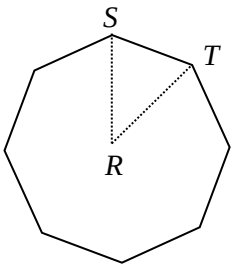
Asia Pacific Mathematical Olympiad for Primary Schools 2014

First Round
2 hours
(150 marks)

1. The figure shows a regular octagon. Find the value of angle *SRT* in degrees, where *R* is the centre of the star.



(SMOPS 2014 Q.1)

2. Which of the following statement is correct?

(1) $\frac{15}{19} < \frac{7}{9} < \frac{3}{4}$ (2) $\frac{3}{4} < \frac{15}{19} < \frac{7}{9}$ (3) $\frac{7}{9} < \frac{15}{19} < \frac{3}{4}$

(4) $\frac{3}{4} < \frac{7}{9} < \frac{15}{19}$ (5) $\frac{7}{9} < \frac{3}{4} < \frac{15}{19}$

(SMOPS 2014 Q.2)

3. Find the smallest positive integer with sum of digits equal to 29.

(SMOPS 2014 Q.3)

4. Abel and Jim run a race together on a 300 metres track. They start simultaneously at the same point. Abel runs at a constant speed of 5 m/s, while Jim runs at a constant speed of 4.2 m/s. How many full laps has Abel run before he is able to overtake Jim for the first time?

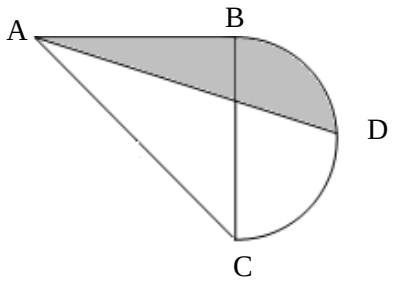
(SMOPS 2014 Q.4)

5. Only one of the following four numbers is a perfect square. Which one is it?

(1) 76186 (2) 750235 (3) 921438 (4) 2660161

(SMOPS 2014 Q.5)

6. As shown in the diagram, ΔABC is an isosceles right-angle triangle with *AB* =28 cm. *BC* is the diameter of the semi-circle and point *D* is the midpoint of arc *BC*. Find the area of the shaded region in cm^2.
(Take π to be $\frac{22}{7}$.)



(SMOPS 2014 Q.6)

7. Three chess pieces, each of the colour red, black and white, are to be placed on a 7×7 chessboard. If any two of the three pieces cannot be placed in the same row or the same column, how many ways are there to place the three chess pieces?

(SMOPS 2014 Q.7)

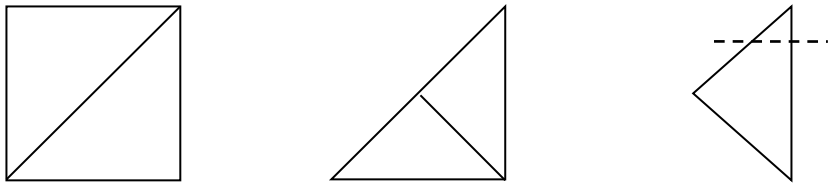
8. There are 6 bags containing 18, 19, 21, 23, 25 and 34 balls respectively. One bag contains only red balls while the other five bags contain only blue balls. Jason takes three bags and Jamie takes two bags. The remaining bag contain red balls. It is known that now Jason has twice as many blue balls as Jamie does. Find the number of red balls in the remaining bag.

(SMOPS 2014 Q.8)

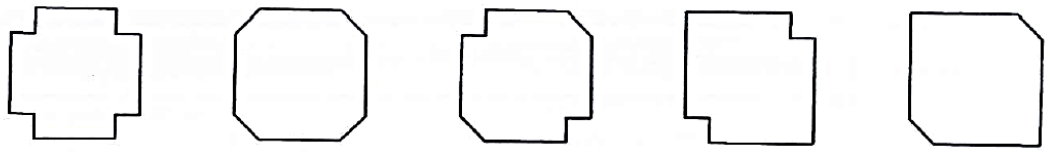
9. A water tank can be filled by using tap A for 8 hours followed by tap B for 15 hours. The same tank can also be filled by using tap A for 5 hours followed by tap B for 24 hours. How long will it take (in hours) to fill the tank by using tap A only?

(SMOPS 2014 Q.9)

10. A square piece of paper is folded along the diagonals twice, as shown in the diagrams below. Then a cut is made along the dotted line.



When the paper is unfolded, which one of the following diagrams shows how the paper appears?



(SMOPS 2014 Q.10)

11. Find the value of $20142013\times20132014-20132013\times20142014$.

(SMOPS 2014 Q.11)

12. Alan, Ben, Chris and Daniel took part in a science quiz. The quiz consisted of 5 True or False questions. The table below shows the answers given by each of them and their scores. Each correct answer was given 1 point.

	Question 1	Question 2	Question 3	Question 4	Question 5	Score
Alan	T	F	F	F	F	2
Ben	F	T	F	F	T	3
Chris	F	T	F	T	T	4
Daniel	F	T	T	F	T	

How many points did Daniel score?

