Solutions:
Central Arizona College's
15th Annual Middle School Math Contest

Hello and Welcome to Central Arizona College's 15th Annual Middle School Math Contest! We are glad you are participating!

This test will be used to determine this years Central Arizona College's Pinal County Mathlete!

The test contains three-sections.

First section: student data (your complete and legal first / last name, and the name of your school)

Second section: Contains 15-questions. You are required to submit an answer for each of the 15-questions before you can advance to the third and final section.

Third section: Contains 35-questions and is single elimination. Your test will end once you submits an incorrect answer.

When the test ends you will be asked to complete a one-question survey. Your feedback on this survey is appreciated.

Good Luck! and Thank you for competing!

* Required

Section 1: Student Information

Please enter your full first and last name and the full name of the school you attend in the following boxes.
Please type your full and legal first and last names. *

Please type the name of your school. *

11/30/2020
Section 2: Multiple Choice-Complete All

This section of the test contains 15-Multiple Choice questions. Complete each question and submit the best answer choice before moving on to the next question. All Questions must be answered before you can move on to the next section, Multiple Choice: Single Elimination.

Eight people had a Covid-19 test and the results are shown below. The three possible outcomes are positive(P), negative(N) and inconclusive(IC). If a person is selected randomly from the group of people, what is the probability that his/her result is not N? *
(1 Point)

\[P, IC, IC, P, P, IC, N, N\]

- \(\frac{2}{3}\)
- Correct: \(\frac{3}{4}\)
- \(\frac{1}{4}\)
- \(\frac{1}{2}\)
- None of the above.

11/30/2020
Given that ABCD and BDEF are rectangles, find the area of the shaded region. *
(1 Point)

- Correct : 24
- 20
- \(16\sqrt{5}\)
- \(8\sqrt{5}\)
- None of the above.
The clues below describe a three-digit number.
- The hundreds digit is 4.
- The ones digit is 3.
- The three-digit number is divisible by 3.

Which of the following could be the tens digit of the number? *

(1 Point)

○ Correct : 2
○ 3
○ 6
○ 9
○ None of the above.

Use the following information to find the value of the expression. *

(1 Point)

\[ r \odot s = 2r + 3s \quad \text{Find: } 3 \odot (4 \odot 5) \]

○ 23
○ 43
○ Correct : 75
○ 76
○ None of the above.
A student has 6-dimes and 2-nickels in his pocket. He selects one-coin at random, looks at it and puts it back. Then he will select another coin at random. What is the probability that the two-coins the student selects add up to 15 cents? *

(1 Point)

○ 1

○ Correct : $\frac{3}{8}$

○ $\frac{1}{2}$

○ $\frac{9}{16}$

○ None of the above.
The graph shown appears on the interval [-6, 6] with line segments connecting designated points whose x and y values are integers. Using these graphs, find the value of (f+g)(2). *  
(1 Point)

- 2
- Correct: -1
- 4
- 6
- None of the above.
ABCD is a parallelogram such that AB is parallel to DC and DA is parallel to CB. The length of side AB is 20 cm. E is a point between A and B such that the length of AE is 3 cm. F is a point between D and C. Find the length DF such that the segment EF divides the parallelogram in two regions with equal area. *
(1 Point)

- Correct: 17 cm
- 18 cm
- 15 cm
- 20 cm
- None of the above.

10

A small company's workforce consists of store employees, store managers, and corporate managers in the ratio 10:3:1. How many employees are either corporate managers or store managers if the company has a total of 126 employees? *
(1 Point)

- 18
- 27
- 9
- Correct: 36
- None of the above.
Which of the following choices is a quadratic equation whose roots are 3 and -6? * (1 Point)

\[ ax^2 + by + c = 0 \]

- \[ x^2 - 3x - 18 = 0 \]
- \[ Correct: \ x^2 + 3x - 18 = 0 \]
- \[ x^2 - 9x + 18 = 0 \]
- \[ x^2 + 9x + 18 = 0 \]
- None of the above.

