Problem-1: let p being prime and n being positive integer such that $n^6 - 1$ is divisible by p prove that $n > \sqrt{p} - 1$. (SKMC-2014-P:67)

Problem-2: Let n be a positive integer and $n = a_1 + a_2 + \cdots. + a_k$ where a_i being nonnegative integers such that $\frac{1}{n} = 0.a_1 a_2 \ldots. a_k$, find the value of n. (SKMC-2014-P:88)

Problem-3: Prove that if a being integer which is relatively prime to 35 , then $(a^4 - 1)(a^4 + 15a^2 + 1)$ is divisible by 35. (SKMC-2013-P:14)

Problem-4: find all positive integers (a, b) such that $a^3 + 1$, $b^3 + 1$ is divisible by $a^2 + b^2$.(SKMC-2013-P:20)

Problem-5*: Prove that the sum $1^1 + 3^3 + 5^5 + \cdots.. + (2^n - 1)^{2^n - 1}$ is divisible by 2^n.(AKMC-2013-P:82)

Problem-6: find all positive integers such that $\frac{a^2+b}{b^2-a}, \frac{b^2+a}{a^2-b}$ being integer. (RMC-2014-P:74)

Problem-7:find all primes such that $p^3 + 107 = 2q(17q + 24)$. (RMC-2014-P:80)

Problem-8: Let $n \geq 5$ be an integer , prove that n is prime if and only if , for any representation of n by the form $a + b + c + d$, where a, b, c, d are positive integers we have $ab \neq cd$. (RMC-2014-P:84)

Problem-9: Find all natural number m, n such that $85^m - n^4 = 4$. (RMC-2014-P:92)

Problem-10: prove that there exist infinitely many positive integers such that $x^2 + y^3$ is divisible by $x^3 + y^2$. (Ukraine-07-09. P:223)

[roblem-10: let $x, y > 1$ prove that there are infinitely many integers which couldn't be represented in the form $\frac{x^2-1}{y^2-1}$ (Rus-2010)

Problem-11: let a, m, n being integers such that $am + 1$ is divisible by n and $an + 1$ is divisible by m prove that $2a(m + n) > mn$.   (Kvant-M1917)

Problem-12: find all positive integers such that $\frac{x^3+y^3-x^2y^2}{(x+y)^2}$ is integer.(Bul95-01,p:250)

Problem-13:let m,n be integers such that$0 \leq m \leq 2n$. And $2^{2n+2} + 2^{m+2} + 1$is perfect square prove that: m=n. (Zhautykov)

Problem-14:Solve the equation$x^5 + 15xy + y^5 = 1$in integers. (Mathematical Reflections)

Problem-15:Find all prime numbers p,q,r such that: $\frac{p^{2q}+q^{2p}}{p^3-pq+q^3} = r$. (Mathematical Reflections)

Problem-16: Find all positive integers satisfying the equation:

$$xy + yz + zx - 5\sqrt{x^2 + y^2 + z^2} = 1$$

(Mathematical Reflections)

Problem-17:Find all positive integers satisfying $\frac{x}{y}+\frac{z}{x}+\frac{y}{z+1}=\frac{5}{2}$. (Mathematical Reflections)

Problem-18:find all pairs of positive integers(a,b) such that $b^2+ab+4$is divisible bya^2+ab+4. (Polish Olympiads)

Problem-19:find all integers n such that$1+2^{n+1}+4^{n+1}$divisible by $1+2^n+4^n$. (Polish Olympiads)

Problem-20:find all values of integer n such that$n+3$and n^2+2n+3both be cube. (Ukrainian Olympiads)

Problem-21:find all triples of integers such that: $\frac{1}{x^2}+\frac{y}{xz}+\frac{1}{z^2}=\frac{1}{2013}$.

Problem-22: find all integers satisfying the following system: (MEMO)

$$\begin{cases} x^2-y^2=z \\ 3xy+(x-y)z=z^2 \end{cases}$$

Problem-23:find all pairs of integers (m,n)satisfying $n^2+n=m^2+2m-9$. (Belaurusian Math Olympiads)

Problem-24: find all pairs of integers (m,n)satisfying $n^2+n+1=(m^2-m+5)(m^2+m-3)$ (Belaurusian Math Olympiads)

Problem-25: Find all primes P, Such that p^3-4p+9 being square. (Turkish Math Olympiads)

Problem-26:find all primes such thatp^2-p-1be cube of some integers. (Belaurusian Math Olympiads)

Problem-27:find all primes such that$p^6-q^2=0.5(p-q)^2$. (Belaurusian Math Olympiads)

Problem-28:find all primes such that $p^3-q^7=p-q$. (Zhautykov Math Olympiads)

Problem-29: let p,q be primes satisfying $q|p^2+1$, $p|q^2-1$, prove that $p+q+1$ wasn't prime.

(St-Petersburg Math Olympiads)

Problem-30:let P be prime greater than 3 and $p^k+p^l+p^m=n^2$ prove that $p+1$ is divisible by 8.

(St-Petersburg Math Olympiads)

Problem-31: let n be even number and p,q be primes such that:

$$p^n+p^{n-1}+\cdots.+p+1=q^2+q+1$$

Find them. (India Math Olympiads)