International Mathematics Assessments for Schools

2012 UPPER PRIMARY DIVISION FIRST ROUND PAPER

Time allowed：75 minutes

INSTRUCTION AND INFORMATION

GENERAL
1. Do not open the booklet until told to do so by your teacher.
2. No calculators, slide rules, log tables, math stencils, mobile phones or other calculating aids are permitted. Scribbling paper, graph paper, ruler and compasses are permitted, but are not essential.
3. Diagrams are NOT drawn to scale. They are intended only as aids.
4. There are 20 multiple-choice questions, each with 5 choices. Choose the most reasonable answer. The last 5 questions require whole number answers between 000 and 999 inclusive. The questions generally get harder as you work through the paper. There is no penalty for an incorrect response.
5. This is a mathematics assessment, not a test; do not expect to answer all questions.
6. Read the instructions on the answer sheet carefully. Ensure your name, school name and school year are filled in. It is your responsibility that the Answer Sheet is correctly coded.
7. When your teacher gives the signal, begin working on the problems.

THE ANSWER SHEET
1. Use only lead pencils.
2. Record your answers on the reverse side of the Answer Sheet (not on the question paper) by FULLY filling in the circles which correspond to your choices.
3. Your Answer Sheet will be read by a machine. The machine will see all markings even if they are in the wrong places. So please be careful not to doodle or write anything extra on the Answer Sheet. If you want to change an answer or remove any marks, use a plastic eraser and be sure to remove all marks and smudges.
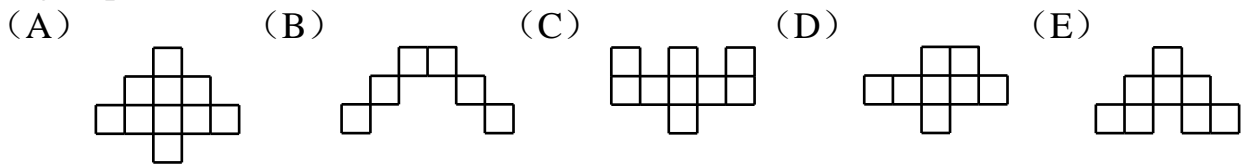
INTEGRITY OF THE COMPETITION
The IMAS reserves the right to re-examine students before deciding whether to grant official status to their scores.

Questions 1-10, 3 marks each

1. What is the value of $101010 - 10101$?

   （A）90909　　（B）10101　　（C）100000　　（D）900000　　（E）10000

2. The following figures are formed by identical squares. Which figure has the longest perimeter?

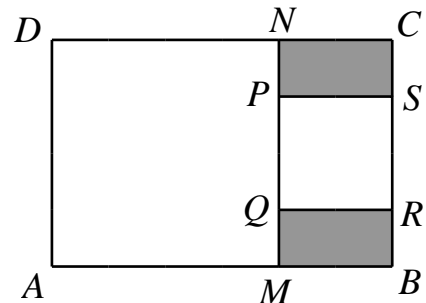   （A）　　　　　（B）　　　　　（C）　　　　　（D）　　　　　（E）

3. Which of the following sets of fractions has sum greater than 1?

   （A）$\dfrac{1}{3}, \dfrac{1}{4}, \dfrac{1}{5}$　　　　　　（B）$\dfrac{1}{2}, \dfrac{1}{4}, \dfrac{1}{6}$　　　　　　（C）$\dfrac{1}{2}, \dfrac{1}{3}, \dfrac{1}{6}$

   （D）$\dfrac{1}{2}, \dfrac{1}{4}, \dfrac{1}{5}$　　　　　　（E）$\dfrac{1}{2}, \dfrac{1}{3}, \dfrac{1}{5}$

4. The diagram to the right shows two squares *AMND* and *PQRS* inside a rectangle *ABCD*. The areas of the two squares are 16 cm^2 and 4 cm^2 respectively. What is the sum of area of the shaded regions in cm^2?

