



**Grade 7/8 Math Circles**  
Winter 2019 – Feb. 5/6/7  
*Ruler-and-Compass Constructions*

**Solutions to in-lesson problems**

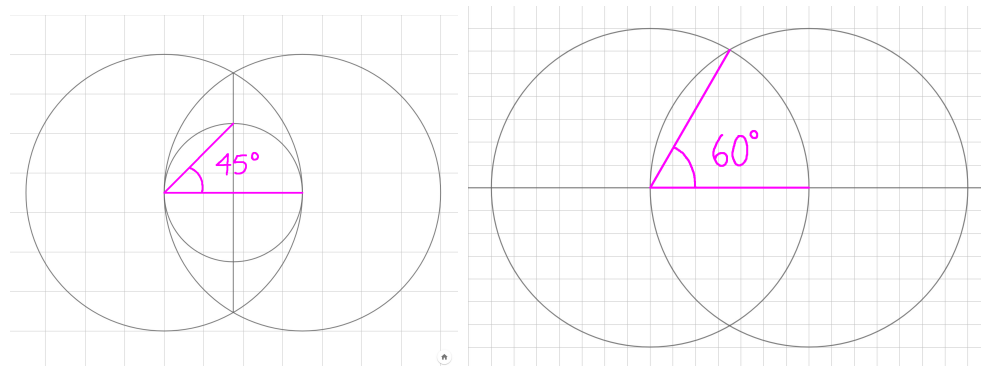
Blanks in order of occurrence: *straight lines, a circle.*

**Creating an octagon**

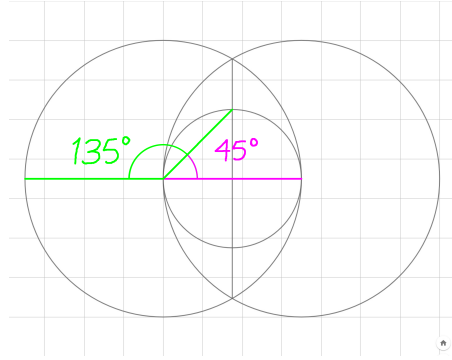
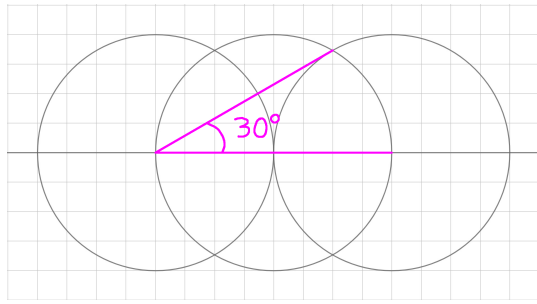
Begin by constructing a square. Then create perpendicular bisectors along each of the sides. Find the points where the bisectors intersect the circle and label them. Then join those points to the existing points of the square to form a regular octagon.

**Solutions to end-of-lesson problems**

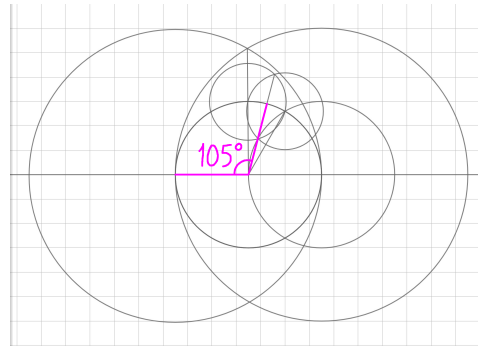
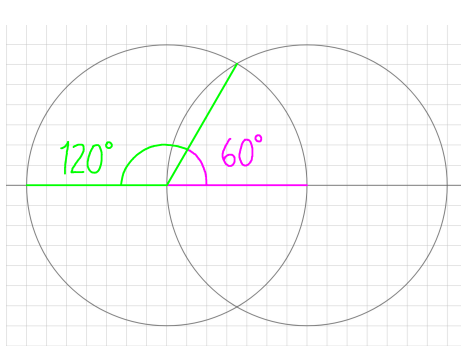
1. (a) To do this, bisect a line, then create a circle centred at the midpoint of that line whose diameter is that of your line. Join the point at the intersection of the circle and the bisector to either end of your line. The resulting angle is  $45^\circ$ .



