

SMC '91-92 w/soln

Exam #1

November 1991

- $\frac{\log 8}{\log 4} =$
 A. $\log 2$ B. $\log 4$ C. $\log 8 - \log 4$
 D. 2 E. $\frac{3}{2}$
- For which values of x in the interval $0 \leq x \leq \frac{\pi}{2}$ does $\sec x$ equal $\tan x$?
 A. 0 B. $\frac{\pi}{4}$ C. $\frac{\pi}{2}$ D. both A and C
 E. no value of x
- The equation $\sqrt{2 + \sqrt{x}} = \sqrt{x}$ has how many real solutions?
 A. none B. 1 positive C. 2 positive
 D. 1 positive and 1 negative
 E. none of these
- Which of the following does NOT equal -4 ? ($i = \sqrt{-1}$)
 A. -2^2 B. $(\frac{-1}{4})^{-1}$ C. $(2i)^2$
 D. $\log_{16} \frac{1}{2}$ E. All equal -4
- A three-member committee is chosen randomly from 3 men and 3 women. The probability that the committee has 2 men and 1 woman is
 A. 0.4 B. 0.45 C. 0.5
 D. 0.55 E. none of these
- The solution of $4 - 3x \leq 16$ is
 A. $[-4, +\infty)$ B. $(-\infty, -4]$ C. $[4, +\infty)$
 D. $(-\infty, 4]$ E. none of these
- Ten people are in a room. At least 1 person is a student, and in any group of 3 people in the room, at least 1 is not a student. How many students are in the room?
 A. exactly 1 B. exactly 2 C. 1 or 2
 D. exactly 3 E. 3 or 4
- If $h(x) = \frac{1}{x} + 1$, then $h(h(x)) =$
 A. $\frac{1}{x+1}$ B. $\frac{(x+1)^2}{x^2}$ C. $x+2$
 D. $1 + \frac{x}{x+1}$ E. none of these
- A bakery sells 5 donuts to Ed; then it reduces the price per donut by 4¢ and sells 6 for the same total price to Al. If Bo buys 8 for the same total price Ed and Al paid, by how much was the price per donut reduced from what Al paid?
 A. 2¢ B. 3¢ C. 5¢ D. 6¢ E. 8¢
- Three circles with centers A, B, and C are mutually externally tangent (that is, each circle's center lies outside the other two circles). If $AB = 5$, $BC = 7$, and $AC = 8$, then the radius of circle A is
 A. 4 B. 3 C. 2 D. 1
 E. none of these
- Camp A is 6 mi due north of point C on a river which runs directly east-west; Camp B is 3 mi due north of point D on the river; $CD = 12$ mi. If a camper walks from A to a point on the river and then to B, what is the shortest walking distance in miles for this trip?
 A. 10 B. 12 C. 15 D. 18 E. 20

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GP-1P

DJME

12. How many digits does 2^{50} have in its standard base ten representation?

- A. 14 B. 15 C. 16 D. 20 E. 50

13. One focus of the ellipse with equation $25x^2 + 16y^2 = 400$ has coordinates

- A. (5,0) B. (0,5) C. (3,0)
D. (0,3) E. (0,4)

14. $\frac{\cos 4x - \cos 6x}{\cos 4x + \cos 6x} =$

- A. $\tan 5x \tan x$ B. $\cot 5x \cot x$
C. $\tan 5x \cot x$ D. $\cot 5x \tan x$
E. none of these

15. How many distinct 4-letter words can be made from AMATYC? Assume no letter can be used more times than it appears, so that AMTA and TCAY are allowed, but MMTC and ACAA are not.

- A. 192 B. 180 C. 360 D. 144
E. none of these

16. If k is a constant, for how many values of k is the system $\begin{cases} kx + y + z = 2 \\ x + ky + z = 2 \\ x + y + kz = 2 \end{cases}$ inconsistent?

- A. 0 B. 1 C. 2 D. 3
E. an infinite number

17. The value of $\frac{\tan \frac{\pi}{8} + \tan \frac{3\pi}{8}}{1 - \tan \frac{\pi}{8} \tan \frac{3\pi}{8}}$ is

- A. 0 B. 1 C. $\sqrt{3}$ D. $\frac{\sqrt{3}}{3}$
E. undefined

18. The range of $f(x) = \frac{2x - 1}{x + 2}$ is

- A. $\{y \mid y \neq -2\}$ B. $\{y \mid y \neq \frac{1}{2}\}$
C. $\{y \mid y \neq 2\}$ D. $\{y \mid y > -2\}$
E. $\{y \mid y < 2\}$

19. The graph in the xy -plane of the function $g(x) = \frac{(x - 1)^2(x + 6)}{x^3}$ has a horizontal asymptote. How many times does the graph of $g(x)$ intersect this asymptote?

- A. never B. once C. twice
D. three times E. none of these

20. In the figure below, circles M and N are mutually tangent, congruent, and tangent to circle P. Circle Q is tangent to the other three circles with radius 8. Place the value of the radius of circle M in the answer blank.

