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

Name of School : _____

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

April 2010

Hwa Chong Institution
Mathematics Learning and Research Centre

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Asia Pacific Mathematical Olympiad for Primary Schools 2010

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 5 printed pages (including this page)

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

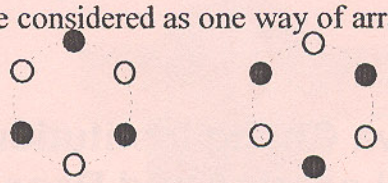
Number of correct answers for Q11 to Q20 : _____ Marks (× **5**) : _____

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

1 Find the value of $\left(1-\frac{1}{2}\right)\times\left(1-\frac{1}{3}\right)\times\left(1-\frac{1}{4}\right)\times\ldots\times\left(1-\frac{1}{98}\right)\times\left(1-\frac{1}{99}\right)\times\left(1-\frac{1}{100}\right)$.

2 Find the value of $\frac{1}{2}+\frac{1}{2\times 2}+\frac{1}{2\times 2\times 2}+\ldots+\frac{1}{\underbrace{2\times 2\times 2\times\ldots\times 2}_{10\ of\ 2's}}$.

3 Find the total number of ways to arrange 3 identical white balls and 3 identical black balls in a circle on a plane. The two layouts below are considered as one way of arrangement.

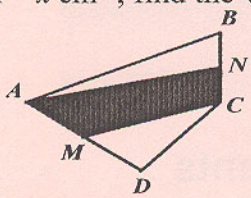


4 Given that one and only one of the following statements is correct, which one is correct?

(1) All of the statements below are correct.
(2) None of the statements below is correct.
(3) One of the statements above is correct.
(4) All of the statements above are correct.
(5) None of the statements above is correct.

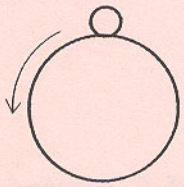
5 Let n be a whole number greater than 1. It leaves a remainder of 1 when divided by any single digit whole number greater than 1. Find the smallest possible value of n.

6 M and N are mid-points of the lines AD and BC respectively. Given that the area of $ABCD$ is 2000 cm^2, and the area of the shaded region $ANCM = x$ cm^2, find the value of x.



7 Your pocket money had previously been decreased by _____%. To get back to the same amount of pocket money before the decrease, you need to have an increase of 25 %.

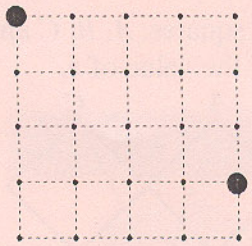
8 A circle of diameter 2 cm rolls along the circumference of a circle of diameter 12 cm, without slipping, until it returns to its starting position. Given that the smaller circle has turned $x°$ about its centre, find the value of x.



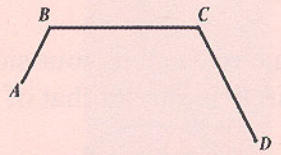
9 Find the last digit of the number $\underbrace{2\times 2\times 2\times\ldots\times 2}_{859435\ of\ 2's}$.

10 Three bus services operate from the same bus interchange. The first service leaves at 24 minute intervals, the second at 30 minute intervals and the third at 36 minute intervals. All three services leave the bus interchange together at 0900. Find the number of minutes that has passed when they next leave the interchange together.

11 Twenty five boys position themselves in a 5 by 5 formation such that the distances between two adjacent boys in the same row or the same column are equal to 1 m. The two dark circles indicate a pair of boys whose distance apart is exactly 5 m. Given that there are n pairs whose distance apart are exactly 5 m, find the value of n.



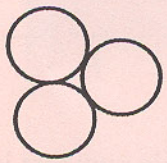
12 When Albert begins walking up slope AB (1 km distance), across level ground BC (12 km distance), and down slope CD (3 km distance), Daniel begins his journey in the opposite direction from D at the same time. Given that the speeds of both traveling up slope, on level ground and down slope are 2 km/h, 4 km/h and 5 km/h respectively, find the number of hours that has passed when they meet.



[*Diagram is not drawn to scale*]

13 Find the value of $1^3+2^3+3^3+4^3+...+20^3+21^3$.

14 Three identical circles have at most three points of contact as shown below. Find the least number of identical circles required to have nine points of contact.



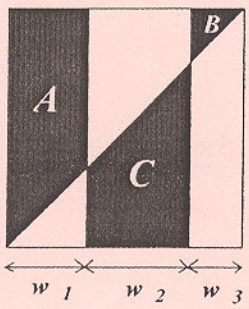
15 A goat in a horizontal ground is tied to one end of 14 m long rope. The other end of the rope is attached to a ring which is free to slide along a fixed 20 m long horizontal rail. If the maximum possible area that the goat can graze is x m^2, find the value of x.

[Ignore the dimension of the ring and take π to be $\frac{22}{7}$.]

16 The 13 squares are to be filled with whole numbers. If the sum of any three adjacent numbers is 21, find the value of x.

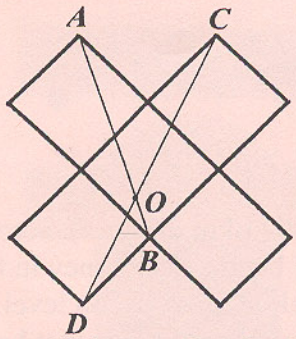
				4				9				x

17 A square is divided into three rectangles of widths w_1, w_2 and w_3 as shown. If $w_1+w_3=w_2$ and the areas of the shaded regions A, B and C are 8 cm^2, x cm^2 and 10 cm^2 respectively, find the value of x.



