
AMC 10

SET 16

HALF-LENGTH PRACTICE

TIME ALLOWED

30 : 00

10 QUESTIONS • 30 MINUTES • 60 POINTS • MIDDLE BAND (PROBLEMS 10--20)

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

Name _____

Date _____

Start _____

Finish _____

All 10 problems come from positions 10–20 of past AMC 10 contests (2000–2019) and appear in their original wording, in order of their original position. Problems © Mathematical Association of America.

INSTRUCTIONS

1. Do not open this booklet until you are told to begin.
2. This is a 10-question multiple-choice test. Every problem was originally problem 10 to 20 of an AMC 10 — the middle band of the paper, where scores are decided. They appear in order of their original position, so the difficulty rises from the first problem to the last.
3. Each question is followed by answers marked (A), (B), (C), (D) and (E). Only one of these is correct. Mark your answers on the answer sheet at the back of this booklet.
4. **Scoring:** 6 points for each correct answer, 1.5 points for each problem left unanswered, 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. No calculators, smartwatches, phones or computing devices.
6. Figures are not necessarily drawn to scale.
7. You will have **30 minutes**. Note your start time on the cover and stop the moment the time is up.

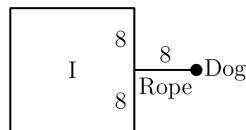
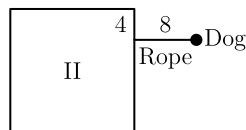
Pacing guide

Three minutes per problem is the pace of the real test in this band: problems 1–5 in about 13 minutes, problems 6–10 in the remaining 17. If a problem has taken three minutes with no plan in sight, move on and come back.

1. If x , y , and z are positive with $xy = 24$, $xz = 48$, and $yz = 72$, then $x + y + z$ is

(A) 18 (B) 19 (C) 20 (D) 22 (E) 24

2. Rolly wishes to secure his dog with an 8-foot rope to a square shed that is 16 feet on each side. His preliminary drawings are shown.



Which of these arrangements gives the dog the greater area to roam, and by how many square feet?

(A) I, by 8π (B) I, by 6π (C) II, by 4π (D) II, by 8π (E) II, by 10π

3. The sum of three numbers is 20. The first is 4 times the sum of the other two. The second is seven times the third. What is the product of all three?

(A) 28 (B) 40 (C) 100 (D) 400 (E) 800

4. The base-ten representation for $19!$ is $121,6T5,100,40M,832,H00$, where T , M , and H denote digits that are not given. What is $T + M + H$?

(A) 3 (B) 8 (C) 12 (D) 14 (E) 17

5. Roy bought a new battery-gasoline hybrid car. On a trip the car ran exclusively on its battery for the first 40 miles, then ran exclusively on gasoline for the rest of the trip, using gasoline at a rate of 0.02 gallons per mile. On the whole trip he averaged 55 miles per gallon. How long was the trip in miles?

(A) 140 (B) 240 (C) 440 (D) 640 (E) 840

6. Points A and B lie on a circle centered at O , and $\angle AOB = 60^\circ$. A second circle is internally tangent to the first and tangent to both OA and OB . What is the ratio of the area of the smaller circle to that of the larger circle?

(A) $\frac{1}{16}$ (B) $\frac{1}{9}$ (C) $\frac{1}{8}$ (D) $\frac{1}{6}$ (E) $\frac{1}{4}$

7. A child builds towers using identically shaped cubes of different colors. How many different towers with a height 8 cubes can the child build with 2 red cubes, 3 blue cubes, and 4 green cubes? (One cube will be left out.)

(A) 24 (B) 288 (C) 312 (D) 1,260 (E) 40,320

8. How many nonnegative integers can be written in the form

$$\begin{aligned} & a_7 \cdot 3^7 + a_6 \cdot 3^6 + a_5 \cdot 3^5 \\ & + a_4 \cdot 3^4 + a_3 \cdot 3^3 + a_2 \cdot 3^2 \\ & + a_1 \cdot 3^1 + a_0 \cdot 3^0, \end{aligned}$$

where $a_i \in \{-1, 0, 1\}$ for $0 \leq i \leq 7$?

(A) 512 (B) 729 (C) 1094 (D) 3281 (E) 59,048

9. Two concentric circles have radii 1 and 2. Two points on the outer circle are chosen independently and uniformly at random. What is the probability that the chord joining the two points intersects the inner circle?

(A) $\frac{1}{6}$ (B) $\frac{1}{4}$ (C) $\frac{2 - \sqrt{2}}{2}$ (D) $\frac{1}{3}$ (E) $\frac{1}{2}$

10. A fly trapped inside a cubical box with side length 1 meter decides to relieve its boredom by visiting each corner of the box. It will begin and end in the same corner and visit each of the other corners exactly once. To get from a corner to any other corner, it will either fly or crawl in a straight line. What is the maximum possible length, in meters, of its path?

(A) $4 + 4\sqrt{2}$ (B) $2 + 4\sqrt{2} + 2\sqrt{3}$ (C) $2 + 3\sqrt{2} + 3\sqrt{3}$
(D) $4\sqrt{2} + 4\sqrt{3}$ (E) $3\sqrt{2} + 5\sqrt{3}$

END OF EXAMINATION

ANSWER SHEET

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Name _____

Date _____

1 ☐ A ☐ B ☐ C ☐ D ☐ E

2 ☐ A ☐ B ☐ C ☐ D ☐ E

3 ☐ A ☐ B ☐ C ☐ D ☐ E

4 ☐ A ☐ B ☐ C ☐ D ☐ E

5 ☐ A ☐ B ☐ C ☐ D ☐ E

6 ☐ A ☐ B ☐ C ☐ D ☐ E

7 ☐ A ☐ B ☐ C ☐ D ☐ E

8 ☐ A ☐ B ☐ C ☐ D ☐ E

9 ☐ A ☐ B ☐ C ☐ D ☐ E

10 ☐ 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	/ 60