8. $3x + 4y = 15$

x	0	1	2
y	3.75	3	2.25

$3x = y$

x	0	1	2
y	0	3	6

Only the pair of values $x = 1$ and $y = 3$ appear in both tables. So, the solution of the system of equations is $x = 1$, $y = 3$.

9. $5x + 4y = 64$

x	6	7	8
y	8.5	7.25	6

$3x + 8y = 72$

x	6	7	8
y	$\frac{27}{4}$	$\frac{51}{8}$	6

Only the pair of values $x = 8$ and $y = 6$ appear in both tables. So, the solution of the system of equations is $x = 8$, $y = 6$.
Jolene took 8 minutes to fold a paper airplane and 6 minutes to fold a paper star.

10. $2x = 9y$

x	0	8	9
y	0	$\frac{16}{9}$	2

$2x + 3y = 24$

x	0	8	9
y	8	$\frac{8}{3}$	2

Only the pair of values $x = 9$ and $y = 2$ appear in both tables. So, the solution of the system of equations is $x = 9$, $y = 2$.
$2x = 2 \cdot 9 = 18$
$3y = 3 \cdot 2 = 6$
At the present time, Janice is 18 years old and Jennifer is 6 years old.

11. $2x + y = 18$

x	1	2	3
y	16	14	12

$2x + 3y = 42$

x	1	2	3
y	$\frac{40}{3}$	$\frac{38}{3}$	12

Only the pair of values $x = 3$ and $y = 12$ appear in both tables. So, the solution of the system of equations is $x = 3$, $y = 12$.
Difference = 12 − 3 = 9
The difference between Jack's walking speed and cycling speed is 9 miles per hour.

Lesson 5.2

1. $3y - x = 2$ — Eq. 1
$3y + x = 16$ — Eq. 2
Add Eq. 1 and Eq. 2:
$(3y - x) + (3y + x) = 2 + 16$
$3y + 3y - x + x = 18$
$6y = 18$
$\frac{6y}{6} = \frac{18}{6}$
$y = 3$
Substitute 3 for y into Eq. 1:
$3(3) - x = 2$
$9 - x = 2$
$x = 7$
So, the solution of the system of linear equations is $x = 7$, $y = 3$.

2. $x - 5y = 13$ — Eq. 1
$9y - x = -17$ — Eq. 2
Add Eq. 1 and Eq. 2:
$(x - 5y) + (9y - x) = 13 + (-17)$
$x - x - 5y + 9y = 13 - 17$
$4y = -4$
$\frac{4y}{4} = \frac{-4}{4}$
$y = -1$
Substitute −1 for y into Eq. 1:
$x - 5(-1) = 13$
$x + 5 = 13$
$x = 8$
So, the solution of the system of linear equations is $x = 8$, $y = -1$.

3. $7q + 2p = 29$ — Eq. 1
$2p - q = 5$ — Eq. 2
Subtract Eq. 2 from Eq. 1:
$(7q + 2p) - (2p - q) = 29 - 5$
$7q + q + 2p - 2p = 24$
$8q = 24$
$\frac{8q}{8} = \frac{24}{8}$
$q = 3$

Substitute 3 for q into Eq. 1:

$$7(3) + 2p = 29$$
$$21 + 2p = 29$$
$$2p = 8$$
$$\frac{2p}{2} = \frac{8}{2}$$
$$p = 4$$

So, the solution of the system of linear equations is $p = 4$, $q = 3$.

4. $2w - 3v = 4$ — Eq. 1

$w + 3v = 29$ — Eq. 2

Add Eq. 1 and Eq. 2:

$$(2w - 3v) + (w + 3v) = 4 + 29$$
$$2w + w - 3v + 3v = 33$$
$$3w = 33$$
$$\frac{3w}{3} = \frac{33}{3}$$
$$w = 11$$

Substitute 11 for w into Eq. 1:

$$2(11) - 3v = 4$$
$$22 - 3v = 4$$
$$3v = 18$$
$$\frac{3v}{3} = \frac{18}{3}$$
$$v = 6$$

So, the solution of the system of linear equations is $v = 6$, $w = 11$.

5. $2a - b = 6$ — Eq. 1

$3a + b = 19$ — Eq. 2

Add Eq. 1 and Eq. 2:

$$(2a - b) + (3a + b) = 6 + 19$$
$$2a + 3a - b + b = 25$$
$$5a = 25$$
$$\frac{5a}{5} = \frac{25}{5}$$
$$a = 5$$

Substitute 5 for a into Eq. 1:

$$2(5) - b = 6$$
$$10 - b = 6$$
$$b = 4$$

So, the solution of the system of linear equations is $a = 5$, $b = 4$.

