

IBSMO

International British Science & Mathematics Olympiad

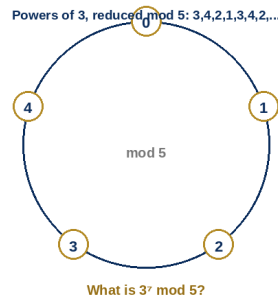
Mathematics — Sample Questions

Senior Level

Grade 9–10

Question 1 — Number Theory

The diagram below shows the repeating cycle of powers of 3, reduced modulo 5.



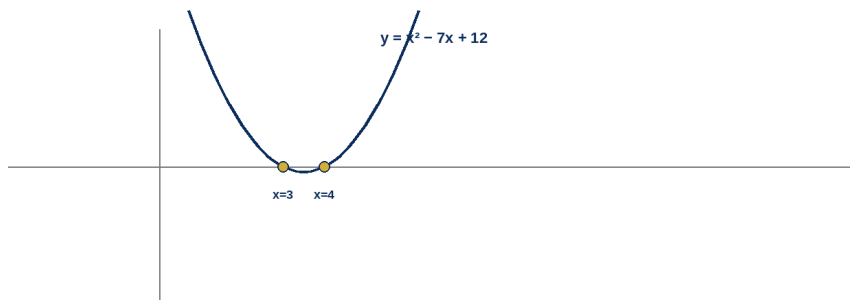
What is the remainder when 3^7 is divided by 5?

- A) 1
- B) 2 ✓
- C) 3
- D) 4

Answer: B. Powers of 3 mod 5 cycle as 3, 4, 2, 1, 3, 4, 2, ... (period 4). 3^7 is the 7th term: 3, 4, 2, 1, 3, 4, 2 → the 7th value is 2.

Question 2 — Algebra

The graph below shows the parabola $y = x^2 - 7x + 12$.



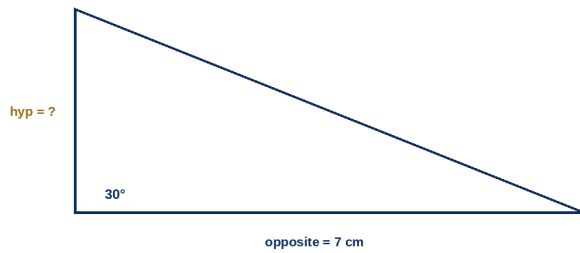
What are the roots of $x^2 - 7x + 12 = 0$?

- A) 2 and 6
- B) 3 and 4 ✓
- C) 1 and 12
- D) 4 and 8

Answer: B. Factoring: $(x-3)(x-4) = 0$, so $x = 3$ or $x = 4$ — the two points where the parabola crosses the x-axis.

Question 3 — Geometry

The right triangle below has a 30° angle, with the side opposite it labelled.



What is the length of the hypotenuse?

- A) 10.5 cm
- B) 12 cm
- C) 14 cm ✓
- D) $14\sqrt{3}$ cm

Answer: C. $\sin(30^\circ) = \text{opposite}/\text{hypotenuse} = 0.5$, so $\text{hypotenuse} = 7 \div 0.5 = 14$ cm.

Question 4 — Logical Thinking

The grid below shows all 36 possible outcomes when rolling two fair six-sided dice. The gold cells mark outcomes where the sum is 8.

	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

Two dice — gold cells show sums equal to 8

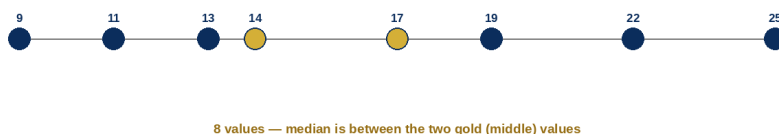
What is the probability that the sum of two dice is 8?

- A) $4/36$
- B) $5/36$ ✓
- C) $6/36$
- D) $1/6$

Answer: B. There are 5 outcomes that sum to 8 — $(2,6),(3,5),(4,4),(5,3),(6,2)$ — out of 36 total: $5/36$.

Question 5 — Data Analysis

The dot plot below shows 8 data values, sorted from smallest to largest.



What is the median of this data set: 14, 9, 22, 17, 11, 25, 19, 13?

- A) 14
- B) 14.5
- C) 15.5 ✓
- D) 17

Answer: C. Sorted: 9,11,13,14,17,19,22,25. With 8 values, the median is the average of the 4th and 5th: $(14+17)/2 = 15.5$.