

International Mathematics Assessments for Schools

2021 ~ 2022 MIDDLE PRIMARY DIVISION FIRST ROUND PAPER

Time allowed : 75 minutes

When your teacher gives the signal, begin working on the problems.

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.

THE ANSWER SHEET

1. Use only 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.

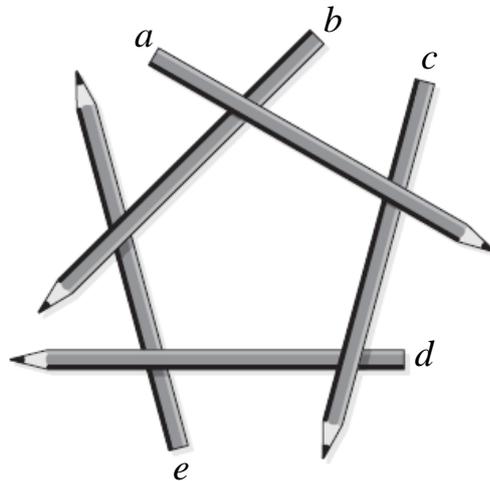
INTEGRITY OF THE COMPETITION

The IMAS reserves the right to re-examine students before deciding whether to grant official status to their scores.

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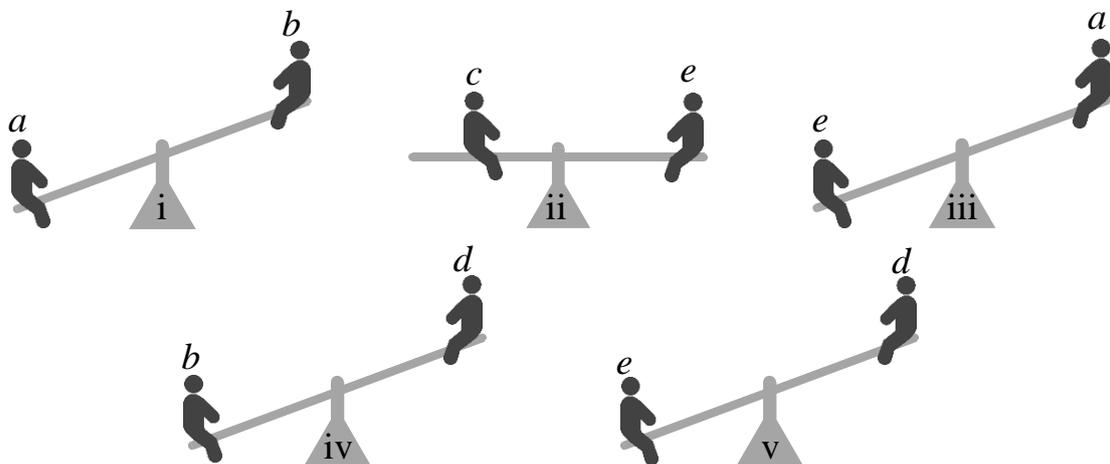
Questions 1-10, 3 marks each

1. Five identical pencils are positioned on the table as shown below. Which two pencils are lying on the same plane?



- (A) *b* and *c* (B) *b* and *d* (C) *b* and *e* (D) *c* and *d* (E) *c* and *e*

-
2. Five children ride on a seesaw. The diagrams below are images showing the weight comparisons between two different persons.



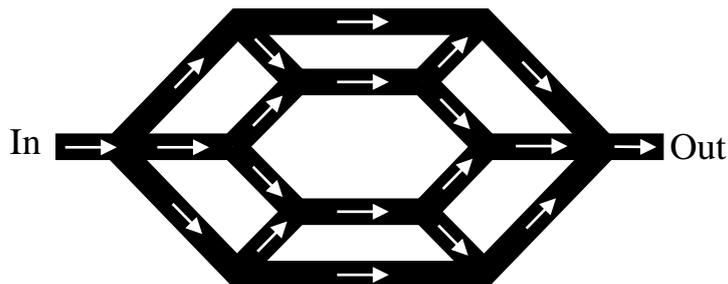
Who has the heaviest weight?

- (A) *a* (B) *b* (C) *c* (D) *d* (E) *e*

-
3. Tom and Tim play a badminton match. The first player to reach 21 points wins a game and the first player to win two games wins the match. If Tom wins the first and third games and gets a total of 60 points for the whole match, what score did Tom get in the second game?

