11+ MATHEMATICS

Top 10 High-Frequency Exam Questions (2020–2025 Trends)

> **Time Allowed:** 15 minutes | **Calculators:** Strictly Prohibited
> **Instructions:** Show your working clearly in the space provided. All structural mathematical conventions, fractions, ratios, and percentages follow standard British grammar school selective guidelines.

1. Calculate the exact value of the following expression, ensuring your final answer is given as a mixed number in its simplest form:

$$3\frac{2}{5} \times 1\frac{7}{12} - 1\frac{1}{3}$$

2. A local library has ***1200*** books in total. ***45%*** of the books are fiction, and $\frac{1}{4}$ of the remaining books are history books. The rest of the books are science books. How many science books are in the library?

3. A rectangular playground measures ***18 metres*** by ***12 metres***. It is surrounded entirely by a concrete path that is exactly ***1.5 metres*** wide all the way around. Calculate the total surface area of the path in ***metres²***.

4. Solve for the unknown variable ***x*** in the following algebraic balance equation:

$$4(2x - 3) + 7 = 3(x + 5)$$

5. The ratio of red marbles to blue marbles in a vintage jar is ***3 : 5***. When ***12*** additional red marbles are added to the jar, the new ratio of red marbles to blue marbles becomes ***4 : 5***. How many blue marbles are there in the jar?

6. A high-speed train travels a total distance of ***135 kilometres*** at a constant average speed of ***90 km/h***. If the train departs from Manchester Piccadilly station at exactly ***09:42***, at what precise time will it arrive at its final destination? Give your answer using the 24-hour clock.

7. Find the lowest common multiple (***LCM***) of ***18***, ***24***, and ***36***.

8. The mean mass of four children is ***38 kg***. When a fifth child joins the group, the new mean mass across all five children increases to ***41 kg***. What is the exact mass of the fifth child?

9. An antique grandfather clock loses precisely ***4 minutes*** every ***6 hours***. If the clock is set perfectly to the correct time at ***08:00*** on Monday morning, what time will the clock show when the true time is ***20:00*** on Wednesday evening of the same week?

10. A regular solid three-dimensional shape has ***8 vertices*** and ***12 edges***. Using Euler's structural formula or spatial deduction, identify how many flat faces this shape possesses.

DETAILED SOLUTIONS & MARK SCHEME

11+ Mathematics High-Frequency Trends (2020–2025)

Question 1 Solution

Convert mixed numbers to improper fractions first:

$3\frac{2}{5} = \frac{17}{5}$ and $1\frac{19}{12}$.

Multiply the fractions: $\frac{17}{5} \times \frac{19}{12} = \frac{323}{60}$.

Subtract $1\frac{1}{3}$ (which is $\frac{4}{3} = \frac{80}{60}$):

$\frac{323}{60} - \frac{80}{60} = \frac{243}{60}$.

Simplify by dividing the numerator and denominator by 3: $\frac{81}{20} = 4\frac{1}{20}$.

Final Answer: $\mathbf{4\frac{1}{20}}$

Question 2 Solution

Fiction books = ***45% of 1200 = 0.45 × 1200 = 540*** books.

Remaining books = ***1200 − 540 = 660*** books.

History books = $\frac{1}{4}$ ***of 660 = 660 ÷ 4 = 165*** books.

Science books = ***660 − 165 = 495*** books.

Final Answer: 495 books

Question 3 Solution

Inner dimensions: width = ***18 m***, height = ***12 m***. Area = ***18 × 12 = 216 m²***.

The path adds ***1.5 m*** to *both sides* of each dimension.

Outer width = ***18 + 1.5 + 1.5 = 21 m***. Outer height = ***12 + 1.5 + 1.5 = 15 m***.

Total outer area = ***21 × 15 = 315 m²***.

Path Area = Outer Area − Inner Area = ***315 − 216 = 99 m²***.

Final Answer: 99 m²

Question 4 Solution

Expand brackets: $8x - 12 + 7 = 3x + 15$.

Simplify left side: $8x - 5 = 3x + 15$.

Subtract $3x$ from both sides: $5x - 5 = 15$.

Add 5 to both sides: $5x = 20$.

Divide by 5: $x = 4$.

Final Answer: x = 4

Question 5 Solution

Let the initial number of red marbles be $3u$ and blue marbles be $5u$.

Adding 12 red marbles gives: $3u + 12$.

Since the blue count remains unchanged, the new ratio is $(3u + 12) : 5u = 4 : 5$.

This directly implies that $3u + 12 = 4u$, so $u = 12$.

Number of blue marbles = $5u = 5 \times 12 = 60$.

Final Answer: 60

Question 6 Solution

Time taken = $Distance \div Speed = 135 \div 90 = 1.5\ hours$ (which is $1\ hour\ 30\ minutes$).

Departure time = $09{:}42$.

Add 1 hour: $10{:}42$. Add 30 minutes: $11{:}12$.

Final Answer: 11:12

Question 7 Solution

List multiples or use prime factors:

Multiples of 36: 36, 72, 108...

Check 72: $72 \div 18 = 4$ (exact), $72 \div 24 = 3$ (exact), $72 \div 36 = 2$ (exact).

Therefore, 72 is the smallest number common to all three lists.

Final Answer: 72

Question 8 Solution

Total mass of original 4 children = $4 \times 38 = 152\ kg$.

Total mass of all 5 children after addition = $5 \times 41 = 205\ kg$.

Mass of the fifth child = $205 - 152 = 53\ kg$.

Final Answer: 53 kg

Question 9 Solution

Calculate total elapsed time from Mon 08:00 to Wed 20:00:

Mon 08:00 to Wed 08:00 = ***48 hours***.

Wed 08:00 to Wed 20:00 = ***12 hours***.

Total time = ***48 + 12 = 60 hours***.

The clock loses ***4 minutes every 6 hours***, so over 60 hours it loses: ***(60 ÷ 6) × 4 = 10 × 4 = 40 minutes***.

Subtract 40 minutes from 20:00 = ***19:20***.

Final Answer: 19:20

Question 10 Solution

Apply Euler's polyhedron formula: ***F + V = E + 2***, where ***F*** = faces, ***V*** = vertices, and ***E*** = edges.

Substitute given values: ***F + 8 = 12 + 2***.

F + 8 = 14, therefore ***F = 14 − 8 = 6***. (The shape is a regular hexahedron/cube).

Final Answer: 6 faces
