MATH 110: Regression Correlation — Worksheet

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Learning Objectives

- Interpret the correlation coefficient r
- Compute the slope and intercept of the least-squares line
- Write and use a regression equation for prediction

Simplify each expression completely. Show all steps and circle your final answer.

Correlation Coefficient Interpretation

1. A study yields a correlation coefficient of r = 0.78. Describe the direction and strength of the linear relationship.

Answer: _____

2. A study yields a correlation coefficient of r = 0.54. Describe the direction and strength of the linear relationship.

Answer: _____

3. A study yields a correlation coefficient of r = -0.65. Describe the direction and strength of the linear relationship.

Answer: _____

4. A study yields a correlation coefficient of r = -0.28. Describe the direction and strength of the linear relationship.

Answer: _____

5. A study yields a correlation coefficient of r = -0.92. Describe the direction and strength of the linear relationship.

Answer: _____

Least-squares regression line from summary statistics

6. For a bivariate data set: r = 0.5, sx = 4, sy = 8, mean of x = 24, mean of y = 43. Find the least-squares regression line y-hat = a + bx.

Answer: _____

7. For a bivariate data set: r = 0.5, sx = 4, sy = 12, mean of x = 13, mean of y = 40. Find the least-squares regression line y-hat = a + bx.

Answer: _____

8. For a bivariate data set: r = 0.5, sx = 2, sy = 8, mean of x = 19, mean of y = 25. Find the least-squares regression line y-hat = a + bx.

Answer: _____

9. For a bivariate data set: r = 0.8, sx = 2, sy = 8, mean of x = 20, mean of y = 38. Find the least-squares regression line y-hat = a + bx.

Answer: _____

10. For a bivariate data set: r = 0.5, sx = 2, sy = 12, mean of x = 24, mean of y = 46. Find the least-squares regression line y-hat = a + bx.

Answer: _____

Prediction from a Regression Equation

11. A regression equation is y-hat = 15 + 9x. Predict y when x = 22.

Answer: _____

12. A regression equation is y-hat = 17 + 5x. Predict y when x = 16.

Answer: _____

13. A regression equation is y-hat = 19 + 1x. Predict y when x = 20.

Answer: _____

14. A regression equation is y-hat = 20 + 3x. Predict y when x = 7.

Answer: _____

15. A regression equation is y-hat = 16 + 9x. Predict y when x = 8.

Answer: _____

Describing a Scatterplot

16. A scatterplot shows: points clustered tightly around a line rising from left to right, with no unusual values. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

Answer: _____

17. A scatterplot shows: points that fall loosely along a line declining from left to right, with moderate scatter. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

Answer: _____

18. A scatterplot shows: points scattered randomly with no discernible pattern or trend. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

Answer: _____

19. A scatterplot shows: points clustered tightly around a line rising from left to right, with no unusual values. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

Answer: _____

20. A scatterplot shows: points that fall loosely along a line declining from left to right, with moderate scatter. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

Answer: _____

21. A scatterplot shows: points scattered randomly with no discernible pattern or trend. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

Answer: _____

22. A scatterplot shows: points clustered tightly around a line rising from left to right, with no unusual values. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

Answer: _____

23. A scatterplot shows: points that fall loosely along a line declining from left to right, with moderate scatter. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

Answer: _____

24. A scatterplot shows: points scattered randomly with no discernible pattern or trend. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

Answer: _____

25. A scatterplot shows: points clustered tightly around a line rising from left to right, with no unusual values. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

Answer: _____

26. A scatterplot shows: points that fall loosely along a line declining from left to right, with moderate scatter. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

Answer: _____

27. A scatterplot shows: points scattered randomly with no discernible pattern or trend. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

Answer: _____

28. A scatterplot shows: points clustered tightly around a line rising from left to right, with no unusual values. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

Answer: _____

29. A scatterplot shows: points that fall loosely along a line declining from left to right, with moderate scatter. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

Answer: _____

30. A scatterplot shows: points scattered randomly with no discernible pattern or trend. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

Answer: _____

Answer Key & Solutions

Topics: Describing a Scatterplot, Least-squares regression line from summary statistics, Correlation Coefficient Interpretation, Prediction from a Regression Equation. All answers verified by independent computation.

Solutions

Correlation Coefficient Interpretation

1. A study yields a correlation coefficient of r = 0.78. Describe the direction and strength of the linear relationship.

    - Sign of r: r=0.78 is positive (positive r means positive association, negative means negative).
    - |r| = 0.78. Strength: |r| < 0.3 is weak, 0.3 to 0.7 is moderate, > 0.7 is strong.
    - This is a strong positive linear relationship.

