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Bhargava, S. [Bhargava, Srinivasamurthy] (6-MYSO);
Adiga, C. (6-MYSO)

A basic bilateral series summation formula and its applications. (English. English summary)

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In this note the authors give the following summation formula for the basic bilateral series ${}_2\psi_2$:

$${}_2\psi_2 \left(\begin{matrix} q/a, & b; \\ d, & bq; \end{matrix} q; a \right) = \frac{(d/b)_\infty (ab)_\infty (q)_\infty^2}{(q/b)_\infty (d)_\infty (a)_\infty (bq)_\infty},$$

where $|a| < 1$, $|d| < 1$ and $|q| < 1$. They show that the use of the above summation formula leads to (i) some sums of squares theorems, (ii) Ramanujan's Fourier series developments related to theta functions, (iii) Lambert series identities related to the Dedekind eta-function, and (iv) q -gamma and q -beta identities. The authors claim that the following formula for $r_3(n)$ is new:

$$r_3(n) = 2 \sum_{m=1}^n \sum_{0 \leq i \leq [n-m(m+1)/2]/m} (-)^{n+m+i} P_m(n-mi-m(m+1)/2) \\ + 4 \sum_{m=1}^n \sum_{0 \leq i \leq [n-m]/m} (-)^{n+m+i} P_m^d(n-mi-m).$$

Hukum Chand Agrawal (Jhansi)