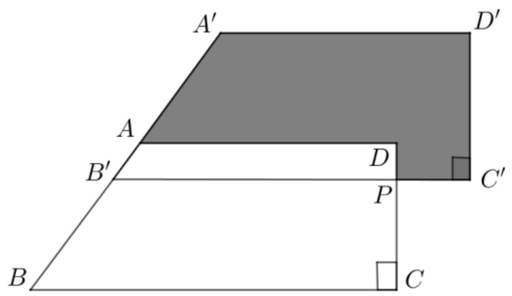
NMOS 2016 Special Round

Time Duration: 1.5 hour Name: __________ Marks: __________

1. In a certain city, there are an equal number of men and women. 40% of men wear glasses while among those wearing glasses, 68% are women. How many percent of women do not wear glasses?

2. The following figure shows two identical right angled trapezium $ABCD$ and $A'B'C'D'$, where $AB = A'B', BC = B'C', CD = C'D', DA = D'A'$ and $\angle BCD = \angle B'C'D' = 90°$. These two trapeziums overlapped and are placed such that AB and $A'B'$ are on the same line. If $BC = 20cm$, $CP = 7cm$ and $C'P = 4cm$, find the area, in cm^2, of the shaded region.



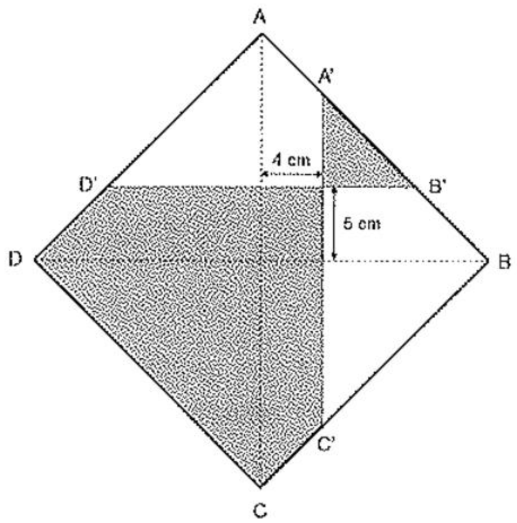
3. Alice, Bob auld David are in an archery club. During one friendly match, they attempted 8, 7 and 6 shoots respectively and there was no miss. Each shoot scores 10, 7 or 5 points. Everyone scored 51 in total. However, the details are not revealed. If Alice scored 5 points x times, Bob scored 7 points y times while David scored 10 points z times, find $x+y+z$.

Name	Attempts	10 points	7 points	5 points	Total
Alice	8			x	51
Bob	7		y		51
David	6	z			51

4. Given that $\dfrac{1}{\dfrac{1}{2014}+\dfrac{1}{2015}+\dfrac{1}{2016}}=A+b$, where A is a whole number and $0<b<1$.
Find the value of A.

5. In a particular school, Primary 5 students sat for English and Mathematics Tests. It turned out that 70% of the Primary 5 students passed English, 80% passed Mathematics while 10% failed both the subjects. Suppose that 282 Primary 5 students passed both English and Mathematics. Find the total number of Primary 5 students in the school.

6. In the following figure, the diagonal AC of a square $ABCD$ is $24cm$. The points A', B', C' and D' are on the sides AB, AB, BC and DA respectively, such that the distance between the parallel line segments AC and $A'C'$ is $4cm$, whereas the distance between the parallel line segments BD and $B'D'$ is $5cm$. Find, in cm^2, the area of the shaded region.



7. In a particular afternoon, a car and a van were travelling at constant speeds of 84 km/h and 72 km/h respectively from Town A to Town B. At the same time, a motorcyclist was travelling at a constant speed of 108 km/h from Town B to Town A. The motorcyclist drove past the van 3 minutes after passing the case. What is the distance, in km, between Town A and Town B?

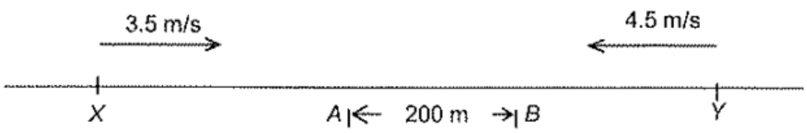
8. It is known that the difference and the sum of two whole numbers are in the ratio 11:25. Furthermore the product of these two whole numbers is 2016. Find the larger number among these two numbers.

9. Frank had a total of 424 local and foreign stamps. He gave away 40% of the local stamps and $\frac{5}{6}$ of the foreign stamps to his friends. Then he bought 28 foreign stamps. As a result, the number of foreign stamps he had was $16\frac{2}{3}\%$ of the number of local stamps left. How many local stamps did he have at first?

10. Alex and Bob love to fold cranes. For a bag of N cranes, Alex will need 2 hours to complete while Bob will need 3 hours. One morning, Alex and Bob started to fold cranes at the same time. After 30 minutes, Alex rested for 10 minutes before continuing to fold cranes while Bob did not rest at all. When they finished a bag of N cranes together, Alex folded 24 more cranes than Bob. Find the value of N.

