

1. (4 points) Fill in the blanks below.

For each variable, the average is 50 and the standard deviation is 10.

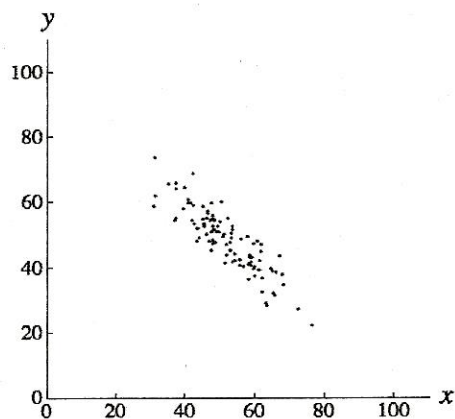
For one of the graphs below, $r = -0.90$.

For one of the graphs below, $r = 0.00$.

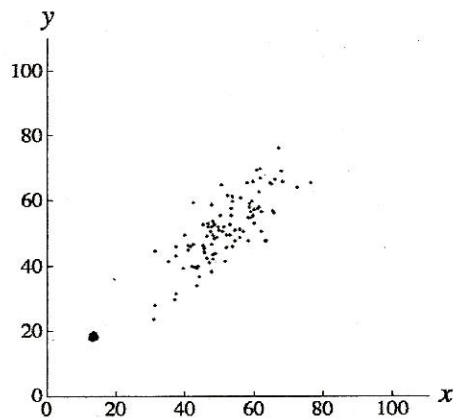
For one of the graphs below, $r = 0.80$.

For one of the graphs below, $r = 0.95$.

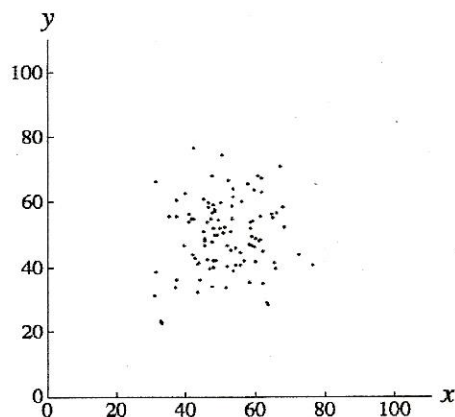
- a) r for the graph below is -0.90



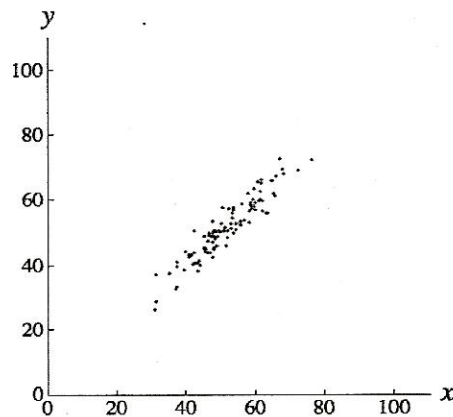
- b) r for the graph below is 0.80



- c) r for the graph below is 0.00



- d) r for the graph below is 0.95



2. (2 points) Fill in the blank: If a regression line for sample data is given by $\hat{y} = 13 + 4x$, then, along the regression line, for every increase of 1 unit in x , there is an increase of 4 units in y .

3. (2 points) Draw a scatterplot when the calculated correlations are -0.89 , -0.34 , 0.65 and 0.86

$r = -0.89$



$r = -0.34$



0.65



4. Concerns about global warming have led to studies of the relationship between global temperature and the concentration of carbon dioxide (CO_2). Listed below are concentrations (in parts per million) of CO_2 and temperatures (in $^{\circ}\text{C}$) for different years (based on the Earth Policy Institute).

CO_2	314	317	320	326	331	339	346	354	361	369
Temperature	13.9	14	13.9	14.1	14	14.3	14.1	14.5	14.5	14.4

- (a) (1 point) Which variable (CO_2 or Temp) should we take as the explanatory variable?

(a) CO_2

- (b) (1 point) Which variable (CO_2 or Temp) should we take as the response variable?

(b) Temp

- (c) (2 points) Find the correlation, r .

(c) 0.89

- (d) (2 points) What is the regression equation?

(d) $\hat{y} = 0.0109x + 10.48$

- (e) (1 point) What is the value of r^2 ?

(e) 0.80

- (f) (2 points) Interpret the meaning of r^2 in this context.

