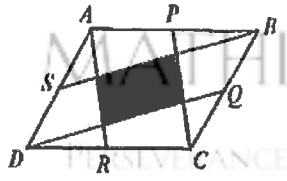
Mathlete Training Centre
SMOPS 2012

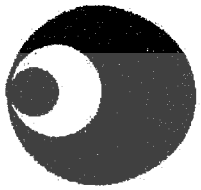
1. (SMOPS 12Q1) Find the value of $2999 + 2999 + 299 + 29 + 9$.

2. (SMOPS 12Q2) $ABCD$ is a parallelogram. P, Q, R and S are the midpoints of the 4 sides of the parallelogram. If the area of the shaded region is 20 cm^2, find the area of the parallelogram $ABCD$.



3. (SMOPS 12Q3) Jane added up all the digits of the whole number $\underbrace{3 \times 3 \times 3 \times \cdots \times 3}_{2012}$ and obtained a new number n_1. She then added up all the digits of n_1 and obtained another number n_2. She continued doing this until she obtained a single digit number. Find the value of this number.

4. (SMOPS 12Q4) The diagram shows 3 circles. The circumference of the smallest circle passes through the centre of the middle circle and the circumference of the middle circle passes through the centre of the largest circle. Find the ratio of the shaded area to the unshaded area.



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5. (SMOPS 12Q5) The product of 4 consecutive whole numbers is 5040. Find the value of the smallest number.

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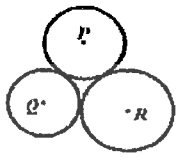
6. (SMOPS 12Q6) The diagram shows 3 circles with centres P, Q and R respectively. Each circle has a point of contact with the other circles. If $PQ = 35$ cm, $QR = 36$ cm and $PR = 37cm$, find the radius of the circle with centre R.



7. (SMOPS 12Q7) 12! is equal to
   (1) 479001600
   (2) 479000610
   (3) 479000160
   (4) 479000061
   (5) 479000016
   (Note: $n! = n \times (n-1) \times (n-2) \times \cdots \times 3 \times 2 \times 1$, for example $5! = 5 \times 4 \times 3 \times 2 \times 1$.)

8. (SMOPS 12Q8) Only 1 of the 3 boys Abel, Ben and Cain can swim. Abel says, "I can swim." Ben says, " I cannot swim." Cain says, "Abel cannot swim". Only 1 boy is telling the truth. Who can swim?

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9. (SMOPS 12Q9) 10 boys received their test papers. The test paper has a maximum score of 10. Each boy added the scores of the other 9 boys. If the 10 totals obtained are 66, 66, 67, 67, 68, 68, 69, 70, 71, and 72, find the lowest score.

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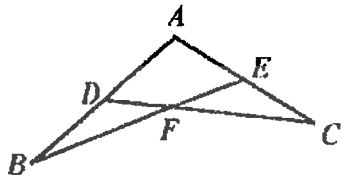
10. (SMOPS 12Q10) In the diagram, D and E are the midpoints of AC and AB respectively. BE cuts CD at F. If the area of the 4-sided figure $ADFE$ is 256 cm^2, find the area of the triangle ABE.



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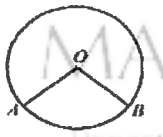
11. (SMOPS 12Q11) A circle with centre O passes through points A and B is shown. If the circle has a radius of 5 cm and $\angle AOB$ is 120°, find the radius of another circle that passes through the points O, A and B.



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12. (SMOPS 12Q12) A line can divide a plane into a maximum of 2 regions, 2 lines can divide a plane into a maximum of 4 regions. Find the number of regions that 5 lines can divide a plane into.

13. (SMOPS 12Q13) Find the value of

$$\frac{1}{1}+\frac{1}{2}+\frac{2}{2}+\frac{1}{3}+\frac{2}{3}+\frac{3}{3}+\frac{1}{4}+\frac{2}{4}+\frac{3}{4}+\frac{4}{4}+\cdots+\frac{1}{100}+\frac{2}{100}+\frac{3}{100}+\cdots+\frac{98}{100}+\frac{99}{100}+\frac{100}{100}$$

14. (SMOPS 12Q14) Trains A and B are travelling towards each other at 48 km/h. In train A, Jane notices that it takes 6 second for train B to pass her. Find the length of train B in m.

15. (SMOPS 12Q15) Find the largest whole number smaller than

$$\frac{1}{\frac{1}{101}+\frac{1}{102}+\cdots+\frac{1}{109}+\frac{1}{110}}$$

16. (SMOPS 12Q16) Find the largest whole number k such that $\underbrace{12 \times 12 \times 12 \times \cdots \times 12}_{50} > \underbrace{k \times k \times k \times \cdots \times k}_{75}$.

