

Warm up:

Write careful directions that describe how to walk from the door of your math classroom to the main office of your school.



1.4 Drawing From a Recipe

Objectives:

- Analyze visual scenes in order to draw them.
- Develop clear language to describe shapes.

In-Class Experiment

Textbook p.19



Drawing From a Recipe

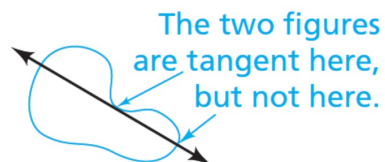
Step 1 Draw a horizontal line segment.

Step 2 Above the segment, draw two circles that are the same size and tangent to the segment. *Tangent* means “just touching.” Leave some space between the two circles—a space roughly the size of the circles’ diameter.

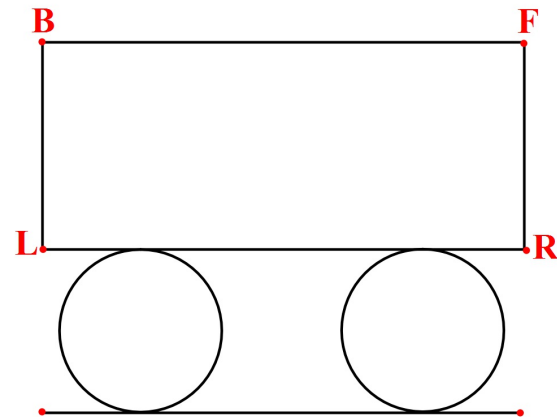
Step 3 Draw a line segment above the two circles and tangent to them. It should extend slightly beyond the two circles. Label this segment’s left endpoint L and its right endpoint R .

Step 4 From L , draw a segment upward that is perpendicular to \overline{LR} and about half the length of \overline{LR} . Label its top endpoint B . From R , draw another segment in the same way. Label its top endpoint F .

Step 5 Draw \overline{BF} .



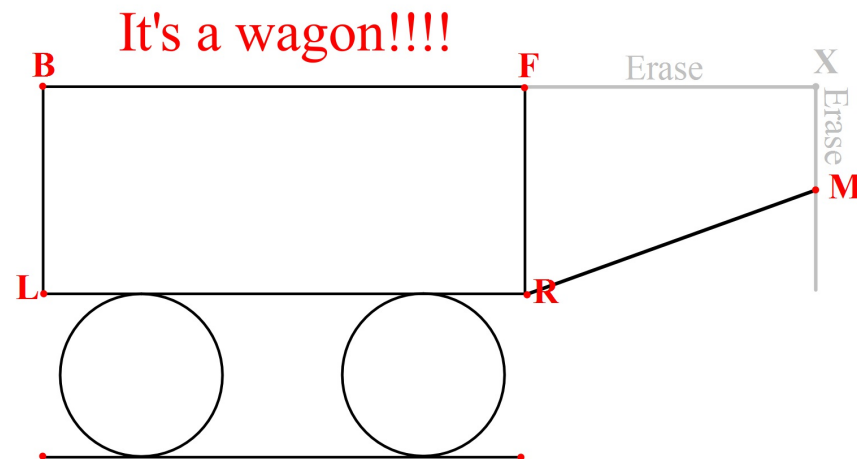
Here's what I did... How did you do?



Step 6 Use a pencil to lightly extend \overline{BF} about two thirds of its length to the right. Label the endpoint of the new segment X .

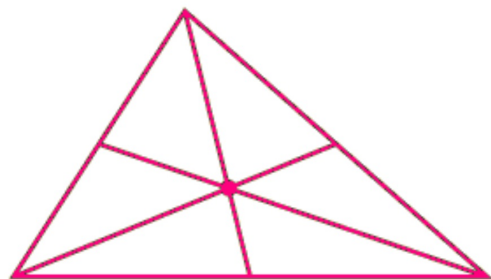
Step 7 Use a pencil to lightly draw a segment downward from X that is perpendicular to \overline{LR} . This segment should be roughly the length of \overline{FR} . Find the midpoint of this new segment. Label it M .

