



2017 AMC 10B

For more practice and resources, visit ziml.aretteam.org

The problems in the AMC-Series Contests are copyrighted by American Mathematics Competitions at Mathematical Association of America (www.maa.org).



Question 1

Not yet answered

Points out of 6

Mary thought of a positive two-digit number. She multiplied it by 3 and added 11. Then she switched the digits of the result, obtaining a number between 71 and 75, inclusive. What was Mary's number?

- (A) 11 (B) 12 (C) 13 (D) 14 (E) 15

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 2

Not yet answered

Points out of 6

Sofia ran 5 laps around the 400-meter track at her school. For each lap, she ran the first 100 meters at an average speed of 4 meters per second and the remaining 300 meters at an average speed of 5 meters per second. How much time did Sofia take running the 5 laps?

- (A) 5 minutes and 35 seconds
- (B) 6 minutes and 40 seconds
- (C) 7 minutes and 5 seconds
- (D) 7 minutes and 25 seconds
- (E) 8 minutes and 10 seconds

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 3

Not yet answered

Points out of 6

Real numbers x , y , and z satisfy the inequalities $0 < x < 1$, $-1 < y < 0$, and $1 < z < 2$. Which of the following numbers is necessarily positive?

(A) $y + x^2$ (B) $y + xz$ (C) $y + y^2$ (D) $y + 2y^2$ (E) $y + z$

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 4

Not yet answered

Points out of 6

Suppose that x and y are nonzero real numbers such that $\frac{3x + y}{x - 3y} = -2$. What is the

value of $\frac{x + 3y}{3x - y}$?

(A) -3 (B) -1 (C) 1 (D) 2 (E) 3

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 5

Not yet answered

Points out of 6

Camilla had twice as many blueberry jelly beans as cherry jelly beans. After eating 10 pieces of each kind, she now has three times as many blueberry jelly beans as cherry jelly beans. How many blueberry jelly beans did she originally have?

(A) 10 (B) 20 (C) 30 (D) 40 (E) 50

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 6

Not yet answered

Points out of 6

What is the largest number of solid 2-in \times 2-in \times 1-in blocks that can fit in a 3-in \times 2-in \times 3-in box?

- (A) 3 (B) 4 (C) 5 (D) 6 (E) 7

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 7

Not yet answered

Points out of 6

Samia set off on her bicycle to visit her friend, traveling at an average speed of 17 kilometers per hour. When she had gone half the distance to her friend's house, a tire went flat, and she walked the rest of the way at 5 kilometers per hour. In all it took her 44 minutes to reach her friend's house. In kilometers rounded to the nearest tenth, how far did Samia walk?

- (A) 2.0 (B) 2.2 (C) 2.8 (D) 3.4 (E) 4.4

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 8

Not yet answered

Points out of 6

Points $A(11, 9)$ and $B(2, -3)$ are vertices of $\triangle ABC$ with $AB = AC$. The altitude from A meets the opposite side at $D(-1, 3)$. What are the coordinates of point C ?

- (A) $(-8, 9)$ (B) $(-4, 8)$ (C) $(-4, 9)$ (D) $(-2, 3)$ (E) $(-1, 0)$

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 9

Not yet answered

Points out of 6

A radio program has a quiz consisting of 3 multiple-choice questions, each with 3 choices. A contestant wins if he or she gets 2 or more of the questions right. The contestant answers randomly to each question. What is the probability of winning?

- (A) $\frac{1}{27}$ (B) $\frac{1}{9}$ (C) $\frac{2}{9}$ (D) $\frac{7}{27}$ (E) $\frac{1}{2}$

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 10

Not yet answered

Points out of 6

The lines with equations $ax - 2y = c$ and $2x + by = -c$ are perpendicular and intersect at $(1, -5)$. What is c ?

- (A) -13 (B) -8 (C) 2 (D) 8 (E) 13

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 11

Not yet answered

Points out of 6

At Typico High School, 60% of the students like dancing, and the rest dislike it. Of those who like dancing, 80% say that they like it, and the rest say that they dislike it. Of those who dislike dancing, 90% say that they dislike it, and the rest say that they like it. What fraction of students who say they dislike dancing actually like it?

(A) 10% (B) 12% (C) 20% (D) 25% (E) $33\frac{1}{3}\%$

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 12

Not yet answered

Points out of 6

Elmer's new car gives 50% percent better fuel efficiency, measured in kilometers per liter, than his old car. However, his new car uses diesel fuel, which is 20% more expensive per liter than the gasoline his old car used. By what percent will Elmer save money if he uses his new car instead of his old car for a long trip?

(A) 20% (B) $26\frac{2}{3}\%$ (C) $27\frac{7}{9}\%$ (D) $33\frac{1}{3}\%$ (E) $66\frac{2}{3}\%$

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 13

Not yet answered

Points out of 6

There are 20 students participating in an after-school program offering classes in yoga, bridge, and painting. Each student must take at least one of these three classes, but may take two or all three. There are 10 students taking yoga, 13 taking bridge, and 9 taking painting. There are 9 students taking at least two classes. How many students are taking all three classes?

- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 14

Not yet answered

Points out of 6

An integer N is selected at random in the range $1 \leq N \leq 2020$. What is the probability that the remainder when N^{16} is divided by 5 is 1?

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

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 15

Not yet answered

Points out of 6

Rectangle $ABCD$ has $AB = 3$ and $BC = 4$. Point E is the foot of the perpendicular from B to diagonal \overline{AC} . What is the area of $\triangle AED$?

- (A) 1 (B) $\frac{42}{25}$ (C) $\frac{28}{15}$ (D) 2 (E) $\frac{54}{25}$

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 16

Not yet answered

Points out of 6

How many of the base-ten numerals for the positive integers less than or equal to 2017 contain the digit 0?

- (A) 469 (B) 471 (C) 475 (D) 478 (E) 481

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 17

Not yet answered

Points out of 6

Call a positive integer *monotonous* if it is a one-digit number or its digits, when read from left to right, form either a strictly increasing or a strictly decreasing sequence. For example, 3, 23578, and 987620 are monotonous, but 88, 7434, and 23557 are not. How many monotonous positive integers are there?

- (A) 1024 (B) 1524 (C) 1533 (D) 1536 (E) 2048

Select one:

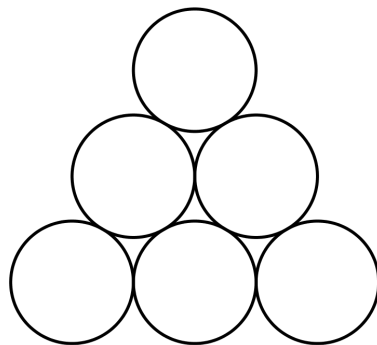
- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 18

Not yet answered

Points out of 6

In the figure below, 3 of the 6 disks are to be painted blue, 2 are to be painted red, and 1 is to be painted green. Two paintings that can be obtained from one another by a rotation or a reflection of the entire figure are considered the same.



How many different paintings are possible?

- (A) 6 (B) 8 (C) 9 (D) 12 (E) 15

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 19

Not yet answered

Points out of 6

Let ABC be an equilateral triangle. Extend side \overline{AB} beyond B to a point B' so that $BB' = 3AB$. Similarly, extend side \overline{BC} beyond C to a point C' so that $CC' = 3BC$, and extend side \overline{CA} beyond A to a point A' so that $AA' = 3CA$. What is the ratio of the area of $\triangle A'B'C'$ to the area of $\triangle ABC$?

- (A) 9 : 1 (B) 16 : 1 (C) 25 : 1 (D) 36 : 1 (E) 37 : 1

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 20

Not yet answered

Points out of 6

The number $21! = 51,090,942,171,709,440,000$ has over 60,000 positive integer divisors. One of them is chosen at random. What is the probability that it is odd?

- (A) $\frac{1}{21}$ (B) $\frac{1}{19}$ (C) $\frac{1}{18}$ (D) $\frac{1}{2}$ (E) $\frac{11}{21}$

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 21

Not yet answered

Points out of 6

In $\triangle ABC$, $AB = 6$, $AC = 8$, $BC = 10$, and D is the midpoint of \overline{BC} . What is the sum of the radii of the circles inscribed in $\triangle ADB$ and $\triangle ADC$?

- (A) $\sqrt{5}$ (B) $\frac{11}{4}$ (C) $2\sqrt{2}$ (D) $\frac{17}{6}$ (E) 3

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 22

Not yet answered

Points out of 6

The diameter \overline{AB} of a circle of radius 2 is extended to a point D outside the circle so that $BD = 3$. Point E is chosen so that $ED = 5$ and line ED is perpendicular to line AD .

Segment \overline{AE} intersects the circle at a point C between A and E . What is the area of $\triangle ABC$?

- (A) $\frac{120}{37}$ (B) $\frac{140}{39}$ (C) $\frac{145}{39}$ (D) $\frac{140}{37}$ (E) $\frac{120}{31}$

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 23

Not yet answered

Points out of 6

Let $N = 123456789101112 \dots 4344$ be the 79-digit number that is formed by writing the integers from 1 to 44 in order, one after the other. What is the remainder when N is divided by 45?

- (A) 1 (B) 4 (C) 9 (D) 18 (E) 44

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 24

Not yet answered

Points out of 6

The vertices of an equilateral triangle lie on the hyperbola $xy = 1$, and a vertex of this hyperbola is the centroid of the triangle. What is the square of the area of the triangle?

(A) 48 (B) 60 (C) 108 (D) 120 (E) 169

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)

Question 25

Not yet answered

Points out of 6

Last year Isabella took 7 math tests and received 7 different scores, each an integer between 91 and 100, inclusive. After each test she noticed that the average of her test scores was an integer. Her score on the seventh test was 95. What was her score on the sixth test?

(A) 92 (B) 94 (C) 96 (D) 98 (E) 100

Select one:

- A
- B
- C
- D
- E
- Leave blank (1.5 points)