Name of Participant : ______________________ **Index No :** ____ / ____
(Statutory Name)

Name of School : ______________________________

Date Of Birth : ____________________ **(DD/MM/YY)**

April 2016

Hwa Chong Institution

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Asia Pacific Mathematical Olympiad for Primary Schools 2016

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) : ______

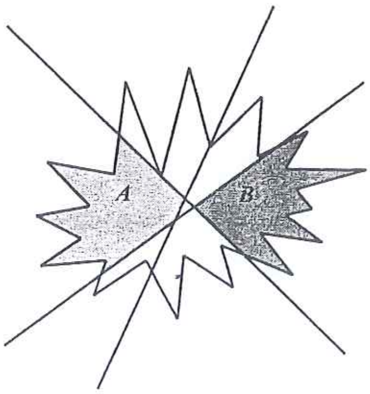
1. Calculate $2016+2015+2014-2013-2012-2011+2010+2009+2008-2007-2006-2005+\ldots$
$\ldots+6+5+4-3-2-1$.

2. A list of numbers are defined as follows. The first number is 1000, the second number is 1016. From the third number onwards, every number is the average of the two preceding numbers. What is the integer part of the 15th number? (For example, the integer part of 2.65 is 2.)

3. Each of the three lines in the diagram below cuts the figure into two shapes of equal area. Compare the areas of region A and B. (The figure is not drawn to scale.)

(1) Area of A > Area of B (2) Area of A < Area of B

(3) Area of A = Area of B (4) Insufficient information to determine



4. A new operation $\oplus$ is defined as $a\oplus b=\frac{2}{a^2}+\frac{1}{b}$, which of the following statement is true?

(1) $2\oplus 4=4\oplus 2$ (2) $3\oplus 6=6\oplus 3$ (3) $4\oplus 8=8\oplus 4$

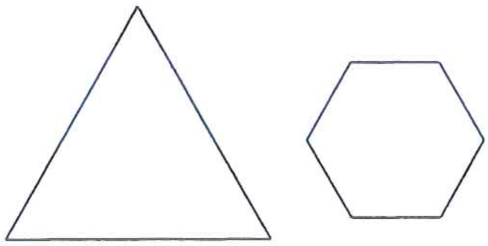
(4) $1008\oplus 2016=2016\oplus 1008$

5. How many fractions below are in the simplest form?

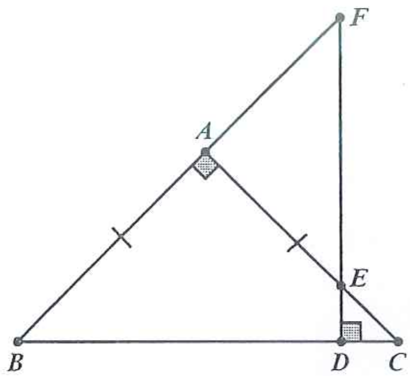
$$\frac{1}{6},\frac{2}{7},\frac{3}{8},\ldots,\frac{2010}{2015},\frac{2011}{2016}.$$

6. Given that the five-digit integer $\overline{abcde}$ is a multiple of 9 and $\overline{abcd}$ is a multiple of 4, find the smallest value of $\overline{abcde}$.

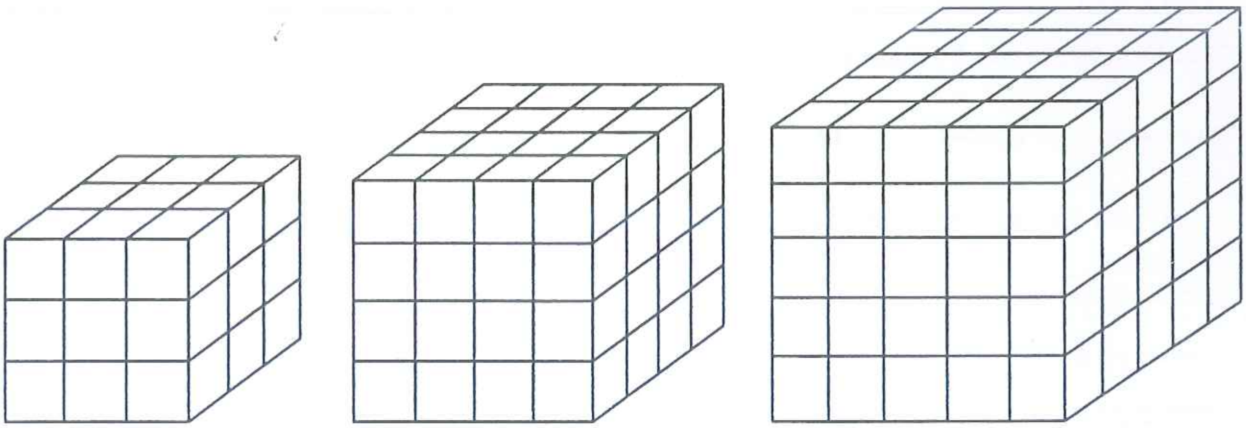
7. The figures show an equilateral triangle with side 3 cm and a regular hexagon with side 1 cm respectively. Given that the ratio of the area of equilateral triangle and that of hexagon is $a : 2$. Find the value of a.



