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The $(n+20)$-th homotopy groups of n-spheres

Dedicated to Professor Y. Akizuki for his 60-th birthday

By

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This paper is a continuation of the calculation of the homotopy groups of spheres in [3]. Denote by S^n the unit n-sphere in euclidean $(n+1)$-space and by $\pi_r(S^n)$ the r-th homotopy groups of S^n, then $\pi_{n+20}(S^n)$ can be calculated and our results are stated as follows.

Theorem.

$\pi_{22}(S^2) \cong Z_{132} \oplus Z_2$,
$\pi_{23}(S^3) \cong Z_2 \oplus Z_2$,
$\pi_{24}(S^4) \cong Z_2 \oplus Z_2 \oplus Z_2 \oplus Z_2 \oplus Z_2 \oplus Z_2$,
$\pi_{25}(S^5) \cong Z_6 \oplus Z_2 \oplus Z_2$,
$\pi_{26}(S^6) \cong Z_{480} \oplus Z_{12}$,
$\pi_{27}(S^7) \cong Z_{24}$,
$\pi_{28}(S^8) \cong Z_{24} \oplus Z_3$,
$\pi_{29}(S^9) \cong Z_{24}$,
$\pi_{30}(S^{10}) \cong Z_{504} \oplus Z_{24}$,
$\pi_{31}(S^{11}) \cong Z_{24} \oplus Z_2 \oplus Z_2$,
$\pi_{32}(S^{12}) \cong Z_{24} \oplus Z_2 \oplus Z_2 \oplus Z_2 \oplus Z_2 \oplus Z_2$,
$\pi_{33}(S^{13}) \cong Z_{24} \oplus Z_2 \oplus Z_2 \oplus Z_2$,
$\pi_{34}(S^{14}) \cong Z_{240} \oplus Z_{24}$,
$\pi_{35}(S^{15}) \cong Z_{24}$,
$\pi_{36}(S^{16}) \cong Z_{24}$,
$\pi_{37}(S^{17}) \cong Z_{24}$,
$\pi_{38}(S^{18}) \cong Z_{24} \oplus Z_{12}$,
$\pi_{39}(S^{19}) \cong Z_{24} \oplus Z_2$,