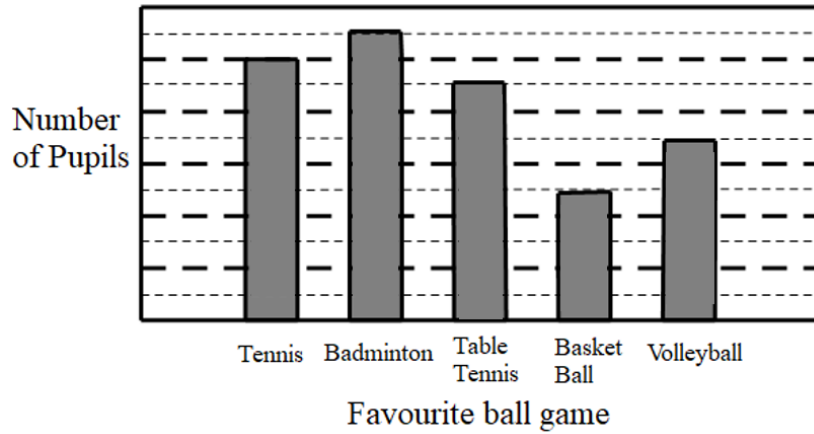


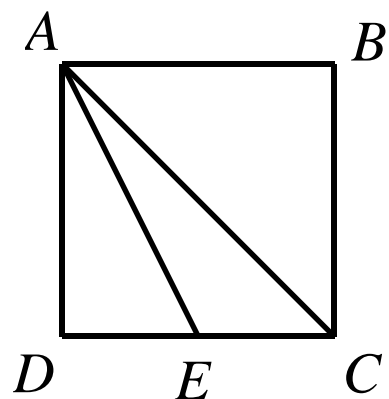
2012 NMOS Question

1. The following bar chart shows the favourite ball games of some pupils in a primary school. Given that the difference in the number of pupils in the most popular ball game and the least popular ball game is 24, find the number of pupils whose favourite ball game is Volleyball.



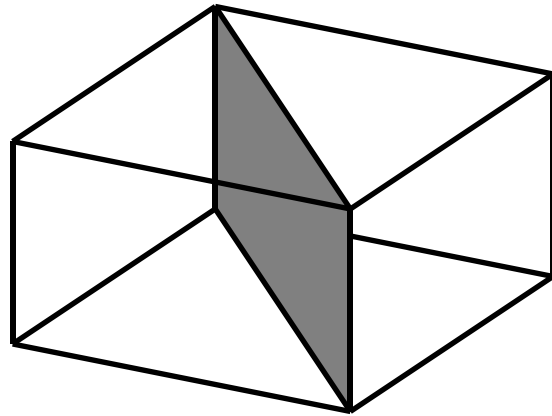
2. The sum of three whole numbers A , B and C is 69. Suppose that A is 20% more than B while B is 20% less than C . Find the value of C .

3. The figure below shows a square $ABCD$, and E is the mid-point of CD . Given that the area of triangle ACE is 16 cm^2 . Find the perimeter (in cm) of the square $ABCD$.



4. Find the value of $1 - 2 + 3 - 4 + 5 - 6 + \dots + 999 - 1000 + 1001$.

5. The figure below shows a rectangular tank of dimension $10\text{ m} \times 6\text{ m} \times 2\text{ m}$. It is filled with oil. A piece of rectangular divider along the diagonal of the base separates the tank into two sections. Now if half of the oil in the left section and one-third of the oil in the right section have been used, find the volume (in m^3) of the remaining oil in the tank.



6. In a certain co-curricular activity (CCA), the ratio of the number of upper primary students to the number of lower primary students is $3:2$. If the ratio of the number of upper primary boys to the number of lower primary girls is $4:5$, find the least possible total number of students.

7. Study the following pattern:

$$\frac{1}{1 \times 2} = \frac{1}{2}$$

$$\frac{1}{1 \times 2} + \frac{1}{2 \times 3} = \frac{2}{3}$$

$$\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} = \frac{3}{4}$$

$$\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \frac{1}{4 \times 5} = \frac{4}{5}$$

$$\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \frac{1}{4 \times 5} + \frac{1}{5 \times 6} = \frac{5}{6}$$

Given the $\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \cdots + \frac{1}{2011 \times 2012} = \frac{k}{k+2}$, where k is positive number, find the value of k .

8. Alice and John had some sweets in the ratio 5:7. After Alice gave John some sweets, the ratio of the number of sweets Alice had to that of John was 17:31. Express the number of sweets that Alice gave John as a percentage of the number of sweets she had at first.

If your answer is $m\%$, shade " m " as your answer. For example, if the answer is 50%, shade "50".

