

Mu Alpha Theta National Convention: Denver, 2001
Colorado Bowl – Euclidean Division

1. If $f(x, y) = 3xy + \frac{18}{x} + y^{\frac{3}{2}}$, what is the value of $f(2, 9)$?

- (A) $\frac{151}{2}$ (B) $56 + 2\sqrt{2}$ (C) $\frac{155}{2}$ (D) 80 (E) NOTA

2. What is the name of the property demonstrated by the following equality?

$$(x + y) + z = x + (y + z)$$

- (A) commutative rule of addition (B) distributive rule of addition
(C) associative rule of addition (D) distributive rule of multiplication
(E) NOTA

3. Through how many quadrants does the graph of $y = 2x^2 - 3x + 4$ pass?

- (A) 4 (B) 3 (C) 2 (D) 1 (E) NOTA

4. What is the slope of a line parallel to $4x + 2y = -17$?

- (A) $-\frac{1}{2}$ (B) $\frac{1}{2}$ (C) -2 (D) 2 (E) NOTA

5. In a given function, y is inversely proportional to the square of k and directly proportional to h . Which of the following is an equation that satisfies these conditions?

- (A) $y = \frac{hz}{xk^2}$ (B) $y = \frac{z}{xk^2}$ (C) $y = \frac{h}{xk}$ (D) $y = \frac{h}{k}$ (E) NOTA

6. Simplify: $\frac{\frac{1}{a} + \frac{1}{b}}{\frac{a-b}{a-b}}$

- (A) $\frac{1}{b}$ (B) $\frac{1}{a}$ (C) $\frac{a^2 + b^2}{ab}$ (D) $\frac{a-b}{ab}$ (E) NOTA

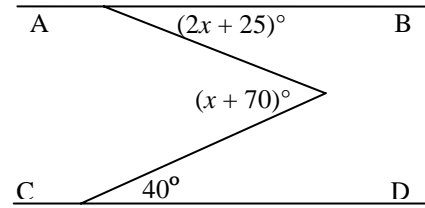
Mu Alpha Theta National Convention: Denver, 2001
Colorado Bowl – Euclidean Division

7. Tom has thrown 112 darts at a dartboard, hitting the dartboard with only 28 of them. If Tom really focuses at this point, and begins to hit the dartboard with every throw, what is the minimum number of darts Tom must throw (and hit the dartboard with) so that at least 35% of his throws will have hit the dartboard overall?
- (A) 16 (B) 17 (C) 18 (D) 19 (E) NOTA
8. What are the roots of $2x^2 - 5x + 8 = 5$?
- (A) $-1, \frac{3}{2}$ (B) $1, \pm \frac{3}{2}$ (C) $1, \frac{3}{2}$ (D) $-1, \pm \frac{3}{2}$ (E) NOTA
9. What is the perimeter, in centimeters, of a rectangle with length 25 centimeters and width 14 centimeters?
- (A) 78 cm (B) 49 cm (C) 48 cm (D) 39 cm (E) NOTA
10. What is the distance between the points $(4, -2)$ and $(-5, 1)$?
- (A) $\frac{19}{2}$ (B) 9 (C) $3\sqrt{10}$ (D) 10 (E) NOTA
11. A water tank in the shape of a right circular cylinder has a base radius of 15 meters, and a volume of 2700π cubic meters. What is the depth of the tank, in meters?
- (A) 10 m (B) $\frac{15\pi}{4}$ m (C) $\sqrt{107}$ m (D) 12 m (E) NOTA
12. A sandwich shop prices their sandwiches proportionally to their volume, and all sandwiches come on rectangular pieces of bread that are fifteen centimeters wide, ten centimeters long, and one centimeter deep. All of the items that can be put on a sandwich have the same width and length as the bread, and are thus described only in terms of their depth. Chuck normally orders a sandwich with a centimeter of meat, a centimeter of cheese, and a centimeter of vegetables, which costs \$10.00. However, Chuck has decided to eat more healthily, and thus changes his order to have half as much meat and cheese as usual. How much will such a sandwich cost?
- (A) \$7.50 (B) \$8.00 (C) \$8.50 (D) \$9.00 (E) NOTA

