1. Two independent sampling stations were chosen for this study, one located downstream from the acid mine discharge point and the other located upstream. For 12 monthly samples collected at the downstream station the species diversity index had a mean value 3.11, and a standard deviation of 0.771, while 10 monthly samples collected at the upstream station had a mean index value of 2.04 and a standard deviation of 0.448. Find a 90% confidence interval for the difference between the population means for the two locations, assuming that the populations are approximately normally distributed with equal variances.

2. A standardized chemistry test was given to 50 girls and 75 boys. The girls made an average grade of 76, while the boys made an average grade of 82. Find a 96% confidence interval for the difference $\mu_1 - \mu_2$ where μ_1 is the mean score of all boys and μ_2 is the mean score of all girls who might take this test. Assume that the population standard deviations are 6 and 8 for girls and boys respectively.

3. Two computer systems are being tested about their processing speeds. Ten benchmark programs were run on each of the two systems, with the following run times:

Benchmark program	(Run times in microseconds)	
	system A	system B
Sieve of Eratosthenes	42	55
Payroll	201	195
Least squares fit	192	204
Queuing network solver	52	40
Lucian puzzle	10	12
Simulation(Trivial Pursuit)	305	290
Statistcal test	10	13
Quickie program	1	1
Satellite image processing	350	320
Music analysis	59	65

Find a 95% confidence interval for the difference between the population means for the two systems.

4. a) A phosphate fertilizer was applied to five plots and a nitrogen fertilizer to six plots. The yield of grain on each plot was recorded (in bushels) below. Construct a 98% confidence interval for the difference in the means of the two fertilizer samples. (Assume that the populations are normally distributed and the variances are equal.)

Phosphate	Nitrogen
40	50
49	41
38	53
48	39
40	40
	47

b) Assuming that the population variances were not equal, find a 98% confidence interval for the ratio of the two variances in yields of the two fertilizers.

5. Information of peptides identified in the brains of different animals is of interest to biologists. an experiment was carried out to compare the content of peptides (μ mole/g fresh tissue) in the brains of two species of fish from the Black Sea: dogfish (*Squalus acanthias*) and the skate (*Raja clavata*). Brains were quickly removed from fish freshly caught, and the peptides in the brain determined by electrophoresis. The values are given in the table below. Estimate the difference in the true means of peptide content in the brain tissue for the true species, using a 90% confidence interval.

Skate	Dogfish
1.00	0.51
0.53	0.74
0.41	0.84
0.70	0.80
0.70	0.60
0.59	0.74
0.82	0.82
0.80	0.73
0.53	0.98
0.70	0.59
0.68	0.74

7. The margin of error in the difference of two population proportions is given by

$$ ME = \left| z_{\frac{\alpha}{2}} \right| \sqrt{\frac{\hat{p}_1 q_1}{m} + \frac{\hat{p}_2 q_2}{n}} $$

In a survey conducted on a college campus, 48 out of 150 professors were smokers and 114 out of 300 students were smokers. Obtain a 95% confidence interval for the difference in the proportions of smokers among all professors and smokers among all students.

8. The scores on the final tests in mathematics, physics, and English for eight randomly picked students are as follows:

Mathematics	50	58	67	70	75	82	86	92
Physics	62	54	63	78	81	78	88	90
English	79	82	70	74	67	62	64	56

a) Find the correlation coefficient between the scores in mathematics and the scores in physics.

b) Find the correlation coefficient between the scores in mathematics and the scores in English.

c) Find the regression line of the scores in mathematics and the scores in physics.