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5^{th} International Mathematics and Science Olympiad (IMSO) for Primary School 2008

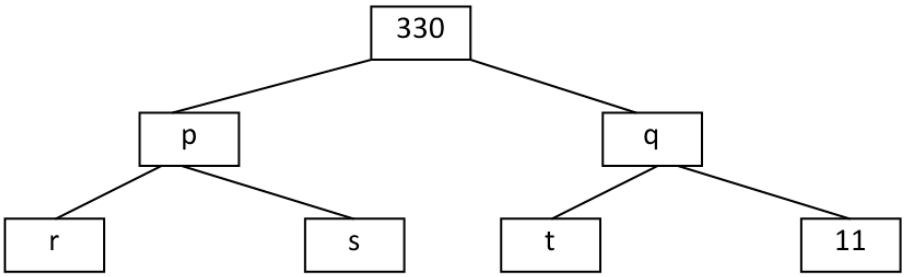
Lombok, November 10, 2008

Instructions:

* Write down your name and country on the answer sheet.
* Write your answer on the answer sheet.
* Answer all 25 questions in English.
* You have 60 minutes to work on this test.
* Use pen or pencil to write your answer.

Name : .....
Country : .....

1. The following diagram shows a way to factorize 330.

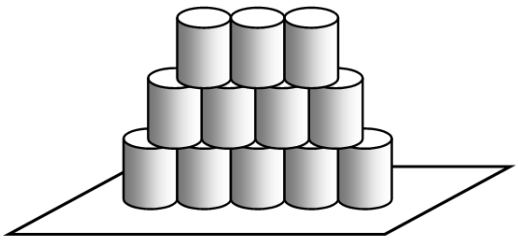


   The largest possible value of (p + q) is . . . .

2. A tank in the shape of rectangular box is half full of water. The height of the tank is 30 cm and the size of its base is 20 cm $\times$ 40 cm. If 4000 cm^3 water is added, the depth of the water is $\ldots cm$.

3. During the first forty-eight days of a year, Monday will appear at most . . . times.

4. The picture below shows the arrangement of twelve drinking cans. The number of cans in one row is always one less than the numbers of cans in the row directly below it.

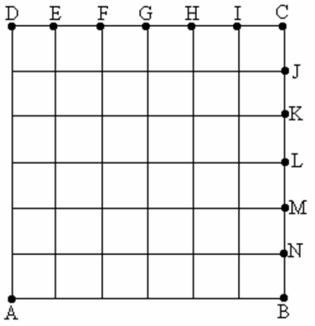


   Anto is asked to arrange 39 cans using similar formation. The maximum height of his arrangement is . . ..

Name : .....
Country : .....

5. In 2007, 33% of participants in an olympiad were male. The following year, the number of participants increases by 12.5%, but the number of female participants decreases by 10%. The percentage of the male participants in 2008 is ...

6. In the following figure, two points that must be connected to the point A to form two lines that will divide the region $ABCD$ into three parts of equal area are ....



7. Using the digits $1, 2, 3,$ and 4, we obtain 24 four-digit numbers. Those numbers are sorted from the smallest to the largest. the rank of 4213 is ....

8. A rectangle $PQRS$ is inscribed in a semi-circle of radius 10 cm. The points P and Q are on diameter and points R and S are on the circle perimeter. If $PQ = 2QR$, the area of the region outside the rectangle is ....

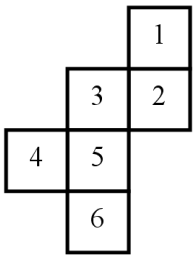
9. The sum of Deny's age and Ali's age is 29. The sum of Banu's age and Carli's age is 35. The sum of Ali's age and Banu's age is 31. Banu is younger than Ali. Among the four people, the oldest is ...

10. Two distinct straight lines meet at most at one point. Three distinct straight lines meet at most at three points. Eight distinct straight lines meet at most at ... points.

11. Given a 2-digit natural number. If order of the digits are changed then value of new number is exactly 20% more than the value of the given number. The given number is ....

Name : .....
Country : .....

12. The figure shows a cube net in which each side is numbered from 1 to 6. The product of all numbers on the sides adjacent to the side numbered 1 is ....

