

AMC 12-style original practice set - Edition 1

Student paper

Name: _____ Date: _____

Select one answer for each question. Write enough reasoning to check domains, equality cases, and counted cases. No calculator is needed.

This is a fixed 12-question original practice set rather than a full-length AMC 12 exam. No official time limit or score conversion is implied.

Use the separate graduated hints after an attempt; worked solutions are in the teacher edition.

1. For $x > 0$, $\log_2(x) + \log_4(x) = 6$. What is x ?

A. 4 B. 8 C. 16 D. 32 E. 64

2. A real angle θ satisfies $\sin(\theta) + \cos(\theta) = 1/3$. What is $\sin(2\theta)$?

A. $-8/9$ B. $-4/9$ C. $1/9$ D. $4/9$ E. $8/9$

3. Let i be the imaginary unit, so $i^2 = -1$. What is $(1 + i)^8$?

A. -16 B. $-16i$ C. 8 D. 16 E. $16i$

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4. The four real roots of $t^4 - 5t^2 + 4 = 0$ are r_1 , r_2 , r_3 , and r_4 . What is $1/r_1^2 + 1/r_2^2 + 1/r_3^2 + 1/r_4^2$?

A. $5/4$ B. 2 C. $5/2$ D. 4 E. 5

5. How many ordered pairs of integers (a, b) , with $2 \leq a \leq 20$ and $2 \leq b \leq 20$, make $\log_a(b)$ an integer?

A. 19 B. 22 C. 23 D. 24 E. 25

6. Two sides of a triangle have lengths 5 and 7, and their included angle is 120 degrees. What is the circumradius of the triangle?

A. $\sqrt{109}/2$ B. $\sqrt{327}/3$ C. $\sqrt{109}$ D. $35\sqrt{3}/4$ E. $\sqrt{327}$

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7. A nonzero complex number z satisfies $z + 1/z = 1$. What is $z^{2026} + 1/z^{2026}$?
A. -2 B. -1 C. 0 D. 1 E. 2

8. Define $f(x) = (2x + 1)/(x + 2)$, and start with $x_0 = 0$ and $x_{(n+1)} = f(x_n)$. What is x_5 ?
A. 40/41 B. 80/81 C. 120/121 D. 121/122 E. 242/243

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9. Two distinct integers are selected uniformly from 1 through 12, with order ignored. What is the probability that their product is a perfect square?

A. $\frac{1}{22}$ B. $\frac{2}{33}$ C. $\frac{5}{66}$ D. $\frac{1}{11}$ E. $\frac{1}{6}$

10. Real numbers x and y satisfy $x^2/9 + y^2/4 = 1$. What is the greatest possible value of $2x + 3y$?

A. 6 B. $\sqrt{39}$ C. $6\sqrt{2}$ D. 9 E. 12

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11. In the expansion of $(x^2 + 1/x)^9$, what is the coefficient of the term independent of x ?
A. 36 B. 72 C. 84 D. 126 E. 252

12. How many real angles θ in the interval $0 \leq \theta < 2\pi$ satisfy $\sin(3\theta) = \cos(2\theta)$? Angles are measured in radians.
A. 4 B. 5 C. 6 D. 7 E. 10
