

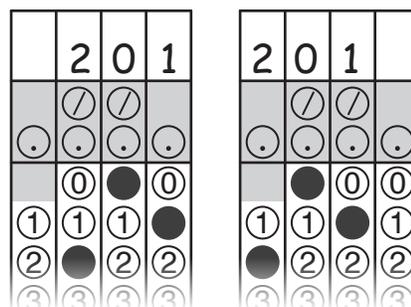
DO NOT TURN TO THE NEXT PAGE until your proctor tells you.

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.



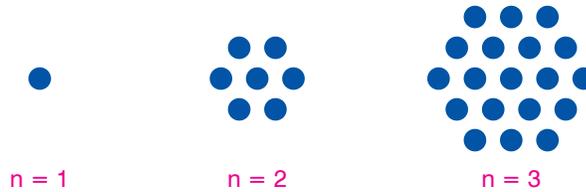
4. No problem has a negative answer.

▶ **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]

This figure shows hexagons made up of $n = 1, 2,$ and 3 dots along each side.

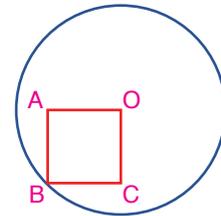


What is the number of dots needed for a hexagon with five dots ($n = 5$) on each side?

- A) 49 B) 52 C) 55 D) 58 E) 61

2. [Geometry, 3 Points]

In the diagram, the circle has center, O and square $OABC$ has vertex B on the circle. If the area of the circle is $36\pi \text{ cm}^2$, then what is the area of the square?



- A) 12 cm^2 B) 16 cm^2 C) 18 cm^2 D) $18\sqrt{2} \text{ cm}^2$ E) 24 cm^2

3. [Number Theory, 3 Points]

The store manager has an invoice for 72 calculators. The first and last digits on the receipt are illegible. The total price before tax is $\$ \square 47.9 \square$. The price of each calculator (before tax) is equal to a whole number of cents.

Which of the following can be the sum of the missing two digits?

- A) 6 B) 7 C) 8 D) 9 E) 12

5. [Algebra, 3 Points]

A city has two towns, three villages within each town, and 12 neighborhoods within each village. For every six neighborhoods, there is a community clinic; in every village, there is a health center, and in every town, there is a hospital. What is the total number of health facilities in this city?

- A) 14 B) 16 C) 18 D) 20 E) 22

8. [Combinatorics, 3 Points]

If x , y , and z are all integers from 0 to 6 and

$$x + y + z = 16,$$

then how many different solutions (x, y, z) are possible?

- A) 6 B) 10 C) 12 D) 16 E) 32

11. [Number Theory, 5 Points]

Six-digit numbers $ABCDEF$ are formed by using different digits of 4, 5, 6, 7, 8, or 9.

$$A + B = C + D = E + F$$

What is the units digit of the **greatest** possible value of $ABCDEF$?

- A) 8 B) 7 C) 6 D) 5 E) 4