Systems of Equations

Integers, Fundraisers, Home Improvements, Ticket Sales, & Transportation

Unit 5: Real World Applications

Solve each question. Round your answer to the nearest hundredth when needed.

1. Find the value of two numbers if their sum is 15 and their difference is 1.

7 and 8

2. The difference of two numbers is 5. Their sum is 21. Find the numbers.

8 and 13

3. Find the value of two numbers if their sum is 20 and their difference is 4.

8 and 12

4. The difference of two numbers is 4.8. Their sum is 23. What are the numbers?

9.1 and 13.9

5. Cory and Audrey are selling cheesecakes for a school fundraiser. Customers can buy French silk cheesecakes and chocolate marble cheesecakes. Cory sold 1 French silk cheesecake and 5 chocolate marble cheesecakes for a total of $111. Audrey sold 11 French silk cheesecakes and 13 chocolate marble cheesecakes for a total of $381. Find the cost each of one French silk cheesecake and one chocolate marble cheesecake.

#11 for a French silk cheesecake

#20 for a Chocolate marble cheesecake

6. Mark and Gracey are selling pies for a school fundraiser. Customers can buy apple pies and pumpkin pies. Mark sold 6 apple pies and 13 pumpkin pies for a total of $210. Gracey sold 3 apple pies and 13 pumpkin pies for a total of $183. Find the cost each of one apple pie and one pumpkin pie.

#9 for apple pie

#12 for pumpkin pie

7. Elisa and Lisa are selling fruit for a school fundraiser. Customers can buy small boxes of grapefruit and large boxes of grapefruit. Elisa sold 12 small boxes of grapefruit and 1 large box of grapefruit for a total of $100.30. Lisa sold 12 small boxes of grapefruit and 11 large boxes of grapefruit for a total of $251.30. What is the cost for each of one small box of grapefruit and one large box of grapefruit?

#7.10 per small box

#15.10 per large box

8. Amy and Emily are selling wrapping paper for a school fundraiser. Customers can buy rolls of plain wrapping paper and rolls of shiny wrapping paper. Amy sold 8 rolls of plain wrapping paper and 5 rolls of shiny wrapping paper for a total of $71. Emily sold 7 rolls of plain wrapping paper and 11 rolls of shiny wrapping paper for a total of $108.50. Find the cost each of one roll of plain wrapping paper and one roll of shiny wrapping paper.

#4.50 for roll of plain wrapping paper

#7.00 for roll of shiny wrapping paper

9. Kevin and John each improved their yards by planting grass sod and ornamental grass. They bought their supplies from the same store. Kevin spent $100 on 6 ft^2 of grass sod and 5 bunches of ornamental grass. John spent $132 on 2 ft^2 of grass sod and 14 bunches of ornamental grass. What is the cost of one ft^2 of grass sod and the cost of one bunch of ornamental grass?

#10 per ft^3 of sod

#8 per bunch of ornamental grass

10. Shanice and Kayla each improved their yards by planting hostas and shrubs. They bought their supplies from the same store. Shanice spent $96 on 6 hostas and 3 shrubs. Kayla spent $175 on 5 hostas and 12 shrubs. Find the cost of one hosta and the cost of one shrub.

$11 for a hosta $10 for a shrub

11. Scott and Travis each improved their yards by planting rose bushes and shrubs. They bought their supplies from the same store. Scott spent $54.58 on 2 rose bushes and 4 shrubs. Travis spent $179.14 on 10 rose bushes and 12 shrubs. Find the cost of one rose bush and the cost of one shrub.

$3.85 for a rose bush $11.72 for a shrub

12. Shayna and Paul each improved their yards by planting rose bushes and ivy. They bought their supplies from the same stone. Shayna spent $180.40 on 14 rose bushes and 10 pots of ivy. Paul spent $75.40 on 7 rose bushes and 3 pots of ivy. What is the cost of one rose bush and the cost of one pot on ivy?

$7.60 for a rose bud $7.40 for a pot of ivy

13. The school that Kaiden goes to is selling tickets to a play. On the first day of ticket sales the school sold 3 senior citizen tickets and 3 child tickets for a total of $66. The school took in $100 on the second day by selling 9 senior citizen tickets and 2 child tickets. What is the price for one senior citizen ticket and one child ticket?

$8 per senior citizen ticket
$14 per child ticket

14. Adam's school is selling tickets to a play. One the first day of ticket sales the school sold 7 adult tickets and 14 student tickets for a total of $147. The school took in $127 on the second day by selling 7 adult tickets and 9 student tickets. Find the price of an adult ticket and the price of a student ticket.

