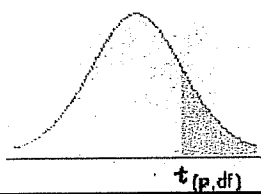




4. In one stage of the development of a new medication for an allergy, an experiment is conducted to study how different dosages of the medication affect the duration of relief from the allergic symptoms. Ten patients are included in the experiment. Each patient receives a specific dosage of the medication and is asked to report back as soon as the protection of the medication seems to wear off. The observations are recorded in the following table, which shows the dosage ( $x$ ) and respective duration of relief ( $y$ ) for the 10 patients. (24 分)

	$x$	$y$	$x^2$	$y^2$	$xy$
	3	9	9	81	27
	3	5	9	25	15
	4	12	16	144	48
	5	9	25	81	45
	6	14	36	196	84
	6	16	36	256	96
	7	22	49	484	154
	8	18	64	324	144
	8	24	64	576	192
	9	22	81	484	198
<i>Totals:</i>	59	151	389	2,651	1,003

- Compute the estimates  $\hat{\beta}_1$  and  $\hat{\beta}_2$ , and then find the fitted regression line for  $\hat{y}_i = \hat{\beta}_1 + \hat{\beta}_2 x_i$ .
- What percentage of the total variability is explained by the linear regression and what percentage remains unexplained?
- Compute the MLE  $\hat{\sigma}^2$  of  $\sigma^2$ .



The following part of t-Distribution Table with right tail probabilities may be useful.

df/p	0.4	0.25	0.1	0.05	0.025	0.01	0.005
6	0.265	0.718	1.440	1.943	2.447	3.143	3.707
7	0.263	0.711	1.415	1.895	2.365	2.998	3.499
8	0.262	0.706	1.397	1.860	2.306	2.896	3.355
9	0.261	0.703	1.383	1.833	2.262	2.821	3.250
10	0.260	0.700	1.372	1.812	2.228	2.764	3.169
11	0.260	0.697	1.363	1.796	2.201	2.718	3.106
12	0.259	0.695	1.356	1.782	2.179	2.681	3.055
13	0.259	0.694	1.350	1.771	2.160	2.650	3.012
14	0.258	0.692	1.345	1.761	2.145	2.624	2.977
15	0.258	0.691	1.341	1.753	2.131	2.602	2.947
16	0.258	0.690	1.337	1.746	2.120	2.583	2.921