



Official Exam Booklet

DO NOT OPEN THIS BOOKLET UNTIL YOUR PROCTOR OR TEACHER PERMITS

- 1) **Do not open the exam booklet** until instructed to do so by your proctor (supervising teacher).
- 2) **Only your Student Answer Sheet is marked** – all your answers and your identity must be recorded there. You can write in this booklet if you wish, but it has no value for marking.
- 3) **You should fill in the Student Identification first.** This is the top portion of the Student Answer Sheet. You don't need to rush. Be sure to fill in all required information fields and write legibly. **Make sure your pencil marks are dark enough** and your writing is neat.
- 4) Please **fill in the circles completely** on your answer sheet for the choice you make for each question. If you change your answer, erase your mark. Be sure it is very clear to the markers if you intend to leave a question unanswered (blank).
- 5) **Don't talk about it online or publicly:** The questions and solutions of the exam must not be publicly discussed or shared online **before Monday**. This is to make sure others across Canada or around the world don't get an advantage before they write the exam.
- 6) **Length:** You get a total of 1 hour and 30 minutes to complete this fifteen-question exam.
- 7) **Scores:**
  - Questions you get *correct* get 4, 5 or 7 points for sections A, B, and C, respectively.
  - Questions you answer *wrong* get zero points.
  - Questions you leave *blank* get one point. So don't guess if you are really unsure.
- 8) **Diagrams** provided are *not* drawn to scale; they are intended as aids only.
- 9) **Scrap paper:** May be used, but only your answer sheet will be marked.



THIS BOOKLET IS NOT MARKED – WRITE YOUR ANSWERS ON THE ANSWER SHEET INSTEAD

Part A: Each correct answer is worth 4 points. Unanswered questions worth 1 point each.

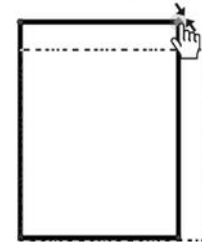
1. Calculate the following (hint: remember order of operations, BEDMAS).

$$1 - 2 \times 2 + 3 \times 3 \times 3$$

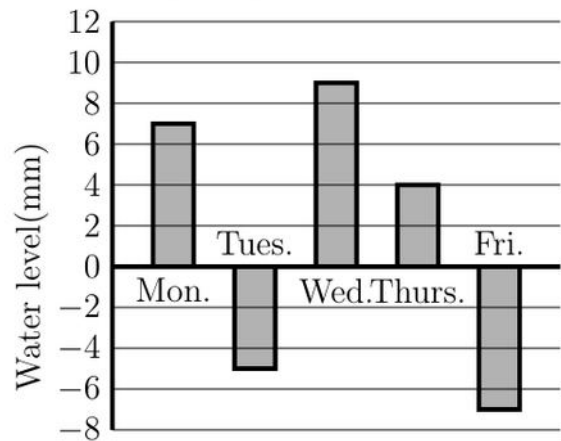
- (A) 9                      (B) 10                      (C) 24                      (D) 25                      (E) 45

2. Romina is working with a rectangle on her computer. It started as a  $45 \times 45$  square. She resized it, keeping its perimeter the same. Its area is now 2021. What are the new length and width?

- (A)  $33 \times 39$                       (B)  $33 \times 37$   
 (C)  $39 \times 49$                       (D)  $43 \times 47$   
 (E)  $41 \times 49$



3. Sophia does an experiment at school. On Monday morning she puts a beaker of water outside and marks the water level. Each day the water level changes, due to rainfall and evaporation. At the end of each school day Sophia measures the water level with respect to the starting level on Monday. She draws a bar chart of the water level at the end of each day from Monday to Friday, as illustrated on the right. By how much did the water level increase from the end of the school day on Tuesday to the end of the school day on Wednesday?



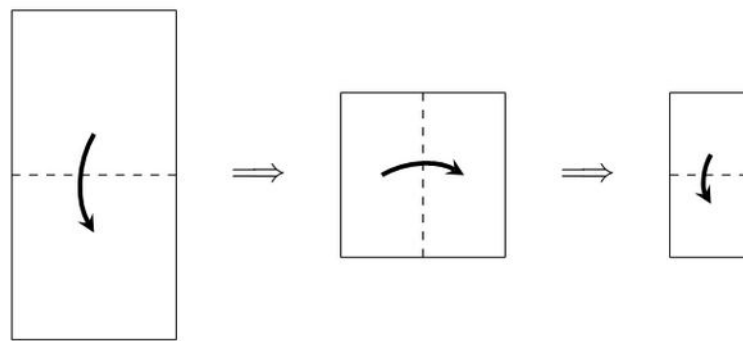
- (A) 7 mm                      (B) 9 mm                      (C) 11 mm                      (D) 12 mm                      (E) 14 mm

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4. Tarik rolls a standard die numbered 1, 2, 3, 4, 5, 6 a number of times and writes down the results. When he is done, he adds all the numbers and finds the sum is 10. He is shocked to find out when he multiplies all the numbers together that the product is also 10. How many times did he roll the die?