$13 for an adult ticket
$4 for a student ticket

15. The school that Eduardo goes to is selling tickets to the annual dance competition. On the first day of ticket sales the school sold 5 adult tickets and 2 child tickets for a total of $22.40. The school took in $13.40 on the second day by selling 2 adult tickets and 2 child tickets. Find the price of an adult ticket and the price of a child ticket.

$3 for an adult ticket
$3.70 for a child ticket

16. The school that Madison goes to is selling tickets to the annual dance competition. On the first day of ticket sales the school sold 11 senior citizen tickets and 14 student tickets for a total of $194.20. The school took in $86.20 on the second day by selling 6 senior citizen tickets and 2 student tickets. Find the price of a senior citizen ticket and the price of a student ticket.

$13.20 for a senior citizen ticket $3.50 for a student

17. The senior classes at High School A and High School B planned separate trips to the water park. The senior class at High School A rented and filled 8 vans and 11 buses with 507 students. High School B rented and filled 2 vans and 2 buses with 96 students. Each van and each bus carried the same number of students. Find the number of students in each van and in each bus.

7 per van
41 per bus

18. The indoor climbing gym is a popular field trip destination. This year the senior class at High School A and the senior class at High School B both planned trips there. The senior class at High School A rented and filled 10 vans and 12 buses with 736 students. High School B rented and filled 4 vans and 8 buses with 464 students. Every van had the same number of students in it as did the buses. How many students can a van carry? How many students can a bus carry?

10 per van
53 per bus

① Sum Equation $x + y = 15$

Difference Equation $x - y = 1$

since the y's are 1's, but opposite signs add the equation to eliminate the y's.

$$\begin{array}{r} x + y = 15 \\ x - y = 1 \\ \hline 2x = 16 \end{array}$$

$$\frac{2x}{2} = \frac{16}{2}$$

$$\boxed{x = 8}$$

Using $x + y = 15$

$$8 + y = 15$$

$$-8 \quad -8$$

$$\boxed{y = 7}$$

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② Sum Equation $x + y = 21$

Difference Equation $x - y = 5$

$$\begin{array}{r} x + y = 21 \\ x - y = 5 \\ \hline 2x = 26 \end{array}$$

$$\frac{2x}{2} = \frac{26}{2}$$

$$\boxed{x = 13}$$

Using $x + y = 21$

$$13 + y = 21$$

$$-13 \quad -13$$

$$\boxed{y = 8}$$

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③ Sum Equation $x + y = 20$

Difference Equation $x - y = 4$

$$\begin{array}{r} x + y = 20 \\ x - y = 4 \\ \hline 2x = 24 \end{array}$$

$$\frac{2x}{2} = \frac{24}{2}$$

$$\boxed{x = 12}$$

Using $x + y = 20$

$$12 + y = 20$$

$$-12 \quad -12$$

$$\boxed{y = 8}$$

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④ Sum Equation $x + y = 23$

Difference Equation $x - y = 4.8$

$$\begin{array}{r} x + y = 23 \\ x - y = 4.8 \\ \hline 2x = 27.8 \end{array}$$

$$\frac{2x}{2} = \frac{27.8}{2}$$

$$\boxed{x = 13.9}$$

Using $x + y = 23$

$$13.9 + y = 23$$

$$-13.9 \quad -13.9$$

$$\boxed{y = 9.1}$$

⑤ Cory's Equation $1F + 5c = 111$

Audrey's Equation $11F + 13c = 381$

Method 1: Substitution

- Solve Cory's equation for F since it has a coefficient of 1

$$1F + 5c = 111$$
$$-5c \quad -5c$$
$$F = 111 - 5c$$

- Replace F in Audrey's equation and solve for c.

$$11F + 13c = 381$$
$$11(111 - 5c) + 13c = 381$$
$$1221 - 55c + 13c = 381$$
$$1221 - 42c = 381$$
$$-1221 \quad -1221$$
$$\frac{-42c}{-42} = \frac{-840}{-42}$$
$$\boxed{c = \$20}$$

- Replace c in equation from Step 1

$$F = 111 - 5c$$
$$F = 111 - 5(20)$$
$$F = 111 - 100$$
$$\boxed{F = \$11}$$

Method 2: Elimination

- Multiply Cory's equation by -11

$$-11(F + 5c = 111)$$
$$-11F - 55c = -1221$$

- Add this equation to Audrey's

$$11F + 13c = 381$$
$$-11F - 55c = -1221$$
$$\frac{-42c}{-42} = \frac{-840}{-42}$$
$$\boxed{c = \$20}$$

