BRITISH COLUMBIA SECONDARY SCHOOL MATHEMATICS CONTEST, 2022

Junior Preliminary

April 2022

1. The value of $1 - \frac{1}{1-\frac{1}{1-\frac{1}{11}}}$ is:

   (A) 11 (B) 0 (C) -3 (D) -9 (E) -10

2. Two sides of an isosceles triangle are 22 and 61. The area of the triangle is:

   (A) 620 (B) 638 (C) 649 (D) 660 (E) 671

3. Madeleine checks the odometer on her car, which reads 78,987 kilometers. She notices the number is a palindrome: it reads the same backward and forward. If she is driving at a speed of 75 kilometers per hour then the amount of time before the odometer shows the next palindrome number will be:

   (A) under 1 hour (B) between 1 and 2 hours (C) between 2 and 3 hours

   (D) between 3 and 4 hours (E) over 4 hours

4. If the following equations are true

$$A + B = 1$$
$$B + C = 2$$
$$C + D = 3$$

   then $A + D$ equals:

   (A) -1 (B) 1 (C) 2 (D) 3 (E) -3

5. In a certain city, a taxi charges 0.20\$ per $1/5$ km traveled when moving faster than x km/h. It charges 0.15\$ per minute when moving slower than x km/h. At x km/h, both methods of charging produce the same cost to the rider. The value of x is:

   (A) 9 (B) 10 (C) 12 (D) 15 (E) 18

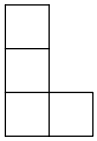
6. Students in an art class are tiling the floor of their classroom with square tiles (1 inch by 1 inch). On the first day, they place one tile in the centre of the floor. On the second day, they surround that first tile with eight more, to make 3-by-3 square. On the third day, this becomes a 5-by-5 square, etc. The number of tiles they use on the 18th day is:

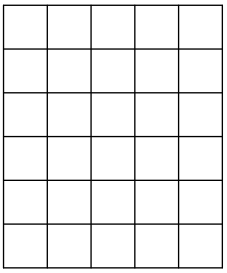
   (A) 124 (B) 132 (C) 136 (D) 140 (E) 144

7. The point $A(4, 0)$ is a vertex of regular hexagon $ABCDEF$, whose side is 8 and whose interior lies completely within Quadrant 1. If vertex D has coordinates (x, y) then (x, y) is:

   (A) $(8, 8\sqrt{3})$ (B) $(4, 4\sqrt{3})$ (C) $(16, 4\sqrt{3})$ (D) $(12, 4\sqrt{3})$ (E) $(12, 8\sqrt{3})$

8. The cutout shown is used to cover exactly four of the squares on the 5×6 checkerboard shown on the right. If rotations of the cutout are allowed, but not reflections, then the number of different choices for the four squares covered is:





(A) 56 (B) 58 (C) 60

(D) 62 (E) 64

9. John throws a fair 6-sided die. If it lands showing a number 4 or more, he wins. If not, he throws again and wins if it lands showing a number 5 or more; if not, he throws again and wins only if it lands showing a 6. The probability that John wins is:

(A) $\frac{2}{3}$ (B) $\frac{3}{4}$ (C) $\frac{5}{6}$ (D) $\frac{1}{12}$ (E) $\frac{13}{18}$

10. The smallest value of n for which the product

$$10^{\frac{1}{7}} \times 10^{\frac{2}{7}} \times 10^{\frac{3}{7}} \times 10^{\frac{4}{7}} \times \cdots \times 10^{\frac{n}{7}}$$

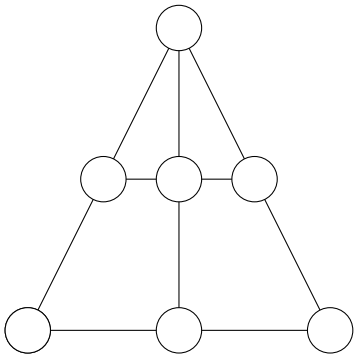
exceeds 2020 is:

(A) 6 (B) 7 (C) 8 (D) 10 (E) 12

11. A number has the “increasing digits" property if its digits increase from left to right. For example, the numbers 189 and 378 have this property but the numbers 814 and 533 do not. The number of integers between 100 and 999 with the “increasing digits" property is:

(A) 48 (B) 60 (C) 72 (D) 84 (E) 96

12. The accompanying diagram contains several sets of circles that ”line up” (3 circles to a line). There are 5 such ”lines”. The integers from 1 through 7 are to be inserted, one number to a circle, so that the sum of the three numbers in each line is the same (this can be done in many ways). The number that can **not** be placed in the lower left circle is:



(A) 1 (B) 2 (C) 3

(D) 4 (E) 5