6. $6n - m = 3$ — Eq. 1

$3m - 6n = 15$ — Eq. 2

Add Eq. 1 and Eq. 2:

$$(6n - m) + (3m - 6n) = 3 + 15$$
$$6n - 6n - m + 3m = 18$$
$$2m = 18$$
$$\frac{2m}{2} = \frac{18}{2}$$
$$m = 9$$

Substitute 9 for m into Eq. 1:

$$6n - 9 = 3$$
$$6n = 12$$
$$\frac{6n}{6} = \frac{12}{6}$$
$$n = 2$$

So, the solution of the system of linear equations is $m = 9$, $n = 2$.

7. $8x + 6y = 14$ — Eq. 1

$6x + 3y = 6$ — Eq. 2

Multiply Eq. 2 by 2:

$2(6x + 3y) = 2(6)$

$12x + 6y = 12$ — Eq. 3

Subtract Eq. 3 from Eq. 1:

$$(8x + 6y) - (12x + 6y) = 14 - 12$$
$$8x - 12x + 6y - 6y = 2$$
$$-4x = 2$$
$$x = -\frac{1}{2}$$

Substitute $-\frac{1}{2}$ for x into Eq. 1:

$$8\left(-\frac{1}{2}\right) + 6y = 14$$
$$-4 + 6y = 14$$
$$6y = 18$$
$$\frac{6y}{6} = \frac{18}{6}$$
$$y = 3$$

So, the solution of the system of linear equations is $x = -\frac{1}{2}$, $y = 3$.

8. $4p + 5q = -18$ — Eq. 1

$3p - 10q = 69$ — Eq. 2

Multiply Eq. 1 by 2:

$2(4p + 5q) = 2(-18)$

$8p + 10q = -36$ — Eq. 3

Add Eq. 2 and Eq. 3:

$$(3p - 10q) + (8p + 10q) = 69 + (-36)$$
$$3p + 8p - 10q + 10q = 69 - 36$$
$$11p = 33$$
$$\frac{11p}{11} = \frac{33}{11}$$
$$p = 3$$

Substitute 3 for p into Eq. 1:

$$4(3) + 5q = -18$$
$$12 + 5q = -18$$
$$12 + 5q - 12 = -18 - 12$$
$$5q = -30$$
$$\frac{5q}{5} = \frac{-30}{5}$$
$$q = -6$$

So, the solution of the system of linear equations is $p = 3$, $q = -6$.

9. $3a - b = 13$ — Eq. 1
$b = 2a - 7$ — Eq. 2
Substitute Eq. 2 into Eq. 1:
$3a - (2a - 7) = 13$
$3a - 2a + 7 = 13$
$a + 7 = 13$
$a + 7 - 7 = 13 - 7$
$a = 6$
Substitute 6 for a into Eq. 2:
$b = 2(6) - 7$
$b = 12 - 7$
$b = 5$
So, the solution of the system of linear equations is $a = 6$, $b = 5$.

10. $5p + 3q = -7$ — Eq. 1
$q = -2p + 5$ — Eq. 2
Substitute Eq. 2 into Eq. 1:
$5p + 3(-2p + 5) = -7$
$5p - 6p + 15 = -7$
$-p = -22$
$\frac{-p}{-1} = \frac{-22}{-1}$
$p = 22$
Substitute 22 for p into Eq. 2:
$q = -2(22) + 5$
$q = -44 + 5$
$q = -39$
So, the solution of the system of linear equations is $p = 22$, $q = -39$.

11. $6c - b = 5$ — Eq. 1
$b - c = 5$ — Eq. 2
Use Eq. 2 to express b in terms of c:
$b - c = 5$
$b - c + c = 5 + c$
$b = 5 + c$ — Eq. 3
Substitute Eq. 3 into Eq. 1:
$6c - (5 + c) = 5$
$6c - 5 - c = 5$
$5c - 5 + 5 = 5 + 5$
$5c = 10$
$c = 2$
Substitute 2 for c into Eq. 3:
$b = 5 + 2$
$= 7$
So, the solution of the system of linear equations is $b = 7$, $c = 2$.

12. $2y - x = 3$ — Eq. 1
$y - x = 4$ — Eq. 2
Use Eq. 2 to express y in terms of x:
$y - x = 4$
$y - x + x = 4 + x$
$y = 4 + x$ — Eq. 3
Substitute Eq. 3 into Eq. 1:
$2(4 + x) - x = 3$
$8 + 2x - x = 3$
$8 + x = 3$
$x = -5$
Substitute -5 for x into Eq. 3:
$y = 4 + (-5)$
$= 4 - 5$
$= -1$
So, the solution of the system of linear equations is $x = -5$, $y = -1$.