Answer: _____

2. A study yields a correlation coefficient of r = 0.54. Describe the direction and strength of the linear relationship.

    - Sign of r: r=0.54 is positive (positive r means positive association, negative means negative).
    - |r| = 0.54. Strength: |r| < 0.3 is weak, 0.3 to 0.7 is moderate, > 0.7 is strong.
    - This is a moderate positive linear relationship.

Answer: _____

3. A study yields a correlation coefficient of r = -0.65. Describe the direction and strength of the linear relationship.

    - Sign of r: r=-0.65 is negative (positive r means positive association, negative means negative).
    - |r| = 0.65. Strength: |r| < 0.3 is weak, 0.3 to 0.7 is moderate, > 0.7 is strong.
    - This is a moderate negative linear relationship.

Answer: _____

4. A study yields a correlation coefficient of r = -0.28. Describe the direction and strength of the linear relationship.

    - Sign of r: r=-0.28 is negative (positive r means positive association, negative means negative).
    - |r| = 0.28. Strength: |r| < 0.3 is weak, 0.3 to 0.7 is moderate, > 0.7 is strong.
    - This is a weak negative linear relationship.

Answer: _____

5. A study yields a correlation coefficient of r = -0.92. Describe the direction and strength of the linear relationship.

    - Sign of r: r=-0.92 is negative (positive r means positive association, negative means negative).

- |r| = 0.92. Strength: |r| < 0.3 is weak, 0.3 to 0.7 is moderate, > 0.7 is strong.
- This is a strong negative linear relationship.

Answer: _____

Least-squares regression line from summary statistics

6. For a bivariate data set: r = 0.5, sx = 4, sy = 8, mean of x = 24, mean of y = 43. Find the least-squares regression line y-hat = a + bx.

   - Slope b = r x (sy/sx) = 0.5 x (8/4) = 1.0.
   - Intercept a = (mean y) - b x (mean x) = 43 - (1.0)(24) = 19.0.
   - Regression line: y-hat = 19.0 + 1.0x (r-squared = 0.25).

Answer: _____

7. For a bivariate data set: r = 0.5, sx = 4, sy = 12, mean of x = 13, mean of y = 40. Find the least-squares regression line y-hat = a + bx.

   - Slope b = r x (sy/sx) = 0.5 x (12/4) = 1.5.
   - Intercept a = (mean y) - b x (mean x) = 40 - (1.5)(13) = 20.5.
   - Regression line: y-hat = 20.5 + 1.5x (r-squared = 0.25).

Answer: _____

8. For a bivariate data set: r = 0.5, sx = 2, sy = 8, mean of x = 19, mean of y = 25. Find the least-squares regression line y-hat = a + bx.

   - Slope b = r x (sy/sx) = 0.5 x (8/2) = 2.0.
   - Intercept a = (mean y) - b x (mean x) = 25 - (2.0)(19) = -13.0.
   - Regression line: y-hat = -13.0 + 2.0x (r-squared = 0.25).

Answer: _____

9. For a bivariate data set: r = 0.8, sx = 2, sy = 8, mean of x = 20, mean of y = 38. Find the least-squares regression line y-hat = a + bx.

   - Slope b = r x (sy/sx) = 0.8 x (8/2) = 3.2.
   - Intercept a = (mean y) - b x (mean x) = 38 - (3.2)(20) = -26.0.
   - Regression line: y-hat = -26.0 + 3.2x (r-squared = 0.64).

Answer: _____

10. For a bivariate data set: r = 0.5, sx = 2, sy = 12, mean of x = 24, mean of y = 46. Find the least-squares regression line y-hat = a + bx.

    - Slope b = r x (sy/sx) = 0.5 x (12/2) = 3.0.
    - Intercept a = (mean y) - b x (mean x) = 46 - (3.0)(24) = -26.0.
    - Regression line: y-hat = -26.0 + 3.0x (r-squared = 0.25).

Answer: _____

Prediction from a Regression Equation

11. A regression equation is y-hat = 15 + 9x. Predict y when x = 22.

- Substitute x = 22 into y-hat = 15 + 9x.
- y-hat = 15 + 9(22) = 213.

Answer: _____

12. A regression equation is y-hat = 17 + 5x. Predict y when x = 16.

- Substitute x = 16 into y-hat = 17 + 5x.
- y-hat = 17 + 5(16) = 97.

