

Math 317 Section B1 Quiz 1

January 24, 2002

Problem 1.

Find the value of

$$\sum_{r=0}^n \binom{n}{r} 3^{n-r} 2^r (-1)^r,$$

for every integer $n \geq 1$, and justify your answer.

Solution.

By the Binomial Theorem for any integers a, b we have

$$(a + b)^n = \sum_{r=0}^n \binom{n}{r} a^{n-r} b^r.$$

Putting $a = 3, b = -2$ in the above formula we get:

$$1 = 1^n = (3 - 2)^n = \sum_{r=0}^n \binom{n}{r} 3^{n-r} (-2)^r = \sum_{r=0}^n \binom{n}{r} 3^{n-r} 2^r (-1)^r.$$