1. What is a system of linear equations?
   - Intersect 2 lines.
   - Parallel or same line.

2. What does it mean to be a solution to a system of linear equations?
   - A solution is a point shared by both lines.

3. Is (-1,1) a solution to the following system?
   \[ \begin{align*}
   5x + 3y &= 1 \\
   6x + 2y &= -3
   \end{align*} \]
   - \[ \begin{align*}
   6(-1) + 2(1) &= -3 \\
   -6 + 2 &= -4
   \end{align*} \]
   - No.

4. Is (4,-1) a solution to the following system?
   \[ \begin{align*}
   3x + y &= 11 \\
   x - 2y &= 6
   \end{align*} \]
   - \[ \begin{align*}
   3(4) + (-1) &= 11 \\
   14 - 2(-1) &= 16
   \end{align*} \]
   - Yes.

5. When will a system have only one solution?
   - How will you tell from a graph?
     - There is one point where the lines intersect.
   - How will you tell from its equations?
     - Different slope \( m_1 \neq m_2 \)
     - Different y-intercept \( b_1 \neq b_2 \)

6. When will a system have no solutions?
   - How will you tell from a graph?
     - Parallel lines
   - How will you tell from its equations?
     - Same slope \( m_1 = m_2 \)
     - Different y-intercept \( b_1 \neq b_2 \)

7. When will a system have an infinite number of solutions?
   - How will you tell from a graph?
     - Same line
   - How will you tell from its equations?
     - Same slope \( m_1 = m_2 \)
     - Same y-intercept \( b_1 = b_2 \)

8. How many solutions does the following system have?
   \[ \begin{align*}
   4x + y &= 9 \\
   4x - y &= -9
   \end{align*} \]
   - \[ \begin{align*}
   y &= -4x + 9 \\
   y &= 4x + 9
   \end{align*} \]
   - One solution

9. How many solutions does the following system have?
   \[ \begin{align*}
   2y &= x + 3 \\
   \frac{2y}{2} &= \frac{x + 3}{2}
   \end{align*} \]
   - \[ \begin{align*}
   y &= \frac{3}{2}x + \frac{3}{2}
   \end{align*} \]
   - Infinite solutions
10. Find the solution to the following system by graphing.
\[ y = \frac{3}{2}x - 6 \]
\[ y = x - 1 \]
Solution: \((-2, 3)\)

11. Find the solution to the following system by graphing.
\[ x - 2y = 10 \]
\[ 2y + x = -5 \]
Solution: \((-2, -6)\)

12. Find the solution to the following system by graphing.
\[ 7x - 2y = 20 \]
\[ 3x + y = 3 \]
\[ y = -3x + 3 \]
Solution: \((2, -3)\)

13. Find the solution to the following system by graphing.
\[ 2y - 3x = 3 \]
\[ x + y = 4 \]
Solution: \((3, 1)\)

\[ x + y = 9 \]
\[ 2x + y = 11 \]
\[ 2(9 - y) = 11 \]
\[ 18 - 2y = 11 \]
\[ -2y = -7 \]
\[ y = 3.5 \]
\[ x = 9 - y \]
\[ x = 9 - 3.5 \]
\[ x = 5.5 \]

15. Solve using substitution.
\[ 2y + 3x = 11 \]
\[ 5x - y = -15 \]
\[ 2 + 3(5x + 15) = 11 \]
\[ 2x + 15x + 45 = 11 \]
\[ -45 \]
\[ 17x = -34 \]
\[ x = -2 \]
\[ y = 5(-2) + 15 \]
\[ y = -10 + 15 \]
\[ y = 5 \]
16. Solve using substitution.
\[ 3x - 4y = -15 \]
\[ 5x + y = -2 \]
\[
\begin{align*}
3x - 4(2 - 5x) & = -15 \\
3x + 8 + 20x & = -15 \\
-8 & = -8 \\
\frac{23x}{23} & = -8 \\
x & = -3
\end{align*}
\]
\[
\begin{align*}
y & = -(2 - 5(-3)) \\
y & = -2 + 15 \\
y & = 13
\end{align*}
\]

17. Solve using substitution.
\[ 4x + 6y = 1 \]
\[ x + y = \frac{1}{2} \]
\[
\begin{align*}
x & = \frac{1}{2} - y \\
4 \left( \frac{1}{2} - y \right) + 6y & = 1 \\
2 - 4y + 6y & = 1 \\
2y & = 1 \\
y & = \frac{1}{2}
\end{align*}
\]
\[
\begin{align*}
x & = \frac{1}{2} - \frac{1}{2} \\
x & = 0
\end{align*}
\]

