## July 2021 challenges

1. There are 10 points equally spaced around the circle with interconnecting lines drawn between them.
a. How many lines are needed to draw the 10-point pattern shown below?
b. How many lines would you need for 50 points on the circle?
c. How many lines would you need for 100 points on the circle?

2. In 2015 the populations of City $X$ and City $Y$ were equal. From 2010 to 2015, the population of City X increased by $20 \%$ and the population of City $Y$ decreased by 10\%. If the population of City X was 120,000 in 2010, what was the population of City Y in 2010?
3. Two bicycles start at the intersection of two perpendicular roads. One rides west at a rate of 9 miles per hour, while the other rides south at a rate of 12 miles per hour. If both travelled in the same plane, how many miles are they in the shortest distance between them at the end of 3 hours?
4. The amount of money a performer earns is directly proportional to the number of people attending the performance. The performer earns $£ 60$ a performance for every 12 people attending. The performer pays $43 \%$ of the money earned to pay the organizer's costs in putting on each performance. The rest of the money earned is the performer's profit.
a. What is the profit that the performer makes at a performance where 48 people attend?
b. If the organizer receives $£ 7.50$ per person, per performance, what is the profit that the organizer makes per performance?
