Euclidean Individual Test
2000 Mu Alpha Theta National Convention

For all questions, answer E. "NOTA", means none of the above.

1. Find p in the equation $-2px+3=25$ if x is one more than the value of y in the equation $2y-3=6$.

   A. -1 B. -2 C. -3 D. -4 E. NOTA

2. A line passes through the points $(2,3)$ and $(-1,-7)$. Where does the line cross the x-axis?

   A. $\left(\frac{11}{10},0\right)$ B. $\left(0,\frac{11}{3}\right)$ C. $\left(-\frac{3}{4},0\right)$ D. $\left(\frac{1}{10},0\right)$ E. NOTA

3. Solve the equation for n. $t=a+d(n-1)$

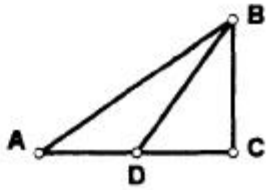
   A. $t-a-d+1$ B. $\frac{t-a}{d}-1$ C. $\frac{t}{a}-d+1$

   D. $\frac{t-a+d}{d}$ E. NOTA

4. A rectangle is one-fourth as wide as it is long and has a perimeter of p. What is the area of the rectangle in terms of p?

   A. $\frac{p^2}{25}$ B. $4p^2$ C. $\frac{50p^2}{2}$ D. $10p$ E. NOTA

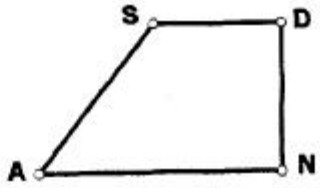
5. Determine BD if $AB=12$, $BC=6$, $AD=4\sqrt{3}$, $\overline{AC}\perp\overline{BC}$.



   A. 4 B. 6 C. $4\sqrt{3}$

   D. $6\sqrt{3}$ E. NOTA

6. Find the area of trapezoid SAND. $AS=10$, $AN=26$, $m\angle A=60$, $\overline{DN}\perp\overline{AN}$, $\overline{SD}\parallel\overline{AN}$.



   A. 117.5 B. 325 C. $\frac{235}{2}\sqrt{3}$

   D. $235\sqrt{3}$ E. NOTA

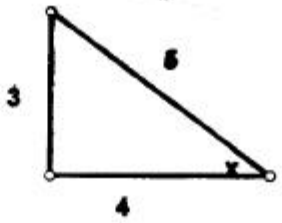
7. Given a triangle with sides 5, 12, and 13. Find the area of a similar triangle that has a perimeter of 20.

   A. 30 B. 20 C. $15\frac{1}{3}$ D. $13\frac{1}{3}$ E. NOTA

8. Find the value of $\sin x + \cos x + \tan x$.

A. $\frac{11}{3}$ B. $\frac{17}{4}$ C. $\frac{41}{15}$

D. $\frac{43}{20}$ E. NOTA



9. $\overline{AC}$ is a diagonal of regular pentagon ABCDE. What is $m\angle ACD$?

A. 36 B. 54 C. 72 D. 108 E. NOTA

10. Find the ratio of x to y. $\frac{4}{y}+\frac{3}{x}=44$ and $\frac{12}{y}-\frac{2}{x}=44$

A. 1:2 B. 8:5 C. 6:5 D. 5:6 E. NOTA

11. Quadrilateral ABCD is inscribed in a circle. Given: $m\angle A = 7x+20, m\angle B = 10x+5$, $m\angle C = 3x+40$. Find $m\angle D$.

A. 80 B. 55 C. 45 D. 40 E. NOTA

12. What is the sum of all values of x which satisfy $x+2=\sqrt{9x-2}$

A. -5 B. 0 C. 3 D. 5 E. NOTA

13. Two paving companies are to pave 34 miles of road. One crew is to pave at a rate that is 3 miles per week faster than the other crew. If they start at opposite ends, and it takes 2 weeks to complete the job, then find the sum of the rates, in miles per week, of the two crews.

A. 10 B. 13 C. 14 D. 17 E. NOTA

14. What is the ratio of the surface area of a sphere to the area of the sphere's great circle?

A. $\frac{1}{4}$ B. $\frac{1}{2}$ C. $\frac{2}{1}$ D. $\frac{4}{1}$ E. NOTA

15. Simplify: $\frac{1+\sqrt{5}}{3-\sqrt{5}}$

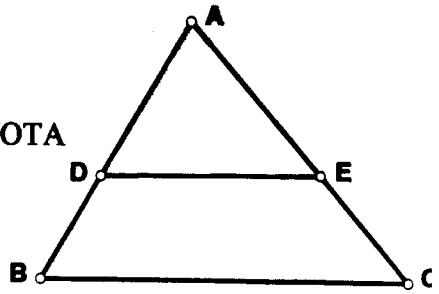
A. $2+\sqrt{5}$ B. $3+\sqrt{5}$ C. $2+2\sqrt{5}$ D. $2+4\sqrt{5}$ E. NOTA

16. If it takes 12 seconds to read this question, what percent of the hour will you have used?

A. 3% B. $\frac{1}{5}\%$ C. $\frac{1}{3}\%$ D. 0.02% E. NOTA

17. ΔABC is equilateral with $BC = 12$. $\overline{DE} \parallel \overline{BC}$, $EC = 8$.
Find the ratio of the area of ΔADE to the area of ΔABC.

