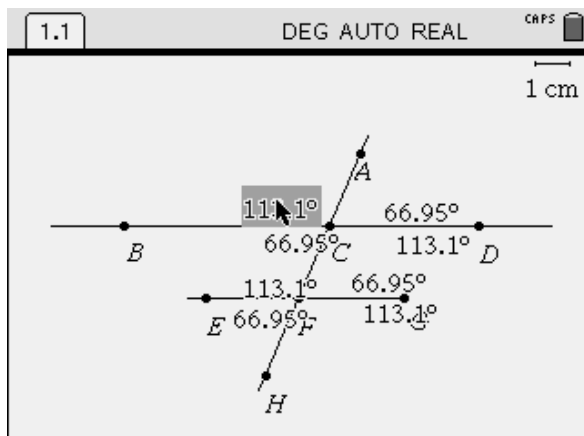




QUESTION 4: When you are marking your angles for measurement, an arc appears at the center of the angle. What is the arcs purpose? What would be the result if you did not put the vertex point as the second point marked for the angle?

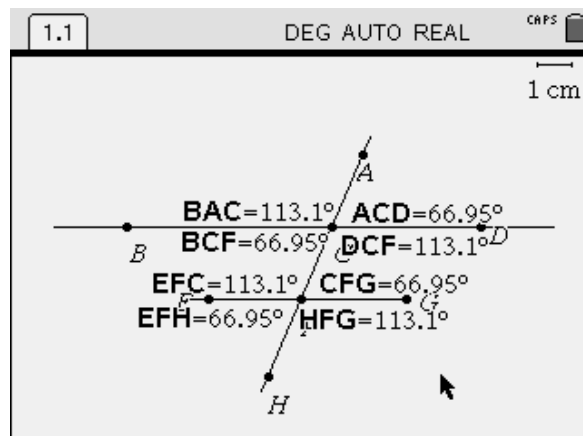
25. Once all of the angles are measured (there should be eight measurements), highlight each measurement by placing your cursor over the measurement and pressing enter once. The Measurement should be grey. Press α , the α : Store Var, then type in the name of the angle on the screen using the alpha keys.
26. Repeat this step for each of the other 7 angle measurements.
27. Again, move the measurements so that it is clear as to which angles they refer.



