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.
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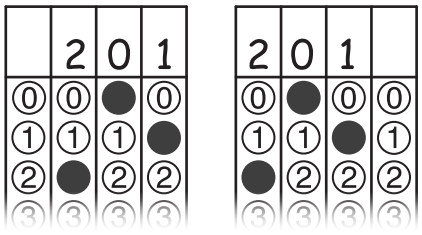
Use of calculators is prohibited. Cell phones must be turned off completely and placed out of sight. MathCON problems are ALL done without a calculator.
- The problems are divided into three categories by the difficulty levels:
  3 Points (Questions 1-8)
  5 Points (Questions 9-24)
  7 Points (Questions 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.



  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]

Four numbers are equally spaced on the number line, in the given order

B, A, $\frac{1}{44}$, $\frac{1}{40}$,

What is the value of B?

A) $\frac{1}{52}$ B) $\frac{1}{55}$ C) $\frac{1}{56}$ D) $\frac{1}{58}$ E) $\frac{1}{60}$

3. [Number Theory, 3 Points]

A, B, and C are digits. A23, 1BA, and CA6 are three-digit numbers.

$$\begin{array}{r} A\ 2\ 3 \\ -\ 1\ B\ A \\ \hline C\ A\ 6 \end{array}$$

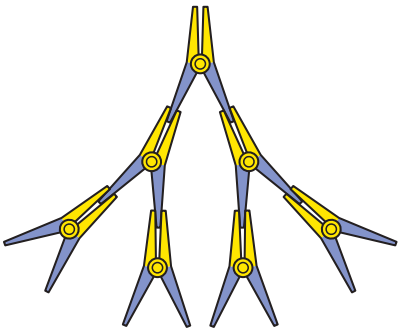
What is the value of A + B + C?

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

7. [Number Theory, 3 Points]

Nora created a toy with identical pegs. A peg was placed on the ground on the first step. She attaches two pegs to all the pegs she placed in the previous step in each following step. Using 7 pegs, Nora completes the first three steps of this toy.

How many more pegs did Nora need to complete the first 12 steps than the first 10 steps?



A) $3 \cdot 2^{10}$ B) $3 \cdot 2^{9}$ C) $7 \cdot 2^{9}$ D) $7 \cdot 2^{10}$ E) None of the preceding

8. [Combinatorics, 3 Points]

What is the **smallest** possible whole number value of the expression, if each letter represents a different non-zero digit?

$$\frac{M \cdot A \cdot T \cdot H \cdot C \cdot O \cdot N}{N \cdot O \cdot W}$$

A) 12 B) 14 C) 15 D) 16 E) 20

9. [Algebra, 5 Points]

For real numbers x and y

$x^2 \cdot y^2 < x \cdot y < x^2 \cdot y$.

Which of the following expressions must be true?

I. $x < 1$

II. $y < 1$

III. $x \cdot y < 1$

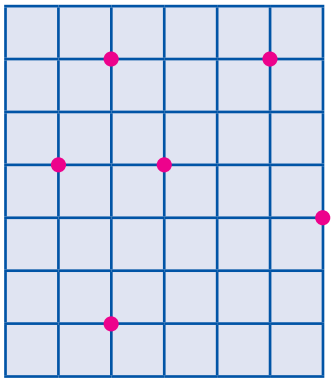
A) Only I B) Only II C) Only I and III D) Only II and III E) I, II, and III

10. [Geometry, 5 Points]

In the given figure,

- The points B, H, K, M, P, and R were plotted on a grid.
- The two furthest points are H and K.
- The points R and P are equidistant from B.
- The points M and K are equidistant from P.

What is the ratio of $\frac{BR}{KM}$?



A) $\frac{1}{2}$ B) $\frac{3}{2}$ C) $\frac{5}{2}$ D) $\frac{2}{3}$ E) $\frac{4}{3}$