# Style By STEM
Student Activity

Name _____

Class _____

Integration of Algebra, Geometry and Fashion

In this activity you will investigate how the points on a circle can lead to some mathematics that is useful when designing a particular type of skirt for a special client.

1. Run (execute) the program "STLBYSTM".

2. Read the opening screen. Press ▶ to proceed to the next screen.

3. Read pages 1.2 to 1.4 and make notes as needed. Use ▶ and ◀ to navigate between pages.

4. Navigate to page 1.5. Press enter to start the simulation and use the right and left arrow keys to move the red point around the circle. Right moves clockwise and left moves counter clockwise.

    As you move the point around the circle what patterns do you notice? What values are *X* and *Y* always between?
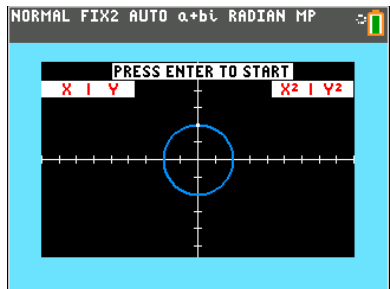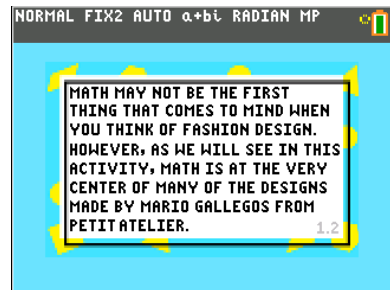
5. For the original circle, move the point to nine different positions and fill out the table below.

X	Y	X^2	Y^2	$X^2 + Y^2$

Use your work in the table to answer the questions below.

a. Between what two values is X^2 always between?

b. What is the maximum value for Y^2?

c. What do you notice about the sum of X^2 and Y^2?

d. Why do you suppose this happens?

6. Press the ⊞ key to show a right triangle.

a. As you move the point around now, what coordinate value corresponds to the length of the horizontal leg of the triangle? What coordinate value corresponds to the length of the vertical leg?

b. What part of the triangle represents the radius of the circle?

c. Write an equation showing how the legs are related to the hypotenuse of the triangle.

7. Press the ▲ or ▼ key or type a number 1 – 4 to change the radius. Does the pattern you noticed in part 6 hold true for any circle centered at (0, 0)? Explain
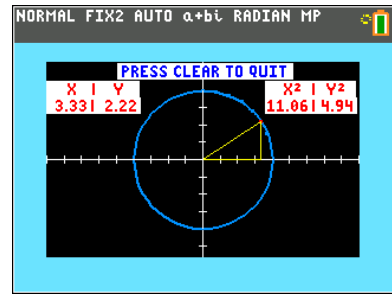
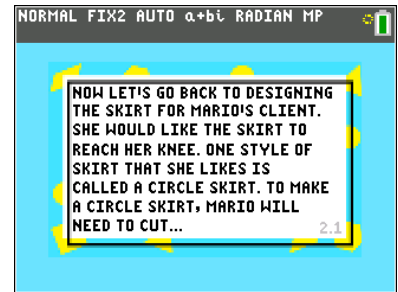8. Based on your exploration, what is the equation of a circle centered at (0, 0) with radius *r*?

9. Now that you've generalized the equation for a circle at (0, 0), we are ready to get back to designing the circle skirt with Mario. Press `clear` to quit the simulation and then press ▶ to proceed to page 1.6.
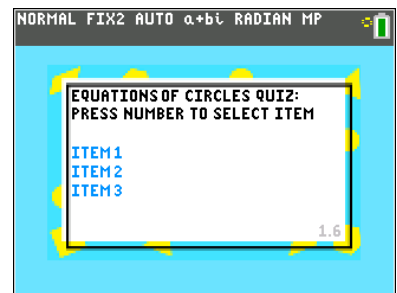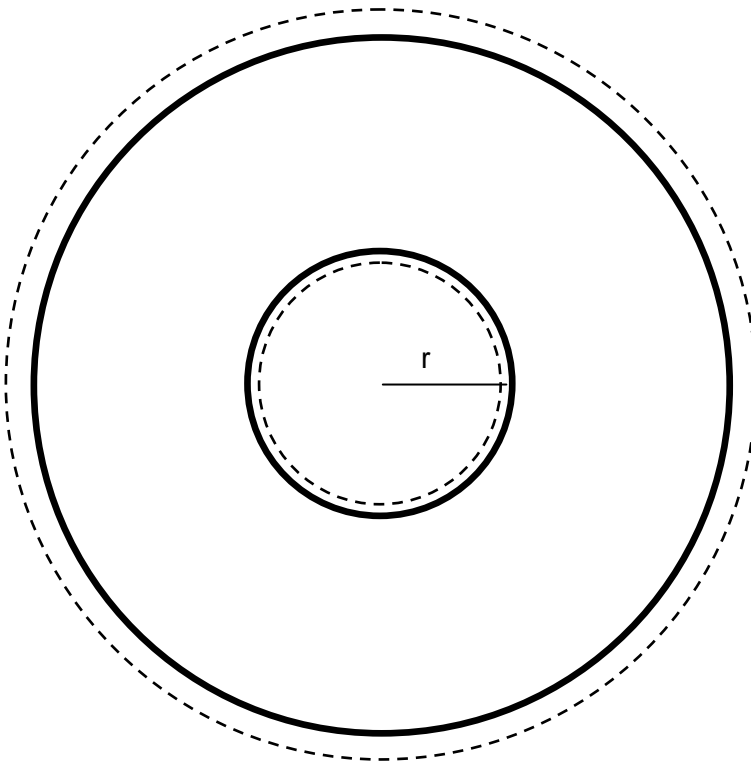
10. Use the number keys to select an item for the Equations of a Circle Quiz. Write your answers to all three questions below. Show the necessary work. (Hint: the equals sign is under the test menu on your calculator)

    a. Question 1: What is the equation of a circle with radius 5, centered at (0, 0)?