- Replace c in Cory's Equation and solve for F

$$F + 5c = 111$$
$$F + 5(20) = 111$$
$$F + 100 = 111$$
$$-100 \quad -100$$
$$\boxed{F = \$11}$$

French silk cheesecakes are $11 each

Chocolate marble cheesecakes are $20 each

⑥ Mark's Equation $6a + 13p = 210$

Gracey's Equation $3a + 13p = 183$

Method 1: Substitution

- Solve one equation for a or p

$$3a + 13p = 183$$
$$-3a \qquad -3a$$
$$\frac{13p}{13} = \frac{183}{13} - \frac{3a}{13}$$
$$p = \frac{183}{13} - \frac{3}{13}a$$

- Substitute into Mark's equation

$$6a + 13p = 210$$
$$6a + 13\left(\frac{183}{13} - \frac{3}{13}a\right) = 210$$
$$6a + 183 - 3a = 210$$
$$3a + 183 = 210$$
$$-183 \qquad -183$$
$$\frac{3a}{3} = \frac{27}{3}$$
$$\boxed{a = \$9}$$

- I'd go back to an original equation and plug in.

$$6a + 13p = 210$$
$$6(9) + 13p = 210$$
$$54 + 13p = 210$$
$$-54 \qquad -54$$
$$\frac{13p}{13} = \frac{156}{13}$$
$$\boxed{p = \$12}$$

Method 2: Elimination

- Multiply Gracey's Equation by -1

$$-1(3a + 13p = 183)$$
$$-3a - 13p = -183$$

- Add to Mark's equation

$$6a + 13p = 210$$
$$-3a - 13p = -183$$
$$\frac{3a}{3} = \frac{27}{3}$$
$$\boxed{a = \$9}$$

- Substitute a into one equation

$$3a + 13p = 183$$
$$3(9) + 13p = 183$$
$$27 + 13p = 183$$
$$-27 \qquad -27$$
$$\frac{13p}{13} = \frac{156}{13}$$
$$\boxed{p = \$12}$$

\$9 per apple pie

\$12 per pumpkin pie

⑦ Elisa's equation $12\$ + 1\ell = 100.30$

Lisa's equation $12\$ + 11\ell = 251.30$

Method 1: substitution

- Solve Elisa's equation for ℓ since its coefficient is 1

$$12\$ + 1\ell = 100.30$$
$$-12\$ \qquad -12\$$$
$$1\ell = 100.30 - 12\$$$

- Replace ℓ in Lisa's equation and solve for \$.

$$12\$ + 11\ell = 251.30$$
$$12\$ + 11(100.30 - 12\$) = 251.30$$
$$12\$ + 1103.3 - 132\$ = 251.30$$
$$-120\$ + 1103.3 = 251.30$$
$$-1103.3 \qquad -1103.3$$
$$\frac{-120\$}{-120} = \frac{-852}{-120}$$
$$\boxed{\$ = \#7.10}$$

- Replace \$ in equation solved for ℓ.

$$\ell = 100.30 - 12\$$$
$$\ell = 100.30 - 12(7.10)$$
$$\ell = 100.30 - 85.20$$
$$\boxed{\ell = \#15.10}$$

Method 2: Elimination

- Multiply Lisa's equation by -1

$$-1(12\$ + 11\ell = 251.30)$$
$$-12\$ - 11\ell = -251.30$$

- Add the two equations

$$12\$ + 1\ell = 100.30$$
$$-12\$ - 11\ell = -251.30$$
$$\frac{-10\ell}{-10} = \frac{-151.00}{-10}$$
$$\boxed{\ell = \#15.10}$$

- Plug into Elisa's equation

$$12\$ + \ell = 100.30$$
$$12\$ + 15.10 = 100.30$$
$$-15.10 \qquad -15.10$$
$$\frac{12\$}{12} = \frac{85.2}{12}$$
$$\boxed{\$ = 7.10}$$

\$7.10 per small box
\$15.10 per large box

⑧ Amy's Equation $8p + 5\$ = 71$

Emily's Equation $7p + 11\$ = 108.50$

Method 1: Substitution

- Solve one equation for p or $

$8p + 5\$ = 71$

$-8p \qquad -8p$

$\frac{5\$}{5} = \frac{71}{5} - \frac{8p}{5}$

$\$ = 14.2 - 1.6p$

- Replace $ in Emily's Equation

$7p + 11\$ = 108.50$

$7p + 11(14.2 - 1.6p) = 108.50$

$7p + 156.2 - 17.6p = 108.50$

$156.2 - 10.6p = 108.50$

$-156.2 \qquad -156.20$

$\frac{-10.6p}{-10.6} = \frac{-47.7}{-10.6}$

$p = \$4.50$

- Replace p in equation solved for $.

