

Palindromes

Palindrome: Integer that's the same forwards and backwards.

7, 22, 434, 9229, 13731

$$\begin{array}{cccc} \underline{A} & \underline{B} & \underline{C} & \underline{D} \\ D & C & B & A \end{array} \quad \begin{array}{l} A = D \\ B = C \end{array}$$

$$\begin{array}{cc} \underline{A} & \underline{B} \\ 1 & 0 \\ 2 & 1 \\ 3 & 2 \\ \vdots & \vdots \\ 9 & 9 \end{array}$$

$9 \cdot 10 = 90$ 4-digit palindromes

$$\begin{aligned} \underline{A} \underline{B} \underline{B} \underline{A} &= 1000A + 100B + 10B + A \\ &= 1001A + 110B \\ &\quad \quad \quad 7 \cdot 111B \quad \quad 2 \cdot 511 \\ &= 11(91A + 10B) \end{aligned}$$

Ex: Find the smallest 3-digit palindrome whose product with 101 is not a 5-digit palindrome

$$\begin{array}{r} 101 \\ \cdot 101 \\ \hline 101 \\ 10100 \\ 10201 \end{array} \quad \begin{array}{r} \underline{A} \underline{B} \underline{A} \\ \cdot 101 \\ \hline ABA \\ \underline{505} \\ AB2ABA \\ 56005 \end{array}$$