Linear Apps Test Review

Topics

- Arithmetic Sequences — $a_n = a_1 + (n-1)d$
- Inverses
- Direct Variation — $y = kx$
- Inequalities in 2 variables
- Scatter/Correlation
- Interpolation/Extrapolation
- Residuals
- Word Problems

Sequences:

Find the 27th term of the sequence:

$-4, -7, -10, \ldots$

$a_{27} = -4 + (27-1)(-3)$

$= -4 + (26)(-3)$

$= -4 - 78$

$a_{27} = -82$

Given that $a_{17} = 101$ and $a_{24} = 150$. Find the first term:

(n, a_n): (17, 101) (24, 150)

$d = \frac{150-101}{24-17} = \frac{49}{7} = 7$

$101 = a_1 + (17-1)(7)$

$101 = a_1 + 112$

$-112 \quad -112$

$-11 = a_1$

Find the missing terms:

63, 80, 97, 114, 131, 148

(1, 63) +17 +17 +17 +17 (6, 148)

$d = \frac{148-63}{6-1} = 17$

Write the explicit formula for:

10, 6, 2, ...

$a_1 = 10$

$d = -4$

$a_n = 10 + (n-1)(-4)$

$a_n = 10 - 4n + 4$

$a_n = -4n + 14$

Find the 83rd term:

$a_{83} = -4(83) + 14$

$a_{83} = -318$

Find which term is -274

$-274 = -4n + 14$

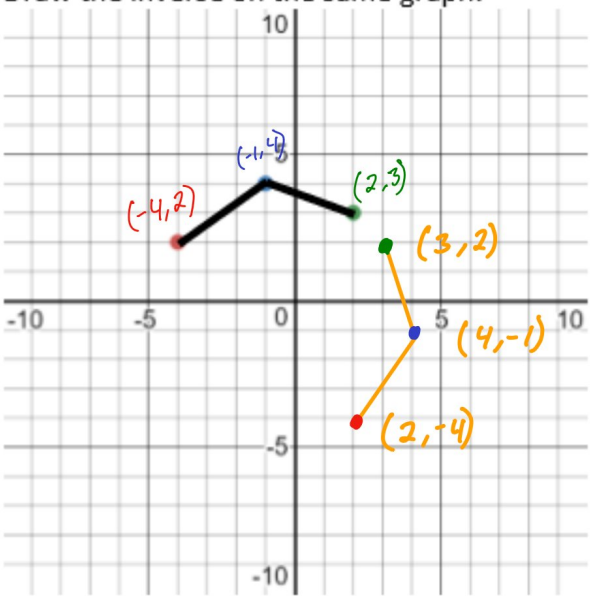
$-14 \quad -14$

$\frac{-288}{-4} = \frac{-4n}{-4}$

$n = 72$

Inverses:

Draw the inverse on the same graph:



Find the inverse of each function:

a) $f(x) = -4x + 3$

$y = -4x + 3$ Write with y

$x = -4y + 3$ Switch x and y

$-3 \quad -3$

Solve for new y

$\frac{x-3}{-4} = \frac{-4y}{-4}$

$y = \frac{x-3}{-4}$ → $f^{-1}(x) = \frac{x-3}{-4}$

b) $f(x) = \frac{3x-1}{2}$

$y = \frac{3x-1}{2}$

$2 \cdot x = \frac{3y-1}{2} \cdot 2$

$2x = 3y - 1$

$+1 \quad +1$

$\frac{2x+1}{3} = \frac{3y}{3}$ → $y = \frac{2x+1}{3}$

$f^{-1}(x) = \frac{2x+1}{3}$

Residuals:

Prediction eq

The following data is modeled by the linear regression equation: $y = 1.1x + 9.3$. Find all the predicted values of y. Then find all the residuals.

x	y	Predicted (y)	Residuals
1	10	10.4	-.4
2	13	11.5	1.5
3	12	12.6	-.6
4	12	13.7	-1.7
5	16	14.8	1.2