$\$ = 14.2 - 1.6p$

$\$ = 14.2 - 1.6(4.5)$

$\$ = 14.2 - 7.2$

$\$ = \$7.00$

Method 2: Elimination

- Multiply Amy's equation by 11

$11(8p + 5\$ = 71)$

$88p + 55\$ = 781$

- Multiply Emily's equation by -5

$-5(7p + 11\$ = 108.50)$

$-35p - 55\$ = -542.5$

- Add these two equations together

$88p + 55\$ = 781$

$-35p - 55\$ = -542.5$

$\frac{53p}{53} = \frac{238.5}{53}$

$p = \$4.50$

- Plug p into on of the equations

$8p + 5\$ = 71$

$8(\$4.50) + 5\$ = 71$

$36 + 5\$ = 71$

$-36 \qquad -36$

$\frac{5\$}{5} = \frac{35}{5}$

$\$ = \$7.00$

$4.50 per roll of plain wrapping paper
$7.00 per roll of shiny wrapping paper

⑨ Kevin's equation $6\$ + 5g = 100$

John's equation $2\$ + 14g = 132$

Method 1: Substitution

- Solve John's equation for $\$$ or g

$$2\$ + 14g = 132$$
$$-14g \quad -14g$$
$$\frac{2\$}{2} = \frac{132 - 14g}{2}$$
$$\$ = 66 - 7g$$

- Replace $\$$ in Kevin's equation and solve for g.

$$6\$ + 5g = 100$$
$$6(66 - 7g) + 5g = 100$$
$$396 - 42g + 5g = 100$$
$$396 - 37g = 100$$
$$-396 \quad -396$$
$$\frac{-37g}{-37} = \frac{-296}{-37}$$
$$\boxed{g = 8}$$

- Replace g in the equation solved for $\$$

$$\$ = 66 - 7g$$
$$\$ = 66 - 7(8)$$
$$\$ = 66 - 56$$
$$\boxed{\$ = 10}$$

Method 2: Elimination

- multiply John's Equation by -3

$$-3(2\$ + 14g = 132)$$
$$-6\$ - 42g = -396$$

- Add this to Kevin's equation

$$6\$ + 5g = 100$$
$$-6\$ - 42g = -396$$
$$-37g = -296$$
$$\frac{-37g}{-37} = \frac{-296}{-37}$$
$$\boxed{g = 8}$$

- Replace g in one equation

$$6\$ + 5g = 100$$
$$6\$ + 5(8) = 100$$
$$6\$ + 40 = 100$$
$$-40 \quad -40$$
$$\frac{6\$}{6} = \frac{60}{6}$$
$$\boxed{\$ = 10}$$

\$10 per ft^3 of sod

\$8 per bunch of ornamental grass

(10) Shanice's Equation $6h + 3\$ = 96$

Kayla's Equation $5h + 12\$ = 175$

Method 1: Substitution

- Solve Shanice's equation for hor $

$6h + 3\$ = 96$

$-6h \qquad -6h$

$\frac{3\$}{3} = \frac{96}{3} - \frac{6h}{3}$

$\$ = 32 - 2h$

- Replace $ in Kayla's Eqn and solve for h.

