$$(1+z)^r = \sum_k \binom{r}{k} z^k$$

$$2^r = \sum_k \binom{r}{k}$$

$r = 9$

$$\underbrace{\binom{9}{0}}_{1} + \underbrace{\binom{9}{1}}_{9} + \underbrace{\binom{9}{2}}_{36} + \underbrace{\binom{9}{3}}_{84} + \underbrace{\binom{9}{4}}_{126} + \underbrace{\binom{9}{5}}_{126} + \underbrace{\binom{9}{6}}_{84} + \underbrace{\binom{9}{7}}_{36} + \underbrace{\binom{9}{8}}_{9} + \underbrace{\binom{9}{9}}_{1} +$$

$$\underbrace{\binom{9}{10}}_{0} + \underbrace{\binom{9}{11}}_{0} + \underbrace{\binom{9}{12}}_{0} + \cdots = 512 = 2^9$$

$r = 9.1$

$$\underbrace{\binom{9.1}{0}}_{1} + \underbrace{\binom{9.1}{1}}_{9.1} + \underbrace{\binom{9.1}{2}}_{36.855} + \underbrace{\binom{9.1}{3}}_{87.2235} + \underbrace{\binom{9.1}{4}}_{133.0158375} + \underbrace{\binom{9.1}{5}}_{135.6761543} + \underbrace{\binom{9.1}{6}}_{92.71203874} + \underbrace{\binom{9.1}{7}}_{41.05818858} + \underbrace{\binom{9.1}{8}}_{10.77777450} + \underbrace{\binom{9.1}{9}}_{1.317283550} +$$

$$\underbrace{\binom{9.1}{10}}_{0.01317283550} + \underbrace{\binom{9.1}{11}}_{-0.001077777450} + \underbrace{\binom{9.1}{12}}_{0.0001706480963} + \underbrace{\binom{9.1}{13}}_{-0.00003806765225} + \underbrace{\binom{9.1}{14}}_{0.00001060456027} + \underbrace{\binom{9.1}{15}}_{-0.0000003464156355} + \cdots \approx 548.7480128 \approx 2^{9.1}$$

$1. + 9.100000000 + 36.85500000 + 87.22350000 + 133.0158375 +$
$135.6761543 + 92.71203874 + 41.05818858 + 10.77777450 + 1.317283550 +$
$0.01317283550 + -0.001077777450 + 0.0001706480963 + -0.00003806765225 +$
$0.00001060456027 + -0.000003464156355 = 548.7480118$