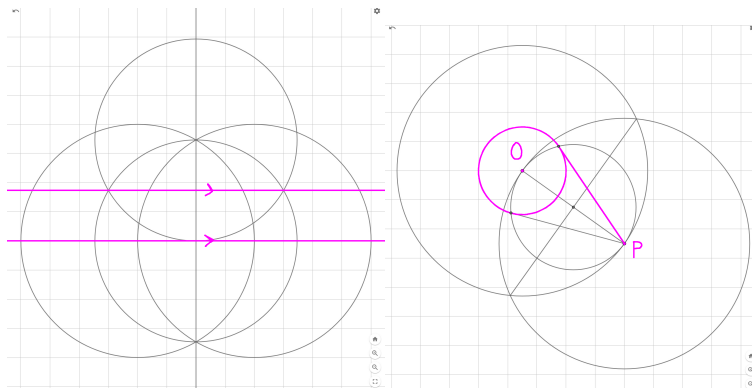
- (b) To construct an angle of  $60^\circ$ , begin with two points,  $A$  and  $B$ . Join them with a line and draw two circles, both with radius  $|AB|$  – one at  $A$  and one at  $B$ . Label the top intersection point  $C$  and the bottom  $D$ . Join either  $A$  or  $B$  to either  $C$  or  $D$ .
- (c) To construct an angle of  $30^\circ$ , bisect your  $60^\circ$  angle.



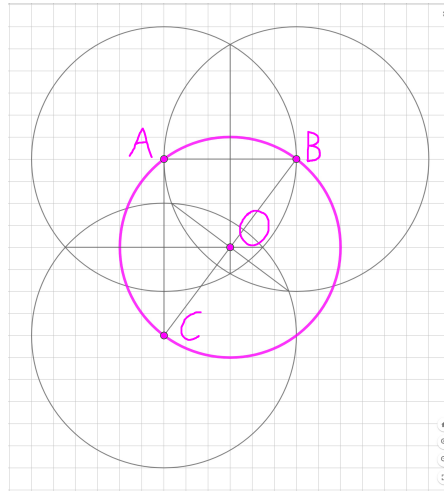
- (d) When you constructed an angle of  $45^\circ$ , you actually constructed an angle of  $135^\circ$  on the other side of it (the obtuse part).
- (e) You actually already constructed an angle of  $120^\circ$  when you constructed an angle of  $60^\circ$ . The  $120^\circ$  angle is on the obtuse side.



- (f) To construct an angle of  $105^\circ$ , begin with your construction of  $120^\circ$ . Erect a perpendicular line through  $B$  and label its intersection with the circle centred at  $A$  to be  $F$ . Bisect the angle  $\angle FBC$  and label the point where the bisector cuts the circle to be  $G$ . Then the angle  $\angle ABG$  is  $105^\circ$ .
2. (a) To do this, erect a perpendicular to the first line, and then a perpendicular through the second line. The first and third lines are then parallel.

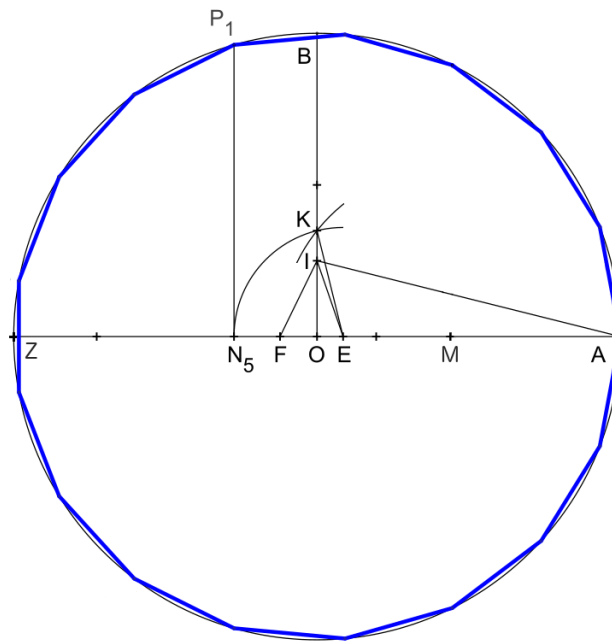


(b) You should have something that looks like the figure on the right above.



(c)

3. When finished, you should have something that looks like this:



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