

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.
- ▶ Use of calculators is prohibited. 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 the 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. Leave unused columns blank, 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.

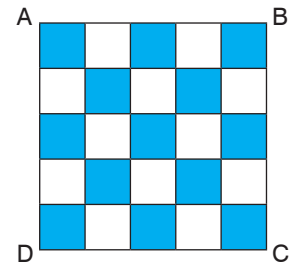
	2	0	1
Ⓐ	Ⓐ	●	Ⓐ
Ⓑ	Ⓑ	Ⓑ	●
Ⓒ	●	Ⓒ	Ⓒ
Ⓓ	Ⓓ	Ⓓ	Ⓓ

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

1. [Algebra, 3 Points]

Square ABCD is divided into 25 small identical squares. Some small squares are colored in blue, as shown. How many more small squares need to be colored so that 80% of the area of ABCD is colored blue?



- A) 7 B) 13 C) 15 D) 18 E) 20

2. [Geometry, 3 Points]

The number 2024 is written on one side of a classroom window using the style of numbers shown. If you were to stand on the other side of the window, how would the number appear?



- A) 4505 B) 5054 C) 2024 D) 5054 E) 4202

4. [Combinatorics, 3 Points]

Eugene has five doors to paint.

The numbers on the doors are 1, 2, 3, 4, and 5.

Each door is to be painted one color: either blue or green.

How many ways can he paint three doors blue and two doors green?

- A) 10 B) 11 C) 12 D) 13 E) 15

7. [Number Theory, 3 Points]

$0.\overline{259}$ represents the number $0.259259259\dots$

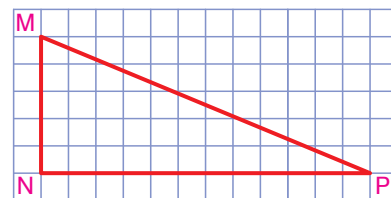
The decimal representation of $\frac{1}{13}$ is $0.\overline{076923}$.

What is the 77th digit to the right of the decimal point in the decimal representation of $\frac{1}{13}$?

- A) 2 B) 3 C) 6 D) 7 E) 9

10. [Geometry, 5 Points]

Points M, N, and P are plotted on a 7×14 grid in the diagram. Line segments join M, N, and P. An ant follows these line segments in a straight line, going from M to N to P to M. What is the total distance that the ant walks?



- A) $24\sqrt{3}$ B) $17 + 10\sqrt{2}$ C) $25\sqrt{2}$ D) $28\sqrt{2}$ E) 30

13. [Algebra, 5 Points]

Sebastian paints a room at a constant rate.

At 8:30 a.m., he had finished painting $\frac{5}{12}$ of the room.

At 9:30 a.m., he had finished painting $\frac{5}{8}$ of the room.

What time did he finish painting the room?

- A) 11:06 a.m. B) 11:12 a.m. C) 11:16 a.m. D) 11:18 a.m. E) 11:22 a.m.