Student Name:_____

Please write your name on *every* page.

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## Section E

**E1.**

Timmy is not doing too well in his math courses! He currently has a 60% average, and each of his tests in the course are weighed equally. After getting a 80% on his next test, he has a new average of 64%. Timmy has two tests remaining in the course. If he gets a 80% on one of the tests, what is the minimum grade he must get on the other in order to have a 70% average in the course?

Answer to E1: _____

**E2**

How many different ways are there to arrange the letters in “ILIKEMATH”?

Answer to E2: _____

**E3**

How many isosceles triangles with integer sides are there with perimeter less than 20?

Answer to E3: _____

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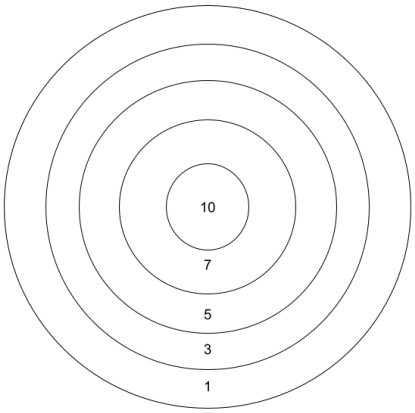
**E4**

Bob is playing darts on the following bullseye target, where each ring has "width" 1 and the center bullseye has radius of 1. Bob is equally as likely to hit any point on the target (he will also always hit the target), what is Bob's average score per throw?




Answer to E4: _____

**E5**

Jerry and Gary are playing a game. Jerry writes n integers less than 100 which are coprime to each other. Gary then must choose a prime number x. If any of Jerry's numbers are divisible by x, Gary wins. Otherwise, Jerry wins. What is the minimum value of n such that Gary will always win.

Answer to E5: _____

**E6** Note that the sum of the digits of 2024 is equal to 8. We call this number a "special" number. Find how many 4 digit special numbers there are.
(Reminder: Numbers such as 0135 and 0967 are not 4 digit numbers)

Answer to E6: _____

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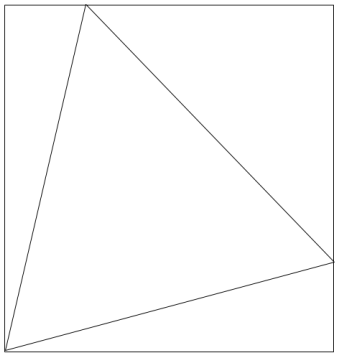
**E7**

In the city of Waterloo, the city uses a special type of pipe, where a triangular prism with equilateral faces is then encased by a rectangular prism pipe with square faces. An example of a cross section of the pipes is provided below



If the side lengths of the square are equal to 1m, what is the total volume of a 100m length section of the smaller triangular pipe?

Answer to E7: _____

**E8:** What is the smallest number n such that 2024 in base n is divisible by 11.

(Recall that for example, 2024 in base n is equal to $2n^3 + 0n^2 + 2n + 4$ )

Answer to E8: _____