80% of the variation in Temperatures can be explained by CO_2 levels.

5. *Identify the type of sample survey.*

- (a) (1 point) A quality control engineer selects every 10,000th can of Febreze that is produced.

(a) Systematic Sampling

- (b) (1 point) All of the members of 22-hour fitness are asked to fill out a half-page questionnaire after they apply to the gym.

(b) Census

- (c) (1 point) PBC News polled reactions to the last presidential elections by surveying adults who were approached by a reporter in a bar in New York City.

(c) Convenience Sample

- (d) (1 point) A medical research corporation seeks to study the population of all hospitals in the U.S. that perform heart bypass surgery. A list of all hospitals in the U.S. that perform heart bypass surgery is generated. The hospitals on the list are numbered 1, 2, ... up to the total number N hospitals in the population. (Such a list is called a sampling frame.) A random number generator is then used to pick 30 hospitals from the list for the study.

(d) Simple Random Sample

- (e) (1 point) Nerdstroms Department Store at the mall has four different employee classifications: management, associate, loss prevention and trainee. Randomly select 10 employees from each category.

(e) Stratified Sampling

- (f) (1 point) Nerdstroms Department Store opened a new location at the mall last month. The district manager wants to find out how happy the employees who work there are with their jobs. She randomly selects a department (say, shoes) and surveys all the people who work in that department.

(f) Cluster

- (g) (1 point) Viewers who watch a certain political talk show are asked to text 333 to a phone number if they agree that Obamacare is a good idea and 444 if they disagree.

(g) Voluntary Response Sampling

6. For each pair of variables, indicate what association you expect: positive (+), negative (-), curved (C) or none (N).

(a) (1 point) The number of years 60-year-old males smoked; their blood pressure readings.

(a) +

(b) (1 point) The number of years 60-year-old males smoked; the number of years a 60-year-old male will live beyond age 60.

(b) -

(c) (1 point) The price of a cup of tea in China; the weekly earnings of a laborer in Sudan.

(c) N

7. A manufacturing company employs 14 project managers, 48 foreman, and 377 laborers. In an effort to keep informed about any possible sources of employee discontent, management wants to conduct job satisfaction interviews with a sample of employees.

(a) (2 points) Discuss any elements of bias in the company's plan.

Conducting interviews do not keep each employees data confidential. Unsatisfied employees are less likely to indicate their displeasure in an interview when they want to keep their jobs.

(b) (1 point) Propose a sampling strategy that uses a simple random sample.

Assign each employee a number from 1 to 439, then select at random 30 numbers from 1 to 439. The 30 employees associated with the 30 numbers are surveyed.

(c) (1 point) Why do you think a simple random sample might not provide the representative opinion the company seeks?

Because there are so many more laborers than there are project managers and foreman, laborers are more likely to be chosen at random than are project managers and foreman.

(d) (1 point) Propose a better sampling strategy.

Draw random samples from each stratum

8. (2 points) Based on the data from six students, the regression equation relating number of hours of preparation (x) and test score (y) is $\hat{y} = 67.3 + 1.07x$. The same data yield $r = 0.224$ and $\bar{y} = 75.2$. What is the best predicted test score for a student who spent 10 hours preparing for the test?

Since the correlation is so weak, the best predicted test score is $\bar{y} = 75.2$.

For questions 9 and 10, read each brief report of statistical research, and identify whether it was an observational study or an experiment.

9. (2 points) Among a group of disabled women aged 65 and older who were tracked for several years, those who had a vitamin B₁₂ deficiency were twice as likely to suffer severe depression as those who did not.

9. Observational Study

10. (2 points) Athletes who had suffered hamstring injuries were randomly assigned to one of two exercise programs. Those who engaged in static stretching returned to sports activity in a mean of 37.4 days (SD = 27.6 days). Those assigned to a program of agility and trunk stabilization exercises returned to sports in a mean of 22.2 days (SD = 8.3 days).

10. Experiment

For questions 11 and 12, a brief report of from an observational study is given. Identify whether the study was retrospective or perspective.

11. (2 points) The leg muscles of men aged 60 to 75 were 50% to 80% stronger after they participated in a 16-week, high intensity resistance-training program twice a week.

11. perspective

12. (2 points) In 2001 a report in the Journal of American Cancer Institute indicated that women who work nights have a 60% greater risk of developing breast cancer. Researchers based findings on the work histories of 763 women with breast cancer and 741 women without the disease.

12. retrospective