International Mathematics Assessments for Schools

2013 JUNIOR 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.

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Questions 1-10, 3 marks each

1. What is the value of the expression $|-2013|+2^0+1^3$?

（A）2014　（B）2015　（C）2016　（D）−2010　（E）−2011

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2. Which of the following real numbers has the greatest absolute value?

（A）$-\pi$　（B）$\sqrt{7}$　（C）3.1　（D）−2　（E）$\frac{23}{8}$

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3. Which of the following five numbers is divisible by 6?

（A）332　（B）363　（C）494　（D）522　（E）586

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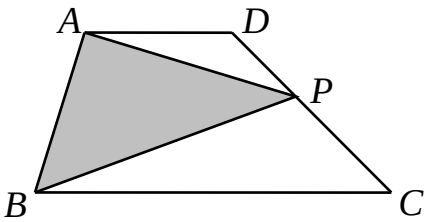
4. In the diagram, *AD* is parallel to *BC*. A point *P* moves from *C* to *D* along the side *CD*. Which of the following is the accurate description of the change in the area of triangle *ABP* during the motion?



（A）increasing　（B）decreasing　（C）increasing then decreasing
（D）decreasing then increasing　（E）unchanged

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5. If *x* is a real number, which of the following is an accurate description of the expression $|x|-x$?

（A）must be positive　（B）may be positive or zero　（C）must be negative
（D）may be negative or zero　（E）may be any number

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6. In a promotional sale, a store reduces the price of all merchandise by 40%. If payment is made on a membership card, there is a further reduction of 10%. What is the combined reduction in using a membership card?

（A）40 %　（B）46 %　（C）50 %　（D）54 %　（E）60 %

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7. The length of each side of a triangle is a different odd positive integer. What is the minimum perimeter of this triangle?

（A）9　（B）11　（C）13　（D）15　（E）21

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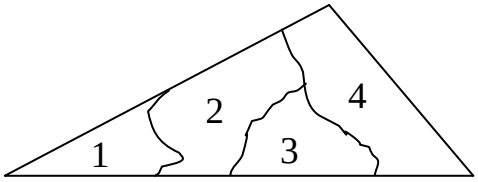
8. The coordinates of a point in the plane are $(w,\ 1-w)$, where w is a real number. Which of the following is an accurate description of the position of this point?

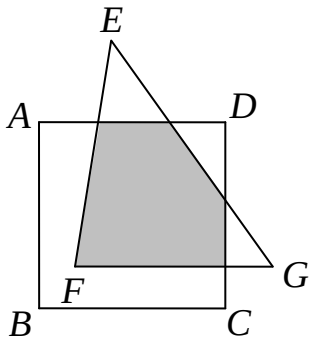
（A）cannot be in the fourth quadrant （B） cannot be in the third quadrant
（C）cannot be in the second quadrant （D）cannot be in the first quadrant
（E）can be anywhere

9. Mickey accidentally drops a triangular sheet of glass into four pieces as shown in the diagram. He wishes to take only one of the pieces to a repair shop so that they can reproduce the triangular sheet of glass. How many different choices for this piece does he have?



（A）4 （B）3 （C）2 （D）1 （E）0

10. In the diagram, *ABCD* is a square. The common part of *ABCD* and triangle *EFG* is shaded. Its area is $\frac{4}{5}$ of that of *EFG* and $\frac{1}{2}$ of that of *ABCD*. If the area of triangle *EFG* is 40 cm^2, what is the length of a side of *ABCD*, in cm?



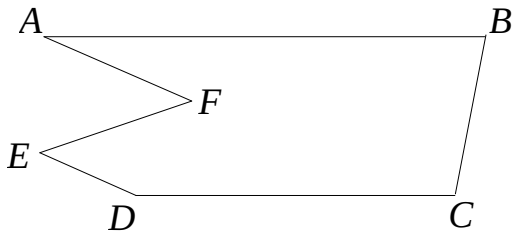
（A）4 （B）5 （C）8 （D）10 （E）$\sqrt{2}$

Questions 11-20, 4 marks each

11. What is the value of the expression $\frac{3^{2013}-3^{2011}}{3^{2013}+3^{2012}}$?

（A）$\frac{2}{3}$ （B）$\frac{4}{5}$ （C）$\frac{3}{2}$ （D）$\frac{1}{2}$ （E）$\frac{3}{4}$

12. Linda cuts out a shape as shown in the diagram. *AB* is parallel to *CD* and the measure of angle *AFE* is 40°. What, in degrees, is the total measure of angles *BAF*, *FED* and *EDC*?

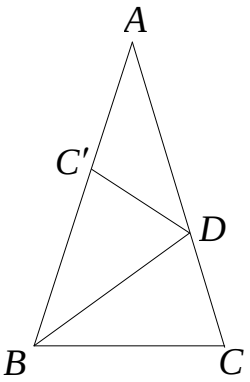


（A）200　（B）220　（C）300
（D）320　（E）not uniquely determined

13. May and Cherry bought the same kind of coloured pens from a stationery store. Such a pen costs more than $10. May's total bill comes to $182 while Cherry's total bill comes to $221. What is the total number of pens the two of them have bought?

