

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.

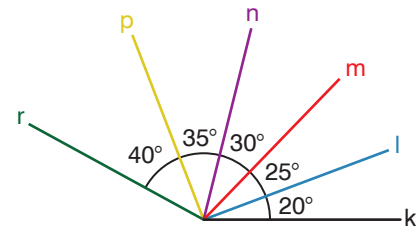
	2	0	1
Ⓐ	Ⓐ	●	Ⓐ
Ⓑ	Ⓑ	Ⓑ	●
Ⓒ	●	Ⓒ	Ⓒ
Ⓓ	Ⓓ	Ⓓ	Ⓓ

2	0	1	
Ⓐ	●	Ⓐ	Ⓐ
Ⓑ	Ⓑ	●	Ⓑ
●	Ⓒ	Ⓒ	Ⓒ
Ⓓ	Ⓓ	Ⓓ	Ⓓ

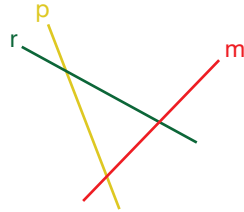
4. No problem has a negative answer.
- ▶ Notations in Geometry Problems:
- A : Point A
- $\overleftrightarrow{AB}$: Line through points A and B
- $\overline{AB}$: Line segment joining A and B
- AB : Length of the line segment AB
- $\angle ABC$: Angle with the vertex point at B
- $m\angle ABC$: Measure of angle ABC
- $\perp$: Perpendicular
- // : Parallel

2. [Geometry, 3 Points]

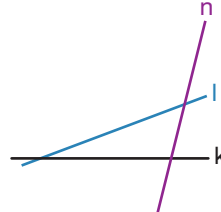
The figure on the right shows six line segments and the measures of the angles between them.



We formed Triangle-A by using three of these line segments and Triangle-B by using remaining three line segment without changing their slopes.



Triangle - A



Triangle - B

What is the sum of the measures of the **biggest** angles of Triangle-A and Triangle-B?

- A) 145° B) 150° C) 160° D) 175° E) 180°

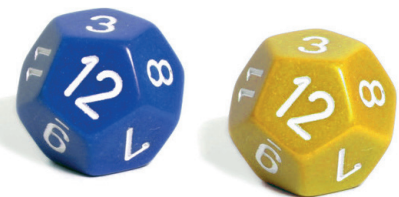
3. [Number Theory, 3 Points]

Find the next term of given sequence. 33, 35, 38, 43, 50, 61, 74, ...

- A) 95 B) 94 C) 93 D) 92 E) 91

4. [Combinatorics, 3 Points]

One blue and one yellow 12-sided dice are rolled by Makeba. Dice are labeled with the numbers 1, 2, 3, ..., 11, and 12. The blue dice is thrown first, followed by the yellow dice. If she adds the face-up numbers, how many different prime numbers can she get?



- A) 6 B) 7 C) 8 D) 9 E) 10

5. [Algebra, 3 Points]

If $f(x) = \frac{x-1}{x+1}$, then which of the following is equal to $f(x+1)$ in terms of $f(x)$? ($x \neq -1$)

A) $-\frac{f(x)+1}{2f(x)}$

B) $-\frac{f(x)+1}{f(x)}$

C) $\frac{f(x)-1}{f(x)}$

D) $\frac{f(x)+1}{3-f(x)}$

E) $-\frac{2f(x)}{f(x)+1}$

7. [Number Theory, 3 Points]

Given for whole numbers x and y ,

$$(x+y) \cdot (2x-y) = 5$$

then, what is the value of $x \cdot y$?

A) 2

B) 6

C) 12

D) 15

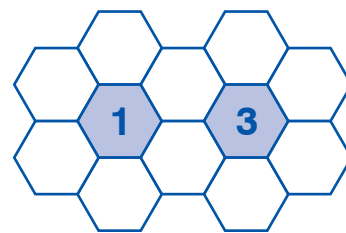
E) 18

8. [Combinatorics, 3 Points]

In the figure, there are 12 identical regular hexagons. A few of the white hexagons will be painted orange.

The numbers in the blue hexagons show the number of orange hexagons that share a common edge with the corresponding blue hexagon.

In how many ways can the white hexagons be painted orange?



A) 28

B) 30

C) 32

D) 34

E) 36