Solutions

1. **Solution:** $\times 6$: $3x+2y=24$, $4x-3y=6$. Eliminate y: $9x+6y=72$ and $8x-6y=12$. Add $\Rightarrow 17x=84 \Rightarrow x=\frac{84}{17}$. Then $2y=24-3\cdot\frac{84}{17}=\frac{156}{17}\Rightarrow y=\frac{78}{17}$.

2. **Solution:** $y=2x+5 \Rightarrow 3x+2(2x+5)=19 \Rightarrow 7x=9 \Rightarrow x=\frac{9}{7}$, $y=\frac{53}{7}$.

3. **Solution:** $\begin{cases} 8A+12S=164 \\ 5A+15S=150 \end{cases}$. $\times 5$: $40A+60S=820$; $\times 8$: $40A+120S=1200$. Subtract: $-60S=-380 \Rightarrow S=\$6.\overline{3}$. Then $8A=164-12S=164-76=88 \Rightarrow A=\$11$.

4. **Solution:** $q+d=22$, $25q+10d=370$. $d=22-q$. $25q+10(22-q)=370 \Rightarrow 15q=150 \Rightarrow q=10$, $d=12$.

5. **Solution:** Doubling first gives $4x-6y=14\neq 20 \Rightarrow$ **no solution**.

6. **Solution:** $2a+3b=3.10$, $4a+b=3.00$. $\times 3$: $12a+3b=9.00$. Subtract first: $10a=5.90 \Rightarrow a=0.59$. Then $b=3.00-4(0.59)=0.64$.

7. **Solution:** $A+B=29$, and $A+3=2(B-3) \Rightarrow A=2B-9$. Then $3B=38 \Rightarrow B=12\frac{2}{3}$, $A=16\frac{1}{3}$.

8. **Solution:** Second is $2\times$ first with same RHS ($10=2\cdot 5$) $\Rightarrow$ **infinitely many** on $x+ky=5$.

9. **Solution:** $2L + 2W = 74 \Rightarrow L + W = 37$, $L = 2W + 5$. Then $3W = 32 \Rightarrow W = \frac{32}{3}$, $L = \frac{79}{3}$.

10. **Solution:** $x + y = 300$, $0.08x + 0.20y = 36$. $8(300 - y) + 20y = 3600 \Rightarrow 12y = 1200 \Rightarrow y = 100$, $x = 200$.

11. **Solution:** Add: $10x = 40 \Rightarrow x = 4$. Then $16 - 7y = -1 \Rightarrow y = \frac{17}{7}$.

12. **Solution:** $x - y = 9$, $x + y = 55 \Rightarrow x = 32,\ y = 23$.

13. **Solution:** $[3v]^2 + [3(v + 2)]^2 = 39^2 \Rightarrow 18v^2 + 36v + 36 = 1521 \Rightarrow v \approx 8.14$ mph (positive root).

14. **Solution:** $0.6x - 0.4y = 1.8$; $\times 2$: $1.2x - 0.8y = 3.6$. Add with $1.2x + 0.8y = 4.0 \Rightarrow 2.4x = 7.6 \Rightarrow x = \frac{19}{6}$. Then $1.9 - 0.4y = 1.8 \Rightarrow y = \frac{1}{4}$.

15. **Solution:** $b + d = 140$, $1.2b + 0.9d = 150.6$. $d = 140 - b \Rightarrow 0.3b = 24.6 \Rightarrow b = 82,\ d = 58$.

16. **Solution:** $c + t = 17$ vs $4(c + t) = 60 \Rightarrow c + t = 15$ (contradiction) $\Rightarrow$ **no solution**.

17. **Solution:** $3x - 9y = 12$ and $x - 3y = 4$ are the same line $\Rightarrow$ **infinitely many**.

18. **Solution:** Substitute $y = -2x + 5$ into $2x + y = 5 \Rightarrow 5 = 5 \Rightarrow$ **infinitely many** on $y = -2x + 5$.

19. **Solution:** $\times 12$: $3x + 4y = 60$; $\times 6$: $3x - y = 6$. Subtract: $5y = 54 \Rightarrow y = \frac{54}{5}$; then $3x = \frac{54}{5} + 6 = \frac{84}{5} \Rightarrow x = \frac{28}{5}$.

20. **Solution:** Let $u = 5x - 2y$. Then $u = 13$ and $3u - 4y = 31 \Rightarrow y = 2$; so $5x - 4 = 13 \Rightarrow x = \frac{17}{5}$.