

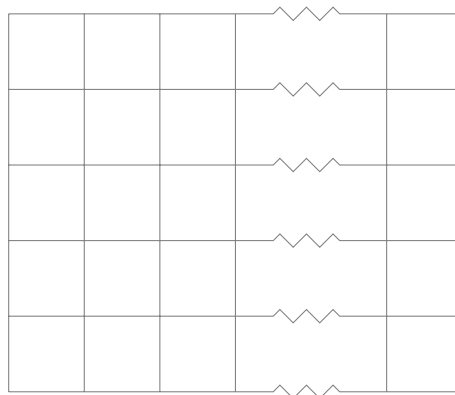
BRITISH COLUMBIA SECONDARY SCHOOL MATHEMATICS CONTEST, 2023

Senior Final, Part A

May 5, 2023

1. If $2^x = 5$, then $2^{2x+1} =$
(A) 11 (B) 26 (C) 10 (D) 50 (E) 64
2. You count the number of printed digits of each page in a book, and count 1035 digits. (For example, there are two printed digits on page 85, and three printed digits on page 126.) How many pages were in the book?
(A) 282 (B) 381 (C) 372 (D) 345 (E) 391
3. How many squares of *any size* are there in the $5 \times n$ diagram for $n \geq 5$?

- (A) $20n - 15$
(B) $15n - 15$
(C) $20n - 20$
(D) $15n - 20$
(E) Can't be determined



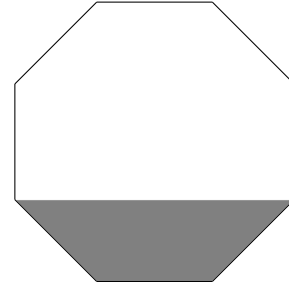
4. Three people, Pat, Nat, and Cat, know each other well. Each either always tells the truth, or always lies. They each make a statement.
 - Pat: (Can't be heard.)
 - Nat: Pat claimed to be a liar.
 - Cat: Nat lied.From the following statements, choose one that is true.
(A) Pat is telling the truth
(B) Nat is telling the truth
(C) Cat is telling the truth
(D) They are all lying
(E) They are all telling the truth
5. The sum of the first n terms of a sequence is $n(n-1)(2n+3)$. The 12th term of the sequence is?
(A) 814 (B) 868 (C) 962 (D) 1256 (E) 2650

6. If a is an integer and the tens digit of a^2 is 7, what is the units (ones) digit of a^2 ?

- (A) 1 (B) 4 (C) 5 (D) 6 (E) 9

7. A “regular” shape is one where all the sides are of equal length and all angles have the same degree measure. A regular octagon is shown below, with all sides of length 1. What proportion of the total octagon area is captured in the shaded region?

- (A) $\frac{1}{2\sqrt{2}}$ (B) $\frac{1}{3}$
 (C) $\frac{1}{4}$ (D) $\frac{3}{8}$
 (E) $\frac{1}{3\sqrt{2}}$



8. A five-digit number is made by randomly arranging the digits of 14874. What is the probability that the number is divisible by 4?

- (A) 0.1 (B) 0.2 (C) 0.25 (D) 0.3 (E) 0.4

9. Suppose $x + \frac{1}{x} = 5$. Then $x^3 + \frac{1}{x^3} =$

- (A) 110 (B) 125 (C) 95 (D) 100 (E) 75

10. Twins Lucas and Lucia are going to their cousins’ house, which is 10km from their home. To save time, they share a bicycle in the following way: Lucas starts out on the bicycle, with Lucia walking behind, then he leaves the bicycle at some point and walks the rest of the way. Lucia walks until she reaches the bicycle, then rides the bicycle the rest of the way. Lucas walks at a rate of 4 km/h while Lucia walks at 5 km/h; Lucas bikes at a rate of 10 km/h while Lucia bikes at 8 km/h. They reach their cousins’ house at the same time. How long was the bicycle left without a rider?

- (A) about 15 minutes
 (B) slightly more than half an hour
 (C) a little less than 45 minutes
 (D) slightly less than 1 hour
 (E) a little more than 1 hour 10 minutes