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On WP Bailey pair and transformation formulae for q-hypergeometric series

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Abstract: In this paper, we have established certain transformation formulae for q-hypergeometric series.

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1. Introduction, Notations and Definitions

Let q be a fixed complex parameter with $|q| < 1$. For any complex parameter 'a', the q-shifted factorial is defined by,

$$(a, q)_n = \begin{cases} 1 & \text{if } n = 0; \\ (1-a)(1-aq)(1-aq^2)\dots,(1-aq^{n-1}) & \text{if } n \geq 1. \end{cases}$$

$$[a; q]_\infty = \prod_{r=0}^{\infty}(1 - aq^r).$$

For brevity, we write

$$[a_1, a_2, a_3, ..., a_r; q]_n = [a_1; q]_n[a_2; q]_n...[a_r; q]_n.$$

A basic (q-) hypergeometric series is defined by,

$${}_r\Phi_s \left[\begin{matrix} a_1, a_2, ..., a_r; q; z \\ b_1, b_2, ..., b_s \end{matrix} \right] = \sum_{n=0}^{\infty} \frac{(a_1, a_2, ..., a_r; q)_n z^n}{(q, b_1, b_2, ..., b_s; q)_n} \left((-)^n q^{n(n-1)/2}\right)^{1+s-r}, \quad (1.1)$$

where for convergence $|z| < 1$ when $r = 1 + s$ and for $1 + s > r$, $|z| < \infty$.