

MATHCOUNTS[®] Problem of the Week Archive

Following Rules – April 25, 2022

Problems & Solutions

Define the relation $M @ N$ as $M @ N = M^2 + 2M/N$. What is the value of $9 @ 4$? Express your answer as a common fraction.

Substituting 9 for M and 4 for N in the given relation, we get $9 @ 4 = 9^2 + 2 \times 9 \div 4 = 81 + 18/4 = 324/4 + 18/4 = 171/2$.

Define the relation $A \# B$ as $A \# B = (A^2 - B^2 + AB)/(2B)$. What is the value of $5 \# 4$? Express your answer as a common fraction.

Substituting 5 for A and 4 for B in the given relation, we get $(5^2 - 4^2 + 5 \times 4)/(2 \times 4) = (25 - 16 + 20)/8 = 29/8$.

Using the two relations defined above, what is the value of $(4 @ 2) \# 10$?

We'll start with the relation in parentheses first. So, substituting 4 for M and 2 for N in the relation provided in problem 1, we get $4 @ 2 = 4^2 + 2 \times 4 \div 2 = 16 + 8/2 = 20$. Now, we can substitute 20 for A and 10 for B in the relation provided in problem 2 to get $20 \# 10 = (20^2 - 10^2 + 20 \times 10)/(2 \times 10) = (400 - 100 + 200)/20 = 500/20 = 25$.

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