

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]

Triangle ABC has an area of 24 square units.

Point D is on side BC, and

$DC : BD = 5 : 3$.

What is the area of triangle ADC?

- A) 15 square units B) 12 square units C) 9 square units
D) 8 square units E) None of the preceding

4. [Combinatorics, 3 Points]

A palindrome is a positive integer that can be read either backward or forward.

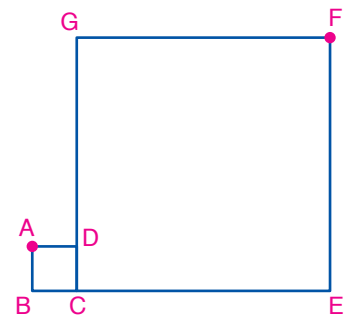
For example, 1, 22, are 303 palindromes.

What is the number of palindromes less than 1000?

- A) 36 B) 72 C) 90 D) 99 E) 108

6. [Geometry, 3 Points]

Two squares ABCD and CEFG are positioned as shown. The smaller square has a side length of 1 cm and the larger square has a side length of 7 cm. If points B, C, and E are collinear, what is the length of AF?



- A) 9 cm B) 10 cm C) 11 cm D) $\sqrt{113}$ cm E) $2\sqrt{30}$ cm

7. [Number Theory, 3 Points]

The prime factorization of the number $10!$ is of the form $2^a \times 3^b \times 5^c \times 7^d$ for the whole numbers a , b , c , and d . What is the value of $a + b + c + d$?

- A) 9 B) 10 C) 12 D) 15 E) 16

9. [Algebra, 5 Points]

In the table, y , the amount of money the worker receives, is a linear function with respect to x , the number of miles driven for work. Aria drove 125 miles for work and personal reasons on Wednesday. As a result of her work-related driving on Wednesday, she received \$33.80. What percentage of her total miles driven on Wednesday were work-related?

Distance Driven, x (miles)	Amount of Money Received, y (dollars)
20	10.40
25	13
30	15.60
35	18.20
40	20.80

- A) 48% B) 49% C) 50% D) 51% E) 52%

13. [Algebra, 5 Points]

The first four terms of an arithmetic sequence are a , x , b , and $2x$.

What is the value of $\frac{b}{a}$?

- A) $\frac{1}{2}$ B) 1 C) $\frac{3}{2}$ D) 2 E) None of the preceding