National Mathematics Day activities for IB Maths: HL: answers

IB Math Revision · IB HL and A Level Further Maths (no calculator) · 22 December · Teacher answers and notes

No calculator needed: every answer is exact.

Teacher notes

- For IB HL and A Level Further Maths classes. Every answer is exact and the whole set works without a calculator.

Starter

1. **3025**
   - $(10 \times 11 \div 2)^2 = 55^2 = 3025$
2. **8**
   - $2 \times 2 \times 2 = 8$
3. **1**
   - $1728 = 4 \times 432$
4. **45**
   - $10 \times 9 \div 2 = 45$

Task A: Ramanujan's number

a. **41075**
- Σ to 20: $210^2 = 44100$. Σ to 10: 3025.
- $44100 - 3025 = 41075$

b. **8**
- $n = 8$: $36^2 = 1296$. $n = 9$: $45^2 = 2025$.

c. **133**
- $1 - 12 + 144 = 133$
- $13 \times 133 = 1729$

Task B: Series

a. **1/4**
- $1/(r(r+1)(r+2)) = \tfrac{1}{2}[1/(r(r+1)) - 1/((r+1)(r+2))]$
- The sum telescopes to $\tfrac{1}{2} \times 1/2 = 1/4$

b. **1/8**
- The even terms add to $\tfrac{1}{4} \times \pi^2/6 = \pi^2/24$.
- $\pi^2/6 - \pi^2/24 = \pi^2/8$

c. **5**
- The coefficients c_n satisfy $c_n = c_{n-1} + c_{n-2}$ with $c_0 = c_1 = 1$.
- 1, 1, 2, 3, 5

Extension

1. **5**
   - 7, 6+1, 5+2, 4+3, 4+2+1

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