（A）13　（B）14　（C）30　（D）31　（E）32

14. The diagram shows the result of folding a piece of triangular paper so that the vertex *C* becomes the point C' on the side *AB*. If $AB = AC$ and $C'A = C'D$, what is the measure, in degrees, of angle *A*?



（A）18　（B）20　（C）24　（D）30　（E）36

15. Mickey is asked to multiply four positive integers, but he adds them instead. Amazingly, his correct answer is equal to the correct answer for the multiplication problem. What is the sum of these four numbers?

（A）6　（B）8　（C）9　（D）10　（E）12

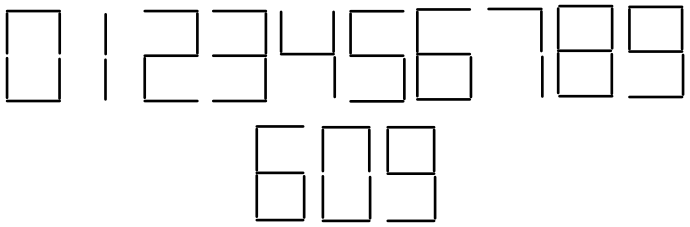
16. Mickey starts working on his report at 7:30 am. By 10:10, he has finished $\frac{2}{3}$ of it. He takes a one-hour break and then continues to work at the same rate. When will he finish the report?

（A）10：50　（B）11：20　（C）11：40　（D）12：30　（E）12：50

17. *P* is a point inside a triangle which has side lengths of 7 cm, 24 cm and 25 cm. If *P* is at the same distance from all three sides of the triangle, what is this distance, in cm?

（A）1　　（B）1.5　　（C）2　　（D）2.5　　（E）3

18. The diagram shows how each of the digits 0 to 9 can be made from matchsticks. In this representation, the number 609 reads the same way upside down as right side up. How many such numbers are there with three digits, the first of which is not 0?



（A）30　　（B）36　　（C）42　　（D）49　　（E）245

19. The alien clock divides an earth day into 10 of their hours, each of which is divided into 100 of their minutes. If they plan to attack earth at 6∶36 am our time, what is the time indicated on their clock?

（A）1∶75　　（B）2∶25　　（C）2∶75

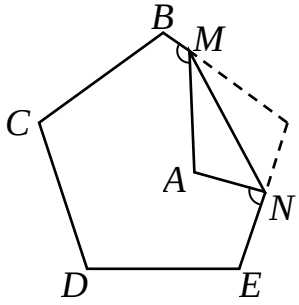
（D）3∶15　　（E）3∶25

20. Fanny, Lily and Sherry all shop at regular intervals, Fanny once every 3 days, Lily once every 4 days and Sherry once every 5 days. Yesterday, all three shopped. On how many of the next 100 days, starting from today (today is the first day), will at least two of them be shopping?

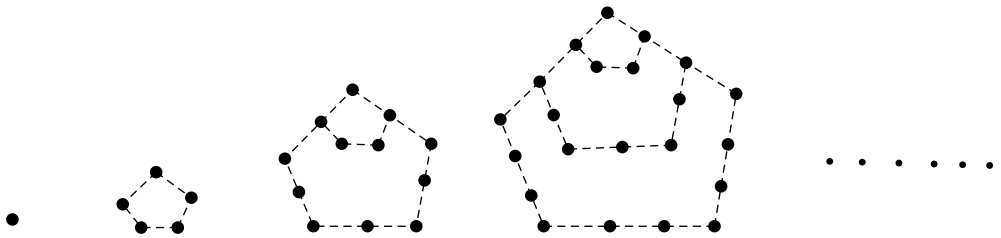
（A）16　　（B）17　　（C）18　　（D）19　　（E）20

Questions 21-25, 6 marks each

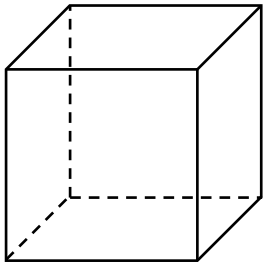
21. The diagram shows a regular pentagon *ABCDE* with a point *M* on *AB* and a point *N* on *AE*. The pentagon is folded along the segment *MN* so that the vertex *A* is now inside the original pentagon. What is the measure of $\angle AMB + \angle ANE$, in degrees?



22. Anne arranges some pebbles in the sand forming a pattern of interesting configurations as shown in the diagram. The numbers of pebbles used in the first four configurations are respectively 1, 5, 12 and 22. What is the number of pebbles used in the tenth configuration of this pattern?



23. The six faces of a cubical die are labelled with six different positive integers. If the numbers on any two adjacent faces differ by at least 2, what is the minimum value of the sum of these six numbers?



24. The non-zero real numbers x and y satisfy

$$(\sqrt{x^2+2013}-x)(\sqrt{y^2+2013}-y)=2013.$$

What is the value of the expression $\dfrac{2013x+y}{5x+y}$?

25. What is the minimum value of a positive integer which has five three-digit divisors?

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