Answer: _____

13. A regression equation is y-hat = 19 + 1x. Predict y when x = 20.

- Substitute x = 20 into y-hat = 19 + 1x.
- y-hat = 19 + 1(20) = 39.

Answer: _____

14. A regression equation is y-hat = 20 + 3x. Predict y when x = 7.

- Substitute x = 7 into y-hat = 20 + 3x.
- y-hat = 20 + 3(7) = 41.

Answer: _____

15. A regression equation is y-hat = 16 + 9x. Predict y when x = 8.

- Substitute x = 8 into y-hat = 16 + 9x.
- y-hat = 16 + 9(8) = 88.

Answer: _____

Describing a Scatterplot

16. A scatterplot shows: points clustered tightly around a line rising from left to right, with no unusual values. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

- Direction: points rise left to right -> positive.
- Form: points cluster around a line -> linear.
- Strength: tight clustering -> strong.
- Answer: A) positive, linear, strong.

Answer: _____

17. A scatterplot shows: points that fall loosely along a line declining from left to right, with moderate scatter. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

    - Direction: points decline left to right -> negative.
    - Form: points loosely follow a line -> linear.
    - Strength: moderate scatter -> moderate.
    - Answer: B) negative, linear, moderate.

Answer: _____

18. A scatterplot shows: points scattered randomly with no discernible pattern or trend. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

    - No pattern is visible in the scatterplot -> no association.
    - Answer: C) no association.

Answer: _____

19. A scatterplot shows: points clustered tightly around a line rising from left to right, with no unusual values. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

    - Direction: points rise left to right -> positive.
    - Form: points cluster around a line -> linear.
    - Strength: tight clustering -> strong.
    - Answer: A) positive, linear, strong.

Answer: _____

20. A scatterplot shows: points that fall loosely along a line declining from left to right, with moderate scatter. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

    - Direction: points decline left to right -> negative.
    - Form: points loosely follow a line -> linear.
    - Strength: moderate scatter -> moderate.
    - Answer: B) negative, linear, moderate.

Answer: _____

21. A scatterplot shows: points scattered randomly with no discernible pattern or trend. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

    - No pattern is visible in the scatterplot -> no association.

- Answer: C) no association.

Answer: _____

22. A scatterplot shows: points clustered tightly around a line rising from left to right, with no unusual values. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

- Direction: points rise left to right -> positive.
- Form: points cluster around a line -> linear.
- Strength: tight clustering -> strong.
- Answer: A) positive, linear, strong.

Answer: _____

23. A scatterplot shows: points that fall loosely along a line declining from left to right, with moderate scatter. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

- Direction: points decline left to right -> negative.
- Form: points loosely follow a line -> linear.
- Strength: moderate scatter -> moderate.
- Answer: B) negative, linear, moderate.

Answer: _____

24. A scatterplot shows: points scattered randomly with no discernible pattern or trend. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

- No pattern is visible in the scatterplot -> no association.
- Answer: C) no association.

Answer: _____

25. A scatterplot shows: points clustered tightly around a line rising from left to right, with no unusual values. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

- Direction: points rise left to right -> positive.
- Form: points cluster around a line -> linear.
- Strength: tight clustering -> strong.
- Answer: A) positive, linear, strong.

Answer: _____

26. A scatterplot shows: points that fall loosely along a line declining from left to right, with moderate scatter. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

- Direction: points decline left to right -> negative.
- Form: points loosely follow a line -> linear.
- Strength: moderate scatter -> moderate.
- Answer: B) negative, linear, moderate.

Answer: _____

27. A scatterplot shows: points scattered randomly with no discernible pattern or trend. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

- No pattern is visible in the scatterplot -> no association.
- Answer: C) no association.

Answer: _____

28. A scatterplot shows: points clustered tightly around a line rising from left to right, with no unusual values. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

- Direction: points rise left to right -> positive.
- Form: points cluster around a line -> linear.
- Strength: tight clustering -> strong.
- Answer: A) positive, linear, strong.

Answer: _____

29. A scatterplot shows: points that fall loosely along a line declining from left to right, with moderate scatter. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

- Direction: points decline left to right -> negative.
- Form: points loosely follow a line -> linear.
- Strength: moderate scatter -> moderate.
- Answer: B) negative, linear, moderate.

Answer: _____

30. A scatterplot shows: points scattered randomly with no discernible pattern or trend. What are the direction, form, and strength of the association? Options: A) positive, linear, strong B) negative, linear, moderate C) no association

- No pattern is visible in the scatterplot -> no association.

- Answer: C) no association.

Answer: _____