2022-2023 Senior Mathematical Olympiad

Round One Examination (Grade 7 and 8) - 11:00am

For each question, determine the letter corresponding to the correct or best response; along with the question number, indicate this letter by shading it on the answer sheet

1. What is the value of
$$(20 + 22) \div (20 - 22)?$$
   (A) -42 (B) -21 (C) -2 (D) 21 (E) 42

2. The statement below is true:
$$(6\blacksquare3) + 4 - (2 - 1) = 5.$$
   The symbol $\blacksquare$ between the 6 and the 3 is representing
   (A) $\div$ (B) $\times$ (C) $+$ (D) $-$ (E) None of these

3. The product of four of the digits
$$3, 4, 5, 6, 7$$
   is 360. Which digit was not used?
   (A) 3   (B) 4   (C) 5   (D) 6   (E) 7

4. Alex, Barry and Carl altogether are 15 years old. Alex and Barry together are 11 years old. Barry and Carl together are 12 years old. How old is the oldest of the three?
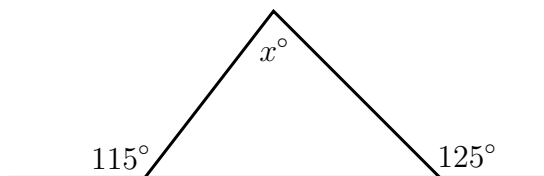   (A) 4   (B) 5   (C) 6   (D) 7   (E) 8

5. Let J, M and O be distinct (different) positive integers. Given that $JMO = 2022$. What is the largest possible value of $J + M + O$?
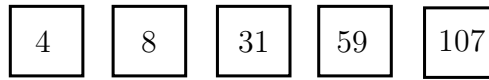   (In the above, $JMO = J \cdot M \cdot O = J \times M \times O$)
   (A) 1014   (B) 342   (C) 343   (D) 2023   (E) 60

6. What is the value of x in the diagram below?

   (A) 50   (B) 55   (C) 60   (D) 65   (E) 70

7. The following five cards are arranged to form the **smallest** 9 digit number.

| 4 | 8 | 31 | 59 | 107 |

Which card must be placed furthest on the right? The card marked

(A) 4   (B) 8   (C) 31   (D) 59   (E) 107

8. Starting at 0, Fogo the frog jumps on a number line. He starts with two big jumps and then three small jumps landing on the numbers

$$3, 6, 7, 8, 9$$

He keeps repeating his jumps in the same way, over and over again. On which of the following numbers will he land in the course of his jumps?

(A) 82   (B) 83   (C) 84   (D) 85   (E) 86

9. Marbles are sold in packages of 5, 10 or 25. Tom buys exactly 95 marbles. What is the minimum number of packages Tom has to buy?

(A) 4   (B) 5   (C) 7   (D) 8   (E) 10

10. The diagram shows an octagon consisting of 10 unit squares. The shapes below PQ is a unit square and a triangle with base 5.
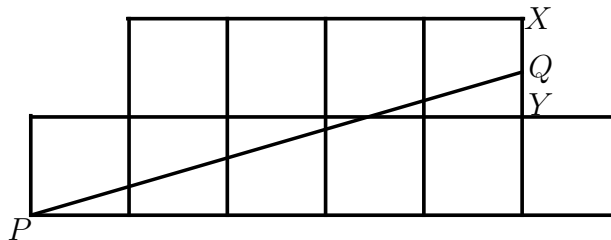
If PQ divides the area of the octagon into two equal parts, what is the value of the ratio $\frac{XQ}{QY}$?

(A) 2/5   (B) 1/2   (C) 3/5   (D) 2/3   (E) 3/4

11. $ABCD$ is a big rectangle consisting of 7 congruent smaller rectangles (see diagram).
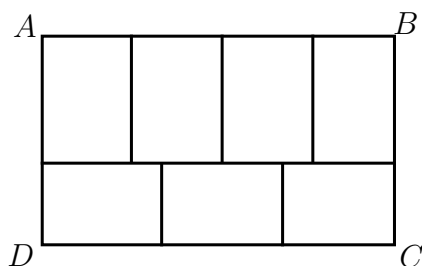

What is the value of the ratio $\dfrac{AB}{BC}$?

(A) 1/2   (B) 4/3   (C) 8/5   (D) 12/7   (E) 7/3

12. What is the degree measure of the smaller angle formed by the hands of an analogue (circular) clock when the time is 2 o'clock?

(A) 30   (B) 45   (C) 60   (D) 75   (E) 90

13. How many integers between 100 and 300 have only odd digits?

(A) 25   (B) 50   (C) 75   (D) 100   (E) 150

14. The diagram shows the midpoints of both longer sides of a rectangle connected as vertices of the shaded region.
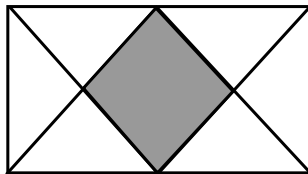
What fraction of the rectangle is shaded?

