Cipher Solvers

Student Activity
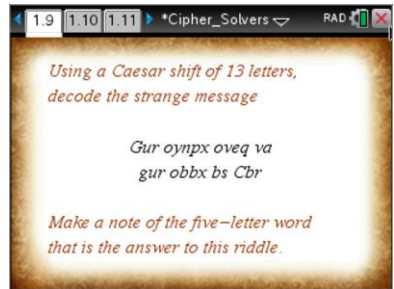
Name _____

Class _____

1. Open the document: *Cipher_Solvers.tns*.
    Read the opening screen then move to page 1.2,
    Day 1, Strange Message.

    Read pages 1.3 through 1.8. Make notes as needed.

2. Move to page 1.9. Decode the message in the space provided
    below:

3. Read pages 1.10 through 1.13.
    On page 1.14, type the five-letter word that is the answer
    to the riddle and select ⌷enter⌷.

4. The screen is changed to the screen shown at the right.

    Read and follow the instructions displayed.
    Once you are ready to continue, select the ⌷esc⌷ key to close
    these instructions.
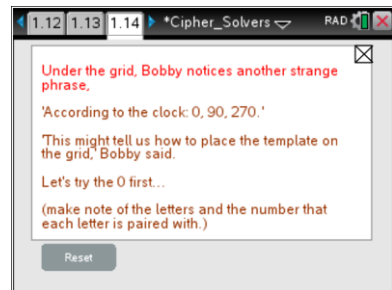
5. Grab the gray template and drag the template to be on top of the
    grid of numbers.

6. The phrase said, "According to the clock: 0, 90, 270." Each of the four numbers in the grid has a letter assigned to it. Write the letter and the number assigned to it for the first orientation below.

   _____   _____   _____   _____

7. With your cursor, select the appropriate button to rotate the template.
   Each of the four numbers in the grid have a letter assigned to it. Write the letter and the number assigned to it for the second orientation below.

   _____   _____   _____   _____

8. With your cursor, select the appropriate button to rotate the template.
   Each of the four numbers in the grid has a letter assigned to it. Write the letter and the number assigned to it for the third orientation below.

   _____   _____   _____   _____

9. Move to page 2.1. Read pages 2.1 through 2.3.
   Find at least one word that can be formed with these letters:
   A   T   M   H
   Write your answer(s) below.
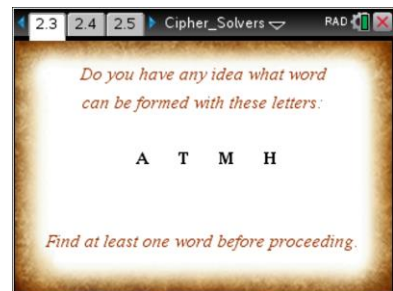
10. Move to page 2.4 and read it.
    a. Using the instructions on page 2.4, write the ordered pairs using the numbers from problem 6.

    _____   _____

    b. Using the instructions on page 2.4, write the ordered pairs using the numbers from problem 7.

    _____   _____

    c. Using the instructions on page 2.4, write the ordered pairs using the numbers from problem 8.

    _____   _____

11. Move to page 2.5.
    Grab and move the points so that each of the points listed in question 10 is plotted. Use the same color for each pair of points. Then, plot the points on the CipherSolver_Graph_Paper supplied by your teacher.
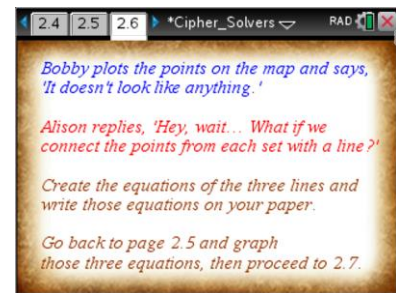

12. Move to page 2.6 and read it.
    Determine the equation of the line for each set of points listed in question 10.
    (Note: Each person in your group should work on just one equation, but a different equation.)
    Show your work below.

13. Write the three equations determined by the members of your group below.

    _____

    _____

    _____

14. Go back to page 2.5 and graph these three equations (also graph on the graph paper). The equations will not display on the screen, but the graphs will display. Then move to page 2.7. What do these three lines determine?

    _____

15. Move to page 2.8

    a. Determine the vertices of the triangle created by these lines. Each person in the group will determine the ordered pair for just one vertex, but a different vertex. Show your work below.
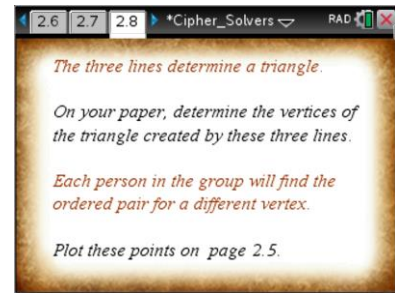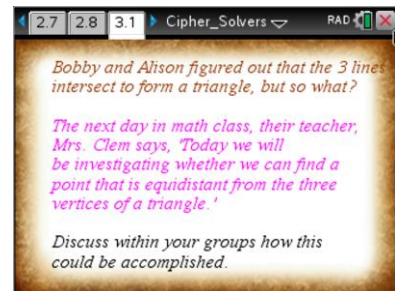
    b. Write the ordered pairs for the three vertices found by the members of your group below.

