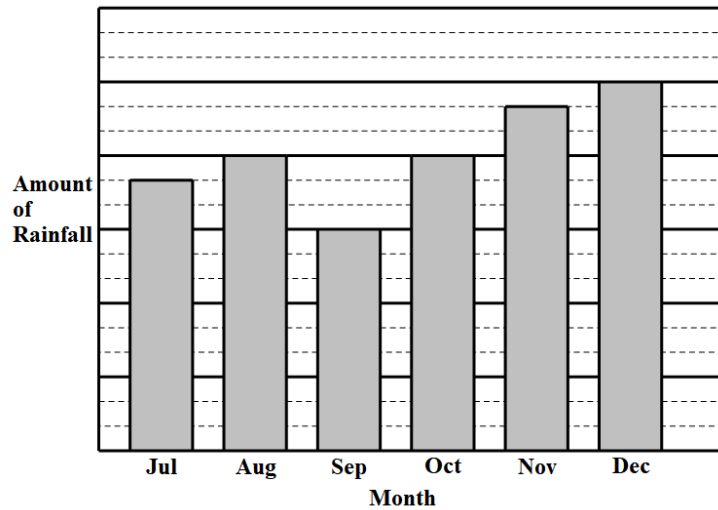# 2011 NMOS Question

1. The following bar chart shows the amount of rainfall (in mm) from July to December of the year 2010. Given that the difference between the average amount of rainfall for the first three months and the average amount of rainfall for the last three months was 60 mm, find the amount of rainfall in July.

2. What is the percentage increase in the area of a triangle if the height of the triangle is decreased by 10% and its base is increased by 20%?

3. A rectangle is divided into four smaller rectangles with areas as shown in the diagram below. Find the value of A.

18 cm^2	15 cm^2
A cm^2	25 cm^2

4. Study the following pattern:

$1 = 1 = 1^2$

$1 + 3 = 4 = 2^2$

$1 + 3 + 5 = 9 = 3^2$

$1 + 3 + 5 + 7 = 16 = 4^2$

$1 + 3 + 5 + 7 + 9 = 25 = 5^2$

$1 + 3 + 5 + 7 + 9 + 11 = 36 = 6^2$

Given that $1 + 3 + 5 + 7 + \cdots + 2009 + 2011 = k^2$, where k is a positive number, find the value of k.

5. The following is a sequence of numbers:

$$2, 2, 4, 6, 0, 6, 6, 2, 8, 0, \cdots$$

where the first two numbers are 2, and the subsequent numbers are obtained by taking the last digit of the sum of its two previous numbers.

What is the 2011th number in this sequence?

6. Mrs Tan distributed candies to her children. She gave a quarter of the candies to Allan, and then half of the remainder to Benjamin. Thereafter, she gave $\frac{1}{3}$ of the rest to Catherine, and what was left over to Dillon. Suppose Benjamin received 6 candies from Mrs Tan. How many candies did Dillon receive?

7. A square was divided into 9 rectangles and 8 triangles, as shown in the diagram below. Find the total area (in cm²) of the shaded regions.
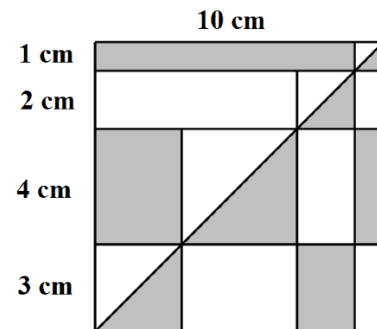
8. Allan and Ben took part in NMOS 2010, and their total score was 78. Allan's score was less than three times of Ben's score by 50. What was Allan's score?

9. There are three boxes *A, B* and *C*. One of them contains chocolate while the other two boxes are empty.

Box *A* labelled: This box is empty.
Box *B* labelled: This box contains chocolate.
Box *C* labelled: Box *B* is empty.

Only one box is labelled correctly. Which box is it?

[If your answer is Box *A*, then shade your answer as "1001";

If your answer is Box *B*, then shade your answer as "1002";

If your answer is Box *C*, then shade your answer as "1003".]

10. The following table shows the test scores obtained by Jane in various subjects.

Subject	Mathematics	Science	English	Chinese
Score	92	84	87	-

It is known that Jane's scores were all whole numbers. Jane's overall average was lower than the average of the three subjects (Mathematics, Science and English) by at least 5 marks. What was the highest possible score Jane can obtain for Chinese?

11. Alice had 50 dollars more than Bob. Alice spent 20% of her own money while Bob spent 30% of his own money. Now Alice has 48 dollars more than Bob. What was the total amount of money (in dollars) that they had at the beginning?

12. There are only Math, Science and English books in a library. The number of Math books is $\frac{3}{7}$ of the total number of books. The number of science books is $\frac{3}{4}$ of the number of English books. Given that the number of English books is less than the number of Math books by 50, what is the total number of books in the library?

13. A farm has some chickens and goats. The difference between the numbers of chickens and goats is 10. Given that the chickens and goats have a total of 140 legs, find the number of chickens in the farm.

14. A six-digit integer $\overline{abcdef}$ is a multiple of 4. What is the largest possible value of $a + b + c + d + e + f$?

15. For the football shown in the diagram, each black pentagon is surrounded by 5 white hexagons, while each white hexagon is surrounded by 3 black pentagons and 3 white hexagons. Given that there are 12 black pentagons on the football, find the number of white hexagons on it.

16. Gary drove from Town A to Town B at an average speed of 60 km/h. What was the average speed (in km/h) on the return journey if the average speed for the whole journey was 70 km/h?

