

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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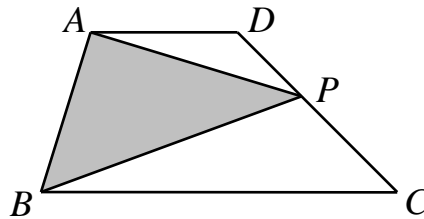
Questions 1-10, 3 marks each

1. What is the value of the expression $|-2013| + 2^0 + 1^3$?
(A) 2014 (B) 2015 (C) 2016 (D) -2010 (E) -2011

2. Which of the following real numbers has the greatest absolute value?
(A) $-\pi$ (B) $\sqrt{7}$ (C) 3.1 (D) -2 (E) $\frac{23}{8}$

3. Which of the following five numbers is divisible by 6?
(A) 332 (B) 363 (C) 494 (D) 522 (E) 586

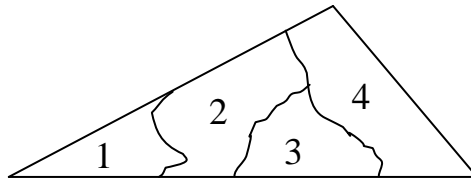
4. In the diagram, AD is parallel to BC . A point P moves from C to D along the side CD . Which of the following is the accurate description of the change in the area of $\triangle ABP$ during the motion?



- (A) increasing (B) decreasing (C) increasing then decreasing
(D) decreasing then increasing (E) unchanged
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
6. In a promotional sale, a store reduces the prices of all merchandises by 40%. If payment is made using a membership card, then 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 %
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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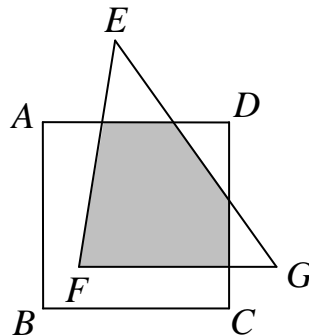
8. The coordinates of a point in the plane are $(w, 1 - w)$, where w is a real number. Which of the following is an accurate description of the position in this point?
- (A) cannot be in the fourth quadrant (B) cannot be in the third quadrant
 (C) cannot be in the second quadrant (D) cannot be in the first quadrant
 (E) can be anywhere
-

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



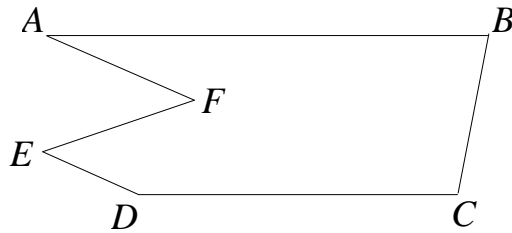
- (A) 4 (B) 5 (C) 8 (D) 10 (E) $\sqrt{2}$
-

Questions 11-20, 4 marks each

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

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

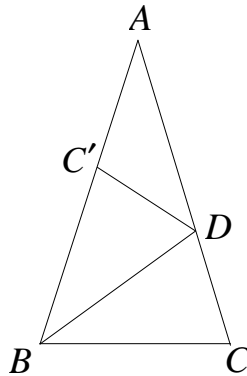


- (A) 200 (B) 220 (C) 300
(D) 320 (E) not uniquely determined

13. May and Cherry bought the same kind of colored pens from a stationery store. Such a pen costs more than \$10. May's total bill has reached \$182 while Cherry's total bill is \$221. What is the total number of pens which May and Cherry bought?

- (A) 13 (B) 14 (C) 30 (D) 31 (E) 32

14. The diagram shows the outcome of a folded piece of triangular paper such 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

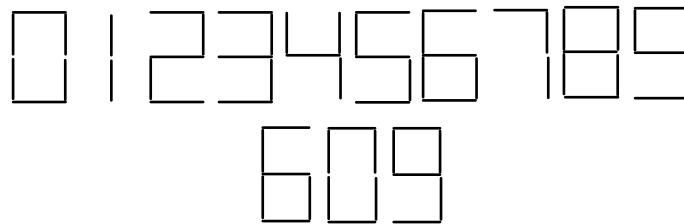
16. Mickey starts working with his report at 7:30 am. By 10:10, he has finished $\frac{2}{3}$ of his report. He takes one-hour break and then continues to work at the same rate. At what time will he finish his report?

- (A) 10 : 50 (B) 11 : 20 (C) 11 : 40 (D) 12 : 30 (E) 12 : 50
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17. P is a point inside a triangle whose side lengths are 7 cm, 24 dm 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 three-digit numbers can be formed if the first digit may not be 0?



(A) 30 (B) 36 (C) 42 (D) 49 (E) 245

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

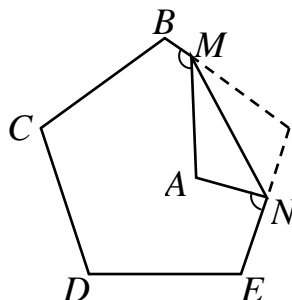
(A) 1 : 75 (B) 2 : 25 (C) 2 : 75
(D) 3 : 15 (E) 3 : 25

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

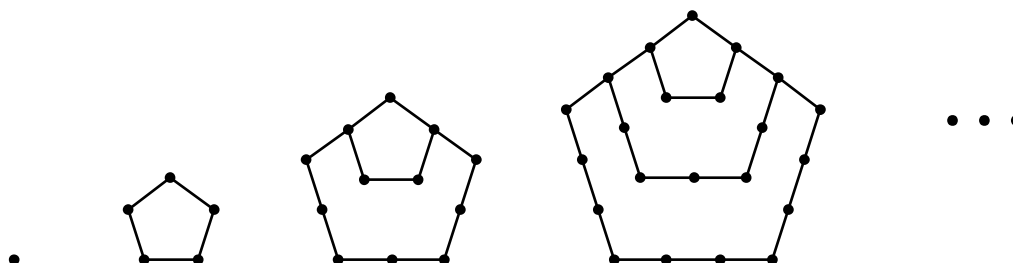
(A) 16 (B) 17 (C) 18 (D) 19 (E) 20

Questions 21-25, 6 marks each

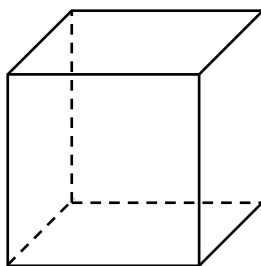
21. The diagram shows a regular pentagon $ABCDE$ with a point M on AB and a point N on AE . The pentagon is folded along the segment MN so that the vertex A is now inside the original pentagon. What, in degrees, is the total measure of the angles AMB and ANE ?



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 1, 5, 12 and 22 respectively. What is the number of pebbles used in the tenth configuration of this pattern?



23. The six faces of a cubical die are labeled 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 satisfies

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

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

25. Determine the least positive integer which has five three-digit divisors?

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