There are 24 pairs of dice, 36 rulers, and 60 marker pens in the supply cabinet. What is the largest number of envelopes needed to hold all of the items, so that each envelope contains the same number of items of each kind? * (1 Point)

- 6
- Correct: 12
- 60
- 120
- None of the above.
Two numbers are in the ratio 7 : 9. If the sum of the numbers is 112, then the larger number is *
(1 Point)

○ 49
○ 72
○ Correct : 63
○ 42
○ None of the above.

If the sum of the roots for the following polynomial is added to the product of its roots, the result is *
(1 Point)
\[ x^2 - 2x - 35 = 0 \]

○ 33
○ Correct : -33
○ -37
○ 37
○ None of the above.
Fencing costs $5 per foot. Find the cost to enclose a 28-yard by 42-yard rectangular field with fencing. *
(1 Point)

- $700
- Correct: $2100
- $5880
- $6300
- None of the above.

16

Twenty bakers make 720 dozen cookies in eight hours. How many cookies does each baker make in an hour? *
(1 Point)

- 1080
- 7
- 90
- Correct: 54
- None of the above.
Find the height of the trapezoid so that the area is equal to 400 square cm. * (1 Point)

- 15 cm
- 18 cm
- Correct: 20 cm
- 14 cm
- None of the above.
Section 3: Multiple Choice-Single Elimination

This section of the test is single elimination, once an incorrect answer is submitted the test will end. There are 35-multiple choice questions, be sure to read each question thoroughly and select the correct answer for the question.

At the end of the test you will be asked to complete a brief survey, please complete it before submitting the test.

Good Luck!

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Single Elimination
Question 1

Find the median of the following set of data: *
(1 Point)
5, 10, 7, 8, 6, 4, 3, 8.

○ Correct: 6.5
○ 6
○ 7
○ 7.5
○ None of the above.
Single Elimination

Question 2

Which situation is best represented by the following equation *
(1 Point)

\[ x - 4 = 16 \]

- Alisa picked 16 apples and ate 1/4 of them. What is \( x \), the number of apples she had left?
- Joe ran for 16 minutes and walked for 4 minutes. What is \( x \), the difference between the time he spent running and the time he spent walking.
- Correct: James spent $4 of his allowance and had $16 left. What is \( x \), the total amount of James’ allowance?
- Annette has hit 4 of the last 16 balls pitched. What is \( x \), the total number of balls pitched?
- None of the above.
Lee, Maria, Nancy, Owen and Paul are the only members of a club. They need to elect a President, a Vice President and a Treasurer. In how many ways can the election turn out? *

(1 Point)

- 120
- 30
- Correct: 60
- 15
- None of the above.
How tall is a tree that casts a 12-foot shadow at the same time as a 5-foot tall person casts a 1-foot shadow? *
(1 Point)

- 35 feet
- 40 feet
- 50 feet
- 70 feet

Correct: None of the above.
Single Elimination

Question 5

22

Which of the following is the prime factorization of 72? *
(1 Point)

- Correct: $2^3 \cdot 3^2$
- $2^4 \cdot 3^3$
- $8 \cdot 3^2$
- $2^3 \cdot 9$
- None of the above.
A scale drawing of a living room has a scale of 1.75 inches = 1.5 feet. How long is a wall that measures 21 inches in the scale drawing? *

(1 Point)

- 24.5 ft
- 20 ft
- Correct: 18 ft
- 12.4 ft
- None of the above.
Use the figure to find the measure of angle 4. *
(1 Point)

- $43^\circ$
- $47^\circ$
- Correct: $73^\circ$
- $77^\circ$
- None of the above.
What is the value of the following expression *
(1 Point)
\[(2 \times 3)^2 - (12 - 7)^2 + (4 + 5)\]

- Correct: 20
- 70
- 40
- 100
- None of the above
Your bill at the fashion-palace can be expressed as $C = T + 0.08T$. What could the $0.08T$ represent? *

