

Mathlete Training Centre  
SMOPS 2003

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1. (SMOPS 03Q1) What is the greatest number of right angles formed by 6 straight lines in a plane?

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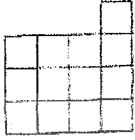
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2. (SMOPS 03Q2) What is the next number in the following sequence? 123, 347, 7815, 151631,  
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3. (SMOPS 03Q3) The following figure is made up of 13 squares. On the answer sheet provided, show two ways to draw a straight line to divide the figure into two parts of equal areas.



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4. (SMOPS 03Q4) There are 30 children in a class. 12 of them can play badminton. 8 of them can play table-tennis. Find the greatest possible number of children that can play neither of the games.

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5. (SMOPS 03Q5) Find the value of  $\frac{1}{2} + \frac{1}{3} + \frac{2}{3} + \frac{1}{4} + \frac{2}{4} + \frac{3}{4} + \dots + \frac{1}{100} + \frac{2}{100} + \frac{3}{100} + \dots + \frac{99}{100}$ .

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6. (SMOPS 03Q6) A card with the starting position



is first rotated clockwise through an angle of  $3000^\circ$ . It is then rotated anti-clockwise through an angle of  $2745^\circ$  and finally rotated clockwise through an angle of  $1320^\circ$ . Which of the following indicates the final position?



(A)



(B)



(C)



(D)



(E)

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7. (SMOPS 03Q7) What fraction of the following figure is shaded?



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8. (SMOPS 03Q8) There are three closed boxes that contain a red ball, a green ball and a yellow ball respectively. However, they are all labelled incorrectly. David opens the box labelled red and finds a green ball in it. What is the colour of the ball in the box labelled green?

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9. (SMOPS 03Q9) A four-digit number  $7a4b$  is a multiple of 18. Find the digits  $a$  and  $b$  if the four-digit number is to be as small as possible.

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10. (SMOPS 03Q10) Find the remainder when  $2^{2003}$  is divided by 3. ( $2^{2003} = \underbrace{2 \times 2 \times \cdots \times 2}_{2003}$ .)

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11. (SMOPS 03Q11) A waterplant grew very fast such that it doubled the area of the water surface that it covered every minute. It was brought to a 100 m by 50 m pond at 11.00 am. At 12 noon it managed to cover the entire pond. Find the time when it covered a quarter of the pond.

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12. (SMOPS 03Q12) There are 10 points on the 5 sides of a pentagon as shown. How many triangles can be drawn with any three of the points as vertices?



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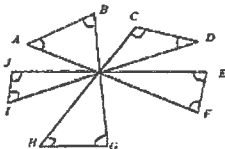
13. (SMOPS 03Q13) Each big bus has a capacity of 39 seats and charges \$100 in rental. Each small bus has a capacity of 30 seats and charges \$80 in rental cost. 267 men need to travel by bus. Given that every man should have a seat and that no seat is left empty, what is the total rental cost?

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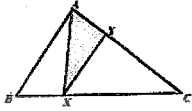
14. (SMOPS 03Q14)  $AF, BG, CH, DI$  and  $EJ$  are straight lines. What is the sum of the angles  $A, B, C, D, E, F, G, H, I$  and  $J$ ?



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15. (SMOPS 03Q15) In triangle  $ABC$ ,  $CX = 2BX$  and  $CY = 3AY$ . The area of triangle  $AXY$  is  $20 \text{ m}^2$ . Find the area of triangle  $ABC$ .



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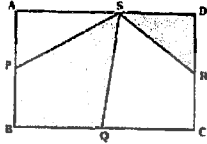
16. (SMOPS 03Q16) There are 20 questions in a mathematics test. 7 marks are awarded for each question answered correctly. 4 marks are deducted for each question answered incorrectly. No mark is given for each question left unanswered. If a pupil scores 100 marks, what is the number of questions he left unanswered?

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17. (SMOPS 03Q17) In the figure below, the area of the rectangle  $ABCD$  is  $36 \text{ cm}^2$ .  $P, Q$  and  $R$  are the midpoints of  $AB, BC$  and  $CD$  respectively.  $S$  is a point on  $AD$ . Find the total area of the shaded parts.