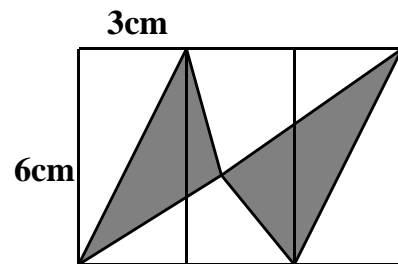
9. Muthu usually walks at a constant speed of 60 m/min from his home to his school. If he runs at a constant speed of 100m/min instead, he will reach his school 5min earlier than usual. What is the distance (in m) between his home and his school?

10. It is known that the whole number in each box below is the same.

$$\square \times \square + \square = 380$$

What is the whole number?

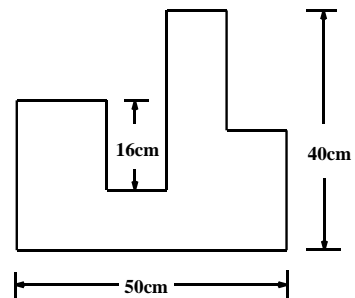
11. In the figure below, three $3\text{ cm} \times 6\text{ cm}$ rectangles are placed together in a row. Find the area (in cm^2) of the shaded region.



12. Mimi was making an orange syrup drink. She mixed 1 litre of the orange syrup with 4 litres of water in a container. Her mother tried the syrup, found it too sweet and poured away 2 litres of the mixture. Then she added 2 litres of water to the remaining mixture in the container. What percentage of the final mixture was made up of water?

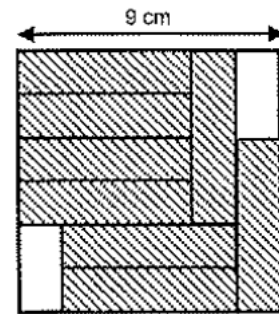
13. If the sum of eight consecutive whole numbers is equal to 2012, find the value of the largest number among these eight whole numbers.

14. The following shape is made up of rectangular pieces in the upright position. According to the scale given, find the perimeter (in cm) of the shape.



15. Alex travelled at a constant speed of 30km/h from Town A to Town B. Ben travelled at a constant speed of 20km/h from Town B to Town A. Ben started travelling 5 min earlier than Alex and met Alex at the midpoint between Town A and Town B. What was the distance (in km) between Town A and Town B?

16. In the figure below, the length of the side of the square is 9 cm. Eight shaded identical rectangles are placed inside the square, without overlapping. What is the area of the unshaded region?



17. The number of 50-cent coins that Mary has to the number of 20-cent coins is 5:2. After exchanging some 50-cent coins for 20-cent coins, Mary has the same amount of money as before, but the ratio of the number of 50-cent coins to the number of 20-cent coins is now 8:5. Find the increase in the number of 20-cent coins as a percentage of the initial number of 20-cent coins.

18. You may get the answer 100 by inserting plus or minus signs (+, -) into the string of digits 123456789 while keeping the digits in this order. For example:

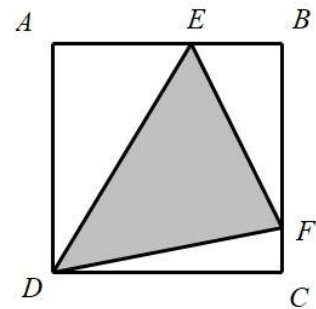
(a) $1 + 2 + 34 - 5 + 67 - 8 + 9 = 100$

(b) $1 + 23 - 4 + 5 + 6 + 78 - 9 = 100$

The order of the signs are +, +, -, +, -, + and +, -, +, +, +, - in example (a) and (b) respectively. Define '+' as '1' and '-' as '0'. Then the order of the signs can be represented by 110101 and 101110 in example (a) and (b) respectively. Using the same method, what is the number that represents the order of the signs, for the following equation?

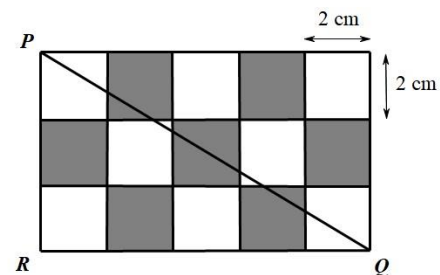
$$123 \square 4 \square 5 \square 67 \square 89 = 100$$

19. In the figure below, the perimeter of the square $ABCD$ is 40 cm. The point E is on the line AB such that $AE : EB = 3 : 2$; while the point F is on the line BC such that $BF : FC = 4 : 1$. Find the area (in cm^2) of the shaded region.



20. A three-digit integer \overline{abc} is a multiple of 7. What is \overline{abc} with the largest value of $a + b + c$?

