

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

4. [Combinatorics, 3 Points]

N is a whole number and the number of different digits of N is represented by $\boxed{N}$.

For example, $\boxed{4202} = 3$

Given that for three-digit numbers $3A5$ and $56A$,

$$\boxed{3A5} + \boxed{56A} = \boxed{71024}$$

What is the sum of the possible values of A ?

- A) 8 B) 9 C) 10 D) 11 E) 12

9. [Algebra, 5 Points]

Points A , B , C , and D lie along a line, in that order.

$$AB : AC = 1 : 5$$

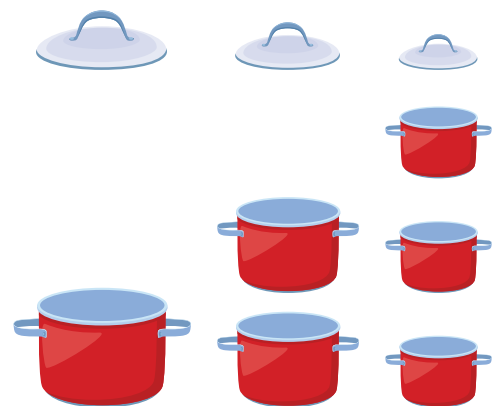
$$BC : CD = 3 : 4$$

What is the ratio $AB : CD$?

- A) 1 : 3 B) 4 : 15 C) 3 : 16 D) 2 : 11 E) 5 : 24

12. [Combinatorics, 5 Points]

A kitchen cabinet contains one large, two medium, and three small pots, as well as one large, one medium, and one small pot lid. It is possible for these lids to cover a pot of the same size or a pot that is smaller than their size. What is the probability that a randomly selected lid will cover a randomly selected pot?



- A) $\frac{13}{18}$ B) $\frac{11}{18}$ C) $\frac{5}{6}$ D) $\frac{7}{9}$ E) $\frac{2}{3}$

16. [Combinatorics, 5 Points]

Totally 276 digits are used to number the pages of a book consecutively from page 1.
How many pages are there in the book?

- A) 127 B) 128 C) 129 D) 130 E) None of the preceding

17. [Algebra, 5 Points]

Given that

$$A - B = 16$$

$$B - C = 4.$$

What is the value of the following expression?

$$A^2 - A \cdot C - A \cdot B + B \cdot C$$

- A) -240 B) 120 C) 160 D) 300 E) 320

25. [Algebra, 7 Points]

If the mean, median, and unique mode of the positive integers

$$5, 6, 7, 8, 8, 9, x$$

are all equal. What is the value of x ?

- A) 6 B) 10 C) 11 D) 12 E) 13