(A) 1/5   (B) 1/4   (C) 2/7   (D) 1/3   (E) 2/5

15. A rectangular garden 50 m long and 10 m wide is enclosed by a fence. To make the garden larger, while using the same fence, its shape is changed to a

square. By how many square metres does this enlarge the garden?

(A) 100   (B) 200   (C) 300   (D) 400   (E) 500

16. Ali, Boo, Cloe, Dre and Ezra have different amounts of money. Neither Dre nor Ali has as much money as Cloe. Both Ali and Boo have more than Ezra. Dre has more than Ezra, but less than Ali. Who has the least amount of money?

(A) Ali   (B) Boo   (C) Cloe   (D) Dre   (E) Ezra

17. Charmaine pays an on-line service provider a fixed monthly fee plus an hourly charge for connect time. Her December bill was $1248.00, but in January her bill was $1754.00 because she used twice as much connect time as in December. What is the fixed monthly fee?

    (A) $253.00   (B) $506.00   (C) $624.00   (D) $742.00   (E) $877.00

18. The quadrilateral $ADCB$ is such that $AB = 11$ cm, $BC = 7$ cm, $CD = 9$ cm and $AD = 3$ cm.
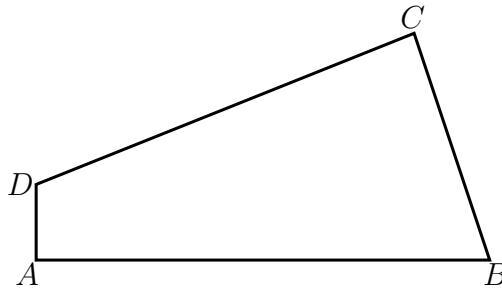
    If the angle at points A and C are $90°$, in square centimetres, what is the area of the quadrilateral?

    (A) 30   (B) 44   (C) 48   (D) 52   (E) 60

19. Winnie has written some numbers on a piece of paper, the sum of which is 22. Rhianna has then subtracted each number from 7 and has also written down the results. The sum of Rhianna's numbers is 34. How many numbers Winnie wrote down?

    (A) 7   (B) 8   (C) 9   (D) 10   (E) 11

20. The square $PQRS$ shown measures 12 m by 12 m
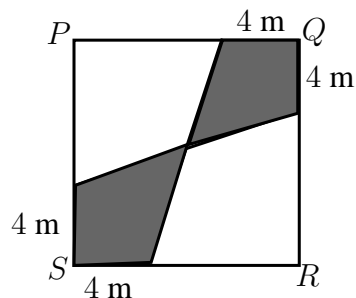
    What is the (total) area of the shaded region?

    (A) 36 m^2 (B) 40 m^2 (C) 44 m^2 (D) 46 m^2 (E) 48 m^2

21. Each of the faces of 2 discs has a different whole number on it. The numbers on two of the faces are shown.
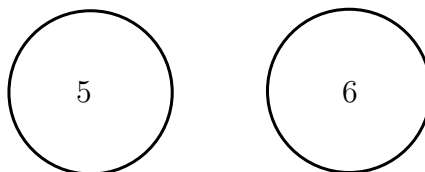
If the discs are tossed, the possible sums of the numbers showing are $10, 11, 12$ and 13. What is the product of the two numbers that are on the other side of these two discs?

(A) 24   (B) 25   (C) 30   (D) 32   (E) 35

22. Bob has an awesome money changing machine. When he puts in a \$100 bill, it returns five \$20 bills; when he puts in a \$20 bills, it returns twenty \$1 bills; and when he puts in a \$1 bill, it returns two \$100 bills. Bob starts with just one \$1 bill. Which of the following amounts could Bob have after using the machine repeatedly?

(A) \$363   (B) \$513   (C) \$630   (D) \$745   (E) \$996

23. There are two clocks, Clock 1 and Clock 2. Clock 1 is one minute fast every hour and Clock 2 is two minutes slow every hour. Yesterday both clocks were set to the correct time. Today, Clock 2 is reading $11 : 00$ and Clock 1 is reading $12 : 00$. What time yesterday were the clocks set?

(A) $23 : 00$ (B) $19 : 40$ (C) $15 : 40$ (D) $14 : 00$ (E) $11 : 20$

24. Tom's dad is one year older than Tom's mom and next year the product of Tom's parents ages will be over 1000 for the first time. What is the present age of Tom's father?

(A) 24   (B) 25   (C) 30   (D) 32   (E) 35

25. A large watermelon weighs 20 kg, with 98% of its weight being water. It is left to stand in the sun, and some of the water evaporates so that now only 95% of its weight is water. What does it now weigh?

(A) 17 kg   (B) 19.4 kg   (C) 10 kg   (D) 19 kg   (E) 8 kg