- (A) 8 (B) 10 (C) 15 (D) 18 (E) 20
-

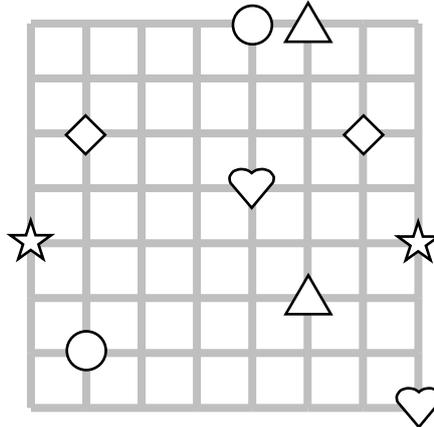
4. Which of the following is closest to 2021 kg?
 (A) 2 cars, and the weight of each car is 1013 kg.
 (B) 21 motorcycles, and the weight of each motorcycle is 101 kg.
 (C) 155 bicycles, and the weight of each bicycle is 13 kg.
 (D) 61 desks, and the weight of each desk is 33 kg.
 (E) 44 refrigerators, and the weight of each refrigerator is 46 kg.
-
5. Let \star be a positive integer such that $(\star - 2) \times (\star + 2) = 2021$, what is the value of \star ?
 (A) 42 (B) 43 (C) 44 (D) 45 (E) 47
-
6. What is the value of $2021 - 2020 + 2019 - 2018 + 2017 + \dots - 2 + 1$?
 (A) 1 (B) 1010 (C) 1011 (D) 1012 (E) 2021
-
7. Josh has 3 dogs, namely Jack, Sparrow and Tom, where each of them have different weights. If Jack and Sparrow weigh 12 kg together, Sparrow and Tom weigh 16 kg together and Tom and Jack weigh 14 kg together, then what is the total weight, in kg, of all 3 dogs?
 (A) 21 kg (B) 24 kg (C) 26 kg (D) 28 kg (E) 42 kg
-
8. A certain year in the 21st Century is a perfect square number. What year is it? (Note: $1=1^2$, $4=2^2$, $9=3^2$, ..., so we call 1, 4, 9, ... perfect square numbers.)
 (A) 1936 (B) 2021 (C) 2025 (D) 2116 (E) 2209
-
9. Peter keeps all of his socks in a messy non-transparent drawer under his bed. He has 8 black socks and 6 white socks. He takes the socks out from the box, one sock at a time. How many attempts does he need to make sure that he gets 2 socks of the same colour? (Note: There is no difference between a left and a right sock.)
 (A) 2 (B) 3 (C) 4 (D) 7 (E) 9
-
10. The puzzle shown in the diagram below has one rule: Always follow the direction of the arrows. How many allowable routes from "in" to "out" adhere to the rule?



- (A) 6 (B) 7 (C) 8 (D) 9 (E) 10
-

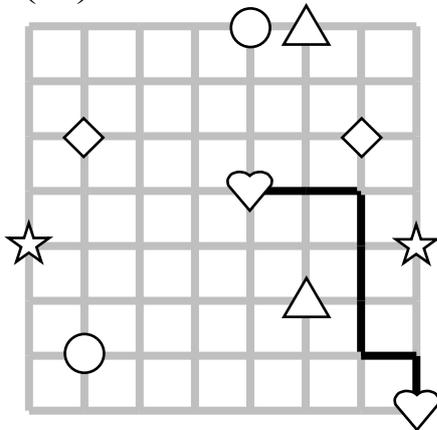
Questions 11-20, 4 marks each

11. The diagram below contains five pairs of figures (square, triangle, circle, heart and star) that are placed on a grid. We must connect any two same figures using a single path such that all connecting paths must run only along the grey segments of the grid and no connecting paths may intersect.

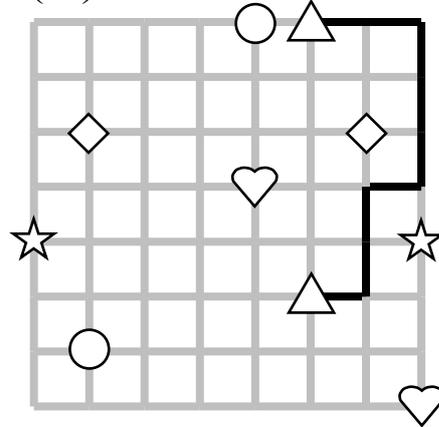


Jane draws five set of connecting paths, as shown in the options. Exactly four of them are satisfying the conditions. Which option is **NOT** a correct set of connecting paths?