13. $4h + k = 7$ — Eq. 1
$h + 2k = 7$ — Eq. 2
Use Eq. 2 to express h in terms of k:
$h + 2k = 7$
$h = 7 - 2k$ — Eq. 3
Substitute Eq. 3 into Eq. 1:
$4(7 - 2k) + k = 7$
$28 - 8k + k = 7$
$28 - 7k = 7$
$28 - 7k - 28 = 7 - 28$
$-7k = -21$
$\frac{-7k}{-7} = \frac{-21}{-7}$
$k = 3$
Substitute 3 for k into Eq. 3:
$h = 7 - 2(3)$
$= 1$
So, the solution of the system of linear equations is $h = 1$, $k = 3$.

14. $3x + 2y = 36$ — Eq. 1
$5y - x = 39$ — Eq. 2
Use Eq. 2 to express x in terms of y:
$5y - x = 39$
$5y - x - 5y = 39 - 5y$
$-x = 39 - 5y$
$\frac{-x}{-1} = \frac{39 - 5y}{-1}$
$x = 5y - 39$ — Eq. 3
Substitute Eq. 3 into Eq. 1:
$3(5y - 39) + 2y = 36$
$15y - 117 + 2y = 36$
$17y - 117 = 36$
$17y - 117 + 117 = 36 + 117$
$17y = 153$
$\frac{17y}{y} = \frac{153}{17}$
$y = 9$
Substitute 9 for y into Eq. 3:
$x = 5(9) - 39$
$= 6$
So, the solution of the system of linear equations is $x = 6$, $y = 9$.

15. $5t + 2s = -3$ — Eq. 1

$7t - 2s = 15$ — Eq. 2

Use Eq. 2 to express $2s$ in terms of t:

$$7t - 2s = 15$$
$$7t - 2s - 7t = 15 - 7t$$
$$-2s = 15 - 7t$$
$$\frac{-2s}{-1} = \frac{15 - 7t}{-1}$$
$$2s = 7t - 15 \quad \text{— Eq. 3}$$

Substitute Eq. 3 into Eq. 1:

$$5t + (7t - 15) = -3$$
$$12t - 15 = -3$$
$$12t - 15 + 15 = -3 + 15$$
$$12t = 12$$
$$\frac{12t}{12} = \frac{12}{12}$$
$$t = 1$$

Substitute 1 for t into Eq. 3:

$$2s = 7(1) - 15$$
$$2s = -8$$
$$s = -4$$

So, the solution of the system of linear equations is $s = -4$, $t = 1$.

16. $5x + 4y = -26$ — Eq. 1

$5 - x = -6y$ — Eq. 2

Use Eq. 2 to express x in terms of y:

$$5 - x = -6y$$
$$5 - x - 5 = -6y - 5$$
$$-x = -6y - 5$$
$$\frac{-x}{-1} = \frac{-6y - 5}{-1}$$
$$x = 6y + 5 \quad \text{— Eq. 3}$$

Substitute Eq. 3 into Eq. 1:

$$5(6y + 5) + 4y = -26$$
$$30y + 25 + 4y = -26$$
$$34y + 25 - 25 = -26 - 25$$
$$34y = -51$$
$$\frac{34y}{34} = \frac{-51}{34}$$
$$y = -\frac{3}{2}$$

Substitute $-\frac{3}{2}$ for y into Eq. 3:

$$x = 6\left(-\frac{3}{2}\right) + 5$$
$$x = -4$$

So, the solution of the system of linear equations is $x = -4$, $y = -\frac{3}{2}$.

17. $3x + 5y = 35$ — Eq. 1

$6x - 4y = -28$ — Eq. 2

Multiply Eq. 1 by 2:

$$2(3x + 5y) = 2(35)$$
$$6x + 10y = 70 \quad \text{— Eq. 3}$$

Subtract Eq. 3 from Eq. 2:

$$(6x - 4y) - (6x + 10y) = -28 - 70$$
$$6x - 6x - 4y - 10y = -98$$
$$-14y = -98$$
$$\frac{-14y}{-14} = \frac{-98}{-14}$$
$$y = 7$$

Substitute 7 for y into Eq. 1:

$$3x + 5(7) = 35$$
$$3x + 35 = 35$$
$$3x + 35 - 35 = 35 - 35$$
$$x = 0$$

So, the solution of the system of linear equations is $x = 0$, $y = 7$.

Elimination method is used because substitution method will result in an algebraic fraction that will make the steps complicated.

