

NMOS 2017 Special Round

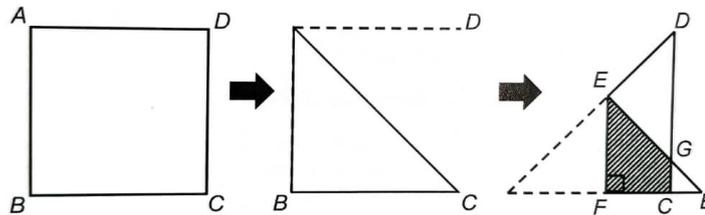
Time Duration: 1.5 hour

Name: _____

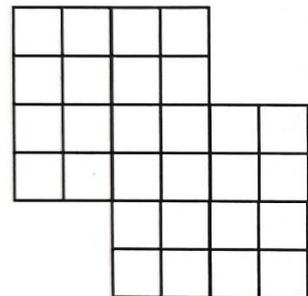
Marks: _____

- Benjamin had 30% more beads than Chloe and 50% fewer beads than Annie. After Annie and Benjamin gave 90 beads and 95 beads respectively to Chloe, Benjamin had $\frac{1}{3}$ as many beads as Annie. How many beads did Chloe have at first?

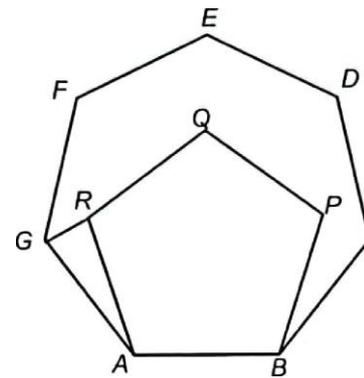
- The figure at the left below shows a square $ABCD$ with side length 20 cm. When it is first folded along the diagonal BD , a triangle BCD is obtained. Then the triangle BCD is folded along the vertical line EF with side length 12 cm to obtain the figure at the right below. Find the area, in cm^2 , of the shaded region in the final figure.



- How many squares are there in the following figure?



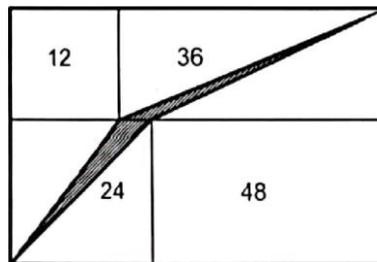
4. As shown in the following figure, $ABCDEFG$ is a regular heptagon and $ABPQR$ is a regular pentagon. Given that $\angle AGR = x^\circ$, find the value of $7x$.



5. There were some oranges and apples at a fruit stall. The ratio of the number of oranges to that of apples was 5 : 3. In the morning, $\frac{3}{7}$ of the oranges and some apples were sold. The ratio of the number of oranges to that of apples became 10 : 7. The fruit seller bought 60 oranges and 240 apples in the afternoon. In the end, the number of oranges left was the same as the number of apples left. How many apples were there at the fruit stall at first?
6. For the sum of $1 + 2 + 3 + 4 + \dots + n$, it is known that the ones digit is 3 and the tens digit is 0, but the hundreds digit is not 0. Find the smallest possible value of n .
7. George and Heidi were jogging at different uniform speeds on a route AB towards each other from points A and B respectively. When they first met each other, they were 64 m away from point A. When they each reached points B and A respectively, they turned around and jogged back towards their starting points. They met each other the second time at a distance 168 m away from point A. What was the distance, in m, of the jogging route AB?

8. In a competition, Team A and Team B are assigned to complete a construction project respectively. It is known that Team A would take 12 sunny days and Team B would take 15 sunny days to complete the project. However, during rainy days, Team A would complete 40% less per day, and Team B would complete 10% less per day. Both teams start working on the same day and complete the project at the same time a few days later. Find the number of rainy days.

9. The big rectangle below is divided into 4 small rectangles with areas 12 cm², 24 cm², 36 cm², and 48 cm² respectively. The lengths of the sides of all rectangles are integers (in cm). Find the area, in cm², of the shaded region.



10. Each of the letters $A, B, C, D, E, F, G, H, I$ and J represents a different one of the digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 such that

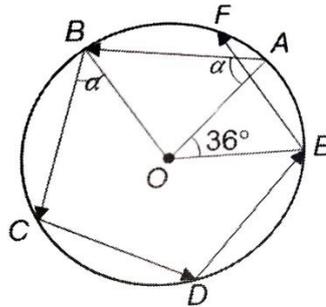
$$\begin{array}{r}
 A \ B \\
 C \ D \\
 + \ E \ F \ G \\
 \hline
 H \ I \ J \\
 \hline
 \end{array}$$

Note that A, C, E and H cannot be 0.

