# MATHCOUNTS® Problem of the Week Archive

## *Follow the Rules – May 8, 2023*

## *Problems & Solutions*

Define $x$ @ $y$ as $(x^3 - y)/x$, for distinct positive integers $x$ and $y$. What is the value of 5 @ 10?

*Evaluating 5 @ 10 yields $(5^3 - 10)/5 = (125 - 10)/5 = 115/5 =$* ***23****.*

Define $a$ # $b$ as $a^2 - b^2 - ab$, for real numbers $a$ and $b$. What is the value of 5 # (4 # 3)?

*Let's first evaluate the expression inside the parentheses. We have $4 \# 3 = 4^2 - 3^2 - 4(3) = 16 - 9 - 12 = -5$. We now evaluate $5 \# (-5)$ to get $5^2 - (-5)^2 - 5(-5) = 25 - 25 + 25 =$* ***25****.*

Define $m$ \$ $n$ as $m^2 + 2m/n$ and define $m$ & $n$ as $(m^2 - n^2 + mn)/(2n)$. What is the value of (4 \$ 2) & 10?

*Again, let's first evaluate the expression inside the parentheses. We have $(4 \$ 2) = 4^2 + 2(4)/2 = 16 + 8/2 = 16 + 4 = 20$. We now evaluate 20 & 10 to get $[20^2 - 10^2 + 20(10)]/[2(10)] = (400 - 100 + 200)/20 = 500/20 =$* ***25****.*

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