18. $7m - 2n = -13$ — Eq. 1

$2n - 5m = 11$ — Eq. 2

Add Eq. 1 and Eq. 2:

$$(7m - 2n) + (2n - 5m) = -13 + 11$$
$$7m - 5m - 2n + 2n = -2$$
$$2m = -2$$
$$\frac{2m}{2} = \frac{-2}{2}$$
$$m = -1$$

Substitute -1 for m into Eq. 1:

$$7(-1) - 2n = -13$$
$$-7 - 2n = -13$$
$$-7 - 2n + 7 = -13 + 7$$
$$-2n = -6$$
$$\frac{-2n}{-2} = \frac{-6}{-2}$$
$$n = 3$$

So, the solution of the system of linear equations is $m = -1$, $n = 3$.

Elimination method is used because substitution method will result in an algebraic fraction that will make the steps complicated.

19. $9m + 4n = 38$ — Eq. 1
$2m = 5n - 21$ — Eq. 2
Multiply Eq. 1 by 2:
$2(9m + 4n) = 2(38)$
$18m + 8n = 76$ — Eq. 3
Multiply Eq. 2 by 9:
$9(2m) = 9(5n - 21)$
$18m = 45n - 189$ — Eq. 4
Subtract Eq. 4 from Eq. 3:
$(18m + 8n) - 18m = 76 - (45n - 189)$
$8n = 76 - 45n + 189$
$8n + 45n = 265 - 45n + 45n$
$53n = 265$
$\frac{53n}{53} = \frac{265}{53}$
$n = 5$
Substitute 5 for n into Eq. 1:
$9m + 4(5) = 38$
$9m + 20 = 38$
$9m + 20 - 20 = 38 - 20$
$9m = 18$
$\frac{9m}{9} = \frac{18}{9}$
$m = 2$
So, the solution of the system of linear equations is $m = 2$, $n = 5$.
Elimination method is used because substitution method will result in an algebraic fraction that will make the steps complicated.

20. $5w - 4v = 1$ — Eq. 1
$v = 6w + 14$ — Eq. 2
Substitute Eq. 2 into Eq. 1:
$5w - 4(6w + 14) = 1$
$5w - 24w - 56 = 1$
$-19w - 56 + 56 = 1 + 56$
$-19w = 57$
$\frac{-19w}{-19} = \frac{57}{-19}$
$w = -3$
Substitute -3 for w into Eq. 2:
$v = 6(-3) + 14$
$= -4$
So, the solution of the system of linear equations is $w = -3$, $v = -4$.
Substitution method is used as v is already expressed in terms of w.

21. $2h + 9k = 19$ — Eq. 1
$5h - 5k = 20$ — Eq. 2
Multiply Eq. 1 by 5:
$5(2h + 9k) = 5(19)$
$10h + 45k = 95$ — Eq. 3
Multiply Eq. 2 by 2:
$2(5h - 5k) = 2(20)$
$10h - 10k = 40$ — Eq. 4
Subtract Eq. 4 from Eq. 3:
$(10h + 45k) - (10h - 10k) = 95 - 40$
$10h - 10h + 45k + 10k = 55$
$55k = 55$
$\frac{55k}{55} = \frac{55}{55}$
$k = 1$
Substitute 1 for k into Eq. 1:
$2h + 9(1) = 19$
$2h + 9 = 19$
$2h + 9 - 9 = 19 - 9$
$2h = 10$
$\frac{2h}{2} = \frac{10}{2}$
$h = 5$
So, the solution of the system of linear equations is $h = 5$, $k = 1$.
Elimination method is used because substitution method will result in an algebraic fraction that will make the steps complicated.

22. $5y + 9 = 3x$ — Eq. 1
$3x - 2y = 18$ — Eq. 2
Substitute Eq. 1 into Eq. 2:
$(5y + 9) - 2y = 18$
$3y + 9 = 18$
$3y + 9 - 9 = 18 - 9$
$3y = 9$
$\frac{3y}{3} = \frac{9}{3}$
$y = 3$
Substitute 3 for y into Eq. 1:
$5(3) + 9 = 3x$
$3x = 24$
$\frac{3x}{3} = \frac{24}{3}$
$x = 8$
So, the solution of the system of linear equations is $x = 8$, $y = 3$.
Substitution method is used as $3x$ is already expressed in terms of y.

