

DO NOT TURN TO THE NEXT PAGE until your proctor tells you.

Please read the directions carefully.

- ▶ You have 100 minutes for 32 Problems.
- ▶ Mark your answers on your Answer Form with a pencil.
- ▶ Extra scratch paper is neither given nor allowed. You may use blank pages/spaces in the booklet as scratch paper.
- ▶ There are no penalties for incorrect answers. Answer as many problems as you can; go back and check your work and also go to questions you skip, before the time is over.
- ▶ Calculators are not permitted. Cell phones must be turned off completely and placed out of sight. MathCON problems are ALL done without a calculator.
- ▶ The problems are divided into three categories by difficulty levels:
3 Points (Questions 1-8)
5 Points (Questions 9-24)
7 Points (Questions 25-32)
- ▶ Problems 29-32, the last four problems are constructed-response problems. Enter your numerical answer in the grid on your answer sheet as shown on the right.

1. Although not required, it is suggested that you write your answer from left to right in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.

2. Mark no more than one circle in any column.
3. You may start your answers in any column, space permitting. Columns you don't use should be left blanks, and there should be no blank columns between columns that are not blank. For example, if your answer is 201, then either arrangement of filled-in circles shown below is acceptable.

For example: Answer: 201 – either position is correct.

	2	0	1
Ⓐ	Ⓐ	●	Ⓐ
Ⓑ	Ⓑ	Ⓑ	●
Ⓒ	●	Ⓒ	Ⓒ
Ⓓ	Ⓓ	Ⓓ	Ⓓ

2	0	1	
Ⓐ	●	Ⓐ	Ⓐ
Ⓑ	Ⓑ	●	Ⓑ
●	Ⓒ	Ⓒ	Ⓒ
Ⓓ	Ⓓ	Ⓓ	Ⓓ

4. No problem has a negative answer.

▶ Notations in Geometry Problems:

- A : Point A
- $\overleftrightarrow{AB}$: Line through points A and B
- $\overline{AB}$: Line segment joining A and B
- AB : Length of the line segment AB
- $\angle ABC$: Angle with the vertex point at B
- $m\angle ABC$: Measure of angle ABC
- $\perp$: Perpendicular
- // : Parallel

3. [Number Theory, 3 Points]

Ezra thinks of a whole number.

- It is not a perfect square.
- The sum of its digits is a prime number.
- It is not a multiple of three.

Which of the following could be Ezra's number?

- A) 21 B) 19 C) 18 D) 16 E) 14

4. [Combinatorics, 3 Points]

Consider the set of numbers

$$A = \{-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5\}.$$

How many ways can Jada select a negative number followed by a prime number?

- A) 10 B) 13 C) 15 D) 18 E) 20

5. [Algebra, 3 Points]

What is the 2023rd letter in the sequence below?

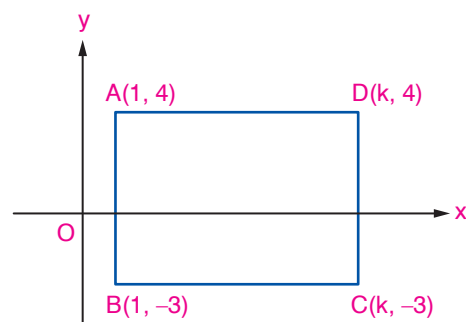
ABCDED CBAABCDED CBAABCDED CBAABCDED C ...

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

6. [Geometry, 3 Points]

In the given figure, k is a whole number and the rectangle ABCD has an area of 70 square units.

What is the perimeter of the rectangle, in units?



A) 34

B) 35

C) 40

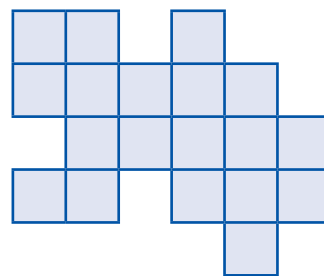
D) 42

E) 44

10. [Geometry, 5 Points]

The figure on the right is made from nineteen identical squares and has a total area of 475 cm^2 .

What is the perimeter of the figure?



A) 140 cm

B) 145 cm

C) 150 cm

D) 155 cm

E) 160 cm

11. [Number Theory, 5 Points]

The first 40 odd counting numbers are written. How many times does 3 appear as a digit?

A) 13

B) 15

C) 17

D) 18

E) 19