T–1. *ABCD* is a convex quadrilateral with $AC = BC = 10$ and $AB + 1 = AD = CD = 13$.
Compute the area of *ABCD*.

T–2. Compute the smallest positive integer K such that K and $K + 1$ each have more than four positive factors.

T–3. Let A, R, M, and L be positive real numbers such that $\log(A \cdot L) + \log(A \cdot M) = 2$,
$\log(M \cdot L) + \log(M \cdot R) = 3$, and $\log(R \cdot A) + \log(R \cdot L) = 4$. Compute the value of the
product $A \cdot R \cdot M \cdot L$.

T–4. Let a and b be integers with $b > a > 1$. If $8\sqrt{.\overline{a}_b} = \dfrac{1}{.\overline{a}_b}$, compute the least value of b.

T–5. Let $N = .\overline{abcdef}$. If N has three 2's in a row in every string *abcdef*, but no more than three 2's in a row in the
entire decimal expression for N, compute the number of distinct N.

T–6. For x and y in radian measure with $0 \le x, y \le 2\pi$, compute the largest possible value of the sum $x + y$
if $2\sin x \cos y + \sin x + \cos y = -\dfrac{1}{2}$.

T–7. In the diagram, circle O has a radius of 10, circle P is internally tangent
to O and has a radius of 4. $\overline{QT}$ is tangent to circle P at T and, if drawn,
line $\overleftrightarrow{PT}$ intersects circle O at points A and B. Compute the
product $TA \cdot TB$.
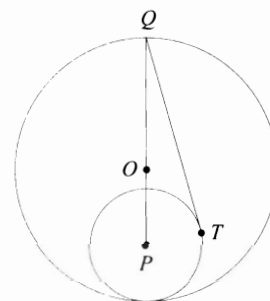
T–8. For t a real number, let $x(t) = at^3 - bt$ and $y(t) = at^3 + bt^2$ be a system of parametric equations for a
curve. If $a, b \in \{0,1,2,3,\ldots,100\}$, compute the number of ordered pairs (a,b) such that the curve has
exactly two distinct y-intercepts.

T–9. Given $A(0, 0)$ and $B(x,y)$ with $0 < x < 1$ and $y > 0$, let the slope of $\overline{AB}$ equal r. Point C lies on the line
$x = 1$ such that the slope of $\overline{BC}$ equals s with $0 < s < r$. The area of $\triangle ABC$ can be written as $k_x(r - s)$
where the value of k_x depends on x. Compute the largest possible value for k_x.

T–10. The numbers $1, 2, 3, \ldots, 17, 18, 19$ can be written down in a sequence that forms a 29-digit palindrome.
Compute the number of distinct 29-digit palindromes that can be formed in this way. Write the answer
without using factorial notation.