8. In the isosceles right-angled triangle ABC, $BC = 8$ cm. D is a point on BC. A perpendicular line to BC is drawn from point D. It meets AC at point E and BA extended at point F respectively. Find the length of $DE + DF$ in cm.



9. Three cubes with sides 3 cm, 4 cm and 5 cm respectively are painted red on their surfaces before they are cut into $1\times1\times1$ cubes. After they are cut into $1\times1\times1$ cubes, find the total number of $1\times1\times1$ cubes obtained which have at least one face painted red.



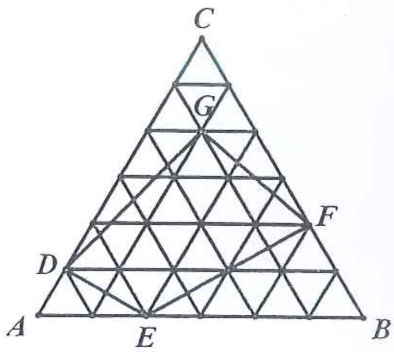
10. The area of three different faces of a cuboid (rectangular box) is in the ratio of $2 : 3 : 5$ and the total length of all edges is equal to 124 cm. Find, in cm^3, the volume of the cuboid.

11. 300 students took part in a math competition. The average score of all students is 84 marks. If the average score of boys is 80 and the average score of girls is 92, how many girls are there?

12. Alan and Betty started running towards each other at the same instant, from cities A and B respectively. The ratio of Alan's speed to Betty's is 3:2. Given that they meet at a point that is 12 km away from the midpoint of AB, find the distance between A and B.

13. What is the remainder when $3^{2016}+2$ is divided by 11?

14. In the diagram, ΔABC is an equilateral triangle. Each side of triangle ABC is divided into 6 equal parts. If the area of each small equilateral triangle is 1 cm^2, find the area of quadrilateral $DEFG$ in cm^2.

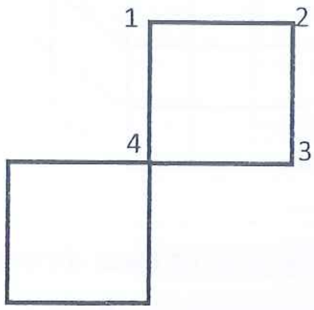


15. Three teams A, B and C, enter into a soccer tournament. Each team played the other two teams once. Overall, team A scored 2 goals and had 1 goal scored against them, team B scored 1 and had 2 scored against them, whilst team C scored 3 and had 3 scored against them. What was the score in the team A - team C match?

(1) 0-0 (2) 0-1 (3) 1-1 (4) 1-2 (5) 2-1

16. Josh was driving and wished to trace a path. His sequence of steering is as follows:

Drive 20 metres and turn left;
Drive 20 metres and turn right;
Drive 20 metres and turn right;
Drive 20 metres and turn right.
Repeat the previous sequence in order.



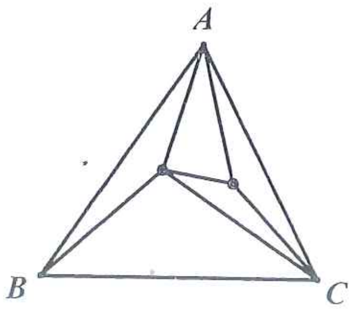
The path that he traced out is shown in the diagram. Amongst the four corners 1, 2, 3 and 4, which corner did he start the journey?

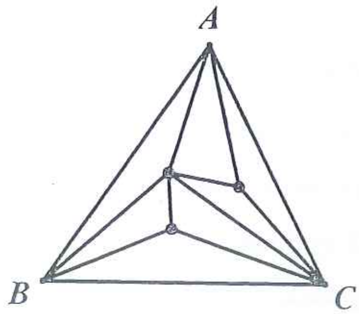
17. In the first 300 positive integers 1, 2, 3, …, 299, 300, if we remove all numbers that are divisible by 5 or 7 (or both), what is the 100^{th} number in the remaining list?

18. Find the value of $21\times\left(\frac{4}{1\times3}-\frac{8}{3\times5}+\frac{12}{5\times7}-\frac{16}{7\times9}+\ldots+\frac{36}{17\times19}-\frac{40}{19\times21}\right)$.

19. Given that a, b and c are prime numbers (not necessarily distinct) and their product abc is the sum of 7 consecutive positive integers, find the smallest value of $a+b+c$.