(SMOPS 2014 Q.12)

13. A computer program generated all five-letter code words that can be formed by using letters A, B, C, D, E, F, G, X, Y, Z (repetition is allowed). When all these words are sorted according to the alphabetical order, the following list is obtained: AAAAA, AAAAB,..., AAAAZ, AAABA, AAABB,..., ZZZZY, ZZZZZ. Find the number of code words between CZYGB and XEFDA, not including these two code words.

(SMOPS 2014 Q.13)

14. Find the largest 3-digit integer N such that when N is divided by 3, 7, 11, the remainders are 1, 3 and 8 respectively.

(SMOPS 2014 Q.14)

15. Find the value of $10\times\left(\frac{1}{1\times2}+\frac{5}{2\times3}+\frac{11}{3\times4}+...+\frac{71}{8\times9}+\frac{89}{9\times10}\right)$.

(SMOPS 2014 Q.15)

16. As shown in the diagram, a square is divided into 9 regions. Region E is a square and the other regions are rectangles. If the area of rectangles A, B, C are 18cm^2, 63cm^2 and 189cm^2 respectively, find the perimeter of rectangle D.

A		*B*
	E	
D		*C*

(SMOPS 2014 Q.16)

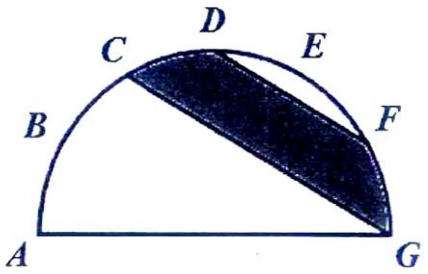
17. The sum of 47 distinct positive integers is 2014. If there are n even numbers among the 47 integers, what is the least possible value of n?

(SMOPS 2014 Q.17)

18. A 9-digit integer $\overline{abcdefghi}$ is formed using digits 1, 2, 3, 4, 5, 6, 7, 8, 9 without repetition. If $A=\overline{abc}+\overline{bcd}+\overline{cde}+\overline{def}+\overline{efg}+\overline{fgh}+\overline{ghi}$, find the largest possible value of A.

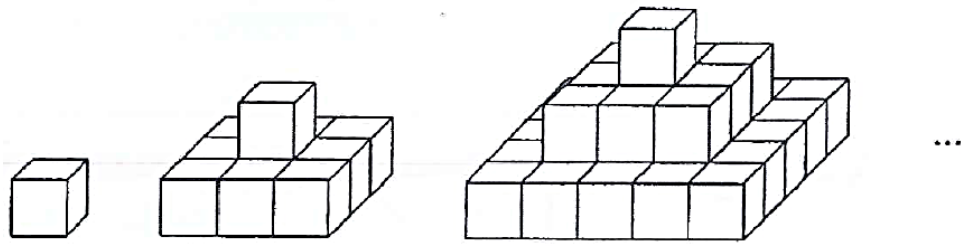
(SMOPS 2014 Q.18)

19. A semi-circle with diameter AG is shown in the diagram, the entire arc of the semi-circle is divided into 6 equal parts by points B, C, D, E, and F. DF and CG are straight lines. Given that the area of the semi-circle is 60cm^2, find the area of the shaded region in cm^2.



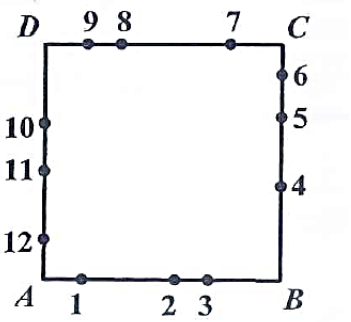
(SMOPS 2014 Q.19)

20. As shown in the diagram below, cubes with side length of 1 cm are placed together to form a sequence of solids. Find the surface area of the 20^{th} solid in cm^2.



(SMOPS 2014 Q.20)

21. In the diagram, each side of the square ABCD is divided into 4 segments by the points numbered from 1 to 12. How many different triangles can be formed whose vertices can be any three points among points 1 to 12?



(SMOPS 2014 Q.21)

22. In a certain calendar year, there are more Mondays than Fridays, and more Sundays than Wednesdays. Which day of the week is 1^{st} march in that year? Choose your answer from the following options:
    (1) Monday
    (2) Tuesday
    (3) Wednesday
    (4) Thursday
    (5) Friday
    (6) Saturday
    (7) Sunday

(SMOPS 2014 Q.22)

23. There is 60 grams of 5% saline solution (Solution A), 60 grams of 8% saline solution (Solution B), and 47 grams of 9% saline solution (Solution C). These three types of solution are mixed together to produce 100 grams of 7% saline solution. Find the sum of the maximum and minimum grams of Solution A that can be used.

