
AMC 10

SET 2

PRACTICE EXAMINATION

TIME ALLOWED

75 : 00

25 QUESTIONS • 75 MINUTES • 150 POINTS

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO BEGIN.

Name _____

Date _____

Start _____

Finish _____

All 25 problems are taken from past AMC 10 contests (2000–2019) and appear in their original wording, rearranged into a new paper. Problems © Mathematical Association of America.

INSTRUCTIONS

1. Do not open this booklet until you are told to begin.
2. This is a 25-question multiple-choice test. Each question is followed by answers marked (A), (B), (C), (D) and (E). Only one of these is correct.
3. Mark your answer to each problem on the answer sheet at the back of this booklet. Fill in one circle completely for each answer.
4. **Scoring:** you will receive 6 points for each correct answer, 1.5 points for each problem left unanswered, and 0 points for each incorrect answer. A random guess is worth less, on average, than a blank.
5. Only scratch paper, graph paper, rulers, compasses, protractors and erasers are allowed as aids. No calculators, smartwatches, phones or computing devices.
6. Figures are not necessarily drawn to scale.
7. You will have **75 minutes** to complete the test. Note your start time on the cover and stop the moment the time is up.

Pacing guide

Problems 1–10: aim for about 20 minutes. Problems 11–20: about 30 minutes. Problems 21–25: the remaining 25 minutes. If a problem has taken three minutes with no plan in sight, move on and come back.

1. What is the value of

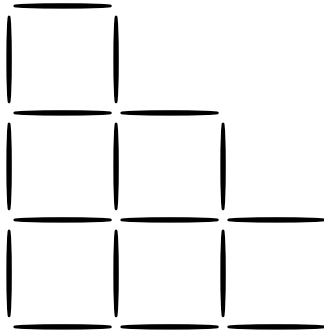
$$2(2(2(2(2(2+1)+1)+1)+1)+1)+1?$$

(A) 70 (B) 97 (C) 127 (D) 159 (E) 729

2. What is $\frac{2^3 + 2^3}{2^{-3} + 2^{-3}}$?

(A) 16 (B) 24 (C) 32 (D) 48 (E) 64

3. Ann made a 3-step staircase using 18 toothpicks as shown in the figure. How many toothpicks does she need to add to complete a 5-step staircase?



(A) 9 (B) 18 (C) 20 (D) 22 (E) 24

4. A semipro baseball league has teams with 21 players each. League rules state that a player must be paid at least \$15,000, and that the total of all players' salaries for each team cannot exceed \$700,000. What is the maximum possible salary, in dollars, for a single player?

(A) 270,000 (B) 385,000 (C) 400,000 (D) 430,000 (E) 700,000

5. A rectangular box has integer side lengths in the ratio 1 : 3 : 4. Which of the following could be the volume of the box?

(A) 48 (B) 56 (C) 64 (D) 96 (E) 144

6. Set A has 20 elements, and set B has 15 elements. What is the smallest possible number of elements in $A \cup B$, the union of A and B ?

(A) 5 (B) 15 (C) 20 (D) 35 (E) 300

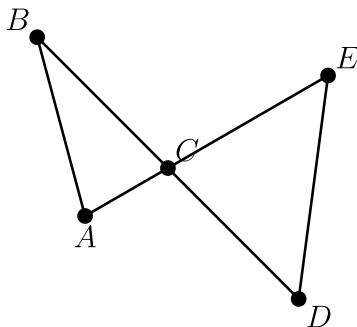
7. Six points are equally spaced around a circle of radius 1. Three of these points are the vertices of a triangle that is neither equilateral nor isosceles. What is the area of this triangle?

(A) $\frac{\sqrt{3}}{3}$ (B) $\frac{\sqrt{3}}{2}$ (C) 1 (D) $\sqrt{2}$ (E) 2

8. A game is played with tokens according to the following rule. In each round, the player with the most tokens gives one token to each of the other players and also places one token into a discard pile. The game ends when some player runs out of tokens. Players A , B , and C start with 15, 14, and 13 tokens, respectively. How many rounds will there be in the game?

(A) 36 (B) 37 (C) 38 (D) 39 (E) 40

9. Segment BD and AE intersect at C , as shown, $AB = BC = CD = CE$, and $\angle A = \frac{5}{2}\angle B$. What is the degree measure of $\angle D$?



(A) 52.5 (B) 55 (C) 57.5 (D) 60 (E) 62.5

10. Consider the set of numbers $\{1, 10, 10^2, 10^3, \dots, 10^{10}\}$. The ratio of the largest element of the set to the sum of the other ten elements of the set is closest to which integer?

(A) 1 (B) 9 (C) 10 (D) 11 (E) 101

11. Among the positive integers less than 100, each of whose digits is a prime number, one is selected at random. What is the probability that the selected number is prime?

(A) $\frac{8}{99}$ (B) $\frac{2}{5}$ (C) $\frac{9}{20}$ (D) $\frac{1}{2}$ (E) $\frac{9}{16}$

12. Elmer's new car gets 50% 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 uses. 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) $41\frac{2}{3}\%$

13. Angelina drove at an average rate of 80 kph and then stopped 20 minutes for gas. After the stop, she drove at an average rate of 100 kph. Altogether she drove 250 km in a total trip time of 3 hours including the stop. Which equation could be used to solve for the time t in hours that she drove before her stop?

