

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

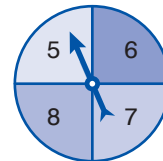
1. [Algebra, 3 Points]

The 7th term of an arithmetic sequence is 29.
What is the sum of 2nd and 12th term of this term?

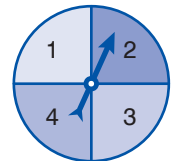
- A) 36 B) 45 C) 50 D) 54 E) 58

8. [Combinatorics, 3 Points]

On both spinners, the arrows are spun. If M is 10 times the number on Spinner B, plus the number on Spinner A, what is the probability that M is a perfect square?



Spinner A

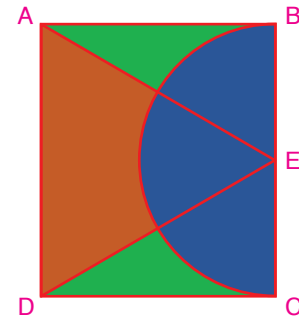


Spinner B

- A) $\frac{1}{16}$ B) $\frac{1}{8}$ C) $\frac{3}{16}$ D) $\frac{1}{4}$ E) $\frac{1}{2}$

10. [Geometry, 5 Points]

In the figure, ABCD is a rectangle, ADE is an equilateral triangle, CB is the diameter of the semicircle with center E.
What is the total area of the green shaded regions if AD = 12 cm?



- A) $18\sqrt{3} + 12\pi \text{ cm}^2$ B) $12\sqrt{3} + 6\pi \text{ cm}^2$ C) $18\sqrt{3} - 6\pi \text{ cm}^2$
D) $18\sqrt{3} - 12\pi \text{ cm}^2$ E) $36\sqrt{3} - 12\pi \text{ cm}^2$

13. [Algebra, 5 Points]

Suppose x , y , and z are real numbers such that

$$x \cdot y + y \cdot z = 12$$

$$2x - 3y + 2z = 0.$$

What is the value of y^2 ?

A) 8

B) 9

C) 12

D) 16

E) 18

16. [Combinatorics, 5 Points]

The sum of all five positive whole numbers A , B , C , D , and E in the boxes is equal to 2031, where the difference between any two adjacent numbers is 2.

A	B	C	D	E
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 =

2031

Which number(s) can be equal to 403?

A) only A or E B) only A or C C) only C or E D) only C

E) all

19. [Number Theory, 5 Points]

How many positive whole numbers m have the property that exactly one of the two numbers m and $m - 21$ has five digits?

A) 20

B) 21

C) 22

D) 40

E) 42