(SMOPS 2014 Q.23)

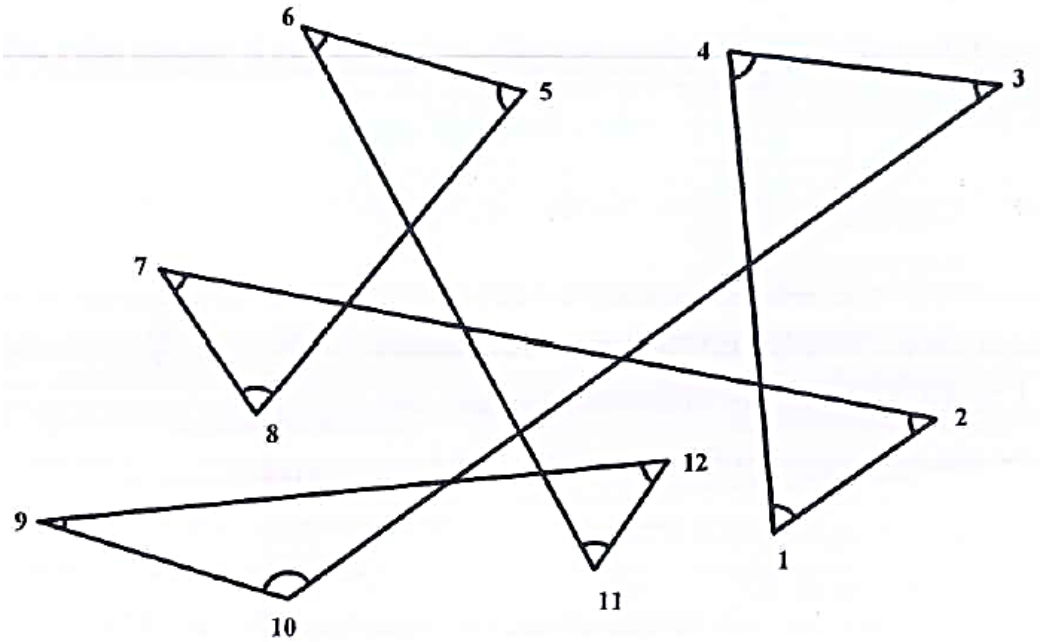
24. When a whole number is divided by 5, the remainder is a; when the same number is divided by 6, the quotient is b. If the sum of a and b is 11, find the sum of all numbers that satisfy this requirement.

(SMOPS 2014 Q.24)

25. Dates can be written as an 8-digit integer in the format of *yyyymmdd*. For example, 20140125 stands for January 25th 2014. How many days are there in year 2014 such that its 8-digit representation contains equal numbers of digit 0, 1, and 2?

(SMOPS 2014 Q.25)

26. Find the sum of all angles labelled from 1 to 12 in the diagram below.

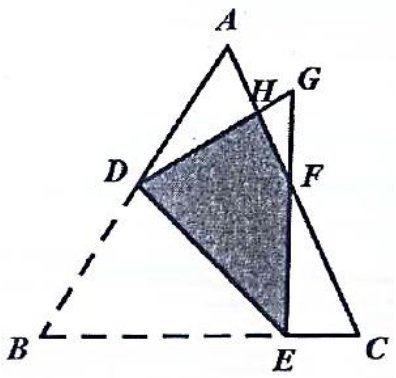


(SMOPS 2014 Q.26)

27. Appending a positive integer N at the end of any positive integer to form a new number (for example, appending 21 at the end of 35 gives 3521), if this new number is always divisible by N, then N is called a "magic number". Find the total number of "magic numbers" less than 600.

(SMOPS 2014 Q.27)

28. As shown in the diagram, part of a triangle *ABC* is folded along the lines *DE*, resulting in a heptagon *ADECFGH*. If the ratio of the area of this heptagon to the area of the triangle *ABC* is 5 : 7, and the area of the shaded region *DEFH* is 8cm^2, find the area of the triangle *ABC*.



(SMOPS 2014 Q.28)

29. From 2014 to 6999, how many integers have their sum of digits divisible by 5?

(SMOPS 2014 Q.29)

30. A bus and a truck started travelling towards each other at the same instant, from cities A and B respectively. When they met along the road after 6 hours, the bus was 240km away from city B. Upon reaching city B, the bus stopped for one hour of maintenance, before it headed back to city A. The truck took 15 hours to travel from city B to city A, and also stopped for one hour of maintenance before going back to city B. The bus and the truck met again on their ways back to their cities of origin. How many hours had passed between their first and second encounters?

(SMOPS 2014 Q.30)

Number of correct answers for Q1 to Q10 : _____ Marks (×4) : _____
Number of correct answers for Q11 to Q20 : _____ Marks (×5) : _____
Number of correct answers for Q21 to Q30 : _____ Marks (×6) : _____

Answers:

SMOPS 2014					
1	45	11	10000	21	216
2	4	12	2	22	4
3	2999	13	44668	23	84
4	6	14	976	24	333
5	4	15	81	25	43
6	252	16	35	26	720
7	44100	17	3	27	12
8	23	18	4648	28	28
9	13	19	20	29	997
10	4	20	4642	30	13