Mu Alpha Theta National Convention: Denver, 2001
Colorado Bowl – Euclidean Division

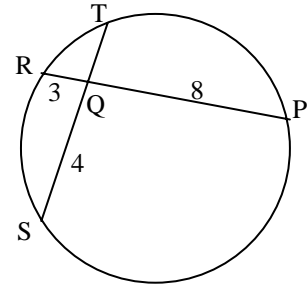
13. Lines \overleftrightarrow{AB} and \overleftrightarrow{CD} are parallel. What is the value of x , if the measures of the angles are given in degrees?

- (A) -5 (B) 5
(C) 10 (D) 20 (E) NOTA



14. Given the two chords, \overline{PR} and \overline{ST} , intersecting at point Q in a circle of radius 12, what is the length of \overline{QT} ?

- (A) 1 (B) 2 (C) 4
(D) 6 (E) NOTA



15. A circle is inscribed in a triangle with sides of lengths 10, 24, and 26 centimeters. What is the radius of the circle, in centimeters?

- (A) 4 (B) $3\sqrt{3}$ (C) $\frac{5\sqrt{2}}{2}$ (D) $\frac{9}{2}$ (E) NOTA

16. What is the equation in slope-intercept form of the line through the points $(2, 6)$ and $(4, -2)$?

- (A) $4x + y = 14$ (B) $4x - y = 2$ (C) $y = -4x + 14$ (D) $y = 4x - 2$ (E) NOTA

17. For what value of x does $2(4x - 3) - 3(x + 1) = 8 + 4(1 - 4x)$?

- (A) 0 (B) 1 (C) 2 (D) $\frac{5}{2}$ (E) NOTA

18. How many natural numbers satisfy the equation $3x^2 - 4x - 15 \leq 0$?

- (A) 2 (B) 3 (C) 4 (D) 5 (E) NOTA

19. Given that $x - y + z = 2$ and $2x - 3y - z = 4$, solve for x in terms of z .

- (A) $x = 2z$ (B) $x = 3z - 2$ (C) $x = -4 + 3z$ (D) $x = 2 - 4z$ (E) NOTA

Mu Alpha Theta National Convention: Denver, 2001
Colorado Bowl – Euclidean Division

20. The probability of event A is $\frac{2}{3}$, and the probability of an independent event B is $\frac{1}{4}$. What is the probability that neither event occurs?

- (A) $\frac{1}{2}$ (B) $\frac{1}{12}$ (C) $\frac{1}{3}$ (D) $\frac{1}{4}$ (E) NOTA

21. What is the sum of the terms of an infinite geometric sequence whose first term is 14 and whose common ratio is $\frac{1}{3}$?

- (A) $\frac{35}{2}$ (B) $\frac{28}{3}$ (C) 21 (D) 28 (E) NOTA

22. How many positive integral factors does 208 have?

- (A) 10 (B) 9 (C) 8 (D) 6 (E) NOTA

23. Express the number 412_7 in base ten.

- (A) 194 (B) 197 (C) 198 (D) 205 (E) NOTA

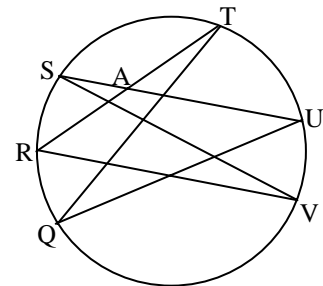
24. Which of the following numbers is congruent to 2 mod 6?

- I. 2
II. 98
III. 150

- (A) I & II only (B) I & III only (C) II & III only (D) I, II, & III (E) NOTA

25. In the figure shown, if $\angle RVS = 42^\circ$ and $\angle TQU = 17^\circ$, what is the measure of $\angle SAT$, in degrees?

