3rd International Mathematics Assessments for Schools (2013-2014)

Upper Primary Division Round 2

Time: 120 minutes

Printed Name: ______________ *Code*: __________ *Score*: __________

Instructions:

- Do not open the contest booklet until you are told to do so.
- Be sure that your name and code are written on the space provided above.
- Round 2 of IMAS is composed of three parts; the total score is 100 marks.
- Questions 1 to 5 are given as a multiple-choice test. Each question has five possible options marked as A, B, C, D and E. Only one of these options is correct. After making your choice, fill in the appropriate letter in the space provided. Each correct answer is worth 4 marks. There is no penalty for an incorrect answer.
- Questions 6 to 13 are a short answer test. Only Arabic numerals are accepted; using other written text will not be honored or credited. Some questions have more than one answer, as such all answers are required to be written down in the space provided to obtain full marks. Each correct answer is worth 5 marks. There is no penalty for incorrect answers.
- Questions 14 and 15 require a detailed solution or process in which 20 marks are to be awarded to a completely written solution. Partial marks may be given to an incomplete presentation. There is no penalty for an incorrect answer.
- Use of electronic computing devices is not allowed.
- Only pencil, blue or black ball-pens may be used to write your solution or answer.
- Diagrams are not drawn to scale. They are intended as aids only.
- After the contest the invigilator will collect the contest paper.

The following area is to be filled in by the judges;
the contestants are not supposed to mark anything here.

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total Score	Signature
Score																	
Score																	

Upper Primary Division Round 2

Questions 1 to 5, 4 marks each

1. What is the value of $57.6\times\frac{8}{5}+28.8\times\frac{184}{5}-14.4\times80$?

（A） 0　　（B） 8　　（C） 14.4　　（D） 38.8　　（E） 57.6

Answer：____________

2. Max gives 27 apples to a group of friends. The numbers of apples they receive are consecutive positive integers. What is the maximum size of this group?

（A） 2　　（B） 3　　（C） 4　　（D） 5　　（E） 6

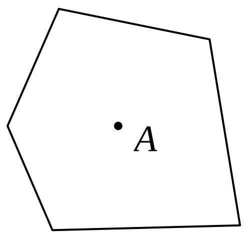
Answer：____________

3. What is the sum of all possible two-digit perfect squares such that the sums of their digits are also perfect squares?

（A） 100　　（B） 110　　（C） 117　　（D） 181　　（E） 271

Answer：____________

4. The diagram shows a point *A* inside a pentagon with area 20 cm^2. If the distance from A to each side of the pentagon is 5 cm., what is the perimeter, in cm, of the pentagon?



（A） 4　　（B） 8　　（C） 10　　（D） 15　　（E） 20

Answer：____________

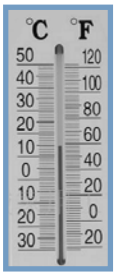
5. What is the sum of the digits of the number whose square is equal to 15984×48951?

（A） 18　　（B） 21　　（C） 24　　（D） 27　　（E） 36

Answer：____________

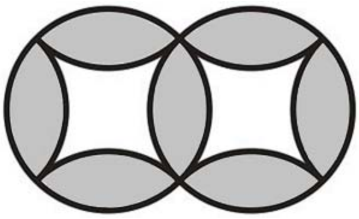
Questions 6 to 13, 5 marks each

6. The usual thermometer has two scales, Celsius measured in °C and Fahrenheit measured in °F. If m°C is the same temperature as n°F, the conversion formula is $m\times\frac{9}{5}+32=n$. What is the value of m if m°C is the same temperature as n°F and $m+n=60$?



Answer：________ °C

7. The diagram shows two intersecting circles of radius 10 cm. The four arcs inside each circle have the same shape and equal length. Taking $\pi\approx3.14$, what is the area, in cm^2, of the shaded region which consists of 7 identical parts?

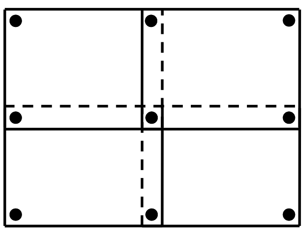


Answer：________ cm^2

8. The total number of players on three badminton teams is 29. No two players on the same team play against each other, while every two players on different teams play each other exactly once. What is the maximum number of games played?

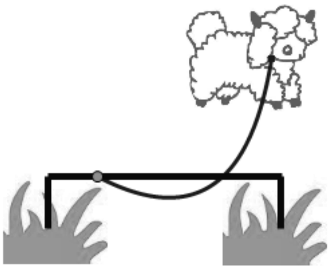
Answer：________ games

9. A class is putting up 40 rectangular posters of the same shape and size on a wall. Each poster must be held in place by one nail near each corner. Adjacent posters may overlap slightly so that the same nail can serve to hold both of them. The diagram shows how 9 nails can hold four posters adjacent diagonally. What is the minimum number of nails required to hold all 40 posters?



Answer：________ nails

10. The diagram shows a sheep on a lawn, tied by a string to a metal rod parallel to the ground. The length of the string is 10 m, the length of the metal rod is 3 m. The sheep is of negligible size and the height of the rod above the ground is also negligible. Taking $\pi \approx 3.14$, what is the area, in m^2, of the part of the lawn from which the sheep can eat the grass?



Answer： ____________ m^2

11. Leon uses a code to convert a letter string consisting only of As, Bs and Cs, into a number string consisting only of 0s and 1s, by replacing A with 101, B with 11 and C with 0. If the number string obtained is 11101010111100110101, what is the number of letters in the original letter string?

Answer： ____________

12. Divide the ten positive integers from 1 to 10 into two groups so that when the product of the numbers in the first group is divisible by the product of the numbers in the second group, the quotient is a positive integer. What is the minimum value of this quotient?

Answer： ____________

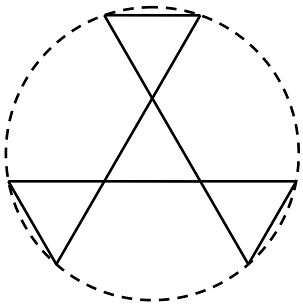
13. Wally writes down three positive integers a, b and c in a row on the blackboard, where $a + c = 2b$. He then erases the commas between the three numbers to obtain a five-digit number. What is the maximum value of this number?

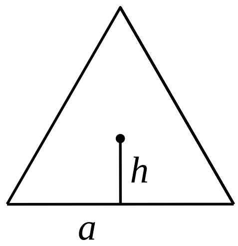
Answer： ____________

UP 4

Questions 14 to 15, 20 marks each
(Detailed solutions are needed for these two problems)

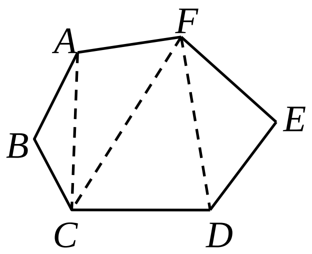
14. In an equilateral triangle of side length *a*, the distance *h* from the centre of the triangle to any side satisfies $a^2 = 12h^2$. Lily uses four equilateral triangles of side length 6 cm to make a cardboard windmill with three blades. Two triangles sharing a common vertex have the corresponding sides lying on the same straight line, as shown in the diagram. Taking $\pi \approx 3.14$, what is the area, in cm^2, of the circle swept out by the blades of the windmill?





Answer： ________ cm^2

15. The diagram shows a hexagon *ABCDEF* partitioned into four triangles by three diagonals *AC*, *CF* and *FD*, no two of which intersect except at the vertices. What the total number of ways of partitioning *ABCDEF* into four triangles with three non-crossing diagonals?



Answer：_______________ ways