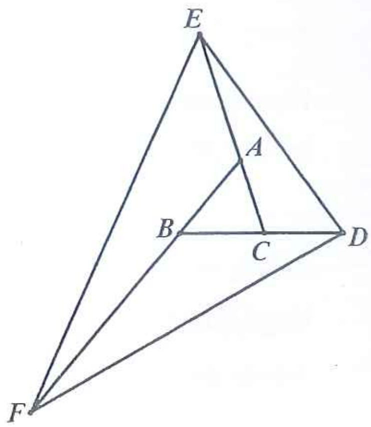
20. 2016 points are placed inside a triangle ABC. No three points are on the same straight line. Using these 2019 points (including A, B, C) as the vertices to dissect the original triangle ABC into small triangles, how many small triangles will be obtained? (For example, the diagram below shows how triangle ABC can be dissected into small triangles when there are 2 points or 3 points inside.)



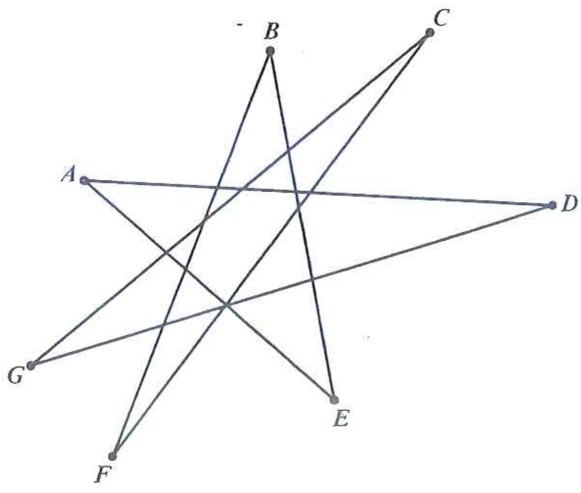


21. How many consecutive 0's are there at the end of the product $1\times4\times7\times10\times\ldots\times397\times400$? (For example, the product $2\times4\times5\times15\times17=10200$ has 2 consecutive 0's at the end.)

22. In the diagram, the area of triangle ABC is 1 cm^2. Extend BC, CA and AB to points D, E and F respectively, such that $BD=2BC$, $CE=3CA$, $AF=4AB$. Find the area of triangle DEF in cm^2.



23. Find the sum of angles $\angle A + \angle B + \angle C + \angle D + \angle E + \angle F + \angle G$ in degrees.



24. If the three-digit number $N = \overline{abc} = \overline{ab} + \overline{ba} + \overline{ac} + \overline{ca} + \overline{bc} + \overline{cb}$, find the largest possible value of N.

25. A pile of six 10-cent coins has the same height as a pile of five 20-cent coins. A pile of four 10-cent coins has the same height as a pile of three 50-cent coins. Johnny uses 10-cent coins to build a cylinder whereas Peter uses 20-cent coins and Ashley uses 50-cent coins. It is known that the 3 cylinders have the same height and a total of 124 coins are used. How many 20-cent coins did Peter use?

26. Daniel would like to go from town A to town B that are 60 km apart. There are two types of bus services available, Bus Alpha and Bus Beta. Bus Alpha stops at every 2 km and charges \$3 for every 2 km trip. Bus Beta stops at every 3 km and charges \$4 for every 3 km trip.

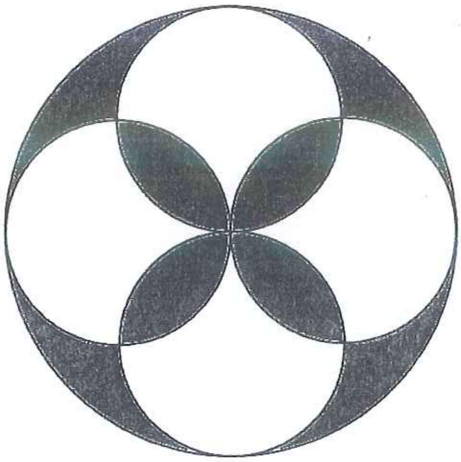
Daniel would like to stopover at distance of 4 km, 21 km, 33 km, and 44 km from Town A before reaching Town B. What is the least amount he will have to pay for the trip?

27. There are 6 bags containing 32, 36, 38, 44, 46 and 53 marbles respectively. Jason takes three bags and Jamie takes two bags. It is known that now Jason has 1.5 times as many marbles as Jamie does. Find the number of marbles in the remaining bag.

28. A computer program generated all six-letter code-words that can be formed by using letters A, P, M, O, P, S. When all these words are sorted according to the dictionary order, the following list is obtained: AMOPPS, AMOPSP, AMOSPP, AMPOPS, …, SPPMOA, SPPOAM, SPPOMA. Find the position of the word POAMSP?

29. The figure on the right shows four identical circles inscribed inside the larger circle with radius 14 cm.

Find the area of the shaded regions in cm^2. Take the value of π to be $\frac{22}{7}$.



30. Find the smallest multiple of 35 that ends with '35' and has a sum of digits equal to 35.