   （A）3　　　　　（B）4　　　　　（C）5

   （D）6　　　　　（E）7

5. Mike jogs at constant speed along a road with lamp posts which are evenly spaced. It takes him 2 minutes to go from the first lamp post to the fifth lamp post. He continues jogging to the *n*-th lamp post before turning back. If he has been jogging for 12 minutes when he returns to the first lamp post, what is the value of *n*?

   （A）6　　　　　（B）9　　　　　（C）11　　　　　（D）12　　　　　（E）13

6. The smallest interior angle of a triangle is 50°. Which of the following statements about this triangle is correct?

   （A）It must be isosceles.　　　　（B）It must be right angled.

   （C）It must be acute angled.　　　（D）It must be obtuse angled.

   （E）None of these is correct.

7. Each of A, B, C and D has a watch.
   (1) A's watch is 10 minutes faster than standard time but A believes that it is 5 minutes slower.
   (2) B's watch is 5 minutes slower than standard time but B believes that it is 10 minutes faster.
   (3) C's watch is 5 minutes faster than standard time but C believes that it is 3 minutes faster.
   (4) D's watch is 5 minutes slower than standard time but D believes that it is 10 minutes slower.

   According to their watches and their beliefs, they go to school in order to be just in time.   Who is late?

   （A）A （B）B （C）C （D）D （E）No one

8. The diagram below shows four squares with numbers which exhibit a certain pattern.   What number should be inside the fourth box?
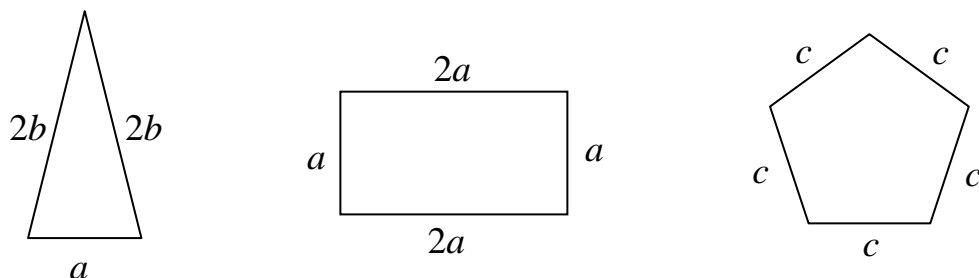
1	2		2	3		3	4		4	5
	14			54			132			?
4	3		5	4		6	5		7	6
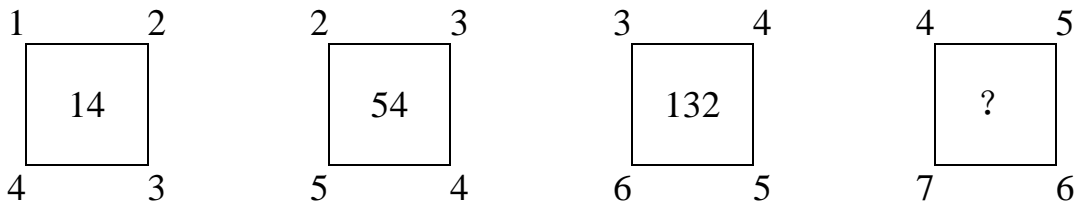
   （A）210 （B）260 （C）288 （D）308 （E）330

9. A piece of square paper is folded along a straight line, dividing it into two regions with the same area and the same shape.   How many such straight lines are there?

