

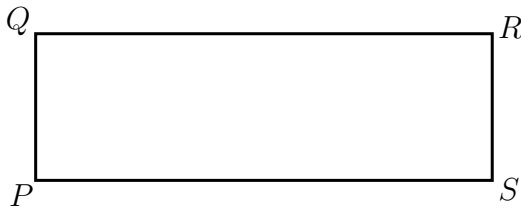
2022-2023 Senior Mathematical Olympiad

Round Two Examination (Grades 7 and 8) - 11:00am

SECTION A

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 half of 1.01?
(A) 5.5 (B) 0.55 (C) 0.505 (D) 0.5005 (E) 0.055
2. Tallyah plants 60 bulbs of tulip. When they flower, she notes that half are yellow; one third of those which are not yellow are red; and one quarter of those which are neither yellow nor red are pink. The remainder are white. What fraction of the tulips are white?
(A) $1/24$ (B) $1/12$ (C) $1/6$ (D) $1/5$ (E) $1/4$
3. A small ink cartridge has enough ink to print 600 pages. Three small cartridges can print as many pages as two medium cartridges. Three medium cartridges can print as many pages as two large cartridges. How many pages can be printed using a large cartridge?
(A) 1200 (B) 1350 (C) 1800 (D) 2400 (E) 5400
4. In the rectangle $PQRS$, the ratio of $\angle PSQ$ to $\angle PQS$ is $1 : 5$.



What is the size of $\angle QSR$?

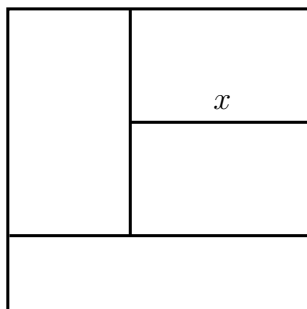
- (A) 15° (B) 18° (C) 45° (D) 72° (E) 75°
5. Alfred says his age is

50 years, 50 months, 50 weeks and 50 days old.

What age will Alfred be on his next birthday?

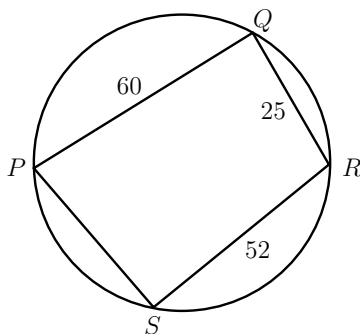
- (A) 57 (B) 56 (C) 55 (D) 54 (E) 53

6. After playing 500 games, Sarah's success rate at Solitaire is 49%. If Sarah wins every game from now on, how many more games does she need to play in order that her success rate increases to 50%?
- (A) 1 (B) 2 (C) 5 (D) 10 (E) 50
7. The diagram, which is not to scale, shows a square with side length 1, divided into four rectangles whose areas are equal.



What is the length labelled x ?

- (A) $2/3$ (B) $17/24$ (C) $4/5$ (D) $49/60$ (E) $5/6$
8. What is the smallest prime number that is equal to the sum of two prime numbers and is also equal to the sum of three different prime numbers?
- (A) 11 (B) 13 (C) 19 (D) 23 (E) 29
9. Shernette makes a nonstandard checkerboard that has 31 squares on each side. The checkerboard has a black square in every corner and alternate red and black squares along every row and column. How many black squares are there on such a checkerboard?
- (A) 480 (B) 481 (C) 482 (D) 483 (E) 484
10. $PQRS$ is a quadrilateral inscribed in a circle of which PR is a diameter. The lengths of PQ , QR and RS are 60, 25 and 52 respectively.



What is the length of SP ?

- (A) $21\frac{2}{3}$ (B) $28\frac{11}{13}$ (C) 33 (D) 36 (E) 39

SECTION B

For each question, provide a complete solution by showing all your workings.

1. What is the units digit in the answer to the sum $3^{2022} + 3^{2023}$?
2. The Olympiad family went to a restaurant and bought two Pizzas, three Chillies and four Burgers. They paid \$5300 in total. The Mathematics family went to the same restaurant and bought five of the same Pizzas, six of the same Chillies and seven of the same Burgers. They paid \$10700 in total. How much more does a Pizza cost than a Burger?
3. The letters A , B and C stand for different, non-zero digits.

$$\begin{array}{r} A \ B \ C \\ B \ C \ A \\ + \ C \ A \ B \\ \hline A \ B \ B \ C \end{array}$$

Find all the possible solutions to the word-sum shown.

4. A regular octagon is formed by cutting an isosceles right triangle from each of the corners of a square with sides of length 10. What is the length of each side of the octagon?
5. The letters a, b, c, d, e and f represent single digits and each letter represents a different digit. They satisfy the following equations:

$$a + b = d, \quad b + c = e \quad \text{and} \quad d + e = f.$$

One solution for the ordered set (a, b, c, d, e, f) is $(2, 1, 4, 3, 5, 8)$. Find all the other solutions.