

Simple Polynomial Puzzle

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This is a nice little puzzle from the 2024 Math Calendar ([1]).

Find the sum of the coefficients of

$$(1 + x + x^2)^3$$

As before, recall that all the answers are integer days of the month.

Solution

Let $p(x) = (1 + x + x^2)^3$. Then we know when $p(x)$ is expanded, it will take the form

$$p(x) = a_6x^6 + a_5x^5 + \dots + a_1x + a_0$$

So

$$p(1) = a_6 + a_5 + \dots + a_1 + a_0$$

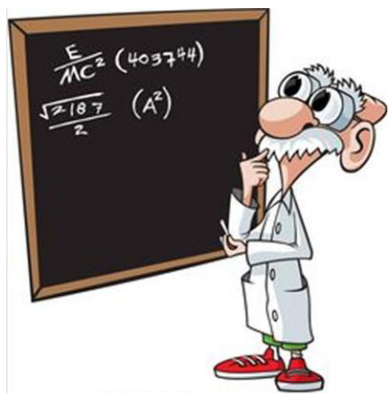
yields the sum of the coefficients. But then

$$p(1) = (3)^3 = 27.$$

References

- [1] Rapoport, Rebecca and Dean Chung, *Mathematics 2024: Your Daily epsilon of Math*, American Mathematical Society, 2024. August

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