

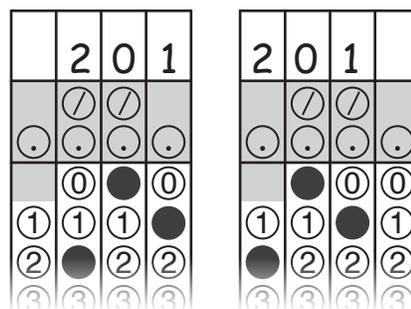
DO NOT TURN TO THE NEXT PAGE until your proctor tells you.

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.



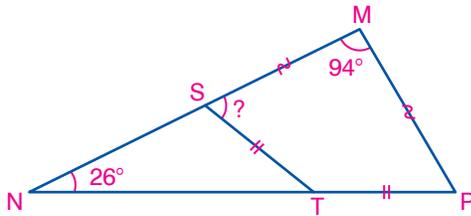
4. No problem has a negative answer.

▶ **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,



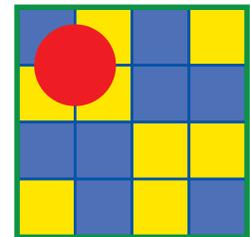
MNP is a triangle,
 $MS = MP$,
 $ST = TP$,
 $m\angle NMP = 94^\circ$, and
 $m\angle MNP = 26^\circ$.

What is $m\angle MST$?

- A) 43° B) 45° C) 52° D) 56° E) 60°

8. [Combinatorics, 3 Points]

The board consists of 16 blue and yellow 3 cm by 3 cm squares, as shown. On the board, Jaylin randomly places a red token (or chip) of diameter 5 cm so that the center of the circle is located at the intersection of four squares. What is the probability that she will place the red token so that it touches an equal number of blue and yellow squares?



- A) $\frac{2}{9}$ B) $\frac{1}{3}$ C) $\frac{4}{9}$ D) $\frac{5}{9}$ E) $\frac{2}{3}$

9. [Algebra, 5 Points]

For positive integers a , b , and c , it is given that $\sqrt{a} = b\sqrt{c}$. \sqrt{a} is modeled with adjoining unit squares when b has the greatest value. b is the number of red squares and c is the number of blue squares. For example, since $\sqrt{128} = 8\sqrt{2}$ then $\sqrt{128}$ can be modeled as follow:



Which of the following numbers' modeling has more blue squares than red squares?

- A) $\sqrt{32}$ B) $\sqrt{48}$ C) $\sqrt{72}$ D) $\sqrt{96}$ E) $\sqrt{108}$

11. [Number Theory, 5 Points]

The value of the n-sided polygon with a whole number A in it is equal to the greatest integer less than or equal to $\frac{A}{n}$. For example, $\triangle 6 = \square 9 = 2$.

If AB is a two-digit integer and

$$\text{Hexagon } AB = \square 19 = \text{Pentagon } AB$$

then, what is the value of A + B?

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

13. [Algebra, 5 Points]

Math teacher Mrs. Aarya brought a box of chocolate candies to share with her students.

On the first day, students ate $\frac{1}{20}$ of the candies in the box.

On the second day, they ate $\frac{3}{19}$ of the remaining candies.

On the third day, they ate $\frac{1}{2}$ of the remaining candies.

On the fourth day, they ate $\frac{5}{8}$ of the remaining candies.

On the fifth day, they ate $\frac{4}{5}$ of the remaining candies.

At the end of the fifth day, there were 3 candies remaining in the box.

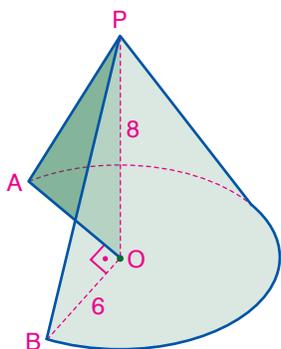
How many chocolate candies were in the box at the beginning?



- A) 80 B) 100 C) 120 D) 160 E) 200

26. [Geometry, 7 Points]

In the given figure, a quarter of a right circular cone is cut out, where O is the center of the base and P is the vertex (or apex) of the cone.



AO ⊥ OB,
OB = 6 cm, and
PO = 8 cm.

What will be the total surface area of the remaining solid figure?

- A) $72\pi + 36 \text{ cm}^2$ B) $72\pi + 48 \text{ cm}^2$ C) $72\pi + 64 \text{ cm}^2$
D) $24\pi + 48 \text{ cm}^2$ E) $96\pi + 48 \text{ cm}^2$