Name of Participant : _____ Index No : _____ / _____
(Statutory Name)

Name of School   : _____

Date Of Birth   : _____ (DD/MM/YY)

April 2014

Hwa Chong Institution

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Asia Pacific Mathematical Olympiad
for Primary Schools 2014

First Round
2 hours
(150 marks)

Instructions to Participants :

Mathematical instruments, tables and calculators are not permitted.
Write your answers in the answer sheet provided.
Marks are awarded for correct answers only.

This question paper consists of 7 printed pages (including this page)

Number of correct answers for Q1 to Q10 : _____   Marks (× 4) : _____

Number of correct answers for Q11 to Q20 : _____   Marks (× 5) : _____

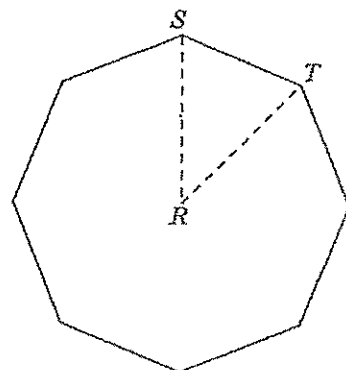*Number of correct answers for Q21 to Q30 : _____*   Marks (× 6) : _____

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

2. Which of the following statements is correct?

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

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

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

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

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

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

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?

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

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

6. As shown in the diagram, $\triangle ABC$ 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 $\dfrac{22}{7}$.)

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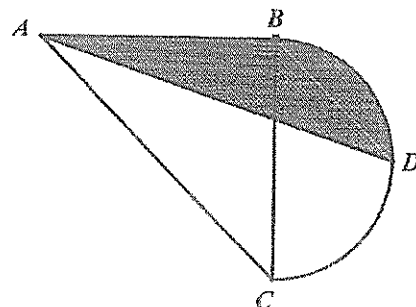
7. Three chess pieces, each of the colour red, black and white, are to be placed on a 7×7 chessboard. If any two of the three pieces cannot be placed in the same row or the same column, how many ways are there to place the three chess pieces?

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 contains 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.

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?

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.
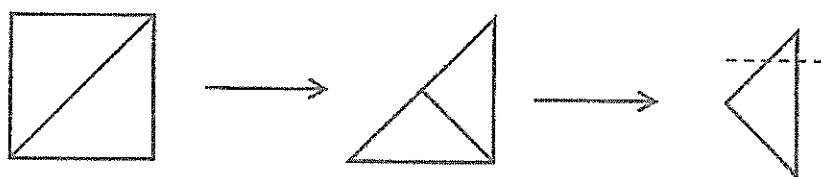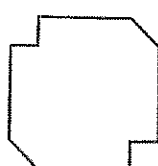

When the paper is unfolded, which one of the following diagrams shows how the paper appears?
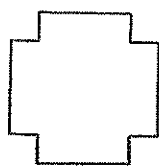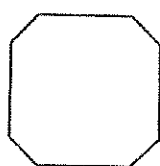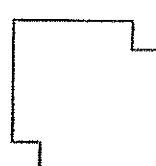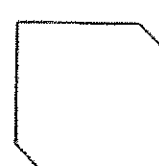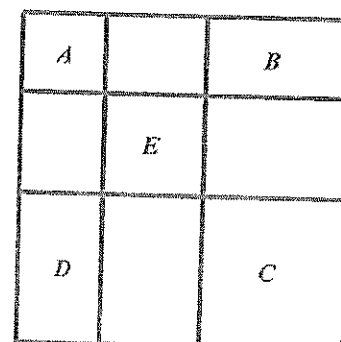

(1)   (2)   (3)   (4)   (5)

11. Find the value of $20142013 \times 20132014 - 20132013 \times 20142014$.

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?

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.

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.

15. Find the value of $10 \times \left(\dfrac{1}{1 \times 2} + \dfrac{5}{2 \times 3} + \dfrac{11}{3 \times 4} + ... + \dfrac{89}{9 \times 10} \right)$.
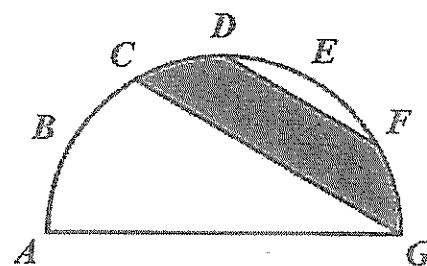
16. As shown in the diagram, a square is divided into 9 regions. Region E is a square and the other regions are rectangles. If the area of rectangles A, B, C are 18 cm^2, 63 cm^2 and 189 cm^2 respectively, find the perimeter of rectangle D.