$5h + 12\$ = 175$

$5h + 12(32 - 2h) = 175$

$5h + 384 - 24h = 175$

$-19h + 384 = 175$

$-384 \quad -384$

$\frac{-19h}{-19} = \frac{-209}{-19}$

$\boxed{h = \$11}$

- Replace h in Shanice's Equation and solve for $

$6h + 3\$ = 96$

$6(11) + 3\$ = 96$

$66 + 3\$ = 96$

$-66 \qquad -66$

$\frac{3\$}{3} = \frac{30}{3}$

$\boxed{\$ = \$10}$

Method 2: Elimination

- Multiply Shanice's equation by -4

$-4(6h + 3\$ = 96)$

$-24h - 12\$ = -384$

- Add to Kayla's equation

$5h + 12\$ = 175$

$-24h - 12\$ = -384$

$\frac{-19h}{-19} = \frac{-209}{-19}$

$\boxed{h = \$11}$

- Plug into Shanice's equation and solve for $

$6h + 3\$ = 96$

$6(11) + 3\$ = 96$

$66 + 3\$ = 96$

$-66 \qquad -66$

$\frac{3\$}{3} = \frac{30}{3}$

$\boxed{\$ = \$10}$

$11 per hosta

$10 per shrub

⑪ Scott's Equation $2r + 4\$ = \$54.58$

Travis' Equation $10r + 12\$ = \$179.14$

Method 1: Substitution

- Solve Scott's equation for r or $

$2r + 4\$ = 54.58$

$-4\$ \quad -4\$$

$\frac{2r}{2} = \frac{54.58}{2} - \frac{4\$}{2}$

$r = 27.29 - 2\$$

- Replace r in Travis' Equation.

$10r + 12\$ = 179.14$

$10(27.29 - 2\$) + 12\$ = 179.14$

$272.9 - 20\$ + 12\$ = 179.14$

$272.9 - 8\$ = 179.14$

$-272.9 \quad -272.90$

$\frac{-8\$}{-8} = \frac{-93.76}{-8}$

$\$ = \$11.72$

- Replace $ into scott's equation and solve for r.

$2r + 4\$ = 54.58$

$2r + 4(11.72) = 54.58$

$2r + 46.88 = 54.58$

$-46.88 \quad -46.88$

$\frac{2r}{2} = \frac{7.7}{2}$

$r = \$3.85$

Method 2: Elimination

- Multiply scott's equation by -3

$-3(2r + 4\$ = 54.58)$

$-6r - 12\$ = -163.74$

- Add this to Travis' equation

$10r + 12\$ = 179.14$

$-6r - 12\$ = -163.74$

$\frac{4r}{4} = \frac{15.4}{4}$

$r = \$3.85$

- Plug into scott's equation and solve for $

$2r + 4\$ = 54.58$

$2(3.85) + 4\$ = 54.58$

$7.70 + 4\$ = 54.58$

$-7.70 \quad -7.70$

$\frac{4\$}{4} = \frac{46.88}{4}$

$\$ = \$11.72$

$3.85 per rose bush

$11.72 per shrub

(12) Shayna's Equation $14r + 10p = 180.40$

Paul's Equation $7r + 3p = 75.40$

Method 1: Substitution

- Solve Paul's equation for r or p

$$7r + 3p = 75.40$$
$$-7r \qquad -7r$$
$$\frac{3p}{3} = \frac{75.40}{3} - \frac{7r}{3}$$
$$p = \frac{75.40}{3} - \frac{7}{3}r$$

- Replace p in Shayna's Equation and solve for r

$$14r + 10p = 180.40$$
$$14r + 10\left(\frac{75.40}{3} - \frac{7}{3}r\right) = 180.40$$
$$3\left[14r + \frac{754.0}{3} - \frac{70}{3}r = 180.40\right]3$$
$$42r + 754 - 70r = 541.20$$
$$-28r + 754 = 541.20$$
$$-754 \qquad -754$$
$$\frac{-28r}{-28} = \frac{-212.80}{-28}$$
$$\boxed{r = \$7.60}$$

- Plug r into Paul's equation and solve for p:

$$7r + 3p = 75.40$$
$$7(7.60) + 3p = 75.40$$
$$53.20 + 3p = 75.40$$
$$-53.20 \qquad -53.20$$
$$\frac{3p}{3} = \frac{22.20}{3}$$
$$\boxed{p = \$7.40}$$

Method 2: Elimination

- Multiply Paul's equation by -2

$$-2(7r + 3p = 75.40)$$
$$-14r - 6p = -150.80$$

- Add the Shayna's equation

$$14r + 10p = 180.40$$
$$-14r - 6p = -150.80$$
$$\frac{4p}{4} = \frac{29.60}{4}$$
$$\boxed{p = \$7.40}$$

- Plug p into Paul's equation and solve for r.

$$7r + 3p = 75.40$$
$$7r + 3(7.40) = 75.40$$
$$7r + 22.20 = 75.40$$
$$-22.20 \qquad -22.20$$
$$\frac{7r}{7} = \frac{53.20}{7}$$
$$\boxed{r = \$7.60}$$

