

MATHEMATICS OLYMPIAD COMPETITION
SELECTION TEST FOR THE NATIONAL LEVEL TRAINING POOL - 2018

General Instructions.

Index no:

2018 / Oly / I /

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

Part I – 15 questions (4 marks per each)

- 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 – 2 questions (20 marks per each)

- Answers to be written only on the spaces provided.
- 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.

Time: 1 hour 30 minutes

Part I

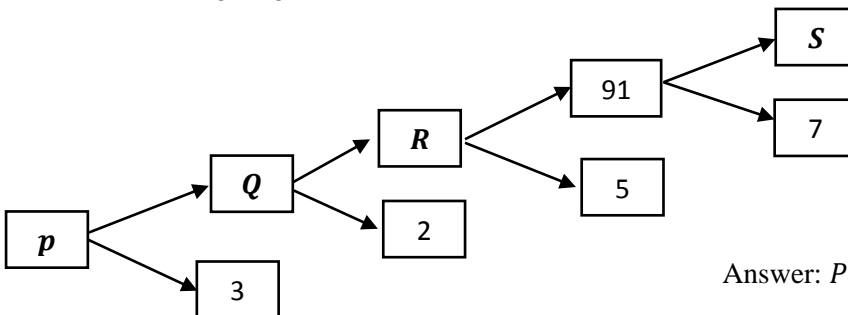
1. If the numbers $a + 1$, $a + 2$, $a - 1$, $a + 5$ and $a - 3$ are arranged in ascending order, what is the middle number?

Answer:

2. If a, b and c are positive integers and $a > b > c$, find all positive integer solutions to:
 $a + b + c = 24$ and $abc = 440$

Answer:

3. The following diagram shows a factor tree. Find P, Q, R and S



Answer: $P=....., Q=....., R=....., S=.....$

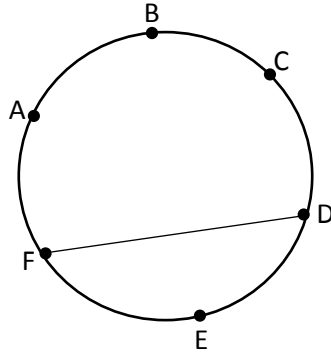
4. A wire of length 2018 m is to be folded in the form of square. If the side of the square has to be an integer (measured in meters), what is the maximum area of the square?

Answer:

5. A, B and C are different whole numbers. If $A \times A = B$ and $C \times C \times C = B$, and B is less than 100, find B .

Answer:

6. A line segment (Such as FD as shown) that connects any two points of a circle is called a chord of the circle. How many different chords including FD can be drawn using only points A, B, C, D, E and F?



Answer:

7. Write the 9th term of the number series $\sqrt{8}, \sqrt{18}, \sqrt{32}, \dots$

Answer:

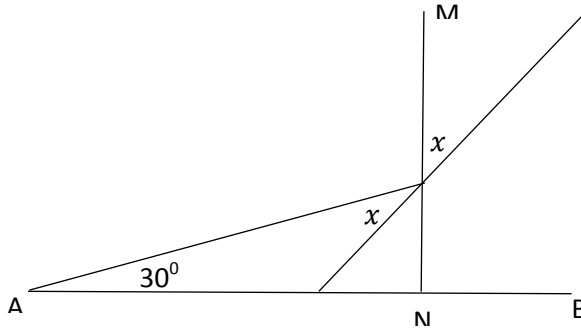
8. Four people A, B, C and D have an average monthly income of 13 500 Rupees. First three of them have an average monthly income of 14 000 Rupees. Average income of first two of them is 17 000 Rupees Find the monthly income of B, C and D separately, if A has a monthly income of 22 000 Rupees.

Answer: B=....., C=....., D=.....