    b. Question 2: What is the radius of a circle that is defined by the equation, $X^2 + Y^2 = 144$?

    c. Question 3: What is the equation of the circle with radius $\sqrt{24}$, centered at (0, 0)?

11. Press ▶ to proceed to page 2.1. Read pages 2.1 and 2.2 making notes if necessary.

NORMAL FIX2 AUTO a+bi RADIAN MP

NOW LET'S GO BACK TO DESIGNING THE SKIRT FOR MARIO'S CLIENT. SHE WOULD LIKE THE SKIRT TO REACH HER KNEE. ONE STYLE OF SKIRT THAT SHE LIKES IS CALLED A CIRCLE SKIRT. TO MAKE A CIRCLE SKIRT, MARIO WILL NEED TO CUT...   2.1

12. Answer the question on page 2.3 using the diagram of the pattern below. The dashed lines are the cuts and the solid lines represent where the hems will be folded.

NORMAL FIX2 AUTO a+bi RADIAN MP

SUPPOSE THE CLIENT HAS A 28IN WAIST. WHAT RADIUS WILL MARIO NEED TO CUT FOR THE INNER CIRCLE IF HE LEAVES 0.5IN FOR FOLDING A HEM? USE THE DIAGRAM IN YOUR HANDOUT FOR REFERENCE.
PRESS 1 FOR CALCULATOR
PRESS 2 TO SUBMIT ANSWER   2.3
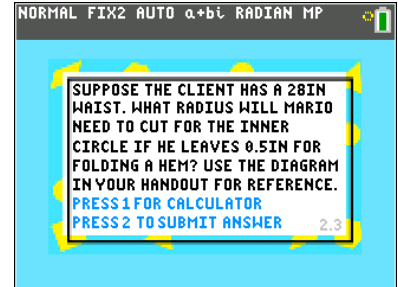
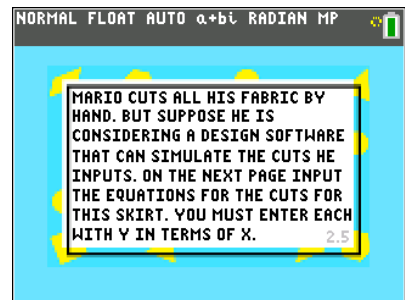Round your answer to the nearest half inch.

13. Answer the question on page 2.4 using the diagram of the pattern below.
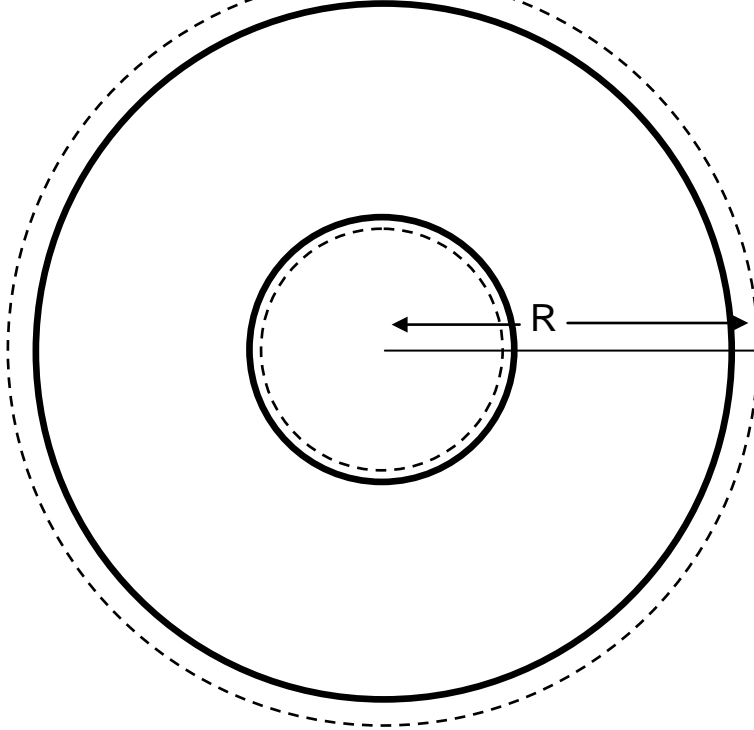
Round your answer to the nearest half inch.

14. Press ▶ to and read page 2.5. Write the equations for the circles of each cut Mario will have to make. Assume that the center of the skirt is at (0, 0).

15. On page 2.6, press enter to start the interactive question. Make sure to solve your equations from part 14 for *Y* in terms of *X*, then enter the positive portion of the equations into the appropriate prompts.