

# Linear Algebra and its Applications with R: Solution Set

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## Chapter 1

### Section 1.2

#### Section 1.2.5

- Quiz 1: False
- Quiz 2: False
- Quiz 3: False
- Quiz 4: False
- Quiz 5: True
- Quiz 6: False
- Quiz 7: True
- Quiz 8: False
- Quiz 9: False
- Quiz 10: False
- Quiz 11: True
- Quiz 12: False
- Quiz 13: (ii)
- Quiz 14: (iv)
- Quiz 15: (iv)
- Quiz 16: (ii)
- Quiz 17: (iii)
- Quiz 18: (i)
- Quiz 19: (i)

#### Section 1.2.6

Exercise 1.6:

1. 3
2. 4
- 3.

$$\begin{bmatrix} 5 & 16 & 3 & 16 \end{bmatrix} \begin{bmatrix} 6 & 19 & 9 & 5 \end{bmatrix} \begin{bmatrix} 10 & 17 & 19 & 13 \end{bmatrix}$$

4.

$$\begin{bmatrix} 5 \\ 6 \\ 10 \end{bmatrix}, \begin{bmatrix} 16 \\ 19 \\ 17 \end{bmatrix}, \begin{bmatrix} 3 \\ 9 \\ 19 \end{bmatrix}, \begin{bmatrix} 16 \\ 5 \\ 13 \end{bmatrix}.$$

### Section 1.3

#### Section 1.3.5

Quiz 20: True

Quiz 21: False

Quiz 22: True

Quiz 23: False

Quiz 24: False

Quiz 25: True

#### Section 1.3.6

Exercise 1.15:

1. Yes
2. Unique
3.  $x_1 = 6, x_2 = 1/2$ .

Exercise 1.17:

1. Yes
2. Unique
3.  $x_1 = 0.6969697, x_2 = -2.7575758$ .

Exercise 1.19:

1. No
2. No solution
3. NA

Exercise 1.21:

1. Yes
2. Unique
3.  $x_1 = 0.8469945, x_2 = -0.1475410, x_3 = 7.0546448$ .

Exercise 1.23:

1. Yes

2. Unique

3.  $x_1 = -1.0986079, x_2 = 0.1392111, x_3 = -0.8016241$ .

Exercise 1.25:

1. Yes

2. Unique

3.  $x_1 = 2.657895, x_2 = 2.052632, x_3 = -2.710526$ .

Exercise 1.27:

1.  $n \neq 1$ .

2.  $x_1 = 8/(h-1), x_2 = \frac{5h+3}{2(h-1)}$ .

Exercise 1.31: Solve the system of equations such that

$$\begin{aligned}x_1 + x_2 &= 2200 \\ 1.5x_1 + 4x_2 &= 5050.\end{aligned}$$

The solution is  $x_1 = 1500, x_2 = 700$ . The number of children is 1500 and the number of adults is 700.

Exercise 1.31: Let  $d$  be the distance and  $t$  be the time running. So we have

$$\begin{aligned}d &= 0.2t \\ d &= 0.5(t - 8.5).\end{aligned}$$

So we have the system of linear equations such that

$$\begin{aligned}d - 0.2t &= 0 \\ d - 0.5t &= -4.25.\end{aligned}$$

The solution is  $d = 17/6, t = 85/6$ . So 17/6km.

Exercise 1.31: Let  $x_1$  be the number of chocolate cupcakes,  $x_2$  be the number of strawberry cupcakes, and  $x_3$  be the number of lemon cupcakes. We have the system of linear equations such that

$$\begin{aligned}x_1 + x_2 + x_3 &= 24 \\ 0.6x_1 + 0.4x_2 + 0.3x_3 &= 61/5 \\ x_1 - 2x_2 - 2x_3 &= 0.\end{aligned}$$

The solution is  $x_1 = 16, x_2 = 2, x_3 = 6$ .

## Section 1.4

### Section 1.4.5

Quiz 27: False

Quiz 28: False

Quiz 29: True

Quiz 30: False

Quiz 31: True

Quiz 32: True

Quiz 33: False

Quiz 34: False

Quiz 35: False

Quiz 36: 2

Quiz 37: 1

Quiz 38: 3

Quiz 39: 3

Quiz 40: 2

Quiz 41: 1

### Section 1.4.6

Exercise 1.38: The system of linear equations

$$\begin{aligned}x_1 - 6x_2 &= 3 \\ -x_1 + 2x_2 &= -1.\end{aligned}$$

has the reduced echelon form:

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & -0.5 \end{bmatrix}.$$

So we have a solution  $x_1 = 0, x_2 = -0.5$ .

Exercise 1.40: The system of linear equations

$$\begin{aligned}-5x_1 + 5x_2 - x_3 &= 57 \\ -7x_1 - 2x_2 - 4x_3 &= 21 \\ x_1 + 3x_2 + 4x_3 &= 3\end{aligned}$$

has the reduced echelon form:

$$\begin{bmatrix} 1 & 0 & 0 & -2.697479 \\ 0 & 1 & 0 & 7.815126 \\ 0 & 0 & 1 & -4.436975 \end{bmatrix}.$$

So we have a solution  $x_1 = -2.697479, x_2 = 7.815126, x_3 = -4.436975$ .

Exercise 1.43: The system of linear equations

$$\begin{aligned}5x_1 + 10x_2 - 5x_3 &= -5 \\ -10x_2 + 3x_3 &= -5 \\ 10x_1 + 6x_2 - 9x_3 &= -1\end{aligned}$$

has the reduced echelon form:

$$\begin{bmatrix} 1 & 0 & 0 & -4 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & -5 \end{bmatrix}.$$

So we have a solution  $x_1 = -4, x_2 = -1, x_3 = -5$ .