C*. Comprehend the following case:

An educational psychologist conducted a study to assess relationship between the vocabulary acquisition of pre-school children and their inclination to think divergently. She administered vocabulary test as well as a divergent-thinking test to a single pseudo-random sample of 150 four years olds. The resulting string of bivariate data X is of the following form:

$$X = ((v_1, d_1), (v_2, d_2), (v_3, d_3), ..., (v_{150}, d_{150}))$$

The resulting sample statistics are as follows:

$$n = 150 \wedge r = {}^{-}0.10$$

She tested the following null hypothesis via a t-test for correlations:

$$H_o : \rho_X = 0$$

The calculation from http://vassarstats.net/textbook/ch4apx.html provided the following results:

N = 150	r = -0.18
Reset	Calculate
t	df
-2.226	148
Probability	
directional	0.0137575
non-directional	0.027515

Because the t value was such that $p < 0.05$, the researcher rejected H_o.

Examine each of the following propositions to determine its truth value; indicate your choice by circling either "T" or "F" and then write a paragraph defending you choice:

i. The results of the *t*-test indicated that the correlation coefficient is statistically significant.

(T) F

This is true. Since the researcher determined that to reject the null hypothesis of $\rho_X = 0$ that p should be less than 0.05, the results of the *t*-test indicated that the magnitude of *r* (i.e., the sample correlation coefficient) is such that the results are statistically significant. Rejecting a null-hypothesis means that the statistical results are significant. That is not to say that it is certain that $\rho_X < 0$, but it is highly unlikely that only sampling error explains why *r* is as small as it is.

ii. The results of the *t*-test indicated that there is a causal effect between vocabulary acquisition and inclination for divergent thinking among four-year old children represented by the study sample.

T (F)

This is false. Correlation coefficients measure the direction and strength of associations between variables (e.g., vocabulary scores and divergent-thinking scores) but they do not imply cause-and-effect relationships. The results of this study suggest that vocabulary acquisition is inversely associated with a tendency toward divergent thinking. But the researcher should not conclude that vocabulary acquisition diminishes divergent thinking (although it just might) or that divergent thinking diminishes vocabulary acquisition (although it might - but I doubt it). Maybe the two variables are both influenced by a third variable that was not a focus of this study.

iii. The results of the *t*-test indicated that $|r|$ is so deviant from 0, that H_o should be rejected.

(T) F

This is true for exactly the same reasons that I tried to convey in my response to Prompt # i above.

iv. Based on the results of the study, a Type I error is possible but it is impossible to have a Type II error.

(T) F

This is true. Since the researcher rejected the null hypothesis of $\rho_X = 0$, there can be no Type II error since a Type II error is the failure to reject a false null hypothesis. In this case the null hypothesis was rejected, if $\rho_X = 0$ is true, then a Type I error occurred. But we are not sure whether or not $\rho_X = 0$.