Biology 4605/7220 Name ________________________
Quiz 9a 13 November 2007 (from 18 October 1995)

An agronomist expects that, on average, low bush blueberry production will be negatively associated with cloud cover. The agronomist obtains records of cloud cover and berry production. The observed correlation is r = −0.40 based on 30 years. Test whether correlation is significantly less than zero (one-tailed test).

For small sample sizes the statistic t_s is normally distributed.

$t_S = (z-0)\,(n-3)^{1/2}$ where $z = (0.5)\ln\left(\frac{1+r}{1-r}\right)$

Thus we can use the normal distribution to calculate p-values for t_S . Here is the cumulative distribution function for negative values of t_S, at values of r ranging from 0 to −0.9

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MTB > set into c1
DATA> 0 -.1 -.2 -.3 -.4 -.5 -.6 -.7 -.8 -.9
DATA> end
MTB > let c2 = 0.5*log((1+c1)/(1-c1))*sqrt(30-3)

MTB > cdf c2;
SUBC> normal 0 1.
     0.0000    0.5000
    -0.5214    0.3011
    -1.0534    0.1461
    -1.6083    0.0539
    -2.2013    0.0139
    -2.8543    0.0022
    -3.6017    0.0002
    -4.5066    0.0000
    -5.7086    0.0000
    -7.6499    0.0000
```

column 1 of the output is the normal score (z) for t_S values of r ranging from 0 to −0.9
column 2 of the output is the p-value corresponding to several negative values of z and hence the t_S statistic.

What is the probability of obtaining a normal score of −3.6 or less? ________

The normal distribution is symmetrical.
What is the probability of obtaining a normal score of 3.6 or more? ________

What is the value of t_S when r = 0 ? ________________

Be sure to state null and alternative hypotheses concerning r,

state your significance criterion, _______

calculate the t-statistic for the observed correlation (r = −0.40),

and declare a decision.