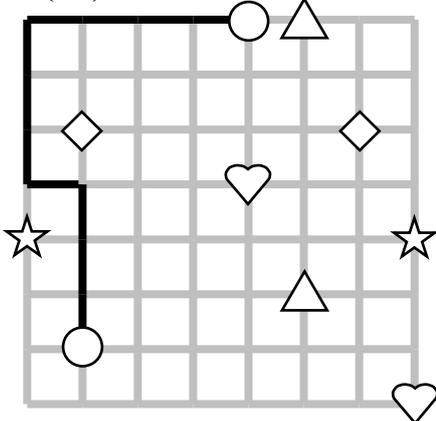
(A)



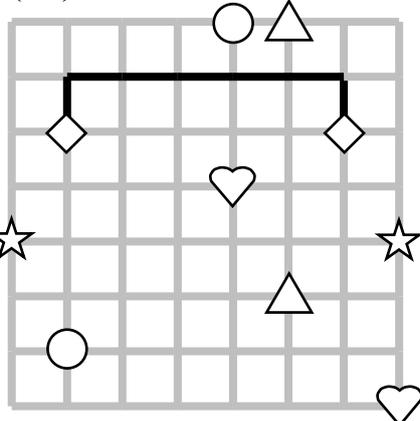
(B)



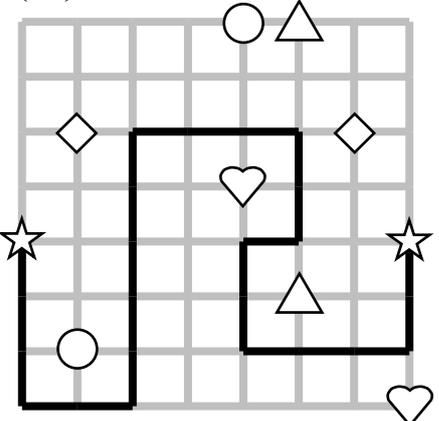
(C)



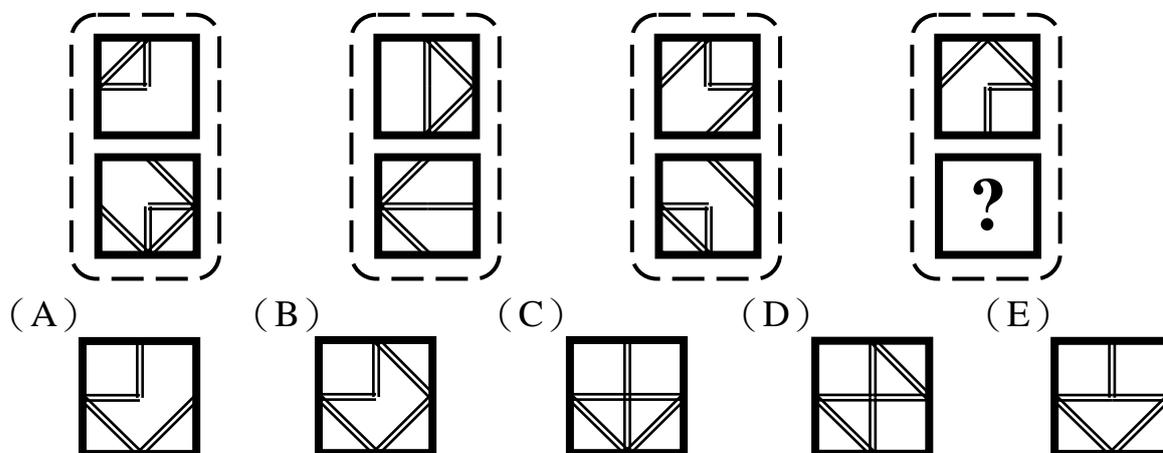
(D)



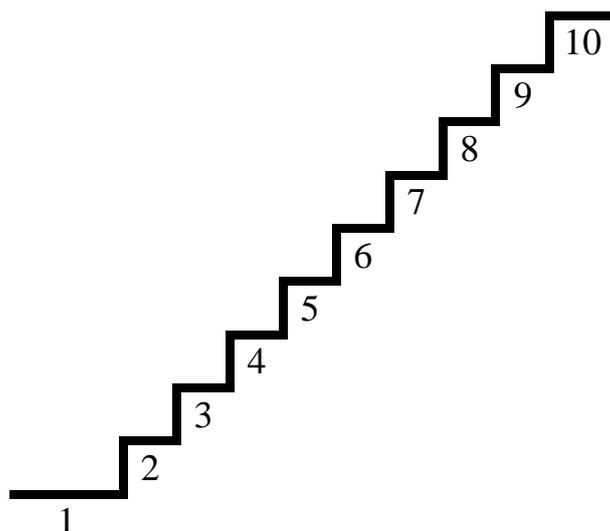
(E)



12. There are four pairs of square patterns as shown below. Inside each square, there is a wire element. In one of the squares (marked with a question mark), the wire element is missing. Which of the following is its pattern?



