



2023 Spring Cup
Mathematical Olympiad
PRELIMINARY ROUND

Date: 28 January 2023

Time Given: 1 hour 30 minutes

Level: Primary 4

Name: _____

Instructions to Candidates

1. Do not open the booklet until you are told to do so.
2. Answer ALL 20 questions.
3. Write your answers in the answer sheet provided.
4. No steps are needed to justify your answers.
5. Questions 1-7 are worth 4 marks each.
6. Questions 8-14 are worth 6 marks each.
7. Questions 15-19 are worth 8 marks each.
8. Question 20 is worth 10 marks.
9. No marks will be deducted for wrong answers.
10. No marks will be given for unanswered questions.
11. No calculators or mathematical instruments are allowed.

Questions 1 to 7 are worth 4 marks each.

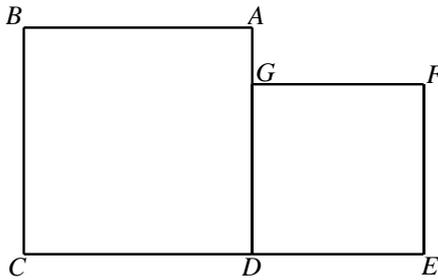
1. Calculate $1+2+3+\cdots+18+19+20+19+18+\cdots+3+2+1=$

2. There are some monks in a mountain, and they need to draw water from the river. Two old monks can carry a bucket of water slung on a bamboo pole across their shoulders. Or, one young monk can carry two buckets of water slung on a bamboo pole across his shoulder. If 38 bamboo poles and 58 buckets are used, how many young monks are there? How many old monks?

3. In the year-end examination, Frank's average mark of Chinese, Mathematics and Music Theory is 96. When the result of English exam is released, his overall average mark of four subjects is decreased by 2, what did Frank get for English?

4. Anna, Blake and Cooper have 73 pieces of chocolate in total. If Cooper eats 3 pieces of chocolate, Blake and Cooper would have the same number of chocolates. If Blake gives Anna 2 pieces of chocolate, Anna's chocolate would be two times the amount of Blake. How many chocolates does Cooper have originally?

5. As shown in the figure, $ABCD$ and $DEFG$ are both squares. If $CE = 14$ and $AG = 2$, what is the sum of the area of these two squares.



6. Four classes participated in a contest, Arthur and Benedict are guessing the outcome, they make the following predictions:

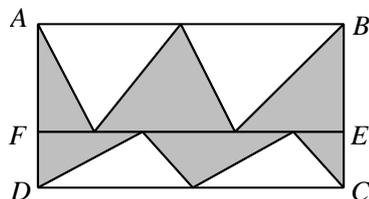
Arthur predicts: “3rd class will be the champion, 2nd class will be the first runner-up, 1st class will be the second runner-up and 4th class will be the third runner-up”

Benedict predicts: “2nd class will be the champion, 4th class will be the first runner-up, 3rd class will be the second runner-up and 1st class will be the third runner-up”

It turned out that only Benedict’s prediction on the “4th class will be the first runner-up” is true and all the other predictions made by them are wrong.

The correct ranking of the four classes should be: Champion: _____ class, first runner-up: _____ class, second runner-up: _____ class, third runner-up: _____.

7. As shown in the figure, the rectangle $AFEB$ and rectangle $FDCE$ combined to form another rectangle $ABCD$ with height 20 and width 12. The area of the shaded region is _____.



Questions 8 to 14 are worth 6 marks each.

8. Starting with a certain number of cells, two cells will die every hour and each of the remaining cells will split into two. If there are 1284 cells after 8 hours, how many cells are there at the beginning?

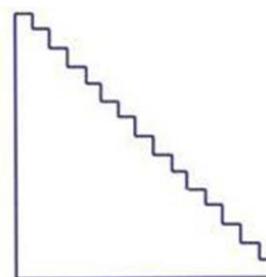
9. Jonah is writing down a sequence according to the following rule:

If he wrote down an even number, the next number is the current number divided by 2 and add 2.

If he wrote down an odd number, the next number is the current number multiplied with 2 and subtract 2.

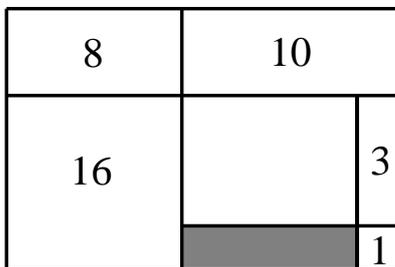
By starting with the number 36, he wrote down: 36, 20, 12, 8, ..., what is the 2016th number in this sequence?

10. The figure below depicts a staircase of a building from ground floor to first floor. If there are 15 steps in this staircase, each step is 16cm high with depth 26cm and the width of this staircase is 3m, how much money it would take to cover the staircase with carpet that costs 80 cents for every meter squared?



11. If a 6-digit number $1992\square\square$ is divisible by 105, what are the last two digits?

12. As shown in the figure, a big rectangle is divided into 7 smaller rectangles. The area of these small rectangles are 8, 10, 16, 3, 1 respectively, find the area of the shaded region.



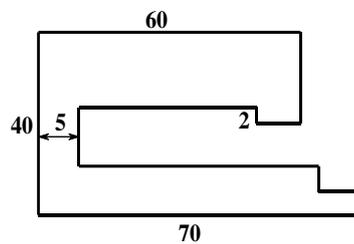
13. Adam and Bradley are playing table tennis, whoever wins the first two games consecutively is the winner. If no one wins the first two games consecutively, whoever wins three games (not necessarily consecutively) is the winner. If they play until there is a winner, how many ways there are?

14. Tony and Steve are driving towards each other and they depart from Point A and B respectively at the same time. 2 hours after their departure, they are 141km apart. If they meet each other 5 hours after their departure, what is the distance between point A and B?

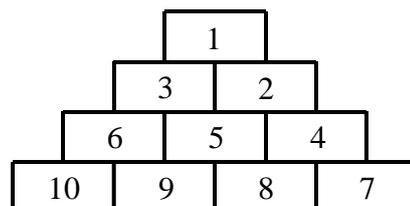
Questions 15 to 19 are worth 8 marks each.

15. Given that $\overline{abcd} + \overline{abc} + \overline{ab} + a = 1370$, find \overline{abcd} .

16. What is the perimeter of the following shape?



17. As shown in the figure, there are ten rooms labelled with the numbers 1 to 10. A person is only allowed to move to an adjacent room whose labelled number is greater than his current room. How many possible paths are there to travel from room number 1 to room number 10?



18. The monkey king is distributing peaches. If the older monkeys receive 5 peaches each and the younger monkeys receive 3 peaches each, the monkey king can keep the remaining 10. If the older monkeys and the younger monkeys each receive 4, the monkey king can keep the remaining 20. The number of older monkeys is _____ more than the number of younger monkeys.

19. Sunflowers, Lily flowers and Orchid flowers are planted in a garden. It is known that:

1. There is only one day in a week, three flowers can be found bloom together.
2. All three flowers cannot bloom for more than three consecutive days.
3. In a week, any two flowers will not bloom together for at most one day.
4. Sunflowers do not bloom on Tuesday, Thursday and Sunday.
5. Lily flowers do not bloom on Thursday and Saturday.
6. Orchid flowers do not bloom on Sunday.

On which day of the week, we can find three flowers bloom together?

Questions 20 is worth 10 marks.

20. In your opinion, from question 1 to 19, your favourite question is question _____ and the most difficult question is question _____.

(As long as your answer is within 1 to 19, you get full marks, otherwise you get zero.)