1.

A: $x-3y=4$

B: $5x-2y=7$

$-2\times$A: $-2x+6y=-8$

$3\times$B: $\underline{15x-6y=21}$

ADD: $13x=13 \Rightarrow x=1$

Substitute in A:

$$(1)-3y=4 \Rightarrow 1-4=3y \Rightarrow y=-1$$

Ans: $x=1$, $y=-1$

2.

A: $2x-3y=2$

B: $6x+y=16$

A: $2x-3y=2$

$3\times$B: $\underline{18x+3y=48}$

ADD: $20x=50 \Rightarrow x=2\frac{1}{2}$

Substitute in B:

$$6\left(2\frac{1}{2}\right)+y=16 \Rightarrow y=16-15=1$$

Ans: $x=2\frac{1}{2}$, $y=1$

3.

A: $x-y=1$

B: $3x+5y=7$

$5\times$A: $5x-5y=5$

B: $\underline{3x+5y=7}$

ADD: $8x=12 \Rightarrow x=1\frac{1}{2}$

Substitute in A:

$$\left(1\frac{1}{2}\right)-y=1 \Rightarrow y=\frac{1}{2}$$

Ans: $x=1\frac{1}{2}$, $y=\frac{1}{2}$

4.

A: $5x-3y=1$

B: $x-y=0$

A: $5x-3y=1$

$-3\times$B: $\underline{-3x+3y=0}$

ADD: $2x=1 \Rightarrow x=\frac{1}{2}$

Substitute in B:

$$\left(\frac{1}{2}\right)-y=0 \Rightarrow y=\frac{1}{2}$$

Ans: $x=\frac{1}{2}$, $y=\frac{1}{2}$

5.

A: $5x-3y-11=0$

B: $3x+10y+17=0$

$10\times$A: $50x-30y-110=0$

$3\times$B: $\underline{9x+30y+51=0}$

ADD: $59x-59=1 \Rightarrow x=1$

Substitute in A:

$$5(1)-3y-11=0 \Rightarrow -6=3y \Rightarrow -2=y$$

Ans: $x=1$, $y=-2$

6.

A: $2x-3y-2=0$

B: $3x+8y-3=0$

$8\times$A: $16x-24y-16=0$

$3\times$B: $\underline{9x+24y-9=0}$

ADD: $25x-25=0 \Rightarrow x=1$

Substitute in B:

$$3(1)+8y-3=0 \Rightarrow y=0$$

Ans: $x=1$, $y=0$

7.

A: $x+3(y-1)=5$

B: $5x+13-y=5$

Rearrange:

A: $x+3y-3=5 \Rightarrow x+3y=8$

B: $5x-y=5-13 \Rightarrow 5x-y=-8$

A: $x+3y=8$

$3\times$B: $15x-3y=-24$

ADD: $16x=-16 \Rightarrow x=-1$

Substitute in A:

$$(-1)+3y=8 \Rightarrow 3y=9 \Rightarrow y=3$$

Ans: $x=-1$, $y=3$

8.

A: $4(x-3)+3(y+1)=10$

B: $6(x-4)+5y=5$

Rearrange:

A: $4x-12+3y+3=10 \Rightarrow 4x+3y=19$

B: $6x-24+5y=5 \Rightarrow 6x+5y=29$

$5\times$A: $20x+15y=95$

$-3\times$B: $-18x-15y=-87$

ADD: $2x=8 \Rightarrow x=4$

Substitute in A:

$$4(4)+3y=19 \Rightarrow 3y=3 \Rightarrow y=1$$

Ans: $x=4$, $y=1$

9.

A: $\frac{x}{2}+\frac{y}{5}=4 \Rightarrow 10\left(\frac{x}{2}\right)+10\left(\frac{y}{5}\right)=10\times 4$

$\Rightarrow 5x+2y=40$

B: $\frac{x}{4}+\frac{y}{2}=6 \Rightarrow 4\left(\frac{x}{4}\right)+4\left(\frac{y}{2}\right)=4\times 6$

$\Rightarrow x+2y=24$

A: $5x+2y=40$

$-$B: $-x-2y=-24$

ADD: $4x=16 \Rightarrow x=4$

Substitute in A:

$$5(4)+2y=40 \Rightarrow 2y=10 \Rightarrow y=10$$

Ans: $x=4$, $y=10$

10.

A: $\frac{x}{2}+y=13$

$\Rightarrow 2\left(\frac{x}{2}\right)+2y=2\times 13$

$\Rightarrow x+2y=26$

B: $\frac{x}{7}-\frac{y}{3}=0$

$\Rightarrow 21\left(\frac{x}{7}\right)-21\left(\frac{y}{3}\right)=21\times 0$

$\Rightarrow 3x-7y=0$

$-3\times$A: $-3x-6y=-78$

B: $3x-7y=0$

ADD: $-13y=-78\Rightarrow y=6$

Substitute in A:

$$x+2(6)=26\Rightarrow x=26-12\Rightarrow x=14$$

Ans: $x=14$, $y=6$

11.

A: $\frac{x+y}{5}+\frac{y-x}{2}=5$

$\Rightarrow 10\left(\frac{x+y}{5}\right)+10\left(\frac{y-x}{2}\right)=10\times 5$

$\Rightarrow 2x+2y+5y-5x=50$

$\Rightarrow -3x+7y=50$

B: $\frac{x+2y}{9}=2\Rightarrow x+2y=2\times 9$

$\Rightarrow x+2y=18$

A: $-3x+7y=50$

$3\times$B: $3x+6y=54$

ADD: $13y=104\Rightarrow y=8$

Substitute in B:

$$x+2(8)=18\Rightarrow x=18-16\Rightarrow x=2$$

Ans: $x=2$, $y=8$

12.

