

Math 124: Algebra with Applications
Spring 2019
Exam 2 Practice Problems

Name (Print): _____

- Solve each equation.

1. $6z + 5 = 59$ Answer: $z = 9$
2. $5m + 10 = 30$ Answer: $m = 4$
3. $5x + 4 = 19$ Answer: $x = 3$
4. $3x + 4 = 22$ Answer: $x = 6$
5. $12x + 3 = 27$ Answer: $x = 2$
6. $6 + 7x = 55$ Answer: $x = 7$
7. $4x + 16 = 20$ Answer: $x = 1$
8. $5x = 6 + 2x$ Answer: $x = 2$
9. $5x + 5 = 20$ Answer: $x = 3$
10. $25x + 30 = 50$ Answer: $x = \frac{4}{5} = 0.8$
11. $5r + 15 = 240$ Answer: $r = 45$
12. $5x + 6(4x - 17) = 14$ Answer: $x = 4$
13. $2(x + 5) - 7 = 3(x - 2)$ Answer: $x = 9$
14. $2x + 30 = 56$ Answer: $x = 13$
15. $\frac{3}{x} - \frac{3}{4x} = \frac{21}{8}$ Answer: $x = \frac{6}{7}$
16. $|9y + 4| = 40$ Answer: $y = 4$ or $y = -\frac{44}{9}$
17. $|8x + 4| = 20$ Answer: $x = 2$ or $x = -3$
18. $\left| \frac{3}{r+3} \right| = 12$ Answer: $r = -\frac{11}{4}$ or $r = -\frac{13}{4}$
19. $|2p - 2| = 6$ Answer: $p = 4$ or $y = -2$
20. $|m - 4| = 12$ Answer: $m = 16$ or $m = -8$
21. $|4x + 7| = 35$ Answer: $x = 7$ or $x = -\frac{21}{2}$
22. $|k - 9| = 4$ Answer: $k = 13$ or $k = 5$
23. $|3x - 6| = 12$ Answer: $x = 6$ or $x = -2$
24. $|4x - 2| = 10$ Answer: $x = 3$ or $x = -2$
25. $|-2x + 7| = 25$ Answer: $x = -9$ or $x = 16$
26. $|9 - 2x| = 3$ Answer: $x = 3$ or $x = 6$
27. $|10 + 5x| = 50$ Answer: $x = 8$ or $x = -12$

- Answer each of the following problems.

1. It is found that at Little General, the distance you can travel on x dollars worth of gas is given by $y = 8x$, where y is the total distance in miles. How much will it cost to get enough gas to travel 120 miles?

Answer: \$15

2. Tommy can only tell temperatures in Kelvin. The relationship between temperature in Kelvin and temperature in degrees Fahrenheit is given by $F = \frac{9}{5}(K - 273) + 32$, where F is the temperature in degrees Fahrenheit and K is the temperature in Kelvin. If the thermostat reading says 59 degrees Fahrenheit, what is the temperature in Kelvin?

Answer: 288 Kelvin

- Solve each inequality.

1. $4 - 2a \leq 36$ Answer: $a \geq -16, [-16, \infty)$

2. $6x - 7 \leq 4 - 2x$ Answer: $x \leq \frac{11}{8}, (-\infty, \frac{11}{8}]$

3. $-7a \leq 21$ Answer: $a \geq -3, [-3, \infty)$

4. $3x + 2 \leq 8$ Answer: $x \leq 2, (-\infty, 2]$

5. $-3x + 5 \leq -16$ Answer: $x \geq 7, [7, \infty)$

6. $-3(4y - 8) \leq 5(2y - 4)$ Answer: $y \geq 2, [2, \infty)$

7. $4(x + 2) \geq -2$ Answer: $x \geq -\frac{5}{2}, [-\frac{5}{2}, \infty)$

8. $10x + 5 < 12 - 18x$ Answer: $x < \frac{1}{4}, (-\infty, \frac{1}{4})$

9. $-4b \leq 16$ Answer: $b \geq -4, [-4, \infty)$

10. $3(x + 3) \leq 5(x - 1)$ Answer: $x \geq 7, [7, \infty)$

11. $3x + 6 \leq 18$ Answer: $x \leq 4, (-\infty, 4]$

12. $-10x \geq 30$ Answer: $x \leq -3, (-\infty, -3]$

13. $4k + 3 < 10$ Answer: $k < \frac{7}{4}, (-\infty, \frac{7}{4})$

14. $4x - 12 < 48$ Answer: $x < 15, (-\infty, 15)$

15. $|x| \leq 2$ Answer: $-2 \leq x \leq 2, [-2, 2]$

16. $|3 + x| < 7$ Answer: $-10 < x < 4, (-10, 4)$

17. $|5x - 3| \geq 13$ Answer: $x \geq \frac{16}{5}$ or $x \leq -2, (-\infty, -2] \cup [\frac{16}{5}, \infty)$