9. Suppose that $4^a = 7$, $7^b = 10$, $10^c = 13$, $13^d = 16$. Find the value of $a \times b \times c \times d$

Answer:

10. In figure, MN is perpendicular to AB. Find the value of x .



Answer:

11. A grid is shown in the figure. You have to write numbers in the small squares of grid such that the difference between any two numbers in neighbor squares of the same row or column results same. For example, the difference between any two numbers in neighbor squares of the first column is 3. The same rule is applicable for the rows. Find the value of $x + y$

1		x	
4			25
7			y
10		36	

Answer:

12. \overline{abcd} is a number of 4 digits where $a = b + c + d$ and $a > b > c > d$. How many such numbers can be found of this type?

Answer:

13. In the following figures a rectangular piece of paper ABCD has been folded several times. First, the side CD was made to fall on the line AD. Point E in figure (ii) represents the point C after folding. In the next figure the portion BF was made to fall on EF. Lastly, the side AG was made to fall on GH. Find the area of IEHJ, If it is given that $AB = 9\text{cm}$ and $BC = 15\text{cm}$.

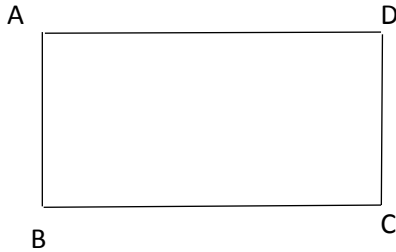


figure (i)

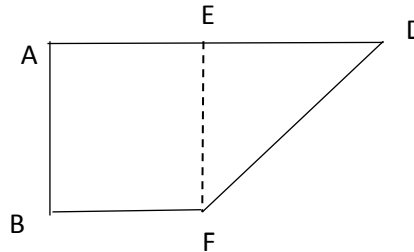


figure (ii)

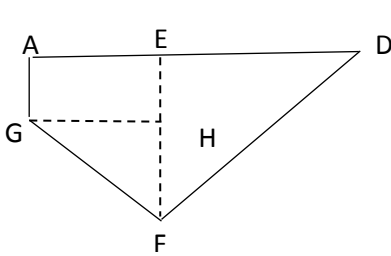


figure (iii)

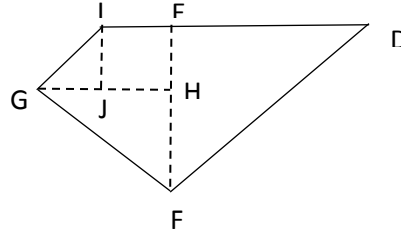
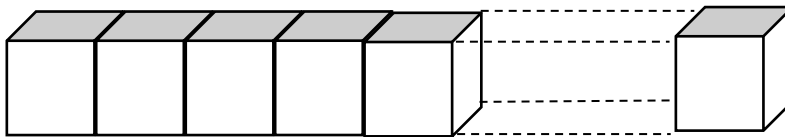


figure (iv)

Answer:

14. The total surface area of the solid block is 2018 cm^2 , Such identical small cubes are put together end to end as shown in the figure below. If the surface area of a cube is 6 cm^2 what is the number of small cubes are put together?



Answer:

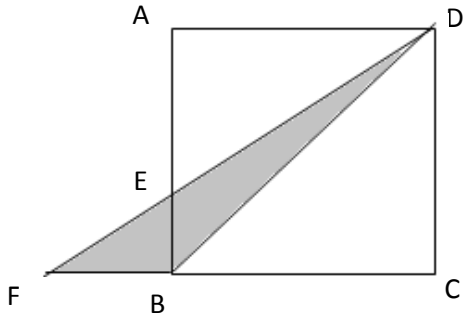
15. In the following alphametic, all the different letters stand for different digits. Find $P+E+E+L$.

$$\begin{array}{r}
 \\
 + \\
 \hline
 P \\
 \hline
 \hline
 \end{array}$$

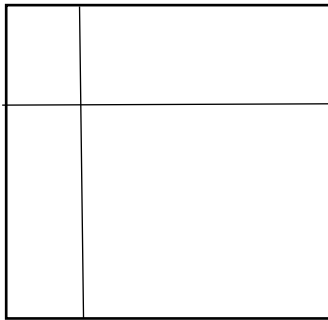
Answer:

Part II

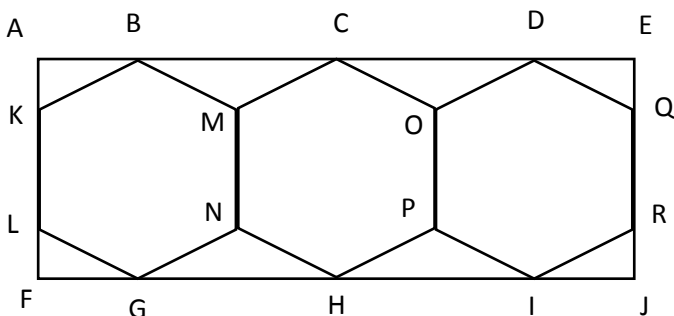
1. a) In the following figure, ABCD is a square of side length 10 cm. AEB, FED and FBC are straight lines. The area of triangle AED is larger than that of triangle FEB by 10 cm^2 . Find the area of the triangle DFB.



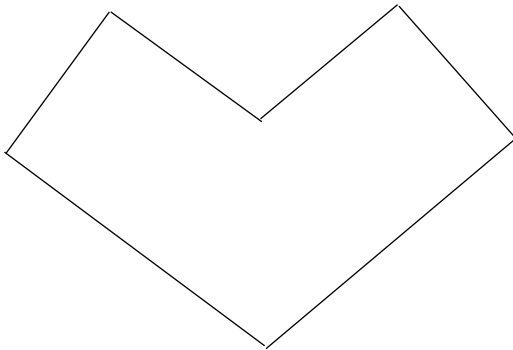
- b) The diagram shows a square being divided into four different rectangles. If the sum of the perimeter of the four rectangles is 32 cm, find the area of the square.



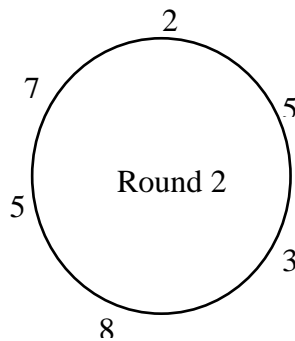
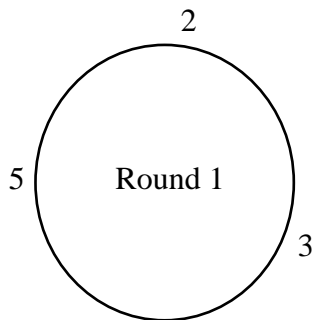
- c) In the following figure BKLGNM, CMNHPO and DOPIRQ are regular hexagons. BKLGNM has an area of 24 square units. What is the area of the rectangle AFJE?



d) Divide the following shape into 4 identical parts.

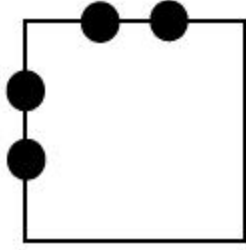


2. a) In Round 1 Of a game, three numbers 2, 3 and 5 are written around the circle. In Round 2, the sum of every two adjacent numbers with respect to the circle is written between them. The following diagram shows the numbers after Round 1 and Round 2. Find the sum of all the numbers written around the circle after Round 5.



b) Amal pasted 4 dot stickers along two sides of a square as shown below.

Show where he should paste 5 more stickers so that there are 3 stickers on each side of the square.



C) The total number of story books that Sunil and Nimal have is 25.

The total number of storybooks that Sunil and Piyal have is 20.

The total number of storybooks that Nimal and Piyal have is 31.

Who has the most number of books? How many does he have?

D) Three ladies Kamani, Ramani and Gayani made the following statements:

Kamani: I am 22 years old. I am 2 years younger than Ramani. I am 1 year older than Gayani.

Betty: I am not the youngest. Gayani and I are 3 years apart. Gayani is 25 years old.

Carol: I am younger than Kamani. Kamani is 23 years old. Ramani is 3 years older than Kamani.

If only two of the three statements made by each lady are true, find the age of Kamani.