Step 8 Draw \overline{MR} . Then erase the construction lines from Steps 6 and 7. What does your picture look like?



Check Your Understanding

1. Use a pencil and straightedge to draw a large triangle. Find and label the midpoint of each side. Connect each midpoint to the opposite vertex. Label the points where these three segments intersect.



Exercises 2–4 describe how to draw certain letters of the alphabet. Use the descriptions to draw the letters. The descriptions are fairly good, but you may have to guess what some parts of the descriptions mean. Check whether your results make sense.

2. Draw an equilateral triangle with 2-inch sides and a horizontal base. Find and connect the midpoints of the two nonhorizontal sides. Erase the base of the original triangle. What letter did you draw?



The prefix *equi-* means "equal." *Lateral* means "side." *Equilateral* means "sides with equal length."

3. Draw a circle with a $\frac{1}{2}$ -inch radius. Draw a slightly larger circle directly below and tangent to the first circle. Draw the vertical segment that connects the centers of the circles. Draw the horizontal diameter of each circle. In the top circle, erase the bottom right 90° section of the circle. In the bottom circle, erase the top left 90° section of the circle. Then erase the vertical and horizontal segments that you sketched. What letter did you draw?
4. Draw a circle. Draw two diameters that are about 45° from vertical and are perpendicular to each other. Erase the 90° section of the circle on the right side of the circle. Then erase the diameters. What letter did you draw?

3.



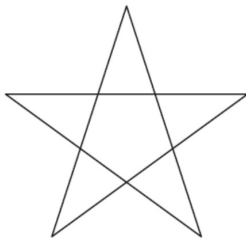
4.



On Your Own

Classwork: p.20 (5, 7, 8 & 9)

5. Write directions that describe how to draw your initials. Use precise language. Some letters are complicated to draw, so take advantage of any geometry terms that will make your directions more clear.
7. Write directions that describe how to draw the figure below. Then have three classmates draw the figure following your directions. If any of the three pictures differs from the figure below, explain what you think caused the difference.



8. **Standardized Test Prep** Enrique has a system he uses to draw regular polygons inscribed in a circle.
 - Step 1** He draws a large circle. Then he draws a line tangent to the circle.
 - Step 2** For a polygon with m congruent sides, he divides 360° by $2m$ to get y .
 - Step 3** He then draws an angle with measure y° such that the following statements are true.
 - The point of tangency is the vertex of the angle.
 - The tangent line is one side of the angle.
 - The other side of the angle passes through the circle.
 - Step 4** Next, he draws a line segment from the point of tangency to the point where the other side of the angle intersects the circle.
 - Step 5** Finally, he uses a compass to construct $(m - 1)$ segments with endpoints on the circle such that the following are true:
 - The $(m - 1)$ segments are congruent to the first segment.
 - The m segments form a regular polygon.

If Enrique wants to draw a regular nonagon, or nine-sided polygon, inscribed in a circle, what number of degrees will he use for his angle with the tangent?

- A. 10° B. 20° C. 40° D. 80°

9. Carefully read and follow the recipe below.

Step 1 Draw a circle. Label the center of the circle point A .

Step 2 Draw a radius of the circle. Label its endpoint on the circle point B .

Step 3 Draw a segment that is tangent to the circle at B . The segment should be longer than the diameter of the circle.

Step 4 Draw a second radius of the circle that is perpendicular to \overline{AB} . Label the point where it touches the circle point D .

Step 5 Draw a segment that is tangent to the circle at D . The segment should be longer than the diameter of the circle.

Step 6 Label the intersection of the two tangent segments point C .

a. What kind of quadrilateral is $ABCD$?

b. Make a conjecture. In a circle, what is the measure of the angle formed by a radius and a line that is tangent to the circle at the endpoint of the radius?