

# The 33<sup>rd</sup> Annual Connecticut Community Colleges Math Contest

## Directions for Student Participants

**Please read these directions carefully before starting the test!**

1. Only students currently enrolled in the community college system are eligible to participate.
2. Do not begin the test until instructed by the test monitor.
3. You have two hours to complete all the questions. Some questions are worth 1 point, some are 2 points, some are 3 points, and some are 4 points.
4. You are allowed to use calculators. No books, notes, or other aids are allowed. You may not share calculators during the test.
5. You will be provided with scrap paper and graph paper, on which you can do all your work.
6. All answers **MUST** be recorded on the answer sheet provided. Answers must be fully simplified, and exact answers must be given unless otherwise specified.
7. All answers must be complete, legible, and with the proper units or labels (for example: inches, pounds, dollars, miles per hour, etc.) No partial credit is given.
8. Please record all answers with a ball point pen.
9. Please sign the answer sheet and initial the test question sheet with a ball point pen.
10. Please return all test papers to the test monitor before leaving, which you can do once you are done.

Sincerely, the Contest Committee

## The 33<sup>rd</sup> Annual Miguel Garcia Math Contest

Sponsored by MATYCONN: Spring 2024

### One Point Questions:

- 1) What is the  $y$ -intercept of the line as an ordered pair:

$$2x - \frac{1}{3}y + 3 = 0$$

- 2) If  $A * B$  is defined as  $(A + 1)(B + 1)$ , then compute the value of  $(2 * 3) * 4$

- 3) The Yankees and Phillies met in the mathematical World Series! It went 7 games! In the odd numbered games, the Yankees scored 1 more run than the Phillies. In the even numbered games, the Phillies scored 2 more runs than the Yankees. Which team scored more runs overall?

- 4) In a bowl of jellybeans,  $\frac{1}{3}$  are yellow,  $\frac{1}{4}$  are green,  $\frac{1}{6}$  are red, and 6 are purple. How many jellybeans are in the bowl?

- 5) Sue is trying to crack the combination of her three-digit lock. Here are the results of her previous attempts:

- 7 9 3 - one number is correct and well placed
- 7 2 5 - one number is correct but wrongly placed
- 3 1 7 - two numbers are correct but wrongly placed
- 8 4 9 - nothing is correct
- 8 9 1 - one number is correct but wrongly placed

What is the combination?

- 6) Nick and Steve both have some pieces of candy. If Nick gives Steve one piece of candy, Steve will have twice as many as Nick. If Steve gives Nick one piece of candy, they will both have the same amount. How many pieces of candy does Nick have?

**Two-point questions:**

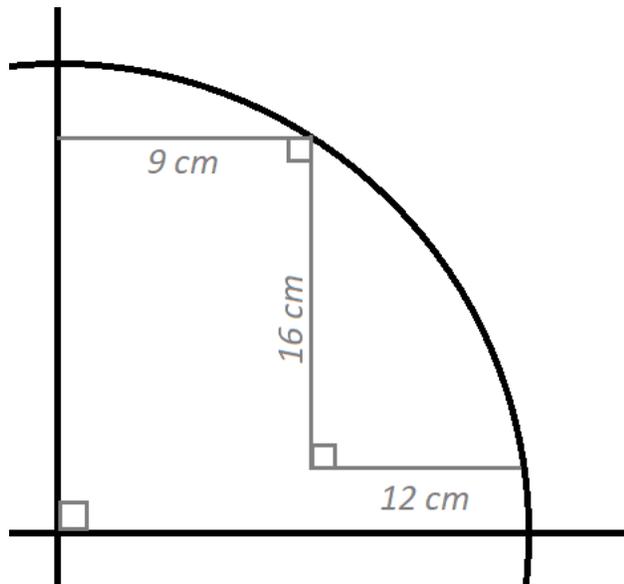
- 7) The number  $B$  is 25% more than the number  $A$ , the number  $C$  is 20% more than  $B$ , and the number  $D$  is  $x\%$  less than  $C$ .  
If  $D = A$ , what is the value of  $x$ ?
- 8) Solve:  $\frac{1}{x} + \frac{1}{x+1} = \frac{3}{2}$
- 9) Find positive integers  $p$  and  $q$  such that  $\frac{1}{p} + \frac{1}{q} = \frac{7}{12}$
- 10) You have 42 cubes, each  $1\text{cm} \times 1\text{cm} \times 1\text{cm}$ . With them you build a solid rectangular prism whose base has a perimeter of  $18\text{cm}$ . What is the height of your prism?
- 11) Solve:  $\sqrt{12x} = x!$
- 12) Find the prime numbers  $p$  and  $q$  such that  $p + q = (p - q)^3$
- 13) If  $(\sqrt[5]{8}) \cdot (\sqrt[3]{16}) = 2^N$ , what does  $N =$ ?
- 14) Solve the system:  
 $5w + 10d = 100$   
 $14w + 7d = 3w + 9d$

**Three-point questions:**

- 15) Given  $f(x) = x^2 + 1$  find the equation of the line that passes through points  $(1, f(1))$  and  $(3, f(3))$
- 16) There are 71 students in the Travel Club. They discovered that 37 members have visited Canada, 34 have visited Mexico, 33 have been to Scotland, 13 have visited Canada and Mexico, 11 have been only to Scotland, and 15 have been only to Canada. 9 have been to Canada and Mexico, but not to Scotland. Some club members have not been to any of the three foreign countries, and some have been to all three countries.  
How many students haven't been to any of the three countries?
- 17)  $f(x) = x + x^2 + x^3$  find  $f(x + 1) - f(x) =$
- 18) You score 20 more points on your final exam than you did on your second quiz. The average of your two quizzes is 75. Each quiz is worth 25% of your overall grade and the final exam is worth 50%. Your overall average is an 80. What score did you get on your first quiz?
- 19) Find the perimeter of the right triangle whose area is  $210 \text{ ft}^2$  and whose hypotenuse is  $37 \text{ ft}$ .
- 20) Michelle has some pebbles that she is trying to sort into equal rows. When she tries to make rows of 3, there are 2 pebbles left over. When she tries to make rows of 4, there are 2 pebbles left over. When she makes rows of 5, there are no pebbles left over. What is the minimum number of pebbles she has?

**Four-point questions:**

- 21) Find the radius of the circle:



- 22) A train running between two towns arrives at its destination 10 minutes late when it runs 48 miles per hour; it arrives 16 minutes late when it runs 45 miles per hour. Find the distance between towns.
- 23) What is the maximum number of times Friday the 13th can occur in a traditional calendar year?
- 24) Consider the trapezoid created by the  $x$ -axis and the line  $y = \frac{1}{2}x + 1$  between  $x = 2$  and  $x = 4$ . If you split the trapezoid into two smaller trapezoids with a vertical line, what *exact* value of  $x$ , creates trapezoids where the area of each trapezoid is the same?
- 25) If  $x + y = 19$  and  $xy = 9$ , what does the value of  $x\sqrt{y} + y\sqrt{x} = ?$