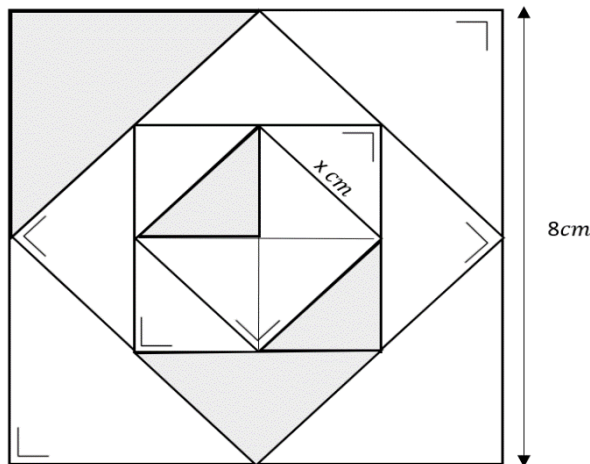# DEPARTMENT OF MATHEMATICS
PROBLEM SOLVING CHALLENGE

Q1. *Junior Cycle*

(i) Find the value of x in the diagram below. Leave your answer in surd form.
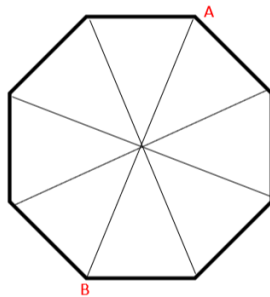
(ii) Show that the area of the shaded region of square below is equal to one quarter the area of the entire shape.

Q2. *Senior Cycle*

A regular shape with n sides is traditionally called an n-gon. For example, a shape with 22 equal sides can be called a 22-gon. A well-known n-gon is the octagon (n=8).

(i) Prove that the perimeter divided by the largest chord length of an octagon is always ≈ 3.061 regardless of the size of the octagon.

(ii) Show that the perimeter divided by the largest chord of an n-gon is $nsin\left(\frac{180}{n}\right)$.

(iii) Explain why $\lim\limits_{n\to\infty} nsin\left(\frac{180}{n}\right) = \pi$

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 27th of April.

Monthly Prize for both Junior and Senior Cycle.*

Good Luck.

Junior Cycle students answer question 1 only.   *Senior Cycle students answer question 2 only*