A: $5x-12y-17=0 \Rightarrow 5x-12y=17$

B: $\frac{1}{9}(x+2)-(y+1)+\frac{3}{2}=0$

$\Rightarrow 18\times\frac{1}{9}(x+2)-18(y+1)+18\times\frac{3}{2}=0$

$\Rightarrow 2x+4-18y-18+27=0 \Rightarrow 2x-18y+13=0$

$\Rightarrow 2x-18y=-13$

$3\times$A: $15x-36y=51$

$-2\times$B: $-4x+36y=26$

ADD: $11x=77 \Rightarrow x=7$

Substitute in A:

$5(7)-12y=17 \Rightarrow 35-17=12y$

$\Rightarrow 18=12y \Rightarrow 1\frac{1}{2}=y$

Ans: $x=7,\ y=1\frac{1}{2}$

13.

total scores $=11 \Rightarrow x+y=11$ A

total points $=17 \Rightarrow 3x+y=17$ B

B: $3x+y=17$

$-$A: $-x-y=-11$

ADD $2x=6 \Rightarrow x=3$

Substitute in A

$(3)+y=11 \Rightarrow y=8$

Ans. $x=3, y=8$

14.

total mass $=10 \Rightarrow x+y=10$ A

total cost $=37 \Rightarrow 3x+4y=37$ B

B: $3x+4y=37$

$-3\times$A: $-3x-3y=-30$

ADD $y=7$

Substitute in A

$x+(7)=10 \Rightarrow x=3$

Ans. $x=3, y=7$

15.

total mass $= 100 \Rightarrow x + y = 100$ A

total cost $= 190 \Rightarrow 2x + 1 \cdot 5y = 190$ B

$2 \times$ B: $4x + 3y = 380$

$-3 \times$ A: $-3x - 3y = -300$

ADD $x = 80$

Substitute in A

$(80) + y = 100 \Rightarrow y = 20$

Ans. $x = 80, y = 20$

16.

total pupils $= 150 \Rightarrow 10x + 6y = 150$ A

or $5x + 18y = 150$ B

$3 \times$ A: $30x + 18y = 450$

$-$B: $-5x - 18y = -150$

ADD $25x = 300 \Rightarrow x = 12$

Substitute in A

$10(12) + 6y = 150 \Rightarrow 6y = 150 - 120 = 30$

$\Rightarrow y = 5$

Ans. $x = 12, y = 5$

17.

$x =$ number of two person rooms

$y =$ number of three person rooms

total rooms $= 10 \Rightarrow x + y = 10$ A

total people $= 23 \Rightarrow 2x + 3y = 23$ B

B: $2x + 3y = 23$

$-2 \times$ A: $-2x - 2y = -20$

ADD $y = 3$

Substitute in A

$x + (3) = 10 \Rightarrow x = 7$

Ans. $x = 7, y = 3$

18.

$x =$ cost of one toffee in cents

$y =$ cost of one ice-pop in cents

total money $= 150 \Rightarrow$

$9x + 3y = 150 \Rightarrow 3x + y = 50$ A

or

$5x + 10y = 150 \Rightarrow x + 2y = 30$ B

$3 \times$ B: $3x + 6y = 90$

$-$A: $-3x - y = -50$

ADD $5y = 40 \Rightarrow y = 8$

Substitute in B

$$x + 2(8) = 30 \Rightarrow x = 30 - 16 = 14$$

Ans. $x = 14, y = 8$

19.

$x =$ first number, $y =$ second number

half of x is 1 more than $2y$

$$\Rightarrow \frac{x}{2} = 2y + 1 \Rightarrow x - 4y = 2 \quad \text{A}$$

two thirds of x is 1 less than $3y$

$$\Rightarrow \frac{2x}{3} = 3y - 1 \Rightarrow 2x - 9y = -3 \quad \text{B}$$

B: $2x - 9y = -3$

$-2 \times$ A: $-2x + 8y = -4$

ADD $-y = -7 \Rightarrow y = 7$

Substitute in A

$$x - 4(7) = 2 \Rightarrow x = 2 + 28 = 30$$

Ans. $x = 30, y = 7$

20.

x = first number, y = second number

a third of x is 4 more than half of y

$$\Rightarrow \frac{x}{3} = \frac{y}{2} + 4 \Rightarrow 6\left(\frac{x}{3}\right) = 6\left(\frac{y}{2}\right) + 6 \times 4$$

$$\Rightarrow 2x = 3y + 24 \Rightarrow \qquad 2x - 3y = 24 \qquad \text{A}$$

x is 1 more than $2y$

$$\Rightarrow x = 2y + 1 \Rightarrow \qquad x - 2y = 1 \qquad \text{B}$$

A: $2x - 3y = 24$

$-2 \times$ B: $-2x + 4y = -2$

ADD $y = 22$

Substitute in B

$$x - 2(22) = 1 \Rightarrow x = 1 + 44 = 45$$

Ans. $x = 45$, $y = 22$

21.

A: $$\frac{1}{x+y} = 2\frac{1}{2} \Rightarrow \frac{1}{x+y} = \frac{5}{2}$$

$$\Rightarrow x + y = \frac{2}{5} \Rightarrow 5x + 5y = 2$$

B: $3x + y = 1$

$5 \times$ B: $15x + 5y = 5$

$-$A: $-5x - 5y = -2$

ADD: $10x = 3 \Rightarrow x = 0 \cdot 3$

Substitute in B:

$$3(0 \cdot 3) + y = 1 \Rightarrow 0 \cdot 9 + y = 1$$

$$\Rightarrow y = 1 - 0 \cdot 9 \Rightarrow y = 0 \cdot 1$$

Ans. $x + 7y = (0 \cdot 3) + 7(0 \cdot 1) = 1$