Problem Solving
Solving Systems of Linear Inequalities

Write the correct answer.

1. Paul earns $7 per hour at the bagel shop and $12 per hour mowing lawns. Paul needs to earn at least $120 per week, but he must work less than 30 hours per week. Write and graph the system of linear inequalities that describes this situation.

\[-7x + 12y \geq 120\]
\[-x + y < 30\]

2. Zoe plans to knit a scarf. She wants the scarf to be more than 1 but less than 1.5 feet wide, and more than 6 but less than 8 feet long. Graph all possible dimensions of Zoe’s scarf. List two possible combinations.

\[x > 1 \quad x < 1.5\]
\[y > 6 \quad y < 8\]

The graph shows the numbers of two types of custom wood tables that can be made to fit a client’s needs. Select the best answer.

3. Which system of linear inequalities represents the graph?

A. \[\begin{align*}
    x + y &\leq 15 \\
    y &\geq 12 - \frac{4}{3} x
\end{align*}\]

B. \[\begin{align*}
    y &\leq x + 15 \\
    y &\geq 12 - \frac{4}{3} x
\end{align*}\]

4. If 6 buffet tables are built, which can NOT be the number of dining tables built?

F. 4
G. 6
H. 8
J. 10
SYSTEM of INEQUALITIES WORD PROBLEMS

5. You can work at most 20 hours next week. You need to earn at least $92 to cover you weekly expenses. Your dog-walking job pays $7.50 per hour and your job as a car wash attendant pays $6 per hour. Write a system of linear inequalities to model the situation.

\[
d = \text{dog}(x) \\
c = \text{car wash}(y) \\
d + c \leq 20 \\
7.50d + 6c \geq 92
\]

6. Marsha is buying plants and soil for her garden. The soil cost $4 per bag, and the plants cost $10 each. She wants to buy at least 5 plants and can spend no more than $100. Write a system of linear inequalities to model the situation.

\[
P = \text{plants}(x) \\
s = \text{soil}(y) \\
4s + 10p \leq 100 \\
s \geq -\frac{5}{2}p + 25 \\
p \geq 5
\]

7. Jonah is going to the store to buy candles. Small candles cost $3.50 and large candles cost $5.00. He needs to buy at least 20 candles, and he cannot spend more than $80. Write a system of linear inequalities that represent the situation.

\[
s = \text{small}(x) \\
l = \text{large}(y) \\
3.50s + 5l \leq 80 \\
s + l \geq 20
\]

8. John is packing books into boxes. Each box can hold either 15 small books or 8 large books. He needs to pack at least 35 boxes and at least 350 books. Write a system of linear inequalities to represent the situation.

\[
s = \text{small}(x) \\
l = \text{large}(y) \\
15s + 8l \geq 350 \\
s + l \geq 35
\]

9. During a family trip, you share the driving with your dad. At most, you are allowed to drive for three hours. While driving, your maximum speed is 55 miles per hour.

a) Write a system of inequalities describing the possible numbers of hours \( t \) and distance \( d \) you may have to drive.

\[
\begin{align*}
t &\leq 3 \\
s &\leq 55 \\
t = \text{time} \\
s = \text{speed}
\end{align*}
\]

b) Is it possible for you to have driven 160 miles?

\[
\frac{55 \times 3}{165} \text{ yes}
\]
10. Katie has $50 in a savings account at the beginning of the summer. She wants to have at least $20 in the account by the end of the summer. She withdraws $2 each week for food, clothes, and movie tickets. Write an inequality that expresses Katie's situation and display it on the graph below. For how many weeks can Katie withdraw money? **15 weeks or less**

\[
\begin{align*}
\text{y} &= 50 - 2x \\
\text{y} &\geq 20 \\
50 - 2x &\geq 20
\end{align*}
\]

11. Skate Land charges a $50 flat fee for a birthday party rental and $4 for each person. Joann has no more than $100 to budget for her party. Write an inequality that models her situation and display it on the graph below. How many people can Joann attend her party? **12 or less**

\[
\begin{align*}
\text{y} &\leq 100 \\
\text{y} &= 50 + 4x \\
50 + 4x &\leq 100 \\
4x &\leq 50 \\
x &\leq 12.5
\end{align*}
\]

12. Sarah is selling bracelets and earrings to make money for summer vacation. The bracelets cost $2 and the earrings cost $3. She needs to make at least $60. Sarah knows she will sell more than 10 bracelets. Write inequalities to represent the income from jewelry sold and number of bracelets sold.

\[
\begin{align*}
b &= \text{bracelets} \\
e &= \text{earrings} \\
2b + 3e &\geq 60 \\
b &> 10
\end{align*}
\]
13. Jason is buying wings and hot dogs for a party. One package of wings costs $8. Hot dogs cost $5 per pound. He must spend less than $40. Jason knows he will be buying at least 4 pound of hot dogs. Write a system of inequalities to model the situation. Graph both inequalities and shade the intersection.

\[
\text{hot dogs (y)} \quad 5y + 8x \leq 40 \\
\text{wings (x)} \quad y \geq 4
\]

14. The boys and girls soccer clubs are trying to raise money for new uniforms. The boys' soccer club is selling cars for $2 per piece and the girls' soccer club is selling candles for $4. They must raise more than $800. The girls expect to sell at least 100 candles. Write a system of inequalities to model the situation. Graph both inequalities and shade the intersection.

\[
\text{Cars (x)} \quad 2x + 4y > 800 \\
\text{Candles (y)} \quad y > -\frac{1}{2}x + 200 \\
y \geq 100
\]