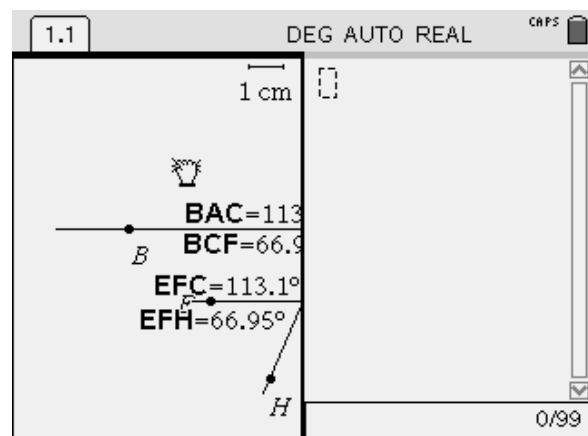
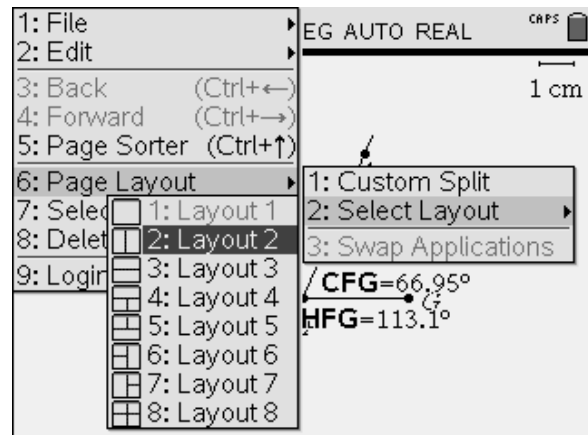
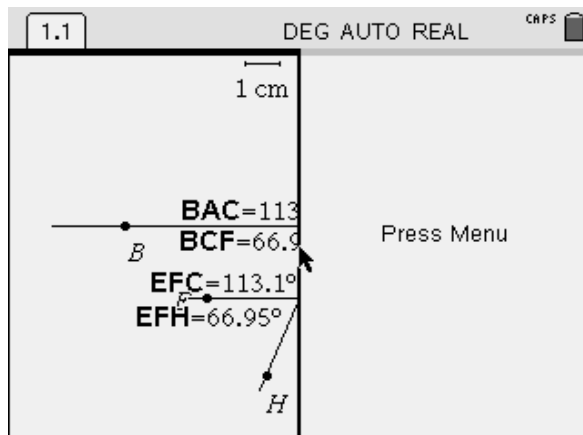
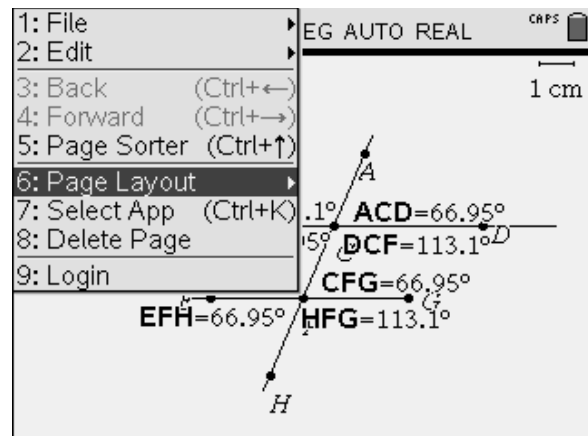
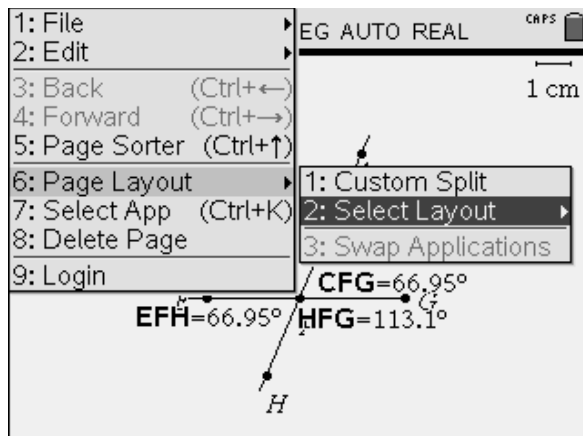


QUESTION 5: At this point, what relationship, if any, do you see between the angles that have been drawn? Check your answer with the student sitting next to you.

28. Press $\left[\frac{\square}{\square}\right]$, $\left[\frac{6}{\square}\right]$: Page Layout, then $\left[\frac{2}{\square}\right]$: Select Layout, and then $\left[\frac{2}{\square}\right]$: Layout 2. This will cause your screen to split into two parts with your graph and geometry page on the left.
29. Move your cursor to a clean spot on the screen. Hold down the “Hand clicker” in the center of the Navpad and grab a hold of the entire page. Move the page so that you can see all of your measurements as good as possible.



QUESTION 6: Move point A left and right. What effect does this have on the angle measures?



30. Press $\text{ctrl} + \text{tab}$ to move over to the right pane of the window.
31. Press $\text{ctrl} + \text{m}$ and choose $\text{ctrl} + \text{c}$: Add Calculator.
32. Now while reference your graph and geometry page and add the angles by typing in the names of the angles based on the variable names you gave the angles previously.

QUESTION 7: At this point, what relationship, if any, do you see between the angles that have been drawn? Check your answer with the student sitting next to you.

QUESTION 8: Move point a again. Tab back over to the calculator side of the screen. Arrow up to grab one of the calculations and press enter to recalculate the sum. What do you notice?

Activity extensions

- Below is a PDF of a maze of lines that have some angles labeled with their measure and others that students need to figure out the measure of the angles using the parallel lines and transversal concepts. In addition, students should know about the relationships between vertical angles, complementary and supplementary angles, and the three angles of a triangle.

