

Disclaimer

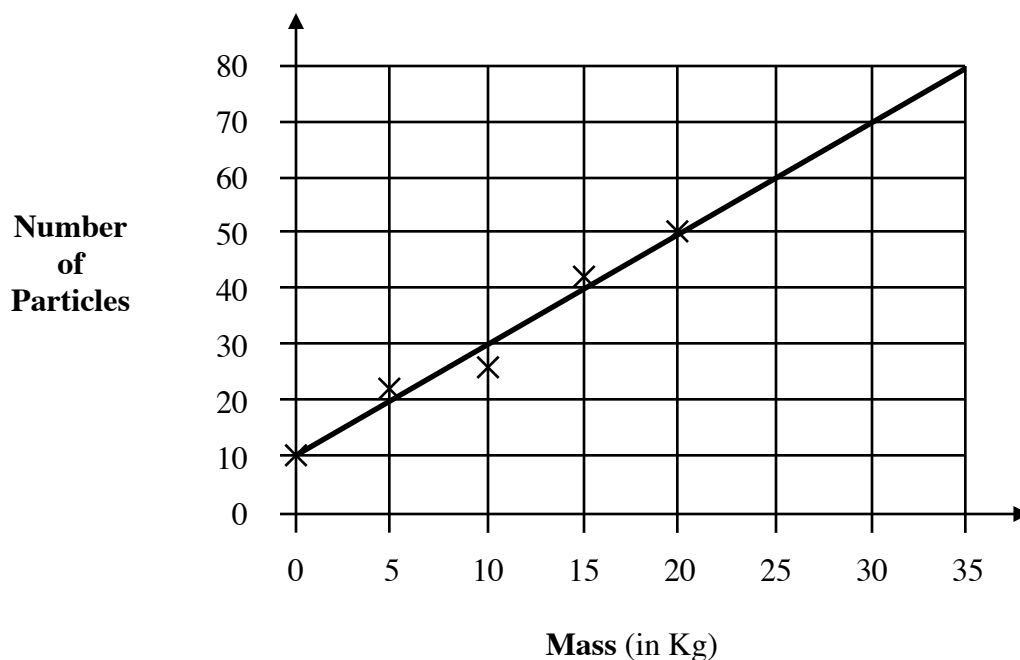
You should use this practice exam to assess your speed and to improve your ability to correctly identify different problem types. The questions on this practice exam are taken from exams given in previous semesters, but they may not be representative of the questions that will appear on this semester's exam. You should also invest time re-reading the relevant parts of your textbook, reviewing your notes, and practicing homework problems.

You will not receive full credit if you do not clearly show work as demonstrated in class. Show all work in the space provided on this exam. Circle your answers.

1. A researcher wishes to determine whether there is a relationship between the mass of a radioactive sample and the number of particles released over a ten minute time interval. The data is below.

Mass (in kilograms), x	10	0	15	20	5
Number of Particles, y	26	10	42	50	22

- a. Draw the scatter plot for the variables. (Mark each point with an \times .)



- b. Compute the correlation coefficient, r .

$$\Sigma x = 50 \quad \Sigma y = 150 \quad \Sigma xy = 2000 \quad \Sigma x^2 = 750 \quad \Sigma y^2 = 5524$$

$$\begin{aligned} r &= \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[n(\Sigma x^2) - (\Sigma x)^2][n(\Sigma y^2) - (\Sigma y)^2]}} \\ &= \frac{5(2000) - (50)(150)}{\sqrt{[5(750) - (50)^2][5(5524) - (150)^2]}} \\ &= \frac{2500}{\sqrt{[1250][5120]}} \\ &\approx 0.988 \end{aligned}$$

1. Continued from the previous page.

c. Test the significance of the correlation coefficient at $\alpha = 0.05$ using the PPMC table.

Step 1: State the hypotheses

$$H_0 : \rho = 0$$

$$H_1 : \rho \neq 0$$

Step 2: Find the critical value(s)

$$C.V. = \pm 0.878 \text{ (two-tailed test with } \alpha = 0.05 \text{ and } d.f. = n - 2 = 5 - 2 = 3)$$

Step 3: Compute the test value

$$r = +0.988$$

Step 4: Determine whether to reject the null (circle the correct phrase)

Reject H_0 .

Step 5: Summarize the results (circle the correct phrase)

There **is** a strong linear relationship between the two variables.

d. Compute the equation of the regression line, and graph it on the scatter plot.

$$a = \frac{(\Sigma y)(\Sigma x^2) - (\Sigma x)(\Sigma xy)}{n(\Sigma x^2) - (\Sigma x)^2} = \frac{(150)(750) - (50)(2000)}{1250} = \frac{12,500}{1250} = 10$$

$$b = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{n(\Sigma x^2) - (\Sigma x)^2} = \frac{2500}{1250} = 2$$

$$y' = a + bx$$

$$y' = 10 + 2x$$

1. *Continued from the previous page.*

e. Predict y' when $x = 45$ kilograms.

$$y' = 10 + 2x = 10 + 2(45) = 10 + 90 = 100$$

f. Compute the coefficient of determination.

$$r^2 = (0.988)^2 = 0.977$$

g. Compute the coefficient of nondetermination.

$$1 - r^2 = 1 - 0.977 = 0.023$$

h. Compute the standard error of the estimate.

$$s_{est} = \sqrt{\frac{\Sigma y^2 - a\Sigma y - b\Sigma xy}{n - 2}} = \sqrt{\frac{(5524) - 10(150) - 2(2000)}{5 - 2}} = \sqrt{\frac{24}{3}} = \sqrt{8} \approx 2.828$$

2. A recent survey asked adults nationwide if they thought that the federal government should continue to fund NASA's efforts to send unstaffed missions to Mars. Fifty-six percent said they should continue, 40% said that they should not continue, and 4% had no opinion. A random sample of 200 college students resulted in these numbers:

Observed

Should continue: 126

Should not continue: 65

No opinion: 9

Expected

Should continue: $200(56\%) = 112$

Should not continue: $200(40\%) = 80$

No opinion: $200(4\%) = 8$

Is there sufficient evidence at $\alpha = 0.05$ to conclude that the opinions of the college students differ from those of the report?

Step 1: State the hypotheses and identify the claim

H_0 : 56% say continue, 40% say don't continue, and 4% have no opinion

H_1 : The distribution is different from the one stated in the null (claim)

Step 2: Find the critical value(s)

C.V. = +5.991 (for $\alpha = 0.05$ and $d.f. = n - 1 = 3 - 1 = 2$)

Step 3: Compute the test value

$$\begin{aligned}\chi^2 &= \sum \frac{(O - E)^2}{E} \\ &= \frac{(126 - 112)^2}{112} + \frac{(65 - 80)^2}{80} + \frac{(9 - 8)^2}{8} \\ &= 1.75 + 2.8125 + 0.125 \\ &= +4.688\end{aligned}$$

Step 4: Determine whether to reject the null (circle the correct phrase)

Don't reject H_0 .

Step 5: Summarize the results (circle the correct terms)

We **don't** have sufficient evidence to **support** the claim.