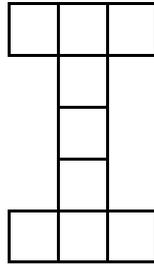
13. Alan and Benjie use the staircase shown in the diagram below to play a game where the goal is to reach a certain level on the staircase first. At the beginning, both of them will start in step 1, and in each turn, they will be playing the “Rock, Paper and Scissors” game to move around the staircase. The winner in each game gets to move 4 consecutive steps upward (or downward or a combination of both) for showing a rock; 5 consecutive steps for showing scissors and 6 consecutive steps for showing a paper. So, for example, when someone reaches step 10, he must go down to the step 9 and so on, finally returning to the step 1 and then goes back up doing the same procedure again until somebody wins. To illustrate further, when a person shows a rock on the first game and wins and then in the second game shows a paper and wins, he will then move and land on step 9.



Since Alan is currently on step 1 of the stairs, what is the least number of times he has to win in order to reach step 2? Note: If a game is a tie (where both players show the same hand, i.e. paper and paper), then they don't move.

- (A) 2 (B) 3 (C) 4 (D) 5 (E) 8
-

18. The diagram below is made up of nine identical squares which form the letter “I”. How many different rectangles located in different positions (including squares) are there in the diagram?



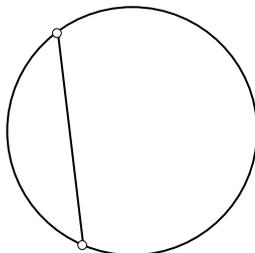
- (A) 9 (B) 12 (C) 18 (D) 22 (E) 25

19. Four persons *A*, *B*, *C* and *D* will participate in a 100-meter race. The following table shows the predicted rankings of each of these four participants before the race. Line ① is participant *B*'s prediction. After the race, all four of them checked the final ranking and after comparing it with their predictions, they found out that nobody predicted their own personal ranking correctly. It is known that everyone has correctly predicted the winner of at least one from the first to third placers, none of them correctly predicted who finished last and exactly two participants correctly predicted the third place winner. Who are the participants that predicted line ②, line ③ and line ④? Note: write the answer in this order.

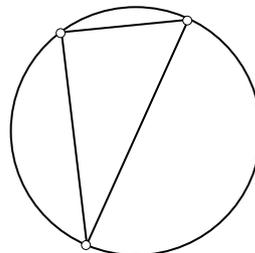
	First Place	Second Place	Third Place	Four Place
①	D	B	C	A
②	D	A	B	C
③	A	B	C	D
④	C	A	B	D

- (A) C, D, A (B) C, A, D (C) D, C, A (D) D, A, C (E) A, C, D

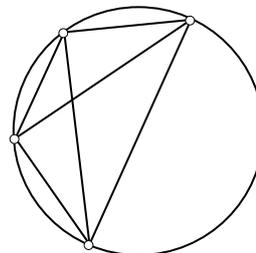
20. The three circles below have some number of points on their circumference. Connect all the points on the same circle using straight lines and count the number of regions these segments have partitioned the circle into.



2 points,
2 regions.



3 points,
4 regions.



4 points,
8 regions.

If there are 5 points on the circumference of a circle, how many regions have been partitioned at the most?

- (A) 10 (B) 12 (C) 15 (D) 16 (E) 20

Questions 21-25, 6 marks each

21. In a race, each athlete must complete a 100-meter distance at their own fixed speed, and the athlete who reaches the finish line first wins. If athlete *A* has reached the finish line, athlete *B* still has 10 meters to complete the race; and when athlete *B* reaches the finish line, athlete *C* is still 20 meters away. How many meters was athlete *A* ahead of athlete *C*?

22. There are four cards with digits 0, 1, 2 and 3 written on them. Choose any three cards and arrange them to form all possible three-digit numbers (where 0 is not allowed to be the leading digit). What is the average of all possible three-digit numbers that are odd?

23. Fill-in the numbers 1, 2, 3, 4, 6, 9, 12, 18, and 36 into each of the unit squares exactly once on the grid below, so that the product of the three numbers on each horizontal, vertical and diagonal lines are all equal. Which number must be filled in the unit square marked with “☆”?

	☆	

24. There are three kinds of tokens having different weights: 5 grams, 10 grams and 20 grams. The total weight of 19 tokens is 250 grams. If the number of 5 gram tokens and the number of 20 gram tokens are interchanged, then the total weight of tokens are reduced to 190 grams. What is the number of tokens having a weight of 10 grams?

25. A strange math teacher gave his students this problem. He first wrote the following eight digits: 1, 2, 3, 4, 5, 7, 8 and 9 on the board. He then asked his students to split these digits into two groups, such that each group has four digits; and then arrange and combine the four digits in each group to form two 2-digit numbers and add them together. Finally, the result of adding the two 2-digit numbers in each group must be the same 2-digit number. What the largest possible value of this sum?
