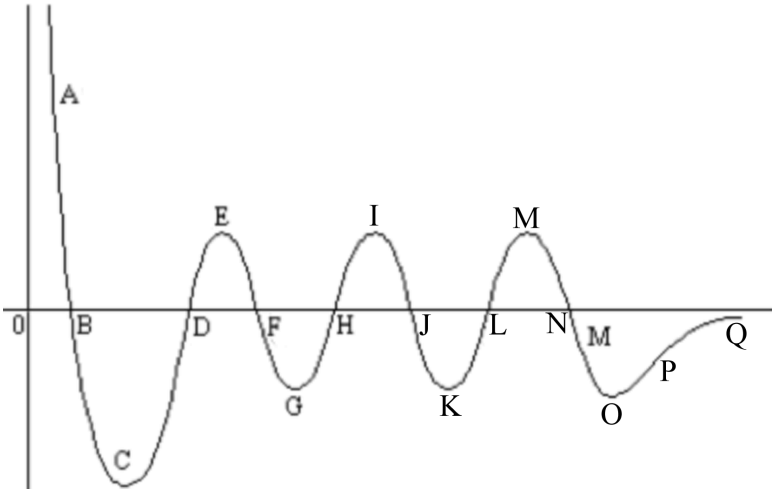
BLC-190 First Class



On some scrap paper write a story about this graph or part of this graph.
The letters are there so that you can refer to specific locations if you want.

Art Project: Using linear or quadratic formulas, construct one of the following.

a) Make a smiley face using a quadratic equation and two points. Then make a frowny face.

b) Make a perfect square which is not parallel to the x or y axes.

c) Make a 5-pointed star.

d) Come up with something else...

1

2 3

4 6 9

8 12 18 27

16 24 36 54 81

32 48 72 108 162 243

64 96 144 216 324 486 729

128 192 288 432 648 972 1458 2187

256 384 576 864 1296 1944 2916 4374 6561

The above triangle of numbers is based on the "Platonic Lambda."
This is sort of an ancient Big Bang theory of the creation of the cosmos from mathematics.

Analyze this set of numbers. Find patterns, groupings, sequences, discrepancies, etc. Draw on the set of numbers. Arrows, boxes, triangles, lines, etc. Analyze it. Find interesting things. How was this arrangement made... what is its recipe? Jot down notes so that you can report your findings.

What is π?

100 pieces of π

π ≅ 3.14159265358979323846264338327950288419716939937510582097494459230781640628620899862803482534211706 79

15 digits of π π ≅ 3.14159265358979

An efficient approximation. $\frac{\text{Digits of Accuracy}}{\text{Digits in Fraction}}$

$\frac{22}{7}$ is a very good and efficient approximation of π.

$\frac{22}{7}$ has three characters, (2, 2, and 7), and you get 3 digits of accuracy: $\frac{22}{7} = \underline{\mathbf{3.14}}28...$ 3, 1, and 4.

Efficiency rating: 3/3 = 100%. [digits-of-accuracy/digits-in-fraction = 3/3]

It's a solid efficiency rating, but memorizing the three characters of $\frac{22}{7}$

has no advantage over memorizing the three digits, 3.14.

Your task (in pairs or triplets): Find another, simple, and efficient rational approximation for π...

...meaning... find a value that can be written as $\frac{x}{y}$, where x and y are counting numbers.

Your objective is to get a high efficiency fraction: $\frac{\text{Digits of Accuracy}}{\text{Digits in Fraction}}$.

Note: When computing efficiency, compare values rounded to a comparable number of decimal places.

E.g. Let's say you come up with a rational fraction that yields this: 3.1415202366.... You need to compare it to the modern decimal value for π. Place your approximation directly over the modern estimate and extend them a couple of decimal places beyond where they agree with each other.

3.141520 = your approximation rounded off to 6 places [7 digits total].
3.141593 = the modern estimate rounded off to 6 places [7 digits total].

Now truncate both numbers until they agree. When truncating you'll sometimes have to do some rounding off, but not this time because you are chopping off a 0 and a 3.

3.14152 = your approximation rounded to 5 places.
3.14159 = modern estimate rounded off to 5 places.

They don't agree yet... chop off the 2 and the 9..... this will require rounding off...

3.1415 = your approximation rounded to 4 places.
3.1416 = modern estimate rounded to 4 places.

They still don't agree.... chop off the 5 and the 6... which will require rounding both up...

3.142 = your approximation rounded to 4 places.
3.142 = modern estimate rounded to 4 places.

Now they agree. Thus your approximation works to 3 decimal places or 4 digits total.

In pairs or triplets....

Before you start computing, discuss the problem in your group and come up with strategies for solving the problem. Each member of each group should then come up with a fraction or fractions to approximate π. These fractions should be in the form $\frac{x}{y}$,

(where x and y are counting numbers (1, 2, 3, 4, etc.), not irrational numbers or decimals).

Once you have several rational fractions, figure out their efficiency ratings.
Compare results. Take good notes.

Refine your group tactics and do another round of fractions. Determine their efficiencies.
Compare and notate.

After a couple of rounds, you'll report to the class your strategies, your most efficient results, and your ideas for future refinements in methodology.

Summary: Find the most efficient rational fraction to approximate π.

Addendum: Discuss how we might better evaluate these rational approximations so that we could incorporate the number of decimal places of accuracy.