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?

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.

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 60 cm^2, find the area of the shaded region in cm^2.

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 20th solid in cm^2.
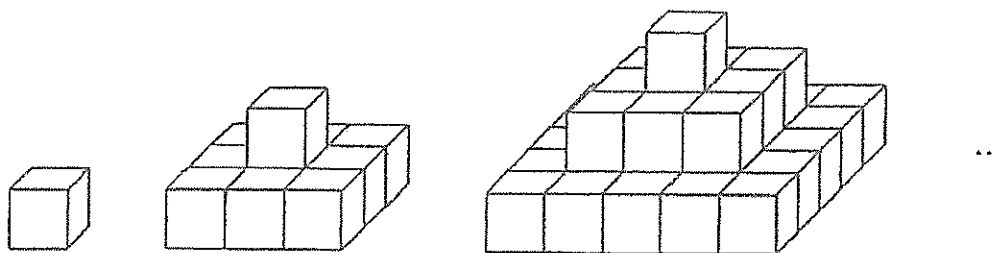
21. In the diagram, each side of the square $ABCD$ is divided into 4 segments by the points numbered from 1 to 12. How many different triangles can be formed whose vertices can be any three points among points 1 to 12?

5
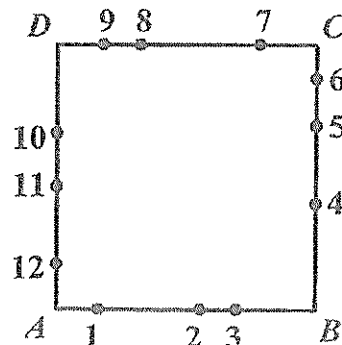
22. In a certain calendar year, there are more Mondays than Fridays, and more Sundays than Wednesdays. Which day of the week is 1st March in that year? Choose your answer from the following options.

(1) Monday (2) Tuesday (3) Wednesday (4) Thursday (5) Friday (6) Saturday (7) Sunday

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.

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.

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?

26. Find the sum of all angles labelled from 1 to 12 in the diagram below.
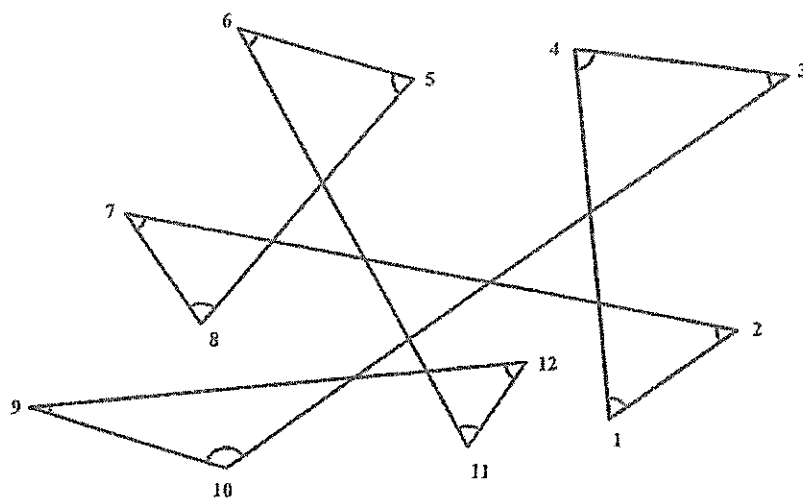
27. Appending a positive integer N at the end of any positive integer to form a new number (for example, appending 21 at the end of 35 gives 3521), if this new number is always divisible by N, then N is called a "magic number". Find the total number of "magic numbers" less than 600.

28. As shown in the diagram, part of a triangle ABC is folded along the line 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 $8\ cm^2$, find the area of the triangle ABC.
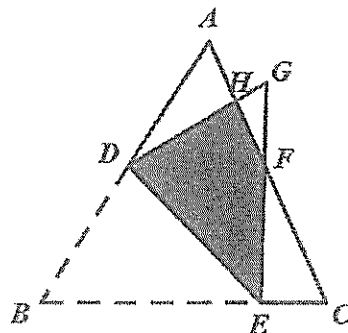
29. From 2014 to 6999, how many integers have its sum of digits divisible by 5?

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 240 km 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?