        _____   _____   _____

    c. Plot these points on page 2.5.

16. Move to page 3.1. Read it and discuss in your group how you might find a point that is equidistant from the three vertices of a triangle.

17. Read pages 3.2 and 3.3. Make notes as necessary.

    a. Discuss in your groups how you know that line k is the perpendicular bisector of segment AB. Write your answer below.

    b. This diagram only shows that points C and E are equidistant from the segment's endpoints. Grab and move point C along $\overleftrightarrow{k}$. Does it appear that $AC = BC$ no matter where C is?
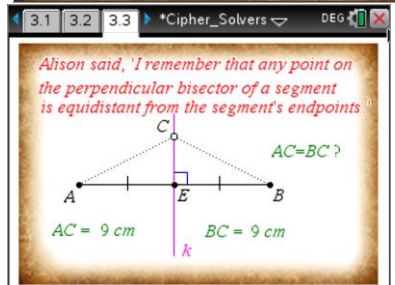
IMPORTANT:

If your teacher has instructed you to finish solving this activity with only algebra (no geometry), then move to page 4.1 in the TI-Nspire documentand skip to number 21 (Algebra only solution) on the next page. If you are solving this with geometry <u>and</u> algebra, move to page 3.5 in the TI-Nspire document, then continue with number 18 below.

(Continue here for the geometry and algebra solution)

18. Read pages 3.4 and 3.5.

We will first geometrically construct the lines that are perpendicular bisectors of each side of the triangle. Go back to page 2.5 to do this.

19. On page 2.5, select menu, Geometry, Construction, Perpendicular Bisector.

- Select one vertex of the triangle.
- Then select a second vertex of the triangle.
- The line that is the perpendicular bisector of that side is shown.

Repeat for each of the other two sides.

(You may need to grab the "end" of one of the lines to extend it to the edge of the page.)

What do you notice about the three perpendicular bisectors?
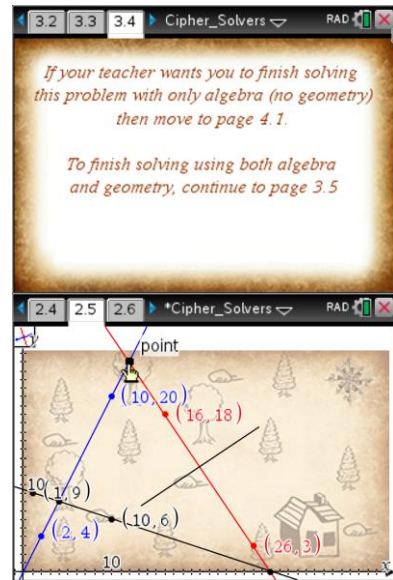
20. Confirm your answer to number 19 using algebra.

Determine the equations of the perpendicular bisectors of each of the three sides of the triangle.

(Each person in the group should determine a different one of these). Show your work below.

***Continue to number 22 on the next page.**

(Continue here for the algebra only solution)

21. Each person in the group will pick a different side of the triangle and will find the equation of the line that is perpendicular to that side and that passes through the midpoint of the side. You will need to decide which midpoint to use for each side of the triangle.

    Midpoints: (20, 12)   (16, 4)   (8, 16)

    Show your work below.

(All students continue with this question)

22. Write the three equations found by the members of your group below.

    Eq. 1_____   Eq. 2_____   Eq. 3 _____
    Graph these three lines on page 2.5 (and on the graph paper) to confirm that they are correct.
    Make any necessary corrections.

23. Determine the coordinates where each pair of lines intersects. Use algebra to do so and show your work below. Each person in the group will find the intersection point of two different lines.

24. Write the coordinates of the points of intersection found by the members of your group below.
   Express them in two ways: as an exact fraction and rounded to the nearest thousandth.

    Eq 1 and Eq 2   _____   _____

    Eq 2 and Eq 3   _____   _____

    Eq 1 and Eq 3   _____   _____

25. Move to page 5.1. Follow the instructions and enter the coordinates of the intersection you determined in question Type the x-coordinate, then select [tab]. Type the y-coordinate. Select [enter].
Did you find the treasure?
If so, great!
If not, follow the directions on the screen.
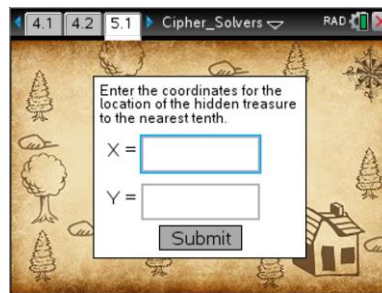
26. Read pages 6.1 and 6.2. Then move to page 6.3.

27. Select [E] to Encrypt or select the Encrypt button.

Type an encryption key: any 4- to 12-digit number and select [enter] . Write it below.

Type your message using only letters and spaces.
When finished typing, select [enter] . Write the message below.

The encrypted message is displayed, along with the key.
Write it below (it will contain letters and spaces).

Select 'clear' twice, by selecting [ctrl] [del] twice. This will navigate back to the main menu.

Select [D] to decrypt. Follow the instructions on the screen.

Do another encrypted message, if you like. Share within your group.