- (A) 2                      (B) 3                      (C) 4                      (D) 5                      (E) 6

5. Chen folded a rectangular-shaped piece of paper in the directions shown by the arrows below



and then he cuts off the shaded part as in the figure below.



What shape is Chen going to get when he opens the folded piece of paper?

- (A)                      (B)                      (C)                      (D)                      (E)

Part B: Each correct answer is worth 5 points. Unanswered questions worth 1 point each.

6. Waneek picks a two-digit number, subtracts the tens digit and then subtracts the ones digit to get a new number. For example if she had picked 37, she would get

$$37 - 3 - 7 = 27$$

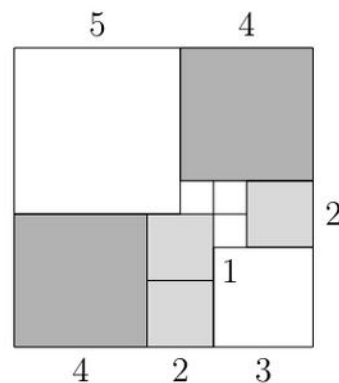
so her new number would be 27. How many different numbers can be formed using Waneek's process?

- (A) 9                      (B) 10                      (C) 11                      (D) 90                      (E) 99

7. The digits 1, 2, 3, 4, 5, 6 are used once each to make two three-digit numbers. What is the smallest possible difference between these two numbers?

- (A) 31                      (B) 39                      (C) 47                      (D) 60                      (E) 76

8. A square is broken up into smaller squares of side length 1, 2, 3, 4, or 5, as shown in the diagram below.



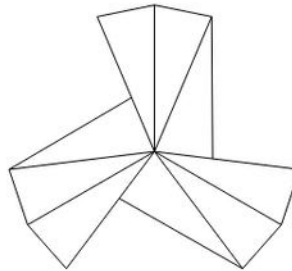
If a dart is thrown randomly at the square, what is the probability that it strikes one of the squares with side length 2?

- (A)  $\frac{4}{81}$                       (B)  $\frac{3}{10}$                       (C)  $\frac{6}{25}$                       (D)  $\frac{4}{27}$                       (E)  $\frac{2}{3}$

9. The 2021<sup>st</sup> number which is not divisible by 3 is

- (A) 2021      (B) 3019      (C) 3031      (D) 3033      (E) 6064

10. In the diagram below, 9 identical copies of an isosceles triangle share a common vertex and fit together as shown.



What is the difference between the largest and smallest angles in the identical triangles?

- (A)  $60^\circ$       (B)  $65^\circ$       (C)  $70^\circ$       (D)  $75^\circ$       (E)  $80^\circ$

Part C: Each correct answer is worth 7 points. Unanswered questions worth 1 point each.

11. At the start of the day a vending machine had 42 sandwiches in it:

- 13 chicken sandwiches at \$3 each,
- 14 cheese sandwiches at \$3 each,
- 15 egg sandwiches at \$2.50 each.



At the end of the day the total money made was \$61, of which \$21 came from cheese sandwich sales.

What additional piece of information would allow us to solve the question “How many sandwiches of each type were left at the end of the day?”

- (A) Total price of remaining sandwiches.  
 (B) Number of remaining sandwiches.  
 (C) Total price of sandwiches at the beginning of the day.  
 (D) Number of remaining cheese sandwiches.  
 (E) No additional information is needed.
12. Which of the numbers 3, 5, 11 and 37 is a divisor of

$$\underbrace{111\ 111\ 111\ 111\ 111\ 111\ 111}_{21 \text{ ones}}$$

- (A) 3, 11, 37      (B) 5, 11      (C) 3, 11      (D) 3, 37      (E) 3, 5, 11, 37
13. Right angled triangle  $ABC$  has its right angle at  $C$ , side  $AC$  has length 9 cm and side  $BC$  has length 12 cm. Points  $D$  and  $E$  are on  $AC$  so that  $AD = DE = EC$ . Similarly, points  $F$  and  $G$  are on  $AB$  so that  $AF = FG = GB$ . What is the area of trapezoid  $DFGE$ ? **Hint:** the area of a triangle is given by  $A = b \times h \div 2$ .