- (A) 59° (B) 121°
(C) 25° (D) 155° (E) NOTA



26. Of the natural numbers from 1 to 100, find the sum of those that are not divisible by 6.

- (A) 4328 (B) 4314 (C) 4288 (D) 4234 (E) NOTA

Mu Alpha Theta National Convention: Denver, 2001
Colorado Bowl – Euclidean Division

27. When the digits of a positive two-digit integer are reversed, the resulting number is 18 more than the original number. What is the largest such number?
- (A) 79 (B) 86 (C) 87 (D) 97 (E) NOTA
28. What is the units digit of 3^{333} ?
- (A) 7 (B) 1 (C) 3 (D) 9 (E) NOTA
29. What is the smallest positive integer with exactly 20 positive integral factors?
- (A) 1112 (B) 1536 (C) 948 (D) 432 (E) NOTA
30. The probability the Mariners win a baseball game is $\frac{2}{3}$. What is the probability they win exactly two of their first four games of the season?
- (A) $\frac{25}{81}$ (B) $\frac{8}{27}$ (C) $\frac{16}{81}$ (D) $\frac{4}{81}$ (E) NOTA
31. The probability that it rains on a given day in July is $\frac{1}{10}$. If it rains, the probability of there being a traffic accident within three blocks of Tom's house is $\frac{1}{4}$, although it is only $\frac{1}{20}$ on days when it doesn't rain. What is the probability there is an accident within three blocks of Tom's house on July 21?
- (A) $\frac{17}{200}$ (B) $\frac{2}{25}$ (C) $\frac{3}{40}$ (D) $\frac{7}{100}$ (E) NOTA
32. When three cards are randomly selected from a regular 52-card deck, what is the probability that none of them have the same rank? Note: there are 13 ranks (2, 3, ..., K, A) in each of four suits (clubs, diamonds, hearts, spades).
- (A) $\frac{1897}{4150}$ (B) $\frac{2112}{4175}$ (C) $\frac{318}{575}$ (D) $\frac{352}{425}$ (E) NOTA
33. Of the 1500 students at the local community college, 438 take both math and science, 847 take neither, and 652 take math. How many students take science, but not math?
- (A) 3 (B) 33 (C) 333 (D) 187 (E) NOTA

Mu Alpha Theta National Convention: Denver, 2001
Colorado Bowl – Euclidean Division

34. What is the twelfth term of the geometric sequence beginning 3, 6, 12, ...?
(A) 2048 (B) 4096 (C) 6144 (D) 12288 (E) NOTA
35. What is the sum of the 37 smallest positive multiples of three?
(A) 1971 (B) 1992 (C) 2088 (D) 2109 (E) NOTA
36. Find the ordered pair (a, b) so that 47, a , b , -22 forms an arithmetic sequence.
(A) (33, 19) (B) (29, 10) (C) (27, 7) (D) (24, 1) (E) NOTA
37. The sum of the first twenty-one terms of an arithmetic series is 210. If the first term is 30, what is the 49th term?
(A) -21 (B) -41 (C) -66 (D) -82 (E) NOTA
38. A parallelogram has sides with lengths of 10 and 15 centimeters, and angles with measures of 60° and 120° . What is the area of this parallelogram?
(A) $50\sqrt{5}$ (B) 75 (C) $75\sqrt{3}$ (D) 150 (E) NOTA
39. In rectangle $ABCD$, AB is 6 centimeters and BC is 9 centimeters. Point E is picked on \overline{AD} such that \overline{CE} is perpendicular to \overline{BD} . Determine the distance between D and E , in centimeters.
(A) 3 (B) 4 (C) $\frac{7}{2}$ (D) $\frac{10}{3}$ (E) NOTA
40. What is the area of a triangle with side lengths of 45, 60, and 75?
(A) 1350 (B) 1500 (C) $600\sqrt{5}$ (D) $1000\sqrt{2}$ (E) NOTA