

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

2. [Geometry, 3 Points]

Three of the following statements are correct but one of them is wrong for triangle ABC.

- $BC = AC$
- $AB = 16$ inches
- $BC + AC = 12$ inches
- Area of triangle ABC is 48 square inches

What is the perimeter of triangle ABC?

- A) 28 inches B) 32 inches C) 36 inches D) 40 inches E) 44 inches

3. [Number Theory, 3 Points]

If the five-digit number 32,N83 is divisible by 7, what is the value of N?

- A) 4 B) 5 C) 8 D) 9 E) None of the preceding

5. [Algebra, 3 Points]

Four straight lines, d_1 , d_2 , d_3 , and d_4 have slopes $-\frac{1}{2}$, $-\frac{1}{3}$, $-\frac{1}{4}$, $-\frac{1}{6}$, respectively. All four lines have the same x-intercept.

What is the x-intercept, if the sum of the y-intercepts of the four lines is 15?

- A) 36 B) 24 C) 18 D) 15 E) 12

9. [Algebra, 5 Points]

A two-meter long wire is cut into two parts so that the ratio of the length of the longer part to that of the shorter part equals the ratio of the length of the whole wire to that of the longer part. What is the length of the longer part in meters?

A) $\sqrt{15} - 2$

B) $\sqrt{3}$

C) $\sqrt{6} - 1$

D) $\sqrt{5} - 1$

E) $\sqrt{10} - 2$

12. [Combinatorics, 5 Points]

Charles has a deck of 20 number cards, and each card contains either a '5' or a '6'. If the sum of all the numbers on all twenty cards is a multiple of 23, then what is the number of cards with 5's?



A) 4

B) 5

C) 6

D) 8

E) 15

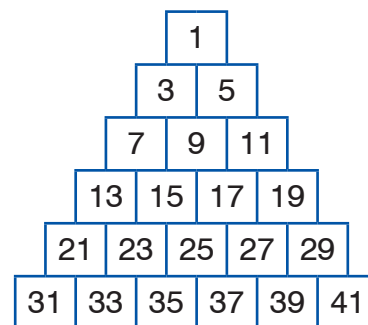
13. [Number Theory, 5 Points]

The first six rows of a number pyramid are given on the right.

- All numbers in the pyramid are odd numbers.
- Numbers increase from left to right and from top to bottom in order, starting from 1.
- There are n numbers in the n th row.

For example, there are three numbers in the 3rd row.

In which row is 243?



A) 14th

B) 15th

C) 16th

D) 17th

E) 18th