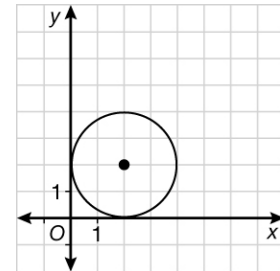


Gearing Up

A gear is essentially a circle with teeth along its circumference. For a system of gears to work together, the collection of gears must mesh, that is, have teeth that interlock. This means that the circles representing gears should be tangent to one another.

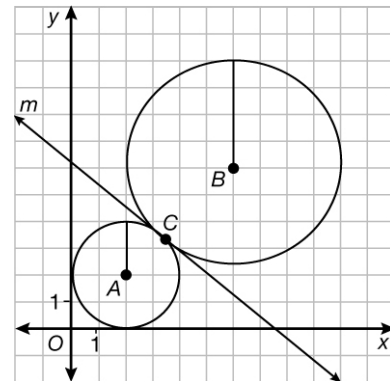
1. The diagram shows a small gear.



- a. On this grid, sketch a gear that is congruent to the one shown, a translation of this gear to the right, and also externally tangent to the gear shown.
- b. Write equations for the given gear and its translation. Explain your reasoning.

- c. Write an equation for the line that is tangent to both gears at the point where they mesh. Explain your reasoning.

2. This diagram shows a pair of gears and the line that is their common tangent at point C.

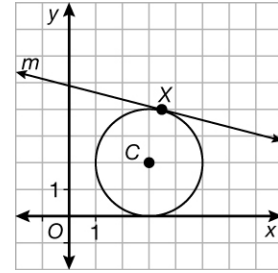


- a. Find the slope of line m by using the slope of \overline{AB} . Show your work.

- b. Find equations for gears A and B. Show your work.

- c. What fractions of AB are AC and CB ? Explain your reasoning.

3. This diagram shows gear C and a tangent line m at point X .

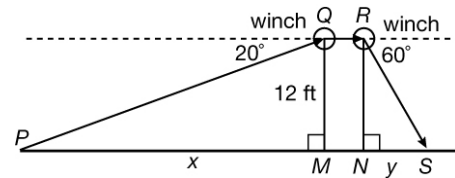


a. Explain how to position a second gear, gear D , congruent to gear C and the reflection of gear C across line m .

b. On this grid, sketch the reflection of gear C across line m .

c. Find the slope of line m . Show your work.

4. Workers used a winch with gears to raise boxes from ground level at P to Q . They used a winch to lower boxes from R back to ground level at S .



a. To the nearest tenth, find x , the horizontal distance between P and M . Show your work.

b. To the nearest tenth, find y , the horizontal distance between N and S . Show your work.

5. This diagram shows gears centered at A , B , and C along \overline{AC} . It also shows tangent lines p and q . Explain why p and q are parallel.