18. $|12t + 9| - 64 < 1$ Answer: $-\frac{37}{6} < t < \frac{14}{3}, (-\frac{37}{6}, \frac{14}{3})$

19. $|3x + 4| < 5$ Answer: $-3 < x < \frac{1}{3}, (-3, \frac{1}{3})$

20. $|x + 2| \leq 4$ Answer: $-6 \leq x \leq 2, [-6, 2]$

21. $|6x + 4| \geq 8$ Answer: $x \geq \frac{2}{3}$ or $x \leq -2, (\frac{2}{3}, \infty) \cup (-\infty, -2]$

22. $2 \cdot |4x + 2| < 12$ Answer: $-2 < x < 1, (-2, 1)$

23. $|s| \leq 10$ Answer: $-10 \leq x \leq 10, [-10, 10]$

24. $|7a + 5| < 21$ Answer: $\frac{26}{7} < x < \frac{16}{7}, (-\frac{26}{7}, \frac{16}{7})$

25. $|x - \frac{2}{3}| > 4$ Answer: $x > \frac{14}{3}$ or $x < -\frac{10}{3}, (-\infty, -\frac{10}{3}) \cup (\frac{14}{3}, \infty)$

26. $|4x + 6| \leq 18$ Answer: $-6 \leq x \leq 3, [-6, 3]$
27. $|x| > 5$ Answer: $x > 5$ or $x < -5, (-\infty, -5] \cup [5, \infty)$
28. $|5x + 3| \geq 11$ Answer: $x \geq \frac{8}{5}$ or $x \leq -\frac{14}{5}, (-\infty, -\frac{14}{5}] \cup [\frac{8}{5}, \infty)$
29. $|x + 5| > 15$ Answer: $x > 10$ or $x < -20, (-\infty, -20) \cup (10, \infty)$

- Find the x -intercepts and y -intercepts of the graph of each equation.

1. $5x + 10y = 50$ Answer: x -intercept= 10, y -intercept= 5
2. $3x + 5y = 15$ Answer: x -intercept= 5, y -intercept= 3
3. $10x - 4y = 20$ Answer: x -intercept= 2, y -intercept= -5
4. $2x + 6y = 18$ Answer: x -intercept= 9, y -intercept= 3
5. $5x + 4y = 20$ Answer: x -intercept= 4, y -intercept= 5
6. $5x + 3y = 30$ Answer: x -intercept= 6, y -intercept= 10
7. $y = 5x - 2$ Answer: x -intercept= $\frac{2}{5}$, y -intercept= -2
8. $y = -2x + 4$ Answer: x -intercept= 2, y -intercept= 4
9. $6x + 2y = 12$ Answer: x -intercept= 2, y -intercept= 6
10. $9x + 4y = 18$ Answer: x -intercept= 2, y -intercept= $\frac{9}{2}$
11. $x - 2y = 1$ Answer: x -intercept= 1, y -intercept= $-\frac{1}{2}$

- Find an equation of the line satisfying the given conditions. Note that multiple answers are possible.

1. Find an equation of the line that passes through (5, 10) and (-3, 6).
Answer: $y - 10 = \frac{1}{2}(x - 5)$
2. Find an equation of the line that passes through (5, 7) and (8, -10).
Answer: $y - 7 = -\frac{17}{3}(x - 5)$
3. Find an equation of the line that passes through (3, 4) and (5, 1).
Answer: $y - 4 = -\frac{3}{2}(x - 3)$
4. Find an equation of the line that passes through (2, 4) and (5, 5).
Answer: $y - 4 = \frac{1}{3}(x - 2)$
5. Find an equation of the line that passes through (3, 5) and (0, 2).
Answer: $y - 5 = x - 3$
6. Find an equation of the line with slope $m = 6$ that passes through the point (12, 6).
Answer: $y - 6 = 6(x - 12)$
7. Find an equation of the line with slope $m = 4$ that passes through the point (4, 3).
Answer: $y - 3 = 4(x - 4)$
8. Find an equation of the line with undefined slope that passes through the point (4, 3).
Answer: $x = 4$
9. Find an equation of the line with slope $m = -4$ that passes through the point (12, 3).
Answer: $y - 3 = -4(x - 12)$
10. Find an equation of the line with slope $m = 2$ that passes through the point (3, 6).
Answer: $y - 6 = 2(x - 3)$