If M is the largest possible value of the 3-digit number \overline{HIJ} , find the value of M .

11. Justin, Kaden and Leon run a 300-m race at different uniform speeds. When Justin finishes the race, Kaden is 12 m behind Justin and Leon is 48 m behind Kaden. Kaden has to run for another 2 seconds when Justin finishes the race. How many more seconds does Leon have to run when Kaden finishes the race?

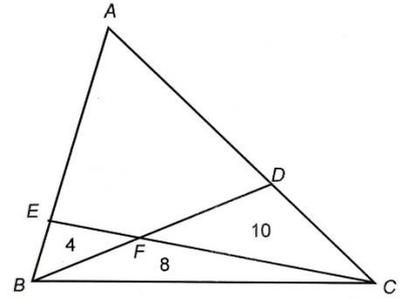
12. Adrian walked on a circular region from starting point A. He walked along the path which formed angle α with radius OA and reached point B on the circle. Then he walked along the path which formed angle α with radius OB and reached point C on the circle. By walking this way, when he reached the point F on the circle, the angle AOE is 36° . From the point F, find the minimum number of times that he reached a point on the circle before he got to point A again.



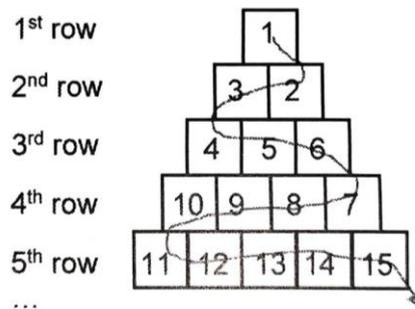
13. There are 5 different whole numbers. The average of some 4 of these 5 numbers is 36, 38, 39, 45 and 49. What is the largest number among these 5 numbers?

14. Within one hour, there are two instances between 11 o'clock and 12 o'clock when the minute hand and the hour hand of the clock make an angle of 70 degrees. What is the time difference, in minutes, between these two timings?

15. In the diagram below, ABC is a triangle. D and E are points on AC and AB respectively. The segments BD and CE intersect at F. If the area of triangles BEF, BCF and CDF are 4 cm^2 , 8 cm^2 and 10 cm^2 respectively, find the area, in cm^2 , of the quadrilateral Aefd.



16. Whole numbers are arranged in the following manner:



For example, the number 10 is placed at 4th row, 1st entry while the number 14 is placed at 5th row, 4th entry. It is known that the number 2017 is placed at Mth row, Nth entry. Find the value of $M + N$.

17. Given that r and s are whole numbers such that $\frac{3}{10} < \frac{r}{s} < \frac{5}{16}$, find the smallest value of s .

18. Given that the 7-digit number $\overline{abc2017}$ is a multiple of 13, find the smallest value of the 3-digit number \overline{abc} .

19. 5 students A, B, C, D and E went to visit their form teacher Ms Fan on Teachers' Day. Before that, they were trying to guess the 3-digit block number of Ms Fan's place and made the following statements.

Student A: The number is a multiple of 27.

Student B: The number is a multiple of 7.

Student C: The sum of the digits of the number is 17.

Student D: The number is a perfect square.

Student E: The number is a factor of 89100.

Ms Fan told them that only three of these statements are true. What is the 3-digit block number of Ms Fan's place?

20. In the following Figures (a) and (b), each number inside a small triangle is the sum of the numbers inside in the neighbouring small circles. The number inside each circle is either 1, 2, 3, 4, 5, 6, 7 or 8.

The sum of whole numbers inside the circles in Figure (a) is $1 + 8 + 8 + 2 + 3 + 5 = 27$. What is the largest possible sum of whole numbers inside the circles in Figure (b)?

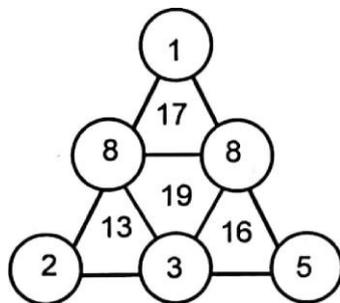


Figure (a)

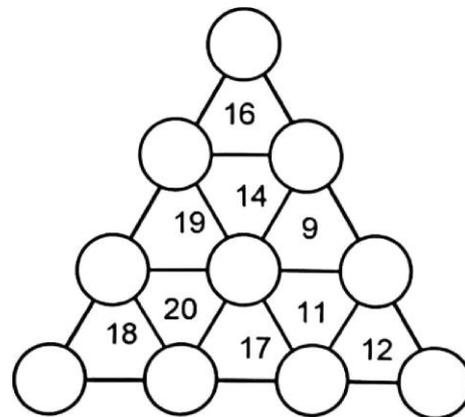


Figure (b)