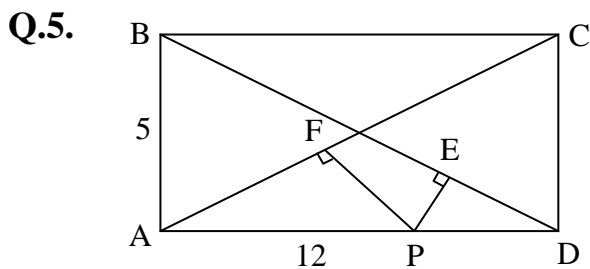Q.1. A rack has 6 different pairs of shoes. Find the number of ways of choosing 4 shoes from it so that there will be no complete pair. **(6 marks)**

Q.2. If $^{20}C_{10}$ is factorized as $(2)^p \cdot (3)^q \cdot (5)^r$ ....., Find $p + q + r$. **(6 marks)**

Q.3. If set A= $\{(x, y)|\ x^2 + y^2 \le 50,\ x, y \in N\}$ and set B= $\{(x, y)|\ 5x + 7y \le 50,\ x, y \in N\}$, then find (i) n (A $\cap$ B), (ii) n (A $\cup$ B), (iii) n (A Δ B) **(6 marks)**

Q.4. If a, b, c > 0, then prove that $\dfrac{a^3}{b} + \dfrac{b^3}{c} + \dfrac{c^3}{a} \ge ab + bc + ca$. **(6 marks)**

Q.5.

ABCD is a rectangle where AD = 12, AB = 5. The point 'P' is a point on AD such that PE is perpendicular to BD at E and PF is perpendicular to AC at F. Find PE + PF. **(6 marks)**

Q.6. Consider set X= $\{1,2,3,....,100\}$. Find number of ways when one can select 3 distinct numbers from set X so that product of the chosen numbers is divisible by 49. **(8 marks)**

Q.7. What is the maximum possible value of K for which 2025 can be written as a sum of K consecutive positive integers? **(8 marks)**
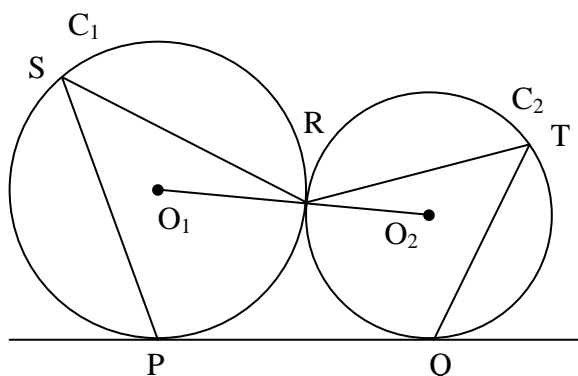
Q.8. (i) How many ordered pairs (p,q) where p and q are natural numbers can be formed such that L.C.M (p,q) = 1800 and G.C.D (p,q) = 6. (ii) Write all pairs. **(8 marks)**

Q.9. The quadratic equation $x^2 - px + q = 0$ has two real roots α and β. **(8 marks)**
(a) Find the quadratic equation with roots α^3, β^3.
(b) If new quadratic equation [obtained in (a)] is still $x^2 - px + q = 0$, then find all possible pairs of (p, q).

Q.10.

Refer figure. PQ is the common tangent to the circles C_1 and C_2 with centres O_1 and O_2 respectively. These circles touch externally at point R. Two chords of circle C_1 are PS and SR and two chords of circle C_2 are QT and RT. Find sum of measures of $\angle$ PSR and $\angle$ QTR. **(8 marks)**
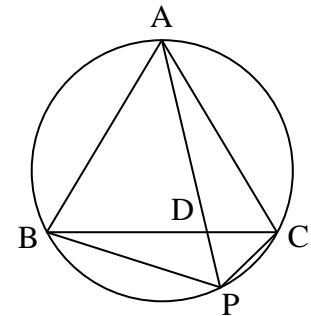
Q.11. A pack contains n cards numbered 1 to n. Two consecutive numbered cards are removed from the pack. The sum of numbers on the remaining cards is 595. If the smallest of the numbers on the removed cards is k, find the value of k. **(10 marks)**

Q.12. If $f(x) + f\left(\dfrac{x-1}{x}\right) = x$, find (i) f(x), (ii) f(2) **(10 marks)**

Q.13. Refer Figure. A line drawn from the vertex A of an equilateral triangle ABC meets BC at D and the circumcircle at P. Prove that **(10 marks)**

(i) PA = PB + PC (ii) $\dfrac{1}{PD} = \dfrac{1}{PB} + \dfrac{1}{PC}$

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