11. Find an equation of the line with undefined slope that passes through the point $(3, 4)$.

Answer: $x = 3$

12. Find an equation of the line with slope $m = 0$ that passes through the point $(2, 5)$.

Answer: $y = 5$

13. Find an equation of the line with slope $m = \frac{1}{3}$ that passes through the point $(6, 4)$.

Answer: $y - 4 = \frac{1}{3}(x - 6)$

14. Find an equation of the line that passes through the point $(2, -4)$ and is parallel to $3x + 2y = 6$.

Answer: $y + 4 = -\frac{3}{2}(x - 2)$

15. Find an equation of the line that passes through the point $(0, 3)$ and is perpendicular to $2x + y = 6$.

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

- In each of the following problems, two linear models are given for the data. For each model, complete the table to find the residuals, the squares of the residuals, and their sum. Then decide which model is the better fit.

1. Consider the following data on the number of deaths per 100,000 people from heart disease in selected years:

Year	1990	1995	2000	2005	2010
Deaths	321.8	293.4	257.6	211.1	178.5

We consider the following two models, where x is the number of years since 1990, so that $x = 0$ corresponds to the year 1990:

Model 1: $y = -7.66x + 331.7$

Model 2: $y = -9.3x + 350.6$

Fill in each table:

$$y = -7.66x + 331.7$$

Data (x, y)	Model (x, \hat{y})	Residual $y - \hat{y}$	Squared Residual $(y - \hat{y})^2$
(0, 321.8)	(0, 331.7)	-9.9	98.01
(5, 293.4)	(5, 293.4)	0	0
(10, 257.6)	(10, 255.1)	2.5	6.25
(15, 211.1)	(15, 216.8)	-5.7	32.49
(20, 178.5)	(20, 178.5)	0	0
		Total:	136.75

$$y = -9.3x + 350.6$$

Data (x, y)	Model (x, \hat{y})	Residual $y - \hat{y}$	Squared Residual $(y - \hat{y})^2$
(0, 321.8)	(0, 350.6)	-28.8	829.44
(5, 293.4)	(5, 304.1)	-10.7	114.49
(10, 257.6)	(10, 257.6)	0	0
(15, 211.1)	(15, 211.1)	0	0
(20, 178.5)	(20, 164.6)	13.9	193.21
		Total:	1137.14

Which model fits the data better?

Answer: $y = -7.66x + 331.7$

2. Consider the following data on the number of basic cable television subscribers (in millions):

Year	2002	2004	2006	2008	2010
Subscribers	66.5	65.7	65.3	64.3	61.0

We consider the following two models, where x is the number of years since 2000, so that $x = 2$ corresponds to the year 2002:

Model 1: $y = -0.5x + 68.3$

Model 2: $y = -0.3x + 67.1$

Fill in each table:

$y = -0.5x + 68.3$			
Data (x, y)	Model (x, \hat{y})	Residual $y - \hat{y}$	Squared Residual $(y - \hat{y})^2$
(2, 66.5)	(2, 67.3)	-0.8	0.64
(4, 65.7)	(4, 66.3)	-0.6	0.36
(6, 65.3)	(6, 65.3)	0	0
(8, 64.3)	(8, 64.3)	0	0
(10, 61.0)	(10, 63.3)	-2.3	5.29
		Total:	6.29

$$y = -0.3x + 67.1$$

Data (x, y)	Model (x, \hat{y})	Residual $y - \hat{y}$	Squared Residual $(y - \hat{y})^2$
(2, 66.5)	(2, 66.5)	0	0
(4, 65.7)	(4, 65.9)	-0.2	0.04
(6, 65.3)	(6, 65.3)	0	0
(8, 64.3)	(8, 64.7)	-0.4	0.16
(10, 61.0)	(10, 64.1)	-3.1	9.61
		Total:	9.81

Which model fits the data better?

Answer: $y = -0.5x + 68.3$