11. Given that x and y are whole numbers such that $24x - 25y = 8$, find the smallest value of x.

12. Linda and Samuel jogged to and fro along a straight road between two points X and Y at uniform speeds of 3.5 m/s and 4.5 m/s respectively. They started from X and Y at the same time as shown:

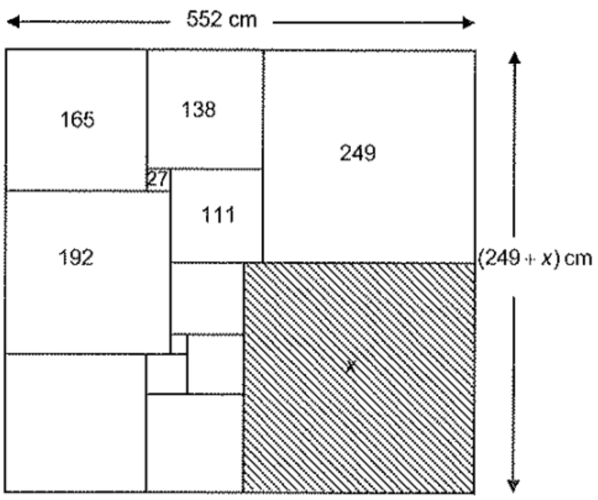


The first time they met each other was at point A. The second time they met each other was at point B. If the distance between A and B is 200 m, find the distance, in m, between X and Y.

13. Joel and Karl each has a watch. The two watches were set correctly at 9 o'clock in the morning. Joel's watch is faster than Karl's watch by 1 minute every 1 hour; Karl's watch is slower than the actual time by 2 minutes every hour. If Joel's watch showed 10:*ab*:*cd* (in the format of HH:MM:SS) when the actual time was 11 o'clock in the same morning, write down the 4-digit number *abcd*.

14. Three poker cards whose number is less than 10 were selected. Let the number on the cards be A, B and C respectively, where $A<B<C$. After reshuffling, the cards were distributed randomly to three students Aaron, Betty and Calvin, one each. After every student had recorded the card's number, all three cards were collected, followed by reshuffling before they were distributed to the three students for recording again. The process of shuffling, distributing and recording was repeated several times. The total of the numbers recorded by Aaron, Betty and Calvin were 34, 40, and 41 respectively. Write down the 3-digit number ABC.

15. The following figure shows a rectangle of width $552cm$ and height $(249+x)cm$. It is partitioned into 13 squares of different sizes. The side length, in cm, of some squares is shown by the number inside the particular squares. For example, the top left square is of side $165cm$ while x represents the side length, in cm, of the shaded square. Find the value of x.



16. It is possible to colour the regions in Figure M using some (or all) of the colours 1, 2, 3 and 4 so that no two regions with a common boundary receive the same colour. See two examples below to the right of Figure M.

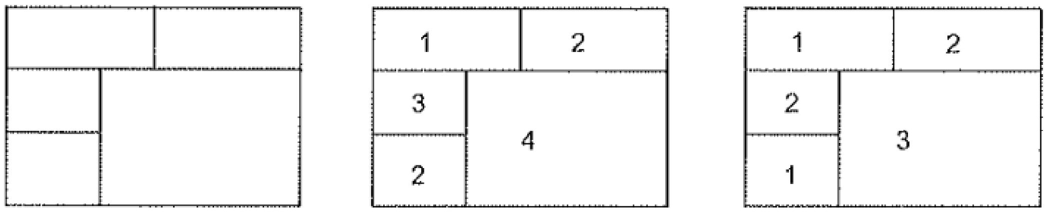


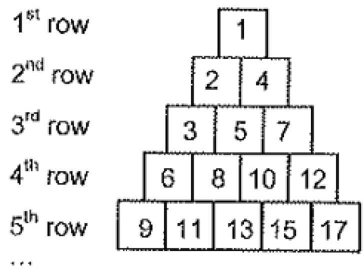
Figure M

How many different ways, including the above two way, can we colour Figure M?

17. A prime number is a whole member which has exactly two factors; examples of some prime numbers are 2, 3, 5, 7, 11 and 13. Given that two distinct prime numbers x and y satisfy the equation $x(2+y)=200+y$, find the largest value of $x+y$.

18. Whole numbers are arranged in the following manner:

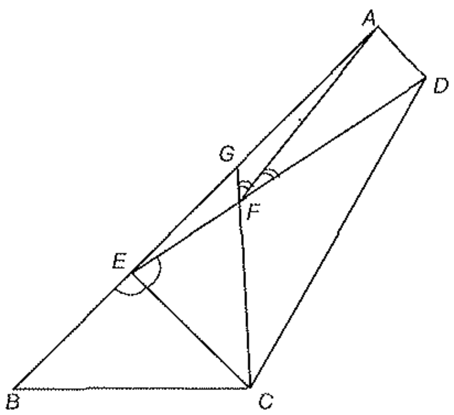
i. The nth row contains n numbers;
ii. The 1st , 3rd , 5th , 7th and all other 'odd-row' contain only odd numbers;
iii. The 2nd , 4th , 6th and all other 'even-row' contain only even numbers;
iv. The numbers are placed according to the sequence, that is, 1 is placed in the 1st row, 2 and 4 in 2nd row, 3, 5 and 7 in the 3rd row and so on.



Which row does 2016 appear in?

(For example, if you think the answer is the 50th row, write your answer as 50.)

19. In the diagram below, $ABCD$ is a quadrilateral. E is a point on AB such that $\angle BEC = \angle CED$. F is a point on the line segment DE such that $CE = EF$. G is a point on AE such that C, F and G are on the same straight line. If $\angle GFA = \angle AFD$ and $AF = EF$, find, in degree, $\angle AED$.



20. A number M is formed by writing the whole numbers from 1 to 2016 in a connected way, as follows:

$$123456789101112131 4...201420152016$$

A number N is obtained from M by removing all the digits 1, as follows:

$$234567890234...204205206$$

Find the 2-digit number after the 2016th digit in N.
(For example, the 2-digit number after 1st digit is 34 and the 2-digit number after the 7th digit is 90.)