

40th ANNUAL DR. SUBHASH C. SAXENA MATH CONTEST

March 8, 2019

COASTAL CAROLINA UNIVERSITY

Notes and directions.

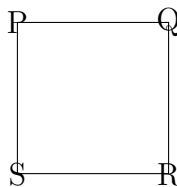
- * Do not turn this page over until you are told to do so.
- * Fill in the SCANTRON form according to your proctor's instructions.
- * Calculators are not permitted on this test.
- * You have fifty minutes to complete the test. If you finish early, you should leave quietly and proceed to Hicks Dining Hall for lunch.
- * The test is yours to keep, so use any extra space for scratch work.

Good luck!

Math Contest - Level 1

March 8, 2019

- 1) If $\frac{52}{x}$ is a positive integer, how many integer values are possible for x ?
A. 5 B. 6 C. 7 D. 8 E. 10
- 2) If $7^9 + 7^9 + 7^9 + 7^9 + 7^9 + 7^9 + 7^9 = 7^x$, what is the value of x ?
A. 9 B. 10 C. 12 D. 63 E. 9^7
- 3) In a certain election race, all of the 8400 votes were cast for either candidate A or candidate B . If votes for candidate A and votes for candidate B were cast in a 4 to 3 ratio, how many votes were cast for candidate A ?
A. 480 B. 840 C. 1200 D. 3600 E. 4800
- 4) The corners of a square sheet of paper are labeled P , Q , R , and S , as below.



- P is folded onto R , and then Q is folded onto R . The area of the resultant figure is 12 square inches. Find the perimeter of the original sheet of paper $PQRS$.
A. 48 in B. 24 in C. $16\sqrt{3}$ in D. $16\sqrt{2}$ in E. 16 in

- 5) If $a^3b^4c^7 > 0$, which of the following statements must be true?
A. $ab < 0$ B. $abc > 0$ C. $ac > 0$ D. $ac < 0$ E. $ab > 0$
- 6) A number x is 32% of a number y . If y is 20% of z , what is z in terms of x ?
A. $0.064x$ B. $0.64x$ C. $6.4x$ D. $\frac{x}{0.064}$ E. $\frac{x}{0.64}$
- 7) Two roots of the polynomial $3x^3 + \alpha x^2 - 5x - 10$ are r and $-r$ for some real number r . What is the value of α ?
A. -2 B. 0 C. 3 D. 5 E. 6
- 8) In a trapezoid RSTV, $\overline{RS} \parallel \overline{VT}$ and $\overline{RV} \perp \overline{VT}$. If $\overline{RS} = \overline{ST} = 13 \text{ in}$ and $\overline{RV} = 5 \text{ in}$, find the area of the trapezoid RSTV.
A. 25 in^2 B. 59 in^2 C. 65 in^2 D. 95 in^2 E. 125 in^2
- 9) Tamika selects two different numbers at random from the set $\{8, 9, 10\}$ and adds them. Carlos takes two different numbers at random from the set $\{3, 5, 6\}$ and multiplies them. What is the probability that Tamika's result is greater than Carlo's result?
A. $\frac{4}{9}$ B. $\frac{5}{9}$ C. $\frac{1}{2}$ D. $\frac{1}{3}$ E. $\frac{2}{3}$

- 10) For what number c is the circle $x^2 - 8x + y^2 + 4y = c$ tangent to the x -axis?
 A. -16 B. -11 C. -4 D. -5 E. 6
- 11) If $x \neq -y$ and $xy \neq 0$, $\frac{x^{36} - y^{36}}{(x^{18} + y^{18})(x^9 + y^9)}$ simplifies to
 A. 1 B. $x^9 + y^9$ C. $x^9 - y^9$ D. $x^{18} - y^{18}$ E. $\frac{1}{x^9 - y^9}$
- 12) If $\frac{|x+4|}{2} > 5$ and $x < 0$, which of the following could be the value of x ?
 A. -6 B. -12 C. -14 D. -18 E. 6
- 13) A right pyramid has a hexagonal base with edges of length 16 inches. The lateral edges of the pyramid are 10 inches long. What is the lateral surface area of the pyramid?
 A. 288 in^2 B. 144 in^2 C. $288 + 216\sqrt{3} \text{ in}^2$ D. 384 in^2 E. $384 + 216\sqrt{3} \text{ in}^2$
- 14) A $4 \times 4 \times 4$ cubical box sitting on a flat surface contains 64 identical smaller cubes that exactly fill the box. How many of these small cubes touch a vertical side or the bottom of the box?
 A. 48 B. 52 C. 56 D. 60 E. 64
- 15) The sequence S is defined so that $S_1 = 45$ and $S_n = S_{n-1} + 2$ for each integer $n \geq 2$. What is the sum of the first 100 terms in sequence S ?
 A. 243 B. $14,400$ C. $14,500$ D. $24,300$ E. $24,545$

16) What is the 119th letter in the following pattern?

ABBCCDDDD...

- A. *L* B. *M* C. *N* D. *O* E. *P*

17) Consider a correctly set clock that starts ticking at noon. Find the exact angle measure between the minute and the hour hands at 1:15 P.M.

- A. 60° B. 57.5° C. 52.5° D. 47.5° E. 42.5°

18) Find a if $\log_2(\log_3(\log_4(a^3))) = 0$.

- A. 4 B. 8 C. 16 D. 32 E. 64

19) Let the vertices of a parallelogram ABCD be the points $A(0, 0)$, $B(p, 0)$, $C(p + q, r)$ and $D(q, r)$. Which equation must hold true if the diagonals are perpendicular?

- A. $\frac{r}{p+q} = -\frac{r}{q-p}$ B. $\frac{r}{p+q} = \frac{r}{q-p}$ C. $\frac{r^2}{q^2-p^2} = -1$ D. $\frac{r^2}{q^2-p^2} = 1$ E. $\frac{r}{p+q} = \frac{r}{2q-p}$.

20) Three couples have purchased tickets to the school play. Their seats are next to one another in a single row. If each couple sits side by side, how many seating arrangements are possible?

- A. 8 B. 16 C. 24 D. 48 E. 64.

- 21) Alex takes a train heading due south. At exactly the same time, his friend Mary who is in a car located 50 miles north of the train starts driving south towards the train on an adjacent roadway parallel to the train track. If the train travels at a constant rate of 50 miles per hour, and the car travels at a constant rate of 80 miles per hour, how long will it take Mary to catch up with Alex?
- A. 1 hr B. 1 hr 20 min C. 1 hr 40 min D. 2 hrs E. 2 hrs 20 min.
- 22) A fair coin with heads on one side and tails on the other is tossed three times. What is the probability that the tosses did not include consecutive tails?
- A. $\frac{3}{8}$ B. $\frac{5}{8}$ C. $\frac{1}{2}$ D. $\frac{3}{4}$ E. $\frac{7}{8}$
- 23) A store is having a 20% off sale today on all items. There is a shirt in the 10% off bin whose original price was \$20. How much does the shirt cost today ?
- A. \$14 B. \$14.40 C. \$16 D. \$16.40 E. \$18
- 24) Fiber X cereal is 55% fiber. Fiber Max cereal is 70% fiber. Sheldon combines an amount of the two cereals in a single bowl of mixed cereal that is 65% fiber. If the bowl contains a total of 12 ounces of cereal, how much of the cereal, in ounces, is Fiber X?
- A. 3 B. 4 C. 6 D. 8 E. 9
- 25) A right triangle has sides of lengths 20 in, 21 in, and 29 in. If a circle is inscribed in this triangle, what is the length of its radius?
- A. 4 in B. 6 in C. 8 in D. 10 in E. 12 in