

MATHCOUNTS[®] Problem of the Week Archive

Archer's Three Sons – June 18, 2018

Problems & Solutions

Archer has three sons named Tanner, Carver and Decker. Archer's age is three times the sum of Carver's and Decker's ages. The sum of Tanner's and Carver's ages is half Archer's age. If Tanner's age is three times Carver's age, what is the ratio of the ages of Carver and Decker? Express your answer as a common fraction.

Let the ages of Archer, Tanner, Carver and Decker be represented by a , t , c and d , respectively. From the given information we can write the following equations: $a = 3(c + d)$, $a = 2(t + c)$, $t = 3c$. Since we have two equations that represent Archer's age, we can set them equal to each other to get $3(c + d) = 2(t + c) \rightarrow 3c + 3d = 2t + 2c \rightarrow c + 3d = 2t$. We can substitute $3c$ for t in this equation to get $c + 3d = 2(3c) \rightarrow c + 3d = 6c \rightarrow 3d = 5c \rightarrow c/d = \mathbf{3/5}$.

If ten times Tanner's age is three times the product of Carver's and Decker's ages, what is the sum of the ages of Tanner, Carver and Decker?

From this information, we can write the equation $10t = 3cd$. Substituting $3c$ for t in this equation yields $10(3c) = 3cd \rightarrow d = 10$ years. Since $c/d = 3/5$, we have $c/10 = 3/5$. Cross-multiplying, we see that $5c = 30$, so $c = 6$ years. Finally, since $t = 3c$, we get $t = 3(6) = 18$ years. The sum of the ages of Tanner, Carver and Decker, then, is $t + c + d = 18 + 6 + 10 = \mathbf{34}$ years.

If Archer's age is k times Carver's age, what is the value of k ?

Since $a = 3(c + d)$, $c = 6$ years and $d = 10$ years, we can substitute to get $a = 3(6 + 10) = 3(16) = 48$ years. So, Carver is 6 years old and Archer is 48 years old. If $48 = 6k$, then $k = 48/6 = \mathbf{8}$.

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