(1 Point)

- Total Cost
- Correct: Sales Tax
- Refund
- Coupon
- None of the above.
Find the surface area of the composite object shown. *
(1 Point)

- $670 \text{ in}^2$
- Correct: $800 \text{ in}^2$
- $920 \text{ in}^2$
- $1800 \text{ in}^2$
- None of the above.
The ratio of 1.5 m to 10 cm is: *
(1 Point)

○ 1:15

○ 15:10

○ 10:15

○ Correct: 15:1

○ None of the above.
Find the value of p, if possible, that makes the following equation true. * 
(1 Point)
$$\frac{p}{2^2} = 12 - 4 \div 4$$

- 11
- 22
- Correct: 44
- 8
- None of the above.
Single Elimination

Question 13

30

Which of these numbers cannot be a probability? *  
(1 Point)

○ 0.000001

○ 77%

○ Correct: 120%

○ 0

○ None of the above.
ABC is a right triangle with the size of angle ACB equal to 74 degrees. The lengths of the sides AM, MQ and QP are all equal. Find the measure of angle QPB. *
(1 Point)

- 140°
- Correct : 148°
- 120°
- 150°
- None of the above.
Length and width of a field are in the ratio 5 : 3. If the width of the field is 42 m then its length is: *
(1 Point)

- 100 m
- 50 m
- 80 m
- Correct: 70 m
- None of the above.
Single Elimination

Question 16

33

What is the common factor in the following expression: *
(1 Point)

\[2x(x - 3) + 3(x - 3)\]

- 2x
- 2
- Correct: (x-3)
- 2 (x - 3)
- None of the above.
A math sentence represents the total number of dog legs in a kennel of 13 dogs. If you know that □ represents the number of dogs, what might the Δ represent?
Choose the best answer.
The equation is □×Δ=52. *
(1 Point)

- The amount of dog food that the dogs eat.
- The number of male dogs in the kennel.
- Correct: The number of legs on each dog
- The total number of legs in the kennel.
- None of the above.
An ordinary 6-sided die is rolled. What is the probability of rolling a prime number? *
(1 Point)

- 0
- Correct: $\frac{1}{2}$
- 1
- $\frac{1}{3}$
- None of the above.
The square of a number exceeds five times the number by thirty-six. Which choice represents a quadratic equation which can be solved to find number(s)? *(1 Point)

- $n^2 = 5n - 36$
- $n^2 + 5n + 36 = 0$
- Correct: $n^2 = 5n + 36$
- $n^2 + 5n - 36 = 0$
- None of the above.
Single Elimination

Question 20

37

The ratio of $a$ to $b$ is 9:2, and the ratio of $c$ to $b$ is 5:3. What is the ratio of $a$ to $c$? *
(1 Point)

- 14:5
- Correct: 27:10
- 3:5
- 3:1
- None of the above.
An S-ounce shot of vanilla flavoring is added to a C-ounce cup of coffee. Which choice is an expression representing the concentration of the vanilla in the mixture of coffee and vanilla? * 
(1 Point)

- $S + C$
- Correct: $\frac{S}{S+C}$
- $\frac{S}{C}$
- $\frac{C}{S+C}$
- None of the above.
The chart shows the results of a survey asking the current age of students in the freshman class. What percent of the students surveyed were over 13 years in age? *  
(1 Point)

- Correct: 80%
- 60%
- 66.666%
- 70%
- None of the above.
In the right triangle shown. Find the measure of angle B? *
(1 Point)

\[ C = (x + 30) \]°

- \( (x + 60) \)°
- \( (30 - x) \)°
- Correct: \( (60 - x) \)°
- \( (90 - x) \)°
- None of the above.
Single Elimination

Question 24

41

It took a ball 1 minute to roll 90 feet. What was this ball’s average rate of speed, in feet per second? *

(1 Point)