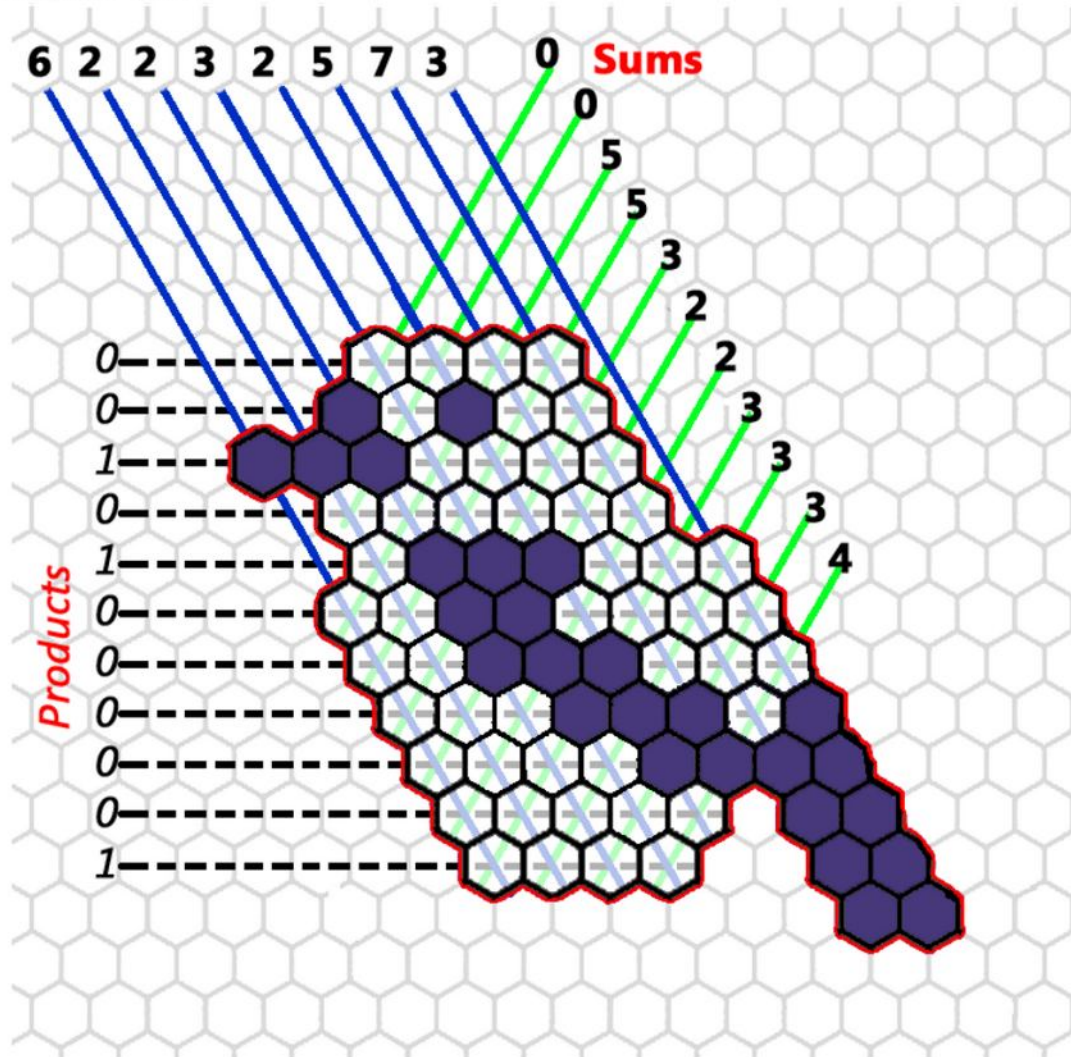
- (A)  $9 \text{ cm}^2$       (B)  $12 \text{ cm}^2$       (C)  $15 \text{ cm}^2$       (D)  $18 \text{ cm}^2$       (E)  $27 \text{ cm}^2$
14. Two creeper plants, one golden hop and the other tea rose, are both climbing up and around a cylindrical tree trunk. The golden hop twists clockwise and the tea rose counterclockwise, and they both start at the same point on the ground. Before they reach the first tree branch, the golden hop has made 5 complete turns around the tree trunk and the tea rose has made 3 complete turns. The turns are equidistant for each creeper.



Without counting the ground and the first tree branch, how many times do the two creepers cross before reaching the first branch?

- (A) 6      (B) 7      (C) 8      (D) 9      (E) 10

15. Nick needs to fill in the picture below as follows: in every hexagon within the bird outline, there is a zero or a one. The **sum** of the numbers on each diagonal is given in **bold** above the picture and the *product* of the numbers in each row is given in *italics* along the side.



Once the picture is completed, how many zeros will there be? **Note:** the shaded hexagons help to form the bird and are **NOT** part of the sum/product counts.

- (A) 18                      (B) 19                      (C) 20                      (D) 21                      (E) 22

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