$1.1(1) + 9.3 = 10.4$

$1.1(2) + 9.3 = 11.5$

$1.1(3) + 9.3 = 12.6$

$1.1(4) + 9.3 = 13.7$

$1.1(5) + 9.3 = 14.8$

Residuals = Actual y − Predicted y

1. The table gives the life expectancy of a child born in the United States in a given year.

a. Enter the data into the calculator. **Use years since 1920 as the independent variable**

b. Describe the correlation of the scatterplot.

positive, strong

Years of Life Expected at Birth	
Year of Birth	Life Expectancy (years)
1920 (0)	54.1
1930 (10)	59.7
1940 (20)	62.9
1950 (30)	68.2
1960 (40)	69.7
1970 (50)	70.8
1980 (60)	73.7
1985 (65)	74.7
1990 (70)	75.4
1995 (75)	75.8

c. Find the linear regression Equation → from calc

$y = .27x + 57$

d. What is the r-value? What does the r-value indicate?

$r = .975$ strong positive

e. Use the data to predict the life expectancy of a baby born in 2016. Explain how you determined your answer (interpolation or extrapolation). Is your answer reasonable in context?

2016 → $x = 96$

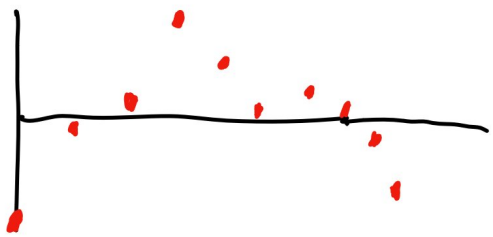
$y = .27(96) + 57$

$y = 82.92$

because 2016 is bigger than 1995

→ yes, people live to 83.

f. **Sketch** the residual plot. Does is imply that a linear model is appropriate?



yes

Word: Ann is twice as old as Bill. The sum of their ages is 48 fewer than 5 times Bill's age. How old be they?

Let x = Bill's age

then $2x$ = Ann's age

$x + 2x = 5x - 48$

$3x = 5x - 48$

$-5x \quad -5x$

$-2x = -48$

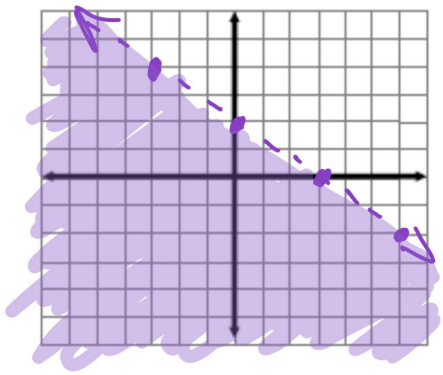
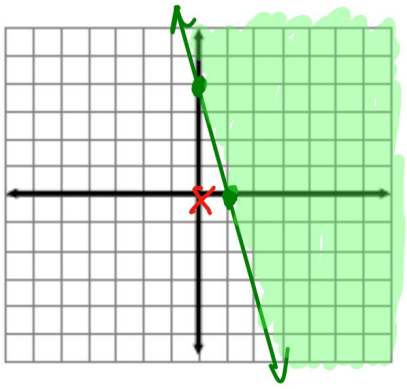
$x = 24$

They be:

Bill is 24

Ann is 48

Graph the following Inequalities

$y < -\frac{2}{3}x + 2$ ↖ y-int ↑ slope dotted Shade below Write one solution:	
$4x + y \geq 4$ → solid X-int: 1 y-int: 4 Test Point: $0 \geq 4$ False Write one solution:	

Find the missing terms: 102, 71, 40, 9, -22, -53

(2,71) (5,-22) $\frac{-22-71}{5-2} = -31$

Write a formula for this sequence: $a_n = 102 + (n-1)(-31)$

$102 + -31n + 31$

$a_n = -31n + 133$

What is the 13th term?

$a_{13} = -31(13) + 133$

$a_{13} = -270$