23. $3b + 4c = -6$ — Eq. 1
$7b + 16c = -34$ — Eq. 2
Multiply Eq. 1 by 4:
$4(3b + 4c) = 4(-6)$
$12b + 16c = -24$ — Eq. 3
Subtract Eq. 3 from Eq. 2:
$(7b + 16c) - (12b + 16c) = -34 - (-24)$
$7b - 12b + 16c - 16c = -34 + 24$
$-5b = -10$
$\frac{-5b}{-5} = \frac{-10}{-5}$
$b = 2$

Substitute 2 for b into Eq. 1:

$$3(2) + 4c = -6$$
$$6 + 4c = -6$$
$$6 + 4c - 6 = -6 - 6$$
$$4c = -12$$
$$\frac{4c}{4} = \frac{-12}{4}$$
$$c = -3$$

So, the solution of the system of linear equations is $b = 2$, $c = -3$.

Elimination method is used because substitution method will result in an algebraic fraction that will make the steps complicated.

24. $7p - q = 18$ — Eq. 1

$3p + 4q = 21$ — Eq. 2

Use Eq. 1 to express q in terms of p:

$7p - q = 18$

$q = 7p - 18$ — Eq. 3

Substitute Eq. 3 into Eq. 2:

$$3p + 4(7p - 18) = 21$$
$$3p + 28p - 72 = 21$$
$$31p - 72 + 72 = 21 + 72$$
$$31p = 93$$
$$\frac{31p}{31} = \frac{93}{31}$$
$$p = 3$$

Substitute 3 for p into Eq. 3:

$q = 7(3) - 18$

$q = 3$

So, the solution of the system of linear equations is $p = 3$, $q = 3$.

Substitution method is used as q can easily be expressed in terms of p.

Lesson 5.3

1. Let the number of art magazines be x and the number of science magazines be y.

$x + y = 26$ — Eq. 1

$4x + 7y = 134$ — Eq. 2

Use Eq. 1 to express x in terms of y:

$x = 26 - y$ — Eq. 3

Substitute Eq. 3 into Eq. 2:

$$4(26 - y) + 7y = 134$$
$$104 - 4y + 7y = 134$$
$$104 + 3y = 134$$
$$104 + 3y - 104 = 134 - 104$$
$$3y = 30$$
$$\frac{3y}{3} = \frac{30}{3}$$
$$y = 10$$

Substitute 10 for y into Eq. 3:

$x = 26 - 10$

$x = 16$

Jenny purchased 16 art magazines and 10 science magazines.

2. Let the number of adult tickets be x and the number of children's tickets be y.

$x + y = 95$ — Eq. 1

$12x + 9y = 960$ — Eq. 2

Use Eq. 1 to express x in terms of y:

$x = 95 - y$ — Eq. 3

Substitute Eq. 3 into Eq. 2:

$$12(95 - y) + 9y = 960$$
$$1{,}140 - 12y + 9y = 960$$
$$1{,}140 - 3y = 960$$
$$1{,}140 - 3y + 1{,}140 = 960 + 1{,}140$$
$$-3y = 2{,}100$$
$$\frac{-3y}{-3} = \frac{2{,}100}{-3}$$
$$y = 60$$

Substitute 60 for y into Eq. 3:

$x = 95 - 60$

$x = 35$

There were 35 adult tickets and 60 children's tickets sold.

3. Let the number of packets of roasted peanuts be x and the number of packets of beef jerky be y.

$5x + 3y = 37.80$ — Eq. 1

$3x + 2y = 23.87$ — Eq. 2

Multiply Eq. 1 by 2:

$2(5x + 3y) = 2(37.80)$

$10x + 6y = 75.60$ — Eq. 3

Multiply Eq. 2 by 3:

$3(3x + 2y) = 3(23.87)$

$9x + 6y = 71.61$ — Eq. 4

Subtract Eq. 4 from Eq. 3:

$$(10x + 6y) - (9x + 6y) = 75.60 - 71.61$$
$$10x - 9x + 6y - 6y = 3.99$$
$$x = 3.99$$

Substitute 3.99 for x into Eq. 3:

$$10(3.99) + 6y = 75.60$$
$$39.90 + 6y = 75.60$$
$$39.90 + 6y - 39.90 = 75.60 - 39.90$$
$$6y = 35.70$$
$$\frac{6y}{6} = \frac{35.70}{6}$$
$$y = 5.95$$

The cost of a packet of roasted peanuts is \$3.99 and that of a packet of beef jerky is \$5.95.

4. Let the number of wheat crackers a glass container can hold be x and the number of wheat crackers a plastic container can hold be y.

$6x + 2y = 180$ — Eq. 1

$4x = 25 + 5y$ — Eq. 2

Multiply Eq. 1 by 2:

$2(6x + 2y) = 2(180)$

$12x + 4y = 360$ — Eq. 3