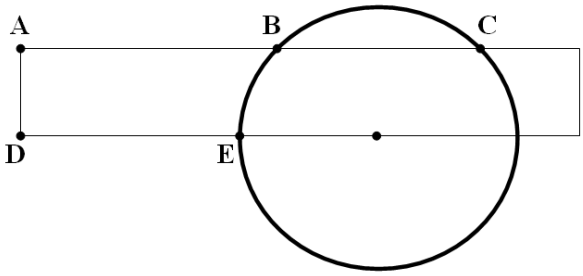


13. There are some boxes. These boxes are labelled by $1, 2, 3, 4,$ and so on. In this way, digit 2 appears 50 times in the labels. The number of boxes is ...

14. A rectangular block of wood of dimension 4 m $\times$ 5 m $\times$ 6 m was painted. It is then cut into smaller cubes of dimension 1 m $\times$ 1 m $\times$ 1 m. The number of smaller cubes with two sides painted is N. The number of smaller cubes with three sides painted is M. The ratio of N to M is ....

15. A positive pair of whole numbers that contain no 0 is called *commensurable*(with each other) if their sums of digits are equal. For example, 14 is commensurable with $5, 14, 32, 1121,$ and 11111. There are ... numbers that are commensurable with 10.

16. A rectangle intersects a circle of radius 5, as shown in the figure.



$BC = 6$ and $DE = 7$. The length of AC is ...

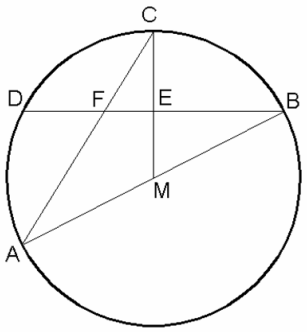
Name : .....
Country : .....

17. There are some black and white balls in a box. The ratio of numbers of black balls to white balls is $3 : 4$. Each of the white balls is marked by either A or B. The number of balls A is $\frac{2}{3}$ of the number of balls B. The difference between numbers of balls A and B is 52. The number of the black balls is ....

18. Fatimah wants to make a drink that contains 40% pure orange juice. This drink is called 40% orange juice. Her mom gives her $100ml$ of 20% orange juice, and a large bottle of drink that contains 80% pure orange juice. Fatimah needs ... ml the drink in the bottle to produce the 40% orange juice.

19. Seventeen unit cubes are arranged to form a solid. The minimum surface area of all possible solids is ....

20. In the figure, M is a center of the circle, F is the intersection of the lines AC and BD, and E is the intersection of the lines CM and BD. The line CM is perpendicular to the line BD. If the measure of angle MBE is 32°, the measure of angle CFD is ...



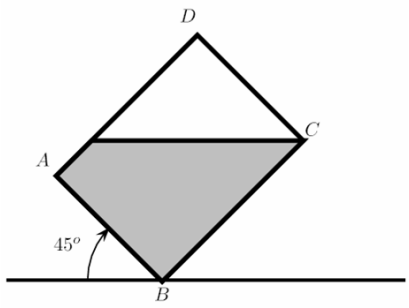
21. Two candles of the same height were lit at the same time. The first took four hours to burn completely while the second one took two hours. Assume that each candle burns at a constant rate. Then it takes ... hour for the first candle to be thrice the height of the second candle.

22. Five one-digit positive numbers are sorted from the smallest to the largest. Their average is equal to the forth number. The second number is different from the forth number. These five numbers that give that the maximum product are ...

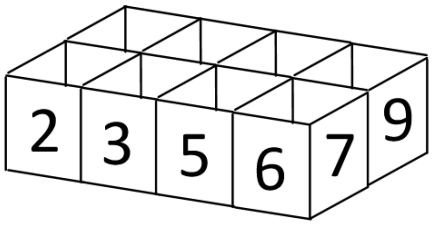
Name : .....
Country : .....

23. The volume of a rectangular box is 2008 cm^3. In centimeters, the length, width and height of the box are whole numbers. The largest possible surface area of the box is . . . .

24. A rectangular cross section of a can $ABCD$ with base AB of length 40 cm and the height BC is filled by water of depth two third of BC. When AB is tiled at 45^o(see figure), the water just came up to C. The height BC is . . . cm.



25. A box of size $4 \times 2 \times 1$ is divided into eight compartments. Sixteen identical balls are put inside the compartments.
Each compartment must be filled with at least one ball. The numbers of balls put into rows of compartments are printed on the box, see figure.



For example, there must be 7 balls in the four front compartments, 9 balls in the four back compartments, and 6 balls in the two rightmost compartments. We can put the sixteen balls into the eight compartments in . . . ways.