Category I

MATHEMATICS OLYMPIAD COMPETITION

SELECTION TEST FOR THE NATIONAL LEVEL TRAINING POOL - 2015

Time: 1 hour 30 minutes

General Instructions. INDEX NO: **2015 / /**

This question paper consists of two parts. Answer all questions in both parts.

PART I – **Write the answer on the dotted line given under each question and it is necessary to mention the relevant units if any with the answer**

PART II

- Answers to be written only on paper provided.Write your index number on the top right hand corner of each paper.
- How the answers were obtained has to be given step by step. No marks will be awarded if the answers are not clear.

Note – Diagrams are not to scale.

---

1. (a) what is the ten's place digit of 5^7?

   (b) The last digit of $5^n - 2^n$ is 7, Find the smallest positive integer value of *n.*

2. (a) Find the value of $\sqrt{16^2 + 12^2}$.

   (b) Simplify and write the numerical value of $\sqrt{20^2 - (65^2 - 63^2)}$

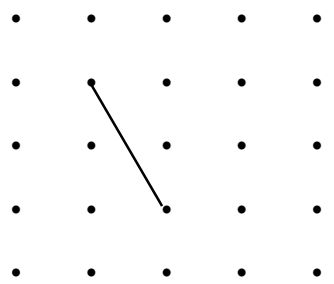
3. (a) Find the coefficient of power of *a* when removed the bracket of $(2a^2)^2$

   (b) $b = 8 - a^2\left(\frac{1}{2} - \frac{1}{2} \times \frac{1}{4}\right) \div \frac{2}{3}$, If *a* = 3 find the value f *b.*

4. (a) When 4 is added to two digit prime number, it is divisible by 5. How many such prime numbers are their?

   (b) Find the smallest two digits number such that if it is reduced by 5 it is a multiple of 7, and if it is reduced by 7 it is a multiple of 6, and if it is reduced by 8 it is a prime number.

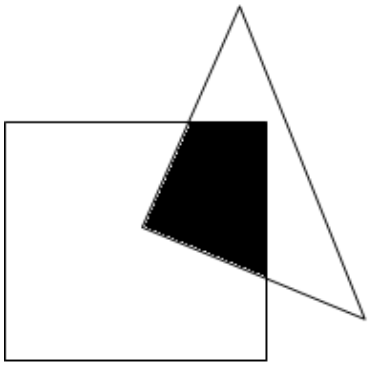
5. One side of an isosceles triangle is drawn on the following grid. How many isosceles triangles can be formed by choosing any points as their vertices? (the dots are equally spaced)



6. (a) Represent 1155 as a multiple of it's prime factors.

   (b) A pair of positive integers ***a*** and ***b*** is such that the greatest common divisor is 5 and the least common multiple is 1,155. Find the smallest value of ($a + b$).

7. (a) The figure shows a right angled isosceles triangle of base 8cm overlapping with a square of side 6cm. The vertex of the triangle lies on the center of the square, find the area of the shaded region.



   (b) Expression X - area of the shaded region.
   Expression Y – further increasing the length of the base of the triangle.
   Statement – "The Expression -Y is not give any effect to the Expression –X"
   Is the statement false?

8. A positive integer that satisfies all the conditions below is called a "Magic" number.
   - the number consist of four digits,
   - each digit is divisor of 48,
   - each digit can appear more than once,
   - the sum of the digit is 20,
   - the number is a multiple of 4.

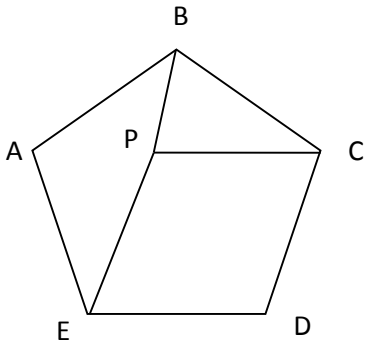
   Find the greatest difference of such Magic Numbers.

9. In the following diagram, CDEP is rhombus and ABCDE is a regular pentagon.

(a) Find the magnitude of .

   i. Angle EPC
   ii. Angle PBC

   (b) Are the points E, P and B are collinear?



10. abc is a 3digit number such that $abc = n^2$ and $a \times b \times c = n + 3$, where n is a positive integer. Find n.

11. Let x, y, and z be none zero real numbers such that $x + \frac{1}{y} = 5.$
    $y + \frac{1}{z} = 12$
    $z + \frac{1}{x} = 13$ Find, $xyz + \frac{1}{xyz}$

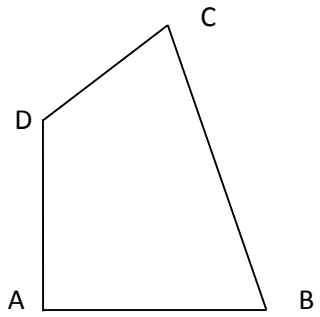
12. A leaf of a book was torn. The sum of the remaining page numbers is 3030. How many pages does the book have?

    Write the small page number of the removed leaf.

13. Kamal and Nimal have many marbles. Kamal tells to Nimal “if you give me 100 marbles, then I will have twice of your number of marbles. But Nimal tells Kamal “if you give me 10 marbles, then my marbles will be 6 times of yours”. How many marbles does Kamal have in the beginning?

14. In the quadrilateral ABCD,
AB:AD:BC:CD = 2:2:3:1and angle A = 90^0.

Find angle ADC.



15. Complete the following magic square using the digits 1 to 16.

1		***b***	4
	6	7	***c***
8	***a***	11	
13			16

Find the value of *a* = …….

b = ……..

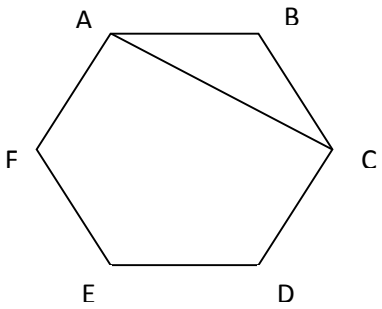
c = ……..

Part – 11

1.

(i). How many symmetrical axes are there in a regular hexagon?

(ii) A reguler hexagon inscribed in a circle with diameter *d*, express a side length of the regular hexagon in term of *d*



(iii) In the reguler hexagon ABCDEF the side AC = 6cm.

(a) Find the length DC in cm

(b) Compute the area of the reguler hexagon in cm^2

2. should be translate