(A) $80t + 100\left(\frac{8}{3} - t\right) = 250$ (B) $80t = 250$
 (C) $100t = 250$ (D) $90t = 250$
 (E) $80\left(\frac{8}{3} - t\right) + 100t = 250$

14. How many squares whose sides are parallel to the axes and whose vertices have coordinates that are integers lie entirely within the region bounded by the line $y = \pi x$, the line $y = -0.1$ and the line $x = 5.1$?

(A) 30 (B) 41 (C) 45 (D) 50 (E) 57

15. Yesterday Han drove 1 hour longer than Ian at an average speed 5 miles per hour faster than Ian. Jan drove 2 hours longer than Ian at an average speed 10 miles per hour faster than Ian. Han drove 70 miles more than Ian. How many more miles did Jan drive than Ian?

(A) 120 (B) 130 (C) 140 (D) 150 (E) 160

16. Let a , b , c , and d be real numbers with $|a - b| = 2$, $|b - c| = 3$, and $|c - d| = 4$. What is the sum of all possible values of $|a - d|$?

(A) 9 (B) 12 (C) 15 (D) 18 (E) 24

17. Let a and b be relatively prime positive integers with $a > b > 0$ and

$$\frac{a^3 - b^3}{(a - b)^3} = \frac{73}{3}.$$

What is $a - b$?

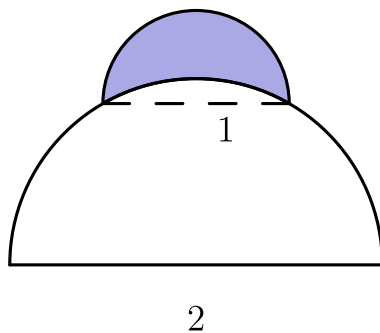
(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

18. Positive integers a , b , and c are randomly and independently selected with replacement from the set $\{1, 2, 3, \dots, 2010\}$.

What is the probability that $abc + ab + a$ is divisible by 3?

(A) $\frac{1}{3}$ (B) $\frac{29}{81}$ (C) $\frac{31}{81}$ (D) $\frac{11}{27}$ (E) $\frac{13}{27}$

19. A semicircle of diameter 1 sits at the top of a semicircle of diameter 2, as shown. The shaded area inside the smaller semicircle and outside the larger semicircle is called a *lune*. Determine the area of this lune.



(A) $\frac{1}{6}\pi - \frac{\sqrt{3}}{4}$ (B) $\frac{\sqrt{3}}{4} - \frac{1}{12}\pi$ (C) $\frac{\sqrt{3}}{4} - \frac{1}{24}\pi$ (D) $\frac{\sqrt{3}}{4} + \frac{1}{24}\pi$ (E) $\frac{\sqrt{3}}{4} + \frac{1}{12}\pi$

20. In rectangle $ABCD$, we have $A = (6, -22)$, $B = (2006, 178)$, and $D = (8, y)$ for some integer y . What is the area of rectangle $ABCD$?

(A) 4000 (B) 4040 (C) 4400 (D) 40,000 (E) 40,400

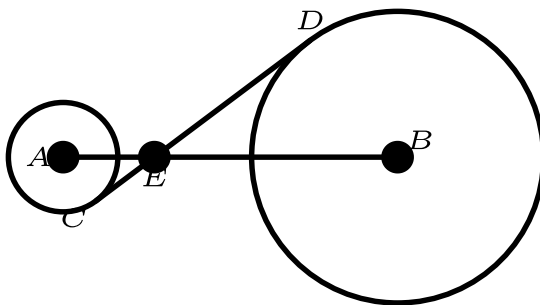
21. A sphere is inscribed in a cube that has a surface area of 24 square meters. A second cube is then inscribed within the sphere. What is the surface area in square meters of the inner cube?

(A) 3 (B) 6 (C) 8 (D) 9 (E) 12

22. Let S be the set of the 2005 smallest positive multiples of 4, and let T be the set of the 2005 smallest positive multiples of 6. How many elements are common to S and T ?

(A) 166 (B) 333 (C) 500 (D) 668 (E) 1001

23. Circles with centers A and B have radii 3 and 8, respectively. A common internal tangent touches the circles at C and D , as shown. Lines AB and CD intersect at E , and $AE = 5$. What is CD ?



(A) 13 (B) $\frac{44}{3}$ (C) $\sqrt{221}$ (D) $\sqrt{255}$ (E) $\frac{55}{3}$

24. Let p , q , and r be the distinct roots of the polynomial

$$x^3 - 22x^2 + 80x - 67.$$

There exist real numbers A , B , and C such that

$$\frac{1}{s^3 - 22s^2 + 80s - 67} = \frac{A}{s - p} + \frac{B}{s - q} + \frac{C}{s - r}$$

for all real numbers s with $s \notin \{p, q, r\}$. What is

$$\frac{1}{A} + \frac{1}{B} + \frac{1}{C}?$$

(A) 243 (B) 244 (C) 245 (D) 246 (E) 247

25. The number 5^{867} is between 2^{2013} and 2^{2014} . How many pairs of integers (m, n) are there such that $1 \leq m \leq 2012$ and

$$5^n < 2^m < 2^{m+2} < 5^{n+1}?$$

- (A) 278 (B) 279 (C) 280 (D) 281 (E) 282

END OF EXAMINATION

ANSWER SHEET

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Name _____

Date _____

- 1 (A) (B) (C) (D) (E)
2 (A) (B) (C) (D) (E)
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24 (A) (B) (C) (D) (E)
25 (A) (B) (C) (D) (E)

Fill in one circle per question. Leave the row empty to skip.

Correct	Blank	Wrong	Score
×6	×1.5	×0	/ 150