

Competition Math Sampler

AMC 8 / AMC 10 style · Free Sample · 8 problems

Name: _____ Date: _____

Directions: Choose the best answer for each problem. These problems are written in the style of the AMC 8 and AMC 10 competitions: 25 minutes suggested, no calculator.

1. What is the value of $2 + 4 + 6 + \cdots + 20$?
A) 100
B) 105
C) 110
D) 115
E) 120
2. A rectangle's length is twice its width. Its perimeter is 36. What is its area?
A) 36
B) 48
C) 72
D) 96
E) 108
3. If $3^x = 81$, what is the value of x^2 ?
A) 8
B) 12
C) 16
D) 25
E) 27
4. Two fair six-sided dice are rolled. What is the probability that the sum of the two numbers is 7?
A) $1/6$
B) $1/7$
C) $5/36$
D) $7/36$
E) $1/12$

5. The average of five numbers is 12. The average of the first four numbers is 10. What is the fifth number?
- A) 14
 - B) 16
 - C) 20
 - D) 22
 - E) 24
6. How many positive integers less than 100 are divisible by both 3 and 4?
- A) 6
 - B) 7
 - C) 8
 - D) 9
 - E) 12
7. A train travels 60 miles per hour for 2 hours, then 40 miles per hour for 3 hours. What was its average speed for the whole trip?
- A) 46 mph
 - B) 48 mph
 - C) 50 mph
 - D) 52 mph
 - E) 54 mph
8. If $n^2 - n = 210$ and n is positive, what is n ?
- A) 12
 - B) 13
 - C) 14
 - D) 15
 - E) 16

Answer Key

Competition Math Sampler (Answer Key) — with step-by-step solutions

1. $2 + 4 + 6 + \cdots + 20$

- Factor out 2: $2(1 + 2 + 3 + \cdots + 10)$.
- Sum 1 through 10: $10 \cdot 11 / 2 = 55$.
- Multiply back: $2 \cdot 55 = 110$.

Answer: C) 110

2. Rectangle: length = $2 \times$ width, perimeter 36

- Let width = w , length = $2w$.
- Perimeter: $2(w + 2w) = 6w = 36$, so $w = 6$ and length = 12.
- Area = $6 \times 12 = 72$.

Answer: C) 72

3. $3^x = 81$, find x^2

- Write 81 as a power of 3: $81 = 3^4$.
- So $x = 4$, and $x^2 = 16$.

Answer: C) 16

4. $P(\text{sum of two dice} = 7)$

- There are $6 \times 6 = 36$ equally likely outcomes.
- Sums of 7: (1,6), (2,5), (3,4), (4,3), (5,2), (6,1) — 6 ways.
- Probability = $6/36 = 1/6$.

Answer: A) 1/6

5. Average of five numbers is 12; first four average 10

- Total of all five: $5 \times 12 = 60$.
- Total of first four: $4 \times 10 = 40$.
- Fifth number = $60 - 40 = 20$.

Answer: C) 20

6. Integers < 100 divisible by both 3 and 4

- Divisible by both 3 and 4 means divisible by $\text{lcm}(3, 4) = 12$.
- Multiples of 12 below 100: 12, 24, $\cdots$, 96.
- Count: $96 / 12 = 8$.

Answer: C) 8

7. 60 mph for 2 h, then 40 mph for 3 h; average speed?
- Distance 1: $60 \times 2 = 120$ miles. Distance 2: $40 \times 3 = 120$ miles.
 - Total distance = 240 miles; total time = 5 hours.
 - Average speed = $240 / 5 = 48$ mph.
 - (Note: it is NOT the plain average of 60 and 40!)

Answer: B) 48 mph

8. $n^2 - n = 210$, n positive
- Factor: $n(n - 1) = 210$ — two consecutive integers.
 - Try squares near 210: $14^2 = 196$, $15^2 = 225$.
 - Check $n = 15$: $15 \times 14 = 210$ ✓

Answer: D) 15