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18. (SMOPS 03Q18) Mrs Lim was carrying a basket of eggs to the market when a passer-by bumped into her. She dropped the basket and all the eggs broke. The passer-by, wishing to pay for the loss, asked: "How many eggs were there in your basket?" "I don't remember exactly," Mrs Lim replied, "but I know that when I count by 3s, there were 2 eggs left over, when I count by 5s, there were 3 eggs left over; and when I count by 7s, there were 4 eggs left over." At least how many eggs were there in Mrs Lim's basket at first?

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19. (SMOPS 03Q19) In calculating the product of two 2-digit numbers, Sam miswrote the ones digit in one of the two numbers as 0 instead of 8 and his answer was 190. June miswrote the ones digit in the same number as 6 and her answer was 304. Find the correct answer of the product.

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20. (SMOPS 03Q20) A rectangular block is cut into 12 identical cubes (as shown). The total surface area of the 12 individual cubes is  $160 \text{ cm}^2$  more than the surface area of the original block. What is the volume of the original block?



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21. (SMOPS 03Q21) Machine A can produce 12000 cakes in 2 hours. Machine B can produce 12000 cakes in 3 hours. Working together without changing their rates of production, how many hours will it take for the two machines to produce 24000 cakes?

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22. (SMOPS 03Q22) Find the value of  $(1 + \frac{19}{39} \times 1) + (1 + \frac{19}{39} \times 2) + \dots + (1 + \frac{19}{39} \times 12)$ .

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23. (SMOPS 03Q23) In a party, three types of bottled drinks, mineral water, cola and fresh orange juice, were served. A bottle of mineral water is to be shared by 2 people. A bottle of cola drink is to be shared by 3 people. A bottle of fresh orange juice is to be shared by 4 people.

Given that 91 bottles of drinks were consumed and that each person had consumed 1 share of each type of drinks, find the total number of people present at the party.

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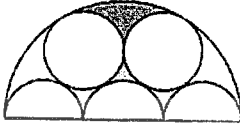
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24. (SMOPS 03Q24) There are two containers P and Q, containing different amounts of oil at first. 60% of the oil in P is poured into Q. Then 50% of the oil in Q is poured into P. After these two pourings, the ratio of the amount of oil in P to the amount of oil in Q is 11:7. What is the ratio of the amount of oil in P to the amount of oil in Q at first?

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25. (SMOPS 03Q25) The diagram shows a semicircle with diameter 6 cm. Find the area of the shaded region. Leave your answer in terms of  $\pi$ .



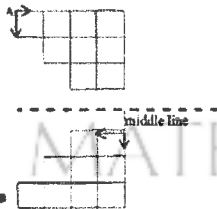
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26. (SMOPS 03Q26) Given that for the upper half of the figure, only downward and rightward movements are allowed and that for the lower half of the figure, only downward and leftward movements are allowed, how many possible routes are there from A to B?



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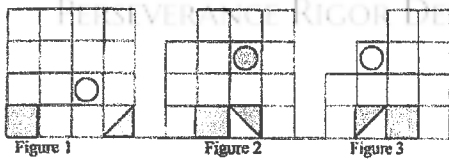
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27. (SMOPS 03Q27) Find the value of  $1 - 2 + 3 + 4 - 5 + 6 + 7 - 8 + 9 + 10 - \dots - 2000 + 2001 + 2002 - 2003$ .

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28. (SMOPS 03Q28) Study the following picture sequence. On the answer sheet provided, sketch Figure 4 that follows.



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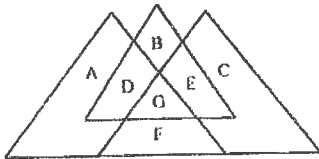
29. (SMOPS 03Q29) Three married couples meet at a party. They are Mr X, Mr Y, Mr Z, Mdm A, Mdm B and Mdm C. Mr X's wife and Mdm C's husband do not know each other. Mdm B's husband and Mdm A do not know each other. Mr Z knows everybody. Who is Mr X's wife?

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30. (SMOPS 03Q30) In the diagram, there are three triangles each containing 4 letters. the letters A to G represent different numbers from 1 to 7. Given that the sum of the 4 letters in each triangle is 19, what is the value of  $G$ ?



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