

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]

The unit prices and the number of appliances sold in a shop in a day are shown in the table below.

	Unit price	Number of items
Refrigerator	\$y	2x
Washing machine	\$(x + 4y)	y
Dishwasher		x + y

How much does a dishwasher cost if the day's total income is $$(2y + 3x)^2$$?

- A) \$12x B) \$9x C) \$6x D) \$4x E) \$3x

4. [Combinatorics, 3 Points]

Maya has a basket of apples, bananas, and oranges.

- 10 of the fruits are **not** apples.
- 12 of the fruits are **not** bananas.
- 14 of the fruits are **not** oranges.

How many fruits are in Maya's basket?



- A) 22 B) 20 C) 18 D) 16 E) None of the preceding

7. [Number Theory, 3 Points]

For the positive integers a, b, c, and d

$$M = 6^a \cdot 5^b$$

$$N = 10^c \cdot 9^d$$

$$\text{GCD}(M, N) = 2^3 \cdot 3^2 \cdot 5$$

$$\text{LCM}(M, N) = 2^5 \cdot 3^3 \cdot 5^5$$

What is the value of $a + b + c + d$?

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

8. [Combinatorics, 3 Points]

Three friends, Asher, Blake, and Caleb, were playing a series of games. In each game, the winner gets 3 points, the second place gets 2 points, and the third place gets 1 point. After the games, Asher has 8 points, Blake has 11 points and Caleb has 5 points.

In how many games did Asher come second?

- A) 0 B) 1 C) 2 D) 3 E) 4

10. [Geometry, 5 Points]

On the coordinate plane, the following five points are plotted.

A(4, 0) B(-3, 0) C(-2, -3) D(0, 6) E(0, -2)

Line d_1 passes through three of these points, while line d_2 passes through the remaining two.

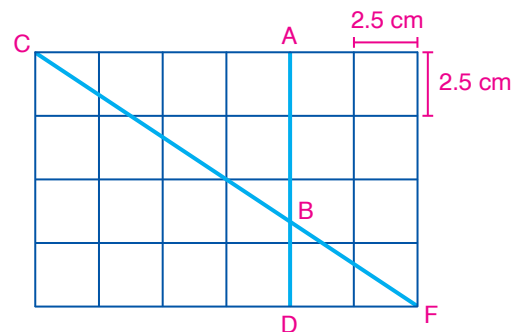
What is the value of $a + b$ if both lines d_1 and d_2 pass through the point (a, b) ?

- A) -9 B) -10 C) -12 D) -14 E) -15

14. [Geometry, 5 Points]

The line segments FC and AD intersect at point B on the grid in the given figure.

What is the length of AB?



- A) $\frac{16}{3}$ cm B) $\frac{17}{3}$ cm C) 6 cm D) $\frac{19}{3}$ cm E) $\frac{20}{3}$ cm