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17. (SMOPS 12Q17) Jane was given a sum of money for her 10 day trip. At the end of day 1, she spent $\frac{1}{10}$ of the money. At the end of day 2, she spent $\frac{1}{9}$ of the remaining sum. At the end of day 3, she spent $\frac{1}{8}$.... At the end of day 9, she spend half of the remaining money and has \$99 left. How much money did she have at the beginning?

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18. (SMOPS 12Q18) 4 classes A, B, C and D each has less than 50 students and the average number of students is 46. Class A and Class B differ in number of students by 4, class B and class C by 3, and class C and class D by 2. If class A has the most number of students, find the number of students in A.

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19. (SMOPS 12Q19) The diagram shows a figure comprising 4 regions. 4 different colours are used at most to colour the figure such that each region is coloured by only 1 colour and regions adjacent to each other cannot have the same colour. Find the number of different ways to colour the figure.

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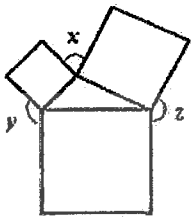
20. (SMOPS 12Q20) The figure consists of 3 squares and a triangle. Find the sum of the angles x, y and z in degrees.



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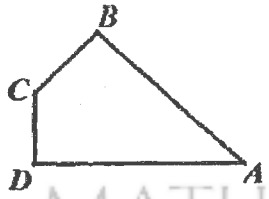
21. (SMOPS 12Q21) In the diagram, $AD = 6$ cm, $BC = 2$ cm, $\angle ABC = \angle ADC = 90°$ and $\angle BCD = 135°$. Find the area of the 4-sided figure $ABCD$ in cm^2.



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22. (SMOPS 12Q22) A bus was scheduled to travel from Town A to Town B at a constant speed of x km/h. If the speed of the bus increased by 20%, it could arrive at Town B 2 hours ahead of schedule. If the bus travelled the first 240 km at x km/h and then the speed decreased to 80%, it could arrive at Town B 2 hours behind schedule. Find the distance, in km, between the 2 towns.

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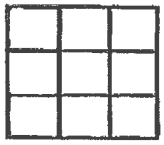
23. (SMOPS 12Q23) In how many ways can we shade exactly 2 of the 9 squares such that the 2 shaded squares have no sides in common?



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24. (SMOPS 12Q24) Jane has an alarm clock that is slower by 5 minutes for every actual hour. One night, Jane resets the clock correctly at 2100. It she wanted the alarm clock to ring at 0700 (the actual time) the following morning, what is the time she should set for the clock to ring?

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25. (SMOPS 12Q25) A particular month has 5 Tuesdays. The first and the last day of a month are not Tuesdays. What is the last day of the month?

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26. (SMOPS 12Q26) Find the value of

$$(1-\frac{1}{2}-\frac{1}{3}-\cdots-\frac{1}{2011})\times(\frac{1}{2}+\frac{1}{3}+\cdots+\frac{1}{2011}+\frac{1}{2012})-(1-\frac{1}{2}-\frac{1}{3}-\cdots-\frac{1}{2011}-\frac{1}{2012})(\frac{1}{2}+\frac{1}{3}+\cdots+\frac{1}{2011})$$

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27. (SMOPS 12Q27) A cross shaped figure comprising 5 identical squares is cut into 3 pieces A, B and C by 2 straight cuts as indicated by the dotted lines. A, B and C can be rearranged to form a rectangle as shown. If the length of the rectangle is 12 cm, find the width of the rectangle in cm.

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28. (SMOPS 12Q28) David wants to go from level 2 to level 1 in the shopping centre. If he walks down 14 steps while taking the escalator, he can move from the top to the bottom of the escalator in 30 seconds. If he walks down 28 steps, he can do the same in 20 seconds. Find the number of steps of the escalator.

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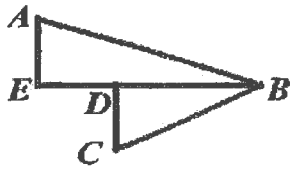
29. (SMOPS 12Q29) ABE and BCD are right-angle triangles. D lies on BE such that $AE = ED = DC = 1$ cm and $DB = 2$ cm. Find the value of angle ABC in degrees.



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30. (SMOPS 12Q30) A 6-digit number $\overline{abcdef}$ is such that $\overline{defabc} = 6 \times \overline{abcdef}$. Find the 6-digit number $\overline{abcdef}$.

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