   （A）1 （B）2 （C）3
   （D）4 （E）infinitely many

10. The three figures in the diagram below have equal perimeters.   What is $a : b : c$?

   （A）1 : 1 : 1 （B）2 : 4 : 5 （C）4 : 6 : 5
   （D）16 : 20 : 25 （E）20 : 25 : 24

Questions 11-20, 4 marks each

11. A triangle is formed with 10 matchsticks of equal length connected end to end. No matchsticks are bent or broken. How many different triangles can be formed?
    （A）2 （B）3 （C）4 （D）5 （E）6

12. The total weight of 5 apples is equal to that of 6 bananas, and the total weight of 3 bananas is equal to that of 4 oranges. How many apples have the same total weight as 16 oranges?
    （A）8 （B）9 （C）10 （D）11 （E）12

13. Jane begins observing a hyacinth plant on last Friday, when some of its flowers bloom. Thereafter, the number of flowers which bloom on any day is equal to the number of flowers which have already bloomed. No flowers wither. All the flowers have bloomed by the following Thursday. On which day of the week have exactly half of the flowers bloomed?
    （A）Saturday （B）Sunday （C）Monday
   （D）Tuesday （E）Wednesday

14. The side length of each square in the diagram below is 1 unit. An ant needs 5 seconds to crawl 1 unit horizontally, and 6 seconds to crawl 1 unit vertically. It requires 1 second to change direction. What is the minimum number of seconds for the ant to crawl from point *A* to point *B*?
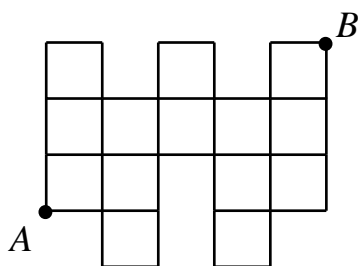
    （A）43 （B）45 （C）46 （D）47 （E）48

15. During the holidays, Dick worked part-time washing bowls in a restaurant. He got paid 3 dollars for washing one bowl. If he broke a bowl, he got no pay for washing it, and must pay 9 dollars to the owner. In one week, Dick washed 500 bowls and earned 1368 dollars. How many bowls did he break?
    （A）7 （B）8 （C）9 （D）10 （E）11

16. Four coloured lamps are arranged in a 2×2 array, where the letters **R**, **Y**, **B** and **W** represent the colours red, yellow, blue and white respectively. Each lamp changes its colour every minute. In the first minute, the colours of the lamps in the two rows are interchanged. In the second minute, colours of the lamps in the two columns are interchanged. See the diagram below. This cycle is then repeated. What are the colours of the four lamps at the 60th minute?

R	Y
B	W

→

B	W
R	Y

→

W	B
Y	R

......

(start)   (1st minute)   (2nd minutes)
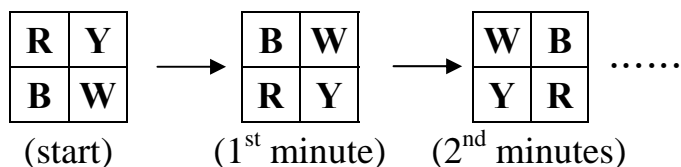
（A）

R	Y
B	W

（B）

B	W
R	Y

（C）

W	B
Y	R

（D）

| Y	R
W	B

（E）

Y	R
B	W

17. The elder sister is 12 years old, the younger sister is 8 years old and brother is 3 years old. Their birthdays are in the same day. When the sum of their ages equal 50, what is the age of the younger sister?
（A）14 　　（B）15 　　（C）16 　　（D）17 　　（E）18

18. Mrs. Wong worked at the airport. She had two consecutive days of rest after working for eight days. If she rests on Saturday and Sunday this week, at least how many weeks later will she rest on Sunday again?
（A）4 　　（B）5 　　（C）6 　　（D）7 　　（E）8

19. The diagram below shows four cups in a row, labelled 1, 2, 3 and 4. Initially, there is a ball inside cup #3. In each move, the ball may be transferred to an adjacent cup. From cup #1, the ball can only go to cup #2, and from cup #4, the ball can only go to cup #3. After 2012 moves, which of the following statements about the ball is correct?

