National Mathematics Day activities for IB Maths: IGCSE / GCSE: answers

IB Math Revision · CBSE Class 9 and Class 10 · 22 December · Teacher answers and notes

No calculator. Every answer is a whole number or an exact fraction.

Teacher notes

- Facts in this pack: 22 December is National Mathematics Day in India, and Ramanujan was born on 22 December 1887. Both are on our National Mathematics Day puzzles page with official sources.
- For the partitions task, ask students to list systematically (largest part first) so that none are missed.
- The magic square is a good place to talk about checking: one missing number found two ways is a strong check.

Starter

1. **1728**
   - 12 × 12 = 144, and 144 × 12 = 1728.
2. **1729**
   - 1000 + 729 = 1729
3. **7 × 13 × 19**
   - 1729 ÷ 7 = 247, and 247 = 13 × 19.
4. **5**
   - 4, 3 + 1, 2 + 2, 2 + 1 + 1, 1 + 1 + 1 + 1

Task A: The number 1729

a. **1 + 1728 = 729 + 1000 = 1729**
- 1 + 1728 = 1729 and 729 + 1000 = 1729.

b. **19 × 91**
- $a + b = 19$ and $a^2 - ab + b^2 = 81 - 90 + 100 = 91$.
- So 1729 = 19 × 91.

c. **HCF 19; LCM 373 464**
- 1729 = 7 × 13 × 19 and $4104 = 2^3 \times 3^3 \times 19$, so HCF = 19.
- LCM = $2^3 \times 3^3 \times 7 \times 13 \times 19 = 216 \times 1729 = 373\,464$.

Task B: Partitions

a. **7**
- 5, 4 + 1, 3 + 2, 3 + 1 + 1, 2 + 2 + 1, 2 + 1 + 1 + 1, 1 + 1 + 1 + 1 + 1

b. **11**
- 6; 5+1; 4+2; 4+1+1; 3+3; 3+2+1; 3+1+1+1; 2+2+2; 2+2+1+1; 2+1+1+1+1; 1+1+1+1+1+1

c. **4 and 4: the same**
- Different numbers: 6, 5 + 1, 4 + 2, 3 + 2 + 1.
- Only odd numbers: 5 + 1, 3 + 3, 3 + 1 + 1 + 1, 1 + 1 + 1 + 1 + 1 + 1.
- Both counts are 4. (This is true for every number, not just 6.)

Task C: A birthday magic square

a. **139**
- Add the top row: 22 + 12 + 18 + 87 = 139.

b. **88, 89, 86 and 11**
- Row 2: 139 − (17 + 9 + 25) = 88.
- Row 3: 139 − (10 + 24 + 16) = 89.
- Column 2: 139 − (12 + 17 + 24) = 86.
- Row 4: 139 − (19 + 86 + 23) = 11.

c. **Both give 139**
- Corners: 22 + 87 + 19 + 11 = 139.
- Middle: 17 + 9 + 24 + 89 = 139.

Task D: Sums of cubes

a. **100; they are all square numbers**
- 1 + 8 + 27 + 64 = 100.
- $1 = 1^2$, $9 = 3^2$, $36 = 6^2$, $100 = 10^2$, and 1, 3, 6, 10 are the triangular numbers.

b. **6084**
- $n(n + 1)/2 = 12 \times 13/2 = 78$, and $78^2 = 6084$.

c. ***n* = 20**
- $44\,100 = 210^2$, so $n(n + 1)/2 = 210$.
- $n^2 + n - 420 = 0$, so $(n + 21)(n - 20) = 0$ and $n = 20$.

Extension

1. **935 = 5 × 11 × 17**
   - Try the smallest first terms: 2, 8, 14 and 3, 9, 15 are not all prime.
   - 5, 11, 17 are all prime, so the answer is 5 × 11 × 17 = 935.
2. **8 + 4096 = 729 + 3375 = 4104**
   - $2^3 + 16^3 = 8 + 4096 = 4104$.
   - $9^3 + 15^3 = 729 + 3375 = 4104$.
3. **Answers vary**
   - Share and check each other's squares: every row, column and diagonal must give the same total.

Every question is original and every answer was checked before publishing.