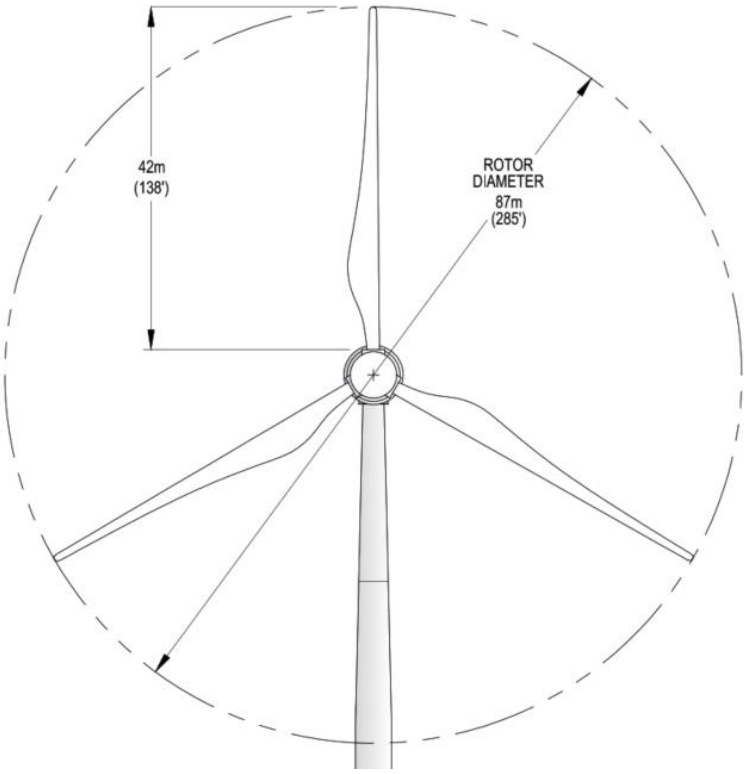
2020Q5 (AREA, FUNCTIONS)

A turbine's *swept area* is the area of the circle that the blades sweep through as they rotate. The circumference of this circle is traced by the tip of each blade. A diagram of One Energy's turbines is shown below.

The dimensions of One Energy's turbine rotor.



Level 1: What is the swept area of one of One Energy's turbines?

Level 2: In the Wind Energy Fact posted on 12/4/2020, we learned that the turbines at the North Findlay Wind Campus complete 16 rotations per minute (RPM) when generating at full capacity, leading to a maximum tip speed of 163 mph. The maximum tip speed is calculated by determining how far the tip of the blade travels in a given time, as shown below:

$$RPM\left(\frac{Rotations}{min}\right) * Circumference\ of\ Swept\ Area\ (\frac{Distance}{Rotation}) = Tip\ Speed\ (\frac{Distance}{min})$$

Determine the tip speed for each RPM below.

RPM	TIP SPEED (MPH)
16	163
13	
10	
8	
4	