21. In the figure below, PQ is the diagonal of the 5×3 grid. Suppose that the side length of each small square is 2 cm. What is the difference of the areas (in cm^2) between the shaded regions and the unshaded regions in triangle PQR ?



22. In a chess competition, every two players played exactly once. After each game, if there was a winner, the winner would have scored 2 points and the loser would have scored 0 point . If there was no winner, each player would have scored 1 point. The total score for the entire competition was recorded by three judges as 1560, 1563 and 1564 but only one was recorded correctly. How many participants were there in this competition?

23. There are some people at a party.

Exactly 1 of them can dance.

Exactly 2 of them can swim.

Exactly 3 of them can cycle.

All of them can do at least two of the above (dance, swim and cycle). How many people are there at the party?

24. It is known that the average of the following 8 whole numbers,

4, 5, 6, 9, 3, 9, p, q

is 6, and that the difference between the highest value and the lowest value is also 6. Given that $p < q$, find the lowest possible value of q.

25. The following table shows the grades obtained by 20 pupils in two Mathematics tests. For example, 2 pupils obtained 'D' in Test 1 while only 1 pupil obtained 'D' in Test 2.

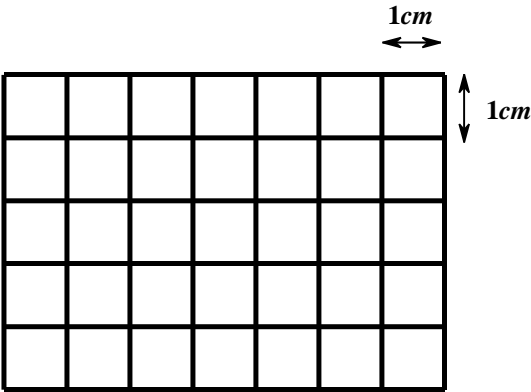
	A	B	C	D
Test 1	6	7	5	2
Test 2	8	8	3	1

The next table shows the details of the same tests. For example, 2 pupils obtained 'C' in Test 1 and 'B' in Test 2.

		Test 2			
		A	B	C	D
Test 1	A	x	y	0	0
	B	4	z	0	0
	C	w	2	2	0
	D	0	0	1	1

Find the percentage of pupils who obtained the same grade in both tests.

26. The figure below shows a 7×5 grid. Suppose that the side length of each small square is 1 cm. How many rectangles with perimeter 10 cm are there in the figure?



27. Rosanne went to the market to buy rice. There were 3 grades of rice to buy: Grade A, B and C. Grade B rice cost 150 cents per kilogram while Grade C rice cost 120 cents per kilogram. Suppose Rosanne used all her money to buy Grade A rice. If she had used all her money to buy Grade C rice instead, she would have 5 more kilograms of rice. On the other hand, if she had used all her money to buy Grade B rice instead, she would have 2 more kilograms of rice. What was the price of kilogram of Grade A rice in cents?

28. Andy, Benny, Calvin and Dennis are playing in a badminton double's match. We know that

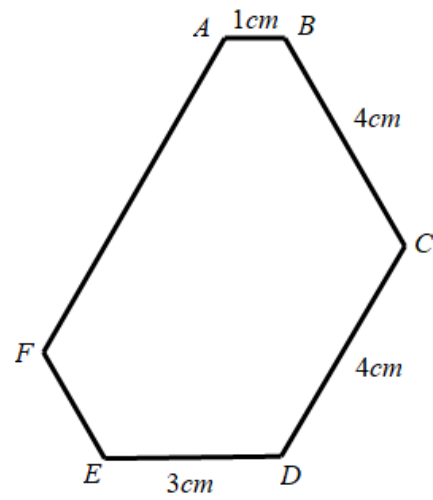
- (a) Dennis is older than Andy;
- (b) Benny is older than his 2 opponents;
- (c) Andy is older than his teammate;
- (d) The difference in age between Andy and Dennis is greater than the difference in age between Benny and Calvin.

Arrange the age of the 4 players from youngest to eldest.

(Let $Andy = 1$, $Benny = 2$, $Calvin = 3$ and $Dennis = 4$.

If you think that Andy is the youngest, followed by Calvin, then Benny then Dennis, write your answer as 1324.)

29. In the figure below, each of the interior angles of hexagon $ABCDEF$ is 120° . Given that $AB = 1\text{ cm}$, $BC = CD = 4\text{ cm}$ and $DE = 3\text{ cm}$, find the perimeter of the hexagon $ABCDEF$.



30. Seven different numbers from 1 to 9 can be placed in the circles below such that the product along each line is the same. What is the number for the 'centre circle', which is labelled as x ?