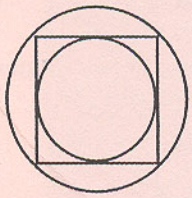
18 Given that $S = \dfrac{1}{\frac{1}{2001}+\frac{1}{2002}+\frac{1}{2003}+\cdots\frac{1}{2009}+\frac{1}{2010}}$, find the largest whole number smaller than S.

19 The figure shown comprises five identical squares. A, B, C and D are vertices of the squares. AB cuts CD at O and angle $AOC = x°$, find the value of x.

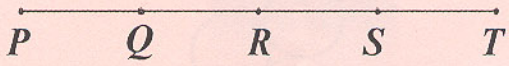


20 Find the smallest whole number that is not a factor of $1\times2\times3\times\ldots\times21\times22\times23$.

21 A square has its four vertices touching a circle and its four sides touching another smaller circle as shown below. If the area of the larger circle is x times that of the smaller one, find the value of x.

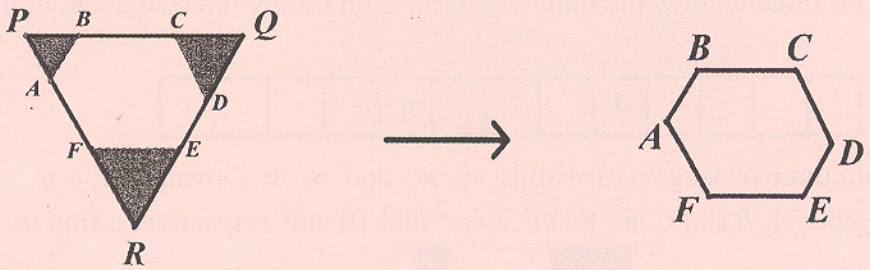


22 P, Q, R, S and T are equally spaced on a straight rod. If the rod is first rotated 180° about T, then 180° about S and finally 180° about P, which point's position remains unchanged?



23 Given that the product of four different whole numbers is 10,000, find the greatest possible value of the sum of the four numbers.

24 An equilateral triangle PQR of side 32 cm has three equilateral triangles cut off from its corners to give rise to a hexagon $ABCDEF$. Another equilateral triangle LMN of side x cm gives rise to the same hexagon when subjected to the same treatment. If $AB = 8$ cm, $BC = 15$ cm, $CD = 9$ cm, $DE = 10$ cm, $EF = 13$ cm and $FA = 11$ cm, find the value of x.



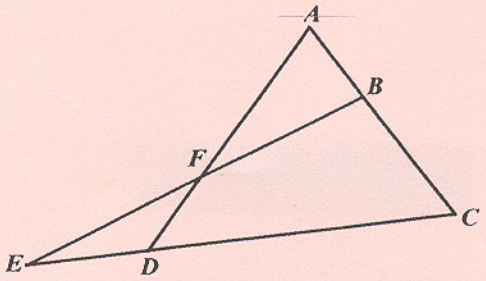
25 The order of the following three numbers

$\underbrace{3\times3\times3\times\ldots\times3}_{40\ of\ 3's}$ A $\qquad$ $\underbrace{5\times5\times5\times\ldots\times5}_{30\ of\ 5's}$ B $\qquad$ $\underbrace{7\times7\times7\times\ldots\times7}_{20\ of\ 7's}$ C

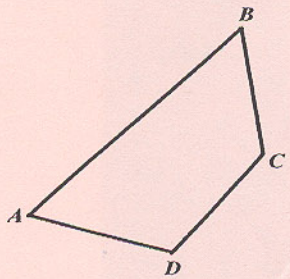
from largest to smallest is _____.

(1) A,B,C (2) A,C,B (3) B,C,A (4) B,A,C (5) C,A,B (6) C,B,A

26 B and D lie on AC and CE respectively and AD cuts BE at F. If $BC = 2AB$, $AF = 2FD$, area of $EFD = x$ cm^2 and area of $BCDF = 1750$ cm^2, find the value of x.

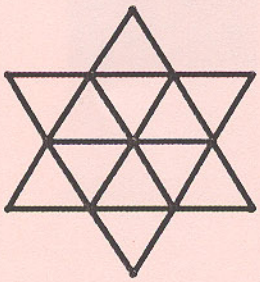


27 In the diagram, $AD = DC = CB$, angle $ADC = 110°$, angle $DCB = 130°$ and angle $ABC = x°$, find the value of x.

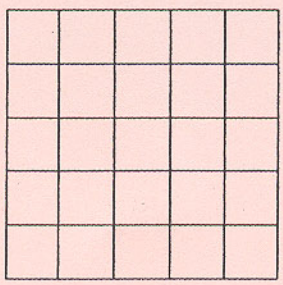


[*Diagram is not drawn to scale*]

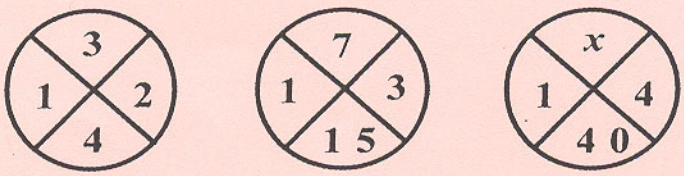
28 The figure comprises twelve equilateral triangles. Find the total number of trapeziums in the figure. Here we define a trapezium to be a 4-sided figure with **exactly one** pair of parallel sides.



29 The following 5 by 5 grid consists of 25 unit squares. Find the largest number of unit squares to be shaded so that each row, each column and each of the two main diagonal lines has **at most** 2 unit squares that are shaded.



30 Find the value of x.



End of Paper