Nassau County Interscholastic Mathematics League

Contest #5 Answers must be integers from 0 to 999, inclusive. 2025 – 2026

No calculators are allowed.

Time: 10 minutes **Name: _____**

25. The values of a, b, and c are 2, 3, and 4, not necessarily in that order. If a^{b^c} is a maximum, compute $100a + 10b + c$.

26. If, in simplest form $\frac{\sqrt{0.4}}{\sqrt{1.8}\sqrt{4.5}} = \frac{p}{q}$, compute $(pq)^2$.

25. ☐ 26. ☐

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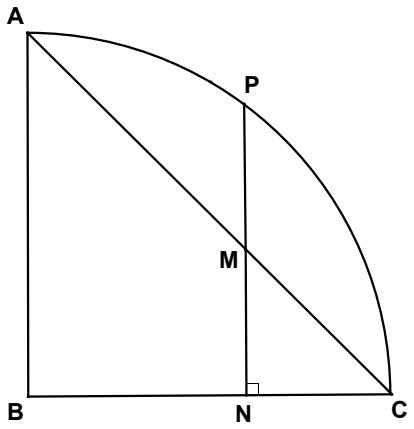
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27. If $\sqrt{x+\sqrt{x+4}} = 4$, compute x.

28. As shown in the diagram: In quarter-circle B, $\overline{PN} \perp \overline{BC}$ at point N and $PM = MN = 4$. Compute AB.



27. ☐

28. ☐

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29. The units digit of a two-digit number is 11 less than twice the tens digit. The two-digit number is 6 less than 7 times the sum of its digits. Compute the two-digit number.

30. Hexagon $ABCDEF$ is inscribed in circle O with $AB = BC = CD = 11$ and $DE = EF = FA = 26$. Compute the length of the radius of circle O.

29. ☐ 30. ☐

Solutions for Contest #5

25. Of the six arrangements of a, b, and c, $2^{3^4} = 2^{81}$ has the greatest value, so $100(2) + 10(3) + 4 = \mathbf{234}$.

26. Re-write the given expression as $\frac{\frac{\sqrt{4}}{\sqrt{10}}}{\frac{\sqrt{18}\cdot\sqrt{45}}{\sqrt{10}\cdot\sqrt{10}}} = \frac{2\sqrt{10}}{\sqrt{18}\cdot\sqrt{45}} = \frac{2\sqrt{2}\sqrt{5}}{3\sqrt{2}\cdot 3\sqrt{5}} = \frac{2}{9} \rightarrow (2\cdot 9)^2 = \mathbf{324}$.

    Alternatively, multiply numerator and denominator by $\sqrt{1000}$:

    $\frac{\sqrt{400}}{\sqrt{18}\cdot\sqrt{450}} = \frac{20}{3\sqrt{2}\cdot 15\sqrt{2}} = \frac{20}{90} = \frac{2}{9}$. Continue as above.

27. From the given, $x + \sqrt{x+4} = 16 \rightarrow x + 4 = 256 - 32x + x^2 \rightarrow 0 = x^2 - 33x + 252$ $\rightarrow (x-12)(x-21) = 0 \rightarrow x = \mathbf{12}$, only.

28. Let $AB = BC = r, m\measuredangle BCA = 45° \rightarrow NC = 4$. Coordinatize the diagram as follows: $B\ (0,0), A(0,r), C(r,0), N(a,0), M(a,4)$,and $P(a,8)$. Since point P lies on the quarter-circle, $a^2 + 64 = r^2$. On $\overline{BC}$, $a + 4 = r \rightarrow a^2 + 8a + 16 = r^2$. So, $a^2 + 8a + 16 = a^2 + 64 \rightarrow$ $8a = 48 \rightarrow a = 6$. Thus, $r = 6 + 4 = \mathbf{10}$.

29. If t is the tens digit, u is the units digit, and $10t + u$ is the two-digit number then, $u = 2t - 11$ and $10t + u = 7(t + u) - 6$. So, $10t + 2t - 11 = 7t + 14t - 77 - 6 \rightarrow$ $12t - 11 = 21t - 83 \rightarrow 9t = 72 \rightarrow t = 8$ and $u = 5$. Thus, the two-digit number is **85.**

30. Draw radii to each vertex of hexagon $ABCDEF$. Let $m\measuredangle AOB = m\measuredangle BOC =$ $m\measuredangle COD = \alpha$ and let $m\measuredangle DOE = m\measuredangle EOF = m\measuredangle FOA = \beta \rightarrow 3\alpha + 3\beta = 360° \rightarrow$ $\alpha + \beta = 120°$. Also, $m\widehat{CDE} = m\measuredangle COE = 120°$ and $m\measuredangle CDE = \frac{1}{2}(360° - 120°) = 120°$. By the Law of Cosines, in ΔCED, $(CE)^2 = 11^2 + 26^2 - 2\cdot 11\cdot 26\cos 120° = 1083$. In ΔCOE, $(CE)^2 = r^2 + r^2 - 2rr\cos 120° = 3r^2 \rightarrow 1083 = 3r^2 \rightarrow r^2 = 361 \rightarrow r = \mathbf{19}$.