17. In the figure below, the square $ABCD$ has a length of 20 cm. The point M is the midpoint of the side AD while the point N is on the diagonal AC such that $AC : AN = 4 : 3$. Find the area (in cm^2) of the shaded region.
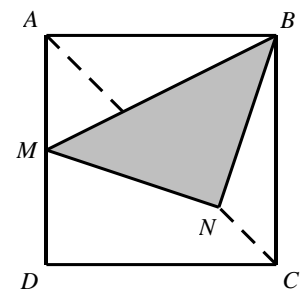

18. The numbers 1 to 8 are placed into the 8 small circles with each number used exactly once such that the sums of the 5 numbers on the two big circles are the same. Let the largest sum be X and the smallest sum be Y. Find the value of $X - Y$.
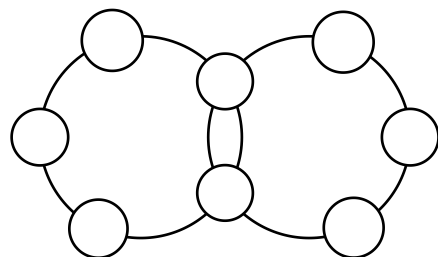
19. A department store buys printers from its supplier for $X each and sells them to the customers for $126 each. The selling price includes a 5% commission for the sales team. If the store earns a profit of 50% of $X for each printer, find the value of X.

20. Pail A contains $\frac{2}{3}$ as much water as Pail B. When 4 litres of water are poured from Pail B into Pail A, Pail A will contain $\frac{7}{8}$ as much water as Pail B. What is the total amount of water (in litres) in both pails?

21. In the figure below, three identical regular hexagons overlap at the shaded regions. Points P and Q are the centres of two of the hexagons. If the total area of the shaded regions is 6 cm², find the total area (in cm²) of the figure.
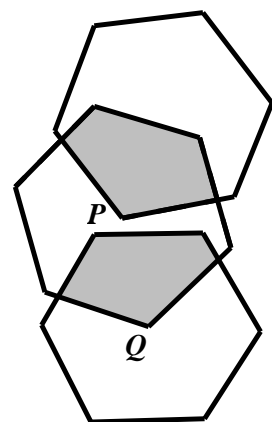
22. Today is 29th of June. Some people use 29/6 to represent this date while others use 6/29.
Written either way, the represented date is clear. We call such a date as a definite date.
On the other hand, 1/7 is unclear. We do not know if it represents 1st of July or 7th of January.
Hence, both dates are examples of non-definite dates.
Find the number of definite dates in the year 2011.

23. Numbers are filled in the following 3×3 array such that the sum of the numbers in each row,
column and diagonal is the same. Two numbers had been filled in, as shown. Find the number in
the top right corner.

		?
2011		
	2005	

24. In the figure below, $ABCD$ is rectangle with $AB = 10$ cm and $BC = 8$ cm. The points E, F, G and
H are on the sides AB, BC, CD and DA respectively, such that $AE = CG = 8$ cm and $AH = FC = 3$
cm. The point P is in the interior of the rectangle $ABCD$ such that the area of $AEPH$ is 28 cm².
Find the area (in cm²) of $PFCG$.
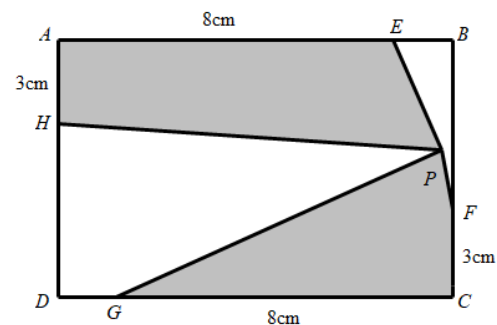
25. A number is formed by writing the whole numbers from 1 to 1200 in a connected way. as follows:

123456…119811991200

What is the 2011th digit of the above number if we count it from the right?

(For example, the 4th and the 5th digit as mentioned, is 1 and 9 respectively)

26. A, B, C, D, $A+C$, $B+C$, $A+D$ and $B+D$ represent different numbers from 1 to 8. If A is the largest number among A, B, C and D, find the value of $A-B$.

27. The total age of a family with 5 members is 121. The following table shows the sum of ages of 4 pairs family members, for example, the total age of Allan and Betty is 19. What is the age of Mother?

Members	Sun of ages
Father and Mother	95
Mother and Allan	52
Allan and Betty	19
Betty and Catherine	24

28. Bus services are available between two terminals A and B. The buses travel at uniform speed and the ride takes 2 hours in each direction. A bus leaves each terminal every 16 minutes. Angela took a bus and left terminal A at 1.00 p.m. Along the way, she first met a bus from terminal B at 1.05 p.m. Find the total number of buses from terminal that Angela will meet before she arrives at terminal B.

29. The following figure shows a rectangle with dimension 177 cm $\times$ 176 cm. It is partitioned into 11 squares of different sizes. It is known that the largest square is of side 99 cm and the square on its right is of side 78 cm. Find (in cm^2) the area of the smallest square.
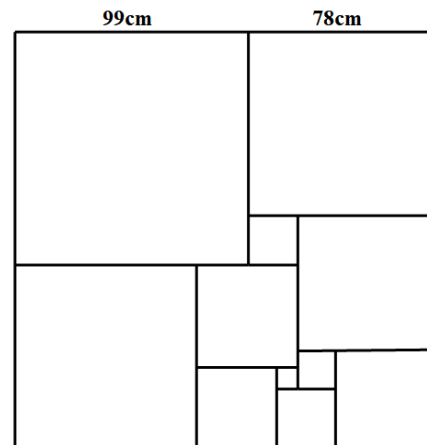
30. The figure below shows the right-angled triangle ABC with $\angle B = 90°$ and $AC = 18$ cm. Given that the lengths of AB and BC differ by 6 cm, find the area (in cm^2) of the triangle ABC.