1　　2　　3　　4
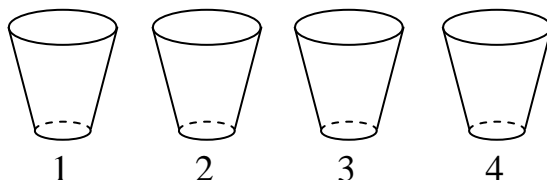
（A）It cannot be in cup #1 and cannot be in cup #2
（B）It cannot be in cup #1 and cannot be in cup #3
（C）It cannot be in cup #2 and cannot be in cup #3
（D）It cannot be in cup #2 and cannot be in cup #4
（E）It cannot be in cup #3 and cannot be in cup #4

20. On a 4×4 chessboard shown in the diagram below on the left, we wish to place a minimum number of copies of the shape shown in the diagram below on the right, so that no more copies of this shape can be placed.   Copies may be rotated. What is this minimum number of copies?
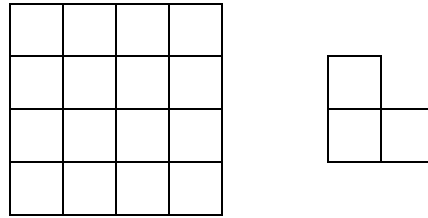
（A）2   （B）3   （C）4   （D）5   （E）6

Questions 21-25, 6 marks each

21. The diagram below shows a cube with three of its faces labeled A, B and C, and a 3×3 square with six of its squares labelled 1, 2, 3, 4, 5 and 6.   The cube is tipped over so that face C lies on square 1, tipped over again so that face B lies on square 2, and so on until the cube lies on square 6.   What is the sum of the numbers of the squares on which the cube has laid with face B on top?
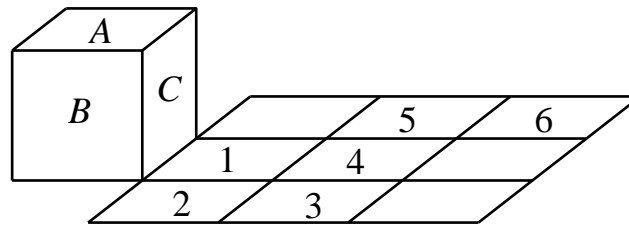
22. The diagram below shows 7 points *A*, *B*, *C*, *D*, *E*, *F* and *G*.
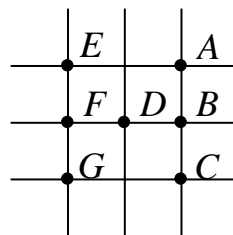
A flea starts from *A*, in each move the flea jumps from a given point to another given point and must always follow any one of the two types of jumps.
　（1）　Jumps two steps to the west (for instance from *A* to *E*), jumps two steps to the south (for instance from *A* to *C*), or jumps one step to the southwest (for instance from *A* to *D*).
　（2）　Jumps one step to the east (for instance from *F* to *D*) or jumps one step to the north (for instance from *F* to *E*).
The flea must make these two types of moves alternately ((1), (2), (1), (2) and so on, or (2), (1), (2), (1) and so on).   It may not land on the same point twice, and it will stop when it gets to *G*.   How many possible routes can it follow?

23. The number of bicycles in the school bicycles lot is a three-digit number, and the number of bicycle wheels is also a three-digit number.   These six digits are 2, 3, 4, 5, 6 and 7 in some order.   At most how many bicycles are there?

24. For any positive integers *a* and *b*, define a new operation $a \odot b$ which yields the remainder when the larger of *a* and *b* is divided by the smaller one.   For example, $5 \odot 12 = 12 \odot 5 = 2$.   Given that $(11 \odot x) \odot 11 = 2$, what is the minimum value of *x*?

25. In the expression 2 □ 3 □ 4 □ 5, an operation sign (addition, subtraction, multiplication or division) is placed in each □.   The same operation may be repeated, and brackets may be inserted.   What is the largest two-digit number that can be obtained?

$* * *$