- 2/3 feet per second
- Correct: 1 1/2 feet per second
- 2 feet per second
- 3 feet per second
- None of the above
In Hank’s garden $\frac{3}{4}$ of his tomato plants have blossoms, and of these $\frac{2}{3}$ have green tomatoes. How many of Hank’s tomato plants have green tomatoes? * 
(1 Point)

- More than $\frac{2}{3}$
- Between $\frac{2}{3}$ and $\frac{3}{4}$
- Less than $\frac{1}{2}$
- Correct: Exactly $\frac{1}{2}$
- None of the above.
If you draw a card from a deck of cards, what is the probability of it being a heart or a red 2? *
(1 Point)

○ Correct: 7/26
○ 5/13
○ 1/2
○ 15/52
○ None of the above.
Find the missing length x. *
(1 Point)

- 6 in
- $5 \frac{5}{7}$ in
- $4 \frac{3}{8}$ in
- Correct: $11 \frac{1}{5}$ in
- None of the above.
The ratio of 1 hour to 300 seconds is: *
(1 Point)

- 1:12
- Correct: 12:1
- 1:5
- 5:1
- None of the above.
What is the probability of flipping a coin 4 times and having it land on heads each time except for the last? *

(1 Point)

- $\frac{1}{2}$
- $\frac{1}{4}$
- $\frac{1}{8}$
- Correct: $\frac{1}{16}$
- None of the above.
Single Elimination

Question 30

47

Which of the following sets of numbers is closed under subtraction? * 
(1 Point)

Natural = (1, 2, 3, ...); Even = (... 2, 4, 6, 8, ...); Odd = (... 1, 3, 5, ...); Whole = (0, 1, 2, 3, ...)

- Natural Numbers
- Correct: Even Integers
- Odd Numbers
- Whole Numbers
- None of the above.
Choose the best description of the roots for the following quadratic equation. 

\[ x^2 + 4x + 2 = 0 \]

- Real, Rational, and Equal
- Real, Rational, and Unequal
- Correct: Real, Irrational, and Unequal
- Imaginary
- None of the above.
The odds of winning a prize in the first lottery are 1 to 5. The odds of winning a prize in the second lottery are 1 to 3. If you enter both lotteries what is the probability of not winning a prize? *

(1 Point)

○ Correct : $\frac{5}{8}$

○ $\frac{3}{8}$

○ $\frac{5}{12}$

○ $\frac{7}{12}$

○ None of the above.
Single Elimination

Question 33

50

The 8th grade class at Cactus Shadows Middle School can be divided into equal size groups of 4, 8 and 13 students. What is the smallest possible size of the class? *
(1 Point)

○ 52
○ 64
○ Correct: 104
○ 416
○ None of the above.
The vertices of the inscribed (inside) square bisect the sides of the second (outside) square. Find the ratio of the area of the outside square to the area of the inscribed square. *
(1 Point)

- 4:1
- 1:2
- 1:3
- Correct: 2:1
- None of the above.
Single Elimination

Question 35

52

In the proportion $1 : x = 2 : y$, which shows a correct alternate proportion? *

(1 Point)

- $1 : y = 2 : x$
- $x : 2 = y : 1$
- Correct: $1 : 2 = x : y$
- $1 : 2 = y : x$
- None of the above.
Thank You for Participating!

Thank You for Participating in Central Arizona College's 15th Annual Middle School Math Contest!

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How difficult was it access the test online? *

*Use the following scale: 1 - Extremely Difficult and 10 - Very Easy

1 2 3 4 5 6 7 8 9 10

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The directions were clearly written and understandable for each of the 3-sections of the test? *

*Use the following scale: 1 - confusing / not understandable and 10 - clear / understandable

1 2 3 4 5 6 7 8 9 10

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Please rate your experience with Central Arizona Colleges Middle School Math Contest - Individual Test. *

*Use the following scale: 1 - Poor Experience and 10 - Great Experience

1 2 3 4 5 6 7 8 9 10