Sign Test

This tests for a difference in location (ie the means) of two populations when paired samples are available. The only assumptions needed are that the observations from different pairs are independent and that, if there are no differences between the two populations, the differences between the paired observations are equally likely to be positive (+) or negative (-). The test is therefore "distribution-free" (ie. non-parametric) in that it does not assume a particular form of underlying distribution. The test is carried out by subtracting the second sample's value from the first for every pair, and then using the signs of the non-zero differences. If there is no difference between the two populations then the number of + and - differences should be approximately equal. The p-value of the test (the probability of observing a result as or more extreme than that actually observed if there is no difference between the two populations) will be calculated for you for a one-sided alternative hypothesis.

Method: Based on the number of + (or -) differences among the non-zero differences (zero differences are ignored). The second of each pair of data points is subtracted from the first. The null hypothesis (Ho) is that the median of the differences is zero. H_1 is that the median of the differences is > 0, < 0 or $\neq 0$ (two-sided alternative). The test makes use of the fact that, when Ho is true, the distribution of the number of + differences is binomial (Bin(n,0.5)) where n is the number of non-zero differences and the probability of a + is 0.5. The level of significance you use will depend upon your problem, but the 5% level ($p < 0.05$) is frequently sufficient to suggest that the result is unlikely to have occurred by chance.

Note also that the result is in the form of $\Pr[\, X \leq x \,] = p$ where X has a Bin(n,0.5) distribution, where x is the number of positive non-zero differences, p is the calculated binomial probability for this outcome, and n is the total number of non-zero differences if the value of $x < n/2$, and will give the opposite if $x > n/2$. You need to consider whether your problem requires a one or two sided alternative, and then make any necessary corrections to this result. For example, if H_1 is one-sided, then this result will be the appropriate probability, but if H_1 is two-sided, then the correct probability will be double that given.

See the Statistics topic for instructions on selecting this test.