

IBSMO

International British Science & Mathematics Olympiad

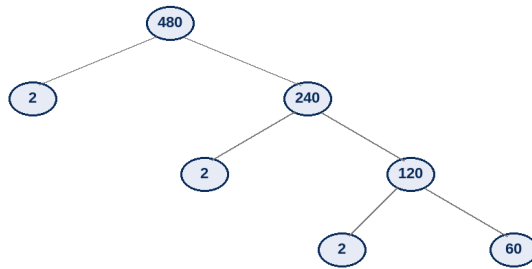
Mathematics — Sample Questions

Elite Level

Grade 11–12

Question 1 — Number Theory

The factor tree below breaks 480 down into its prime factors.



$480 = 2^5 \times 3 \times 5$ — how many total positive divisors?

Given that $480 = 2^5 \times 3 \times 5$, how many positive divisors does 480 have?

- A) 18
- B) 20
- C) 24 ✓
- D) 30

Answer: C. Number of divisors = $(5+1)(1+1)(1+1) = 6 \times 2 \times 2 = 24$.

Question 2 — Algebra

The diagram below shows successive powers of 3, leading up to the unknown value of x .

$$\log_3(x) = 4 \rightarrow x = 3^4 = ?$$



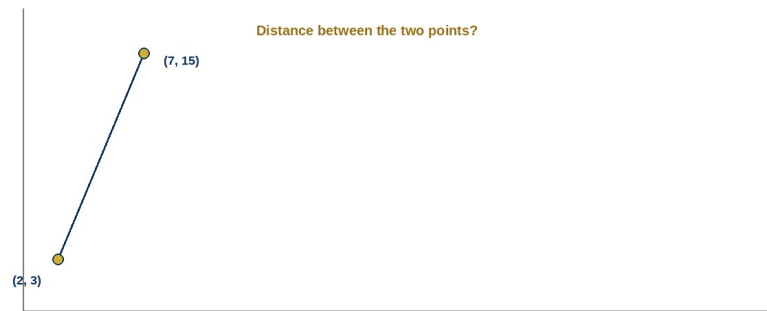
If $\log_3(x) = 4$, what is the value of x ?

- A) 12
- B) 27
- C) 64
- D) 81 ✓

Answer: D. $\log_3(x) = 4$ means $x = 3^4 = 81$.

Question 3 — Geometry

The coordinate plane below shows two points.



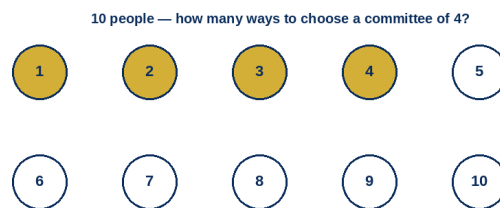
What is the distance between the points (2, 3) and (7, 15)?

- A) 12
- B) 13 ✓**
- C) 14
- D) 15

Answer: B. $Distance = \sqrt{[(7-2)^2 + (15-3)^2]} = \sqrt{(25+144)} = \sqrt{169} = 13.$

Question 4 — Logical Thinking

The diagram below shows 10 people, with a group of 4 highlighted as one possible committee.



In how many ways can a committee of 4 be chosen from a group of 10?

- A) 120
- B) 210 ✓**
- C) 240
- D) 5040

Answer: B. *This is a combination: $C(10,4) = 10!/(4! \cdot 6!) = 210.$*

Question 5 — Data Analysis

The table below shows the outcomes of a spinner game and their probabilities.

Spinner outcomes and probabilities

Win \$10	$p = 0.2$
Win \$5	$p = 0.3$
Lose \$2	$p = 0.4$
Win \$0	$p = 0.1$

What is the expected value of the winnings?

What is the expected value of the winnings?

- A) \$1.70

B) \$2.00

C) \$2.70 ✓

D) \$3.00

Answer: C. *Expected value* = $0.2 \times 10 + 0.3 \times 5 + 0.4 \times (-2) + 0.1 \times 0 = 2 + 1.5 - 0.8 + 0 = \2.70 .