

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	
Ⓐ	●	Ⓐ	Ⓐ
Ⓑ	Ⓑ	●	Ⓑ
●	Ⓒ	Ⓒ	Ⓒ
Ⓓ	Ⓓ	Ⓓ	Ⓓ

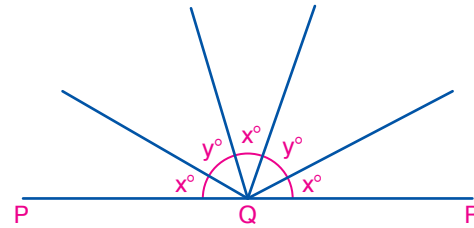
4. No problem has a negative answer.

▶ 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]

In the given figure, PQR is a straight line segment.
 If $x^\circ + y^\circ = 75^\circ$, what is the value of x ?



A) 25

B) 30

C) 35

D) 36

E) 45

4. [Combinatorics, 3 Points]

The MathCON café sells orange juice for \$3, but when you return the bottle, you get \$1 back.
 What is the **maximum** number of bottles of juice you can buy if you start with \$12?

A) 4

B) 5

C) 6

D) 7

E) None of preceding

8. [Combinatorics, 3 Points]

The set $S = \{1, 2, 3, \dots, 99, 100\}$ contains the first 100 positive integers.
 First, all the multiples of 2 are removed from the list.
 Then all the multiples of 3 are removed from the list.
 How many integers remain in the set S ?

A) 30

B) 33

C) 42

D) 45

E) 48

9. [Algebra, 5 Points]

Each of the numbers a and b are chosen from whole numbers $1, 2, 3, 4, \dots, 10$.

In how many different ways can a and b be selected so that $\frac{1}{2} < \frac{a}{b} < 1$?

Note that equivalent fractions with different numerators and denominators, such as $\frac{6}{9}$ and $\frac{2}{3}$, should be considered different.

A) 5

B) 10

C) 15

D) 16

E) 20

13. [Number Theory, 5 Points]

Suppose x and y are positive integers. How many ordered pairs (x, y) can be written, such that $2x + 3y = 25$?

A) 1

B) 2

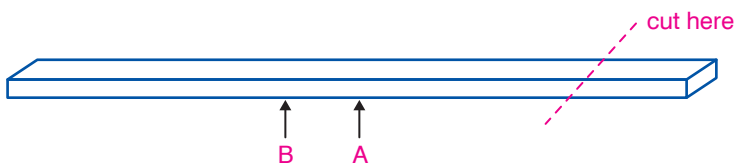
C) 3

D) 4

E) 5

17. [Algebra, 5 Points]

A uniform board is balanced at point A . When $\frac{1}{6}$ of the board is cut off, the board balances at point B . If the distance from A to B is 2 cm, what was the original length of the board?



A) 12 cm

B) 18 cm

C) 24 cm

D) 30 cm

E) 36 cm