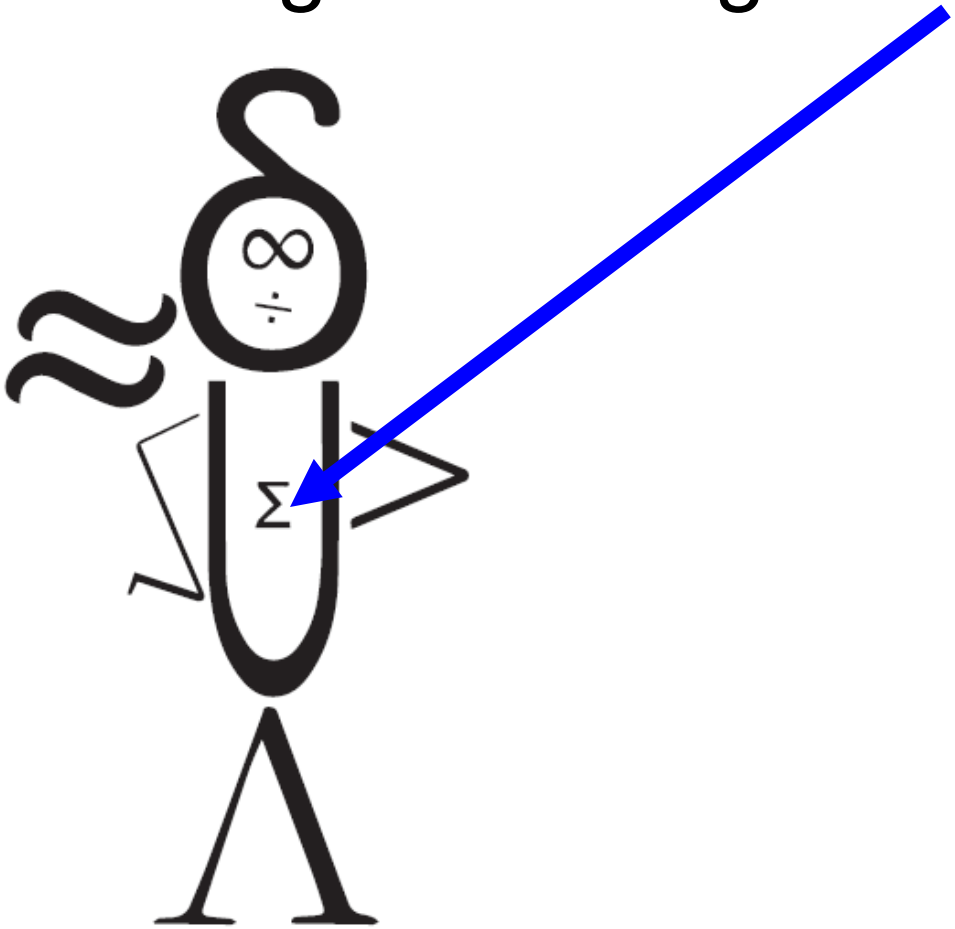
2017
Calhoun Community College Mathematics Tournament

CIPHERING

PRACTICE Question 1

Write the name of the Greek letter emblazoned on the chest of “The Significant Figure” here:



Answer to PRACTICE Question 1

SIGMA

PRACTICE Question 2

Buddy the elf is *hungry*.

How many different ways can he choose, without regard to order, two different items from his four main food groups (candy, candy canes, candy corn, and syrup)?

Answer to PRACTICE Question 2

6

Question 1

The sum of two positive numbers is five times their difference. What is the ratio (written as a fraction) of the larger number to the smaller number?

Answer to Question 1

$$\frac{3}{2}$$

Question 2

Find the product of the real roots for

$$\frac{1}{3}x^2 = -\frac{1}{2}x + \frac{1}{3}.$$

Answer to Question 2

-1

Question 3

What is the smallest number greater than $\mathbf{20{,}000}$ that is divisible by the product of the first five prime numbers?

Answer to Question 3

20,790

Question 4

If $\sin x + \cos x = \frac{1}{2}$,

what is the value of $\sin^3 x + \cos^3 x$?

Answer to Question 4

$$\frac{11}{16}$$

Question 5

Find the sum of the squares of the first fifty positive integers.

Answer to Question 5

42,925

Question 6

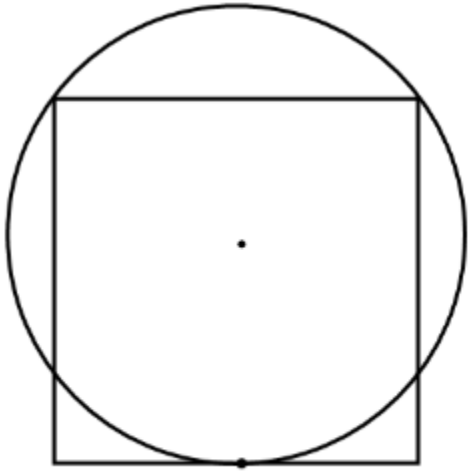
What is the largest integer n such that $\dfrac{n^2-38}{n+1}$ is an integer?

Answer to Question 6

36

Question 7

A circle passes through two adjacent vertices
of a square and is tangent to one side of the square.
If the side length of the square is 2,
what is the radius of the circle?



Answer to Question 7

$$\frac{5}{4}$$

Question 8

Find the largest critical number of the function:

$$f(x) = sin^2(6x) + \cos(6x), 0 < x < \frac{\pi}{3}.$$

Answer to Question 8

$$\frac{5\pi}{18}$$

Question 9

What is the positive angle, less than 180 degrees, formed by the hands of a clock at precisely 1:20 p.m.? (Write the measure of the angle in degrees.)

Answer to Question 9

80°

Question 10

Nicholas wants to serve holiday cookies,
but is in need of an open box.
He has a square scrap piece of poster board,
12 inches on a side.
If he cuts equal squares from each corner,
turns up the sides, and tapes them together,
what is the volume of the largest box he can make?
You must include the unit in your answer.

Answer to Question 10

128 in.^3