18. Solve using elimination (add/subtract).
\[ 2x + 3y = -5 \]
\[ 5x - 3y = 19 \]
\[
\begin{align*}
2x + 3y & = -5 \\
+ \quad 5x - 3y & = 19 \\
\hline
7x & = 14 \\
x & = 2
\end{align*}
\]
\[
\begin{align*}
y & = -3
\end{align*}
\]

19. Solve using elimination (add/subtract).
\[ 3s + 4t = 18 \]
\[ 2s - 3t = -5 \]
\[
\begin{align*}
3s + 12t & = 54 \\
+ \quad 2s - 3t & = -5 \\
\hline
5s + 9t & = 49
\end{align*}
\]
\[
\begin{align*}
s & = 2 \\
\frac{17s + 6t = 34}{17} \\
17s + 6t & = 34 \\
17s & = 34 \\
17 & = 34
\end{align*}
\]
\[
\begin{align*}
t & = 3
\end{align*}
\]

20. Solve using elimination (add/subtract).
\[ 3x + y = 9 \]
\[ 6x + 2y = 6 \]
\[
\begin{align*}
-6x - 2y & = -18 \\
+ \quad 6x + 2y & = 6 \\
\hline
0x + 0y & = -12
\end{align*}
\]
\[
\text{no solution} \\
\text{LHS \& RHS.}
\]

\[ 3x + t = 9 \\
6x + 2t = 18 \]
\[
\begin{align*}
-6x - 2t & = -18 \\
+ \quad 6s + 2t & = 18 \\
\hline
0s + 0t & = 0
\end{align*}
\]
\[
\text{infinite solutions} \\
\text{LHS = RHS means same line.}
\]
22. The cost of 4L of oil and 50L of gasoline is $42.50. The cost of 3L of oil and 35L of gasoline is $30.30. Find the price per litre of gasoline and oil.

\[
\begin{align*}
40 + 50g &= 42.50 \\
30 + 35g &= 30.30 \\
10 &= 12.50 - 12.50 \\
0 &= 0.63 \\
10 &= 10.63 - 7.87 \\
2.73 &= 0.75
\end{align*}
\]

23. The cost to rent a car is composed of a daily fee and a rate per kilometre. Chad rented a car for 5 days and drove 400 km at a cost of $240. He later rented the same car for 3 days and drove 160 km at a cost of $124. Find the daily fee and price per kilometre.

24. A 60% acid solution is required for a chemistry lab. The instructor has a 30% stock solution and a 80% stock solution. She needs to make 20 litres of the 60% acid solution. How much of each stock solution should she use? (Round to nearest tenth if necessary.)

\[
\begin{align*}
0.3x + 0.8y &= 0.60 \\
x + y &= 20 \\
x &= 20 - y
\end{align*}
\]

25. A goldsmith needs to make 70g of 14K gold (58.5%) from 18K (75%) and 10K (41.7%) stock alloys. How much of each does she need? (Round to nearest tenth if necessary.)

\[
\begin{align*}
x + y &= 70 \\
x &= 70 - y
\end{align*}
\]

26. A plane flew a distance of 800 km in 2.75 hours when travelling in a tailwind. The return trip took 5 hours against the same wind. Assume both speeds are constant. Find the speed of the plane and the wind speed. (Round to nearest tenth if necessary.)

27. The Lucky-Lady dinghy travels 36 km upstream in four hours. The return trip takes only three-quarters of an hour. Find the speed of the boat and the speed of the current. (Round to nearest tenth if necessary.)

FMPC10. Systems of Linear Equations Practice Test KEY

1. Two linear equations.
2. All ordered pairs \((x, y)\) that satisfy both equations.
3. No.
4. Yes.
5. Compare with a peer.
6. Compare with a peer.
7. Compare with a peer.
8. One solution. Consistent.
10. \((-2, -3)\)
11. \((-2, -6)\)
12. \((2, -3)\)
13. \((3, 1)\)
14. \((2, 7)\)
15. \((-2, 5)\)
16. \((-1, 3)\)
17. \((11.5, -7.5)\)
18. \((2, -3)\)
19. No solution.
20. No solution.
22. Gas \(\rightarrow\) $0.63/litre
Oil \(\rightarrow\) $2.75/litre
23. Daily Fee \(\rightarrow\) $28.00
Per Km \(\rightarrow\) $0.25
24. 30% stock \(\rightarrow\) 8 litres
80% stock \(\rightarrow\) 12 litres
25. 18K \(\rightarrow\) 35.32 grams
10K \(\rightarrow\) 34.68 grams
26. Plane \(\rightarrow\) 225.5 km/h
Wind \(\rightarrow\) 65.5 km/h
27. Boat \(\rightarrow\) 28.5 km/h
Current \(\rightarrow\) 19.5 km/h