A researcher wants to examine the relationship between the hours spent studying and the exam scores of a group of students.

Data: Let's consider the number of hours spent studying and the corresponding exam scores for a sample of 30 students:

Hours Spent Studying:

10, 12, 15, 18, 20, 22, 25, 28, 30, 32, 35, 38, 40, 42, 45, 48, 50, 52, 55, 58, 60, 62, 65, 68, 70, 72, 75, 78, 80, 82 Exam Scores: 60, 65, 70, 75, 80, 82, 85, 88, 90, 92, 93, 95, 96, 97, 98, 99, 100, 102, 105, 106, 107, 108, 110, 112, 114, 115, 116, 118, 120, 122

Question:

Calculate the correlation coefficient between the hours spent studying and the exam scores. Interpret the value of the correlation coefficient and explain the nature of the relationship between studying hours and exam scores.

**the data:**

| **Month** | **X (temperature, °C)** | **Y (rainfall, mm)** |
| --- | --- | --- |
| **1** | **10** | **420** |
| **2** | **12** | **430** |
| **3** | **15** | **440** |
| **4** | **18** | **460** |
| **5** | **20** | **475** |
| **6** | **22** | **495** |
| **7** | **25** | **510** |
| **8** | **27** | **530** |
| **9** | **30** | **540** |
| **10** | **32** | **550** |
| **11** | **34** | **565** |
| **12** | **35** | **590** |
| **13** | **36** | **600** |
| **14** | **37** | **610** |
| **15** | **38** | **620** |
| **16** | **39** | **635** |
| **17** | **40** | **650** |
| **18** | **41** | **660** |
| **19** | **42** | **680** |
| **20** | **43** | **690** |
| **21** | **44** | **705** |
| **22** | **45** | **720** |
| **23** | **46** | **740** |
| **24** | **47** | **750** |
| **25** | **48** | **765** |
| **26** | **49** | **775** |
| **27** | **50** | **790** |
| **28** | **51** | **800** |

**Number of observations *n* = 28**

**Calculate the means:**

**= 445.71 mm**

**Calculate the sums needed for r:**

**Correlation coefficient:**

**Plugging the numbers:**

**Numerator = 28 (86,590,460) − 3,098 (12,480) = 307,010**

**Denominator:**

**= 314,142.6**

**Test of significance (null hypothesis : ρ = 0)**

**T– test for Pearson’s *r*:**

**≈ 0.955, 1 − ≈ 0.045**

**Degrees of freedom = n – 2 = 26**

**The two‑tailed critical value for df = 26 at α = 0.05 is ≈ 2.05; for α = 0.01 it is ≈ 2.78.**

**Our calculated t ≈ 24.3 is far larger than either critical value, giving a p‑value < 0.00001.**