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All answers on this relay are integers.

1. Find the y -coordinate of the vertex of the parabola with equation $y = 2x^2 - 3x + \frac{1}{8}$.
2. Let $T = \text{TAFTPQ}$. If d is the distance between the points with coordinates $(T, 5)$ and $(-3, T)$, find $\lfloor d \rfloor$, the greatest integer less than or equal to d .
3. Let $T = \text{TAFTPQ}$. A regular T -gon contains how many degrees in one of its interior angles?
4. Let $T = \text{TAFTPQ}$. Find the remainder when $x^3 - 12x^2 + Tx - 64$ is divided by $x - 5$.
5. Let $T = \text{TAFTPQ}$. Find the sum of the positive integral factors of T .
6. Let $T = \text{TAFTPQ}$. There are T distinct marbles in a jar. Two marbles are to be selected simultaneously and at random from the jar. How many distinct sets of two marbles can be drawn from this jar in this way?

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1. Sophia babysits 4 hours per day, 5 days per week, for 4 weeks. If she charges \$17 per hour babysitting, how much money, in dollars, did she earn babysitting over this period?

2. Let $T = \text{TAFTPQ}$. If S is the sum of the digits of T , find the value of $\frac{T}{S}$.

3. Let $T = \text{TAFTPQ}$. If $\begin{vmatrix} 13 & x \\ 5 & 7 \end{vmatrix} = T$, find the value of x .

4. Let $T = \text{TAFTPQ}$. A regular n -gon has $(T^2 + T + 5)$ diagonals. Find the value of n .

5. Let $T = \text{TAFTPQ}$. For the linear system
$$\begin{cases} x - Ty + Cz = 5 \\ -3x + 4y + Tz = 3 \\ Cx + y + z = 2 \end{cases}$$
 find the product of the real values

of C such that this system has either no solutions or an infinite number of solutions.

6. Let $T = \text{TAFTPQ}$. As long as $x \neq 5$ and $x \neq -2$, let
$$f(x) = \begin{cases} \frac{-2x^2 + Tx + D}{x - 5}, & \text{if } x < T \\ \frac{3x^2 - Dx + 22}{x + 2}, & \text{if } x > T \end{cases}$$
. Find the

value of D such that $f(2) = 1$.

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1. Two sides of a triangle have lengths 43 and 91. The third side of this triangle has how many possible integer lengths?
2. Let $T = \text{TAFTPQ}$. A right triangle's two legs have lengths that are integers. If the hypotenuse of this right triangle has length T , how many such right triangles exist?
3. Let $T = \text{TAFTPQ}$. A right triangle has hypotenuse of length $T^3 - 3$. Find the numerical value of the area enclosed by this triangle.
4. Let $T = \text{TAFTPQ}$. Let n and k be positive integers with $n > k$. If $\binom{n}{k} = T$, find the smallest possible value of $n + k$.
5. Let $T = \text{TAFTPQ}$. If the terms in the expansion of $(2x - 1)^T$ are written from left to right in order of decreasing power of x , find the coefficient of the fourteenth term.
6. Let $T = \text{TAFTPQ}$. An arithmetic series consisting solely of integers has first term T , last term K , and sum $1 - 2T$. Find the sum of all possible values of K .

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1. Find the distance between the vertices of the ellipse with equation $\frac{(x+3)^2}{25} + \frac{(y-4)^2}{121} = 1$.
2. Let $T = \text{TAFTPQ}$. In a group of T people, the probability that at least two people share a birthday (month and day of the month; e.g., March 18) is p . Additionally, there are 366 distinct birthdays. If $p < \frac{1}{2}$, the answer to this question is 32. If $p = \frac{1}{2}$, the answer to this question is 64. If $p > \frac{1}{2}$, the answer to this question is 128.
3. Let $T = \text{TAFTPQ}$. Find the value of $\log_2 T$.
4. Let $T = \text{TAFTPQ}$. A triangle has two sides of lengths T^2 and $(T+1)^2$. An angle bisector is drawn from the vertex of this triangle connecting those two sides to the triangle's third side. If the length of this angle bisector is greater than 15, find the maximum integral length of the third side of this triangle.
5. Let $T = \text{TAFTPQ}$. A collection of T indistinguishable candies are to be distributed among four people such that every person gets at least five candies. In how many distinct ways can the candies be distributed? A distribution is distinct from another distribution if at least one person has a different number of candies in the two distributions.
6. Let $T = \text{TAFTPQ}$. How many positive integral factors does T have?

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1. Find the sum of the infinite geometric series $32 + \frac{128}{5} + \frac{512}{25} + \dots$.

2. Let $T = \text{TAFTPQ}$. The line $x = A$ is an asymptote of the function $y = \frac{3x^2 + 28x - T}{x^2 + x - (T - 140)}$. Find the value of A .

3. Let $T = \text{TAFTPQ}$. In how many consecutive zeros does $(2T^2 - T)!$ end?

4. Let $T = \text{TAFTPQ}$. If T is prime, the answer to this question is 184. If T is composite, the answer to this question is -32 . If T is neither prime nor composite, the answer to this question is 8.

5. Let $T = \text{TAFTPQ}$. Find the real solution to the equation $4^x - 2^{x+1} - 40 = T$.

6. Let $T = \text{TAFTPQ}$. The point (A, B) is the intersection of the lines with equations $(T^3 - T + 1)x + (2T)y = -287$ and $(1 - 2T)x + (3T + 2)y = -161$. Find the value of $A + B$.