A. 1:3 B. 1:4 C. 1:9 D. 2:3 E. NOTA



18. Simplify: $\dfrac{1}{1+\dfrac{1}{1+x^2}}$

A. $\frac{x+1}{x+2}$ B. $\frac{x+2}{x+1}$ C. $\frac{x^2+2}{x^2+1}$ D. $\frac{x^2+1}{x^2+2}$ E. NOTA

19. A regular polygon has an interior angle of 156°. How many diagonals does it have?

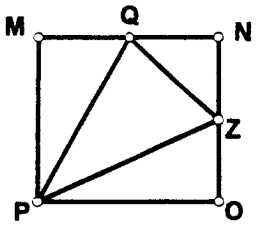
A. 60 B. 90 C. 105 D. 180 E. NOTA

20. Factor $36x^2+30x-24$ into the form $A(Bx+C)(Dx+E)$ and find $A+B+C+D+E$.

A. 11 B. 13 C. 14 D. 16 E. NOTA

21. In the figure, MNOP is a square of area 1, Q is the midpoint of $\overline{MN}$, and Z is the midpoint of $\overline{NO}$. What is the ratio of the area of ΔPQZ to the area of the square?

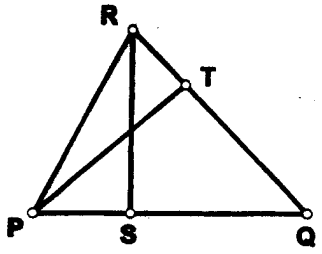
A. $\frac{1}{4}$ B. $\frac{3}{8}$ C. $\frac{1}{2}$ D. $\frac{1}{3}$ E. NOTA



22. A lab researcher has 4 liters of a 10% acid solution. How much pure acid should be added to increase the concentration of acid to 25%?

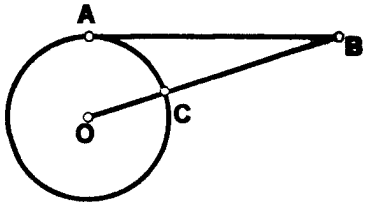
A. 15 B. 10 C. 1.2 D. 0.8 E. NOTA

23. In ΔPQR, $\overline{PT}$ and $\overline{RS}$ are altitudes.
$PR = 13$, $PS = 5$, $m\angle Q = 45°$. Find PT.



A. 17 B. 12 C. $6\sqrt{2}$
D. $\frac{17\sqrt{2}}{2}$ E. NOTA

24. In the figure, $\overline{AB}$ is tangent to circle O at A.
If AB = 20 and BC = 12, find OC.



A. $\frac{221}{3}$ B. $\frac{64}{3}$ C. $\frac{32}{3}$
D. $\frac{5}{3}$ E. NOTA

25. Which quadrants contain solutions to the system: $2x + y < 3$ and $x - 2y > 5$. ?
A. III and IV B. II, III, and IV C. II and III
D. I, II, III, IV E. NOTA

26. ΔABC has coordinates A(4,8), B(2,1), and C (12,3). $\overline{AM}$ is a median of ΔABC, find AM.
A. $\sqrt{145}$ B. $5\sqrt{3}$ C. $3\sqrt{5}$ D. $3\sqrt{3}$ E. NOTA

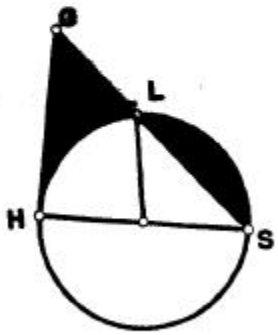
27. ABCD is an isosceles trapezoid with upper base $\overline{AD}$. $\overline{AC}$ and $\overline{BD}$ intersect at E.
If $BE = x + 7$, $CE = y - 3$, $AE = x + 5$, $BD = y + 4$, find AC.
A. 16 B. 14 C. 12 D. 9 E. NOTA

28. Which of the following are true statements if the variables represent real numbers?
I. $a^2 \geq a$ for all values of a.
II. If $0 < a < b$, then $\frac{1}{a} > \frac{1}{b}$.
III. If $0 < a < b$, then $-a < -b$.
IV. If $a < 0$, then $-a > 0$.
A. All are true. B. II, III, IV only C. I, II, III only
D. II and IV only E. NOTA

29. When k is divided by 4, the result is 12. What is the difference of k and 3?

A. 0 B. 90 C. 93 D. 102 E. NOTA

30. Given: isosceles right triangle GHS with right angle at H. HS = 6, and $\overset{\frown}{HLS}$ is a semicircle. Find the area of the shaded region.



A. 9 B. $18-\frac{9\pi}{4}$ C. 18

D. $9+\frac{9\pi}{4}$ E. NOTA