

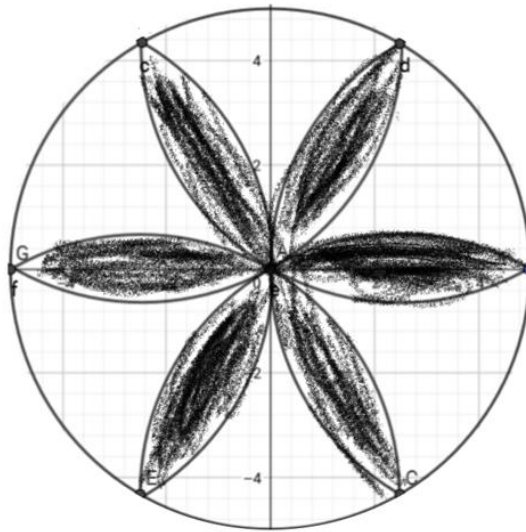
DEC 2017

DEPARTMENT OF MATHEMATICS  
**PROBLEM SOLVING CHALLENGE**

Q1.

Junior Cycle

Find the area of the shaded petal shape inscribed in the circle. The circle's diameter is 10 units.  
Give your answer correct to two decimal places.



Q2.

Senior Cycle

- a) Given the complex number  $Z = 32$ . Find the five roots  $W_1, W_2, W_3, W_4$  and  $W_5$  of  $\sqrt[5]{Z}$  and sketch them on an argand diagram.
- b) Using your answers from part a) find the distance between  $W_1$  and  $W_2$  and prove that  $|W_1W_2| = |W_2W_3| = |W_3W_4| = |W_4W_5| = |W_5W_1|$ .
- c) Show that for the  $n$ th root ( $n > 2$ ) of any complex number  $Z$  that the distance between any root  $W_n$  and  $W_{n+1}$  can be given as:

$$|W_n W_m| = \left( \frac{\sqrt[n]{|Z|} \left( \sin \left( \frac{360}{n} \right) \right)}{\sin \left( 90 - \frac{180}{n} \right)} \right)$$

Answers on an A4 sheet with your Name, Year and Class should be given to Mr. McManus or to Mr. McEvoy in room 33 before 4pm on Friday 22<sup>nd</sup> of December.

Monthly Prize for both Junior and Senior Cycle.\*

Good Luck.

Junior Cycle students answer question 1 only.

Senior Cycle students answer question 2 only