$7.60 per rose bush

$7.40 per pot of ivy

(13) Day 1 Sales $3\$ + 3c = 66$

Day 2 sales $9\$ + 2c = 100$

Method 1: Substitution

- Solve Day 1 Sales for $\$$ or c

$$3\$ + 3c = 66$$
$$-3c \quad -3c$$
$$\frac{3\$}{3} = \frac{66}{3} - \frac{3c}{3}$$
$$\$ = 22 - c$$

- Replace $\$$ in Day 2 sales and solve for c

$$9\$ + 2c = 100$$
$$9(22-c) + 2c = 100$$
$$198 - 9c + 2c = 100$$
$$198 - 7c = 100$$
$$-198 \quad -198$$
$$\frac{-7c}{-7} = \frac{-98}{-7}$$
$$\boxed{c = \$14}$$

- Using Day 1 plug in c and solve for $\$$

$$3\$ + 3c = 66$$
$$3\$ + 3(14) = 66$$
$$3\$ + 42 = 66$$
$$-42 \quad -42$$
$$\frac{3\$}{3} = \frac{24}{3}$$
$$\boxed{\$ = 8}$$

Method 2: Elimination

- Multiply Day 1 sales by -3

$$-3(3\$ + 3c = 66)$$
$$-9\$ - 9c = -198$$

- Add to Day 2 sales

$$9\$ + 2c = 100$$
$$-9\$ - 9c = -198$$
$$\frac{-7c}{-7} = \frac{-98}{-7}$$
$$\boxed{c = \$14}$$

- Plug into Day 2 sales and solve for $\$$

$$9\$ + 2c = 100$$
$$9\$ + 2(14) = 100$$
$$9\$ + 28 = 100$$
$$-28 \quad -28$$
$$\frac{9\$}{9} = \frac{72}{9}$$
$$\boxed{\$ = \$8}$$

\$8 per Senior Citizen

\$14 per child

(14) Day 1 Sales $7a + 14\$ = 147$

Day 2 Sales $7a + 9\$ = 127$

Method 1: Substitution

- Solve Day 1 equation for a or $

$$7a + 14\$ = 147$$
$$-14\$ \quad -14\$$$
$$\frac{7a}{7} = \frac{147}{7} - \frac{14\$}{7}$$
$$a = 21 - 2\$$$

- Replace a in Day 2 sales and solve for $.

$$7a + 9\$ = 127$$
$$7(21 - 2\$) + 9\$ = 127$$
$$147 - 14\$ + 9\$ = 127$$
$$147 - 5\$ = 127$$
$$-147 \quad -147$$
$$\frac{-5\$}{-5} = \frac{-20}{-5}$$
$$\boxed{\$ = \$4}$$

- Plug $ into Day 1 equation and solve for a.

$$7a + 14\$ = 147$$
$$7a + 14(4) = 147$$
$$7a + 56 = 147$$
$$-56 \quad -56$$
$$\frac{7a}{7} = \frac{91}{7}$$
$$\boxed{a = \$13}$$

Method 2: Elimination

- Multiply Day 2 by -1

$$-1(7a + 9\$ = 127)$$
$$-7a - 9\$ = -127$$

- Add this to Day 1

$$7a + 14\$ = 147$$
$$-7a - 9\$ = -127$$
$$\frac{5\$}{5} = \frac{20}{5}$$
$$\boxed{\$ = \$4}$$

- Plug $ into one of the equations and solve for a.

$$7a + 9\$ = 127$$
$$7a + 9(4) = 127$$
$$7a + 36 = 127$$
$$-36 \quad -36$$
$$\frac{7a}{7} = \frac{91}{7}$$
$$\boxed{a = \$13}$$

$13 per adult ticket
$4 per student ticket

(15) Day 1 Sales $5a + 2c = 22.40$

Day 2 Sales $2a + 2c = 13.40$

Method 1: Substitution

- Solve Day 2 for a or c

$$2a + 2c = 13.40$$
$$-2c \quad -2c$$
$$\frac{2a}{2} = \frac{13.40}{2} - \frac{2c}{2}$$
$$a = 6.70 - c$$

- Replace a in Day 1 and solve for c.

$$5a + 2c = 22.40$$
$$5(6.70 - c) + 2c = 22.40$$
$$33.5 - 5c + 2c = 22.40$$
$$33.5 - 3c = 22.40$$
$$-33.5 \quad -33.50$$
$$\frac{-3c}{-3} = \frac{-11.1}{-3}$$
$$\boxed{c = \$3.70}$$

- Replace c in Day 2 and solve for a.

$$2a + 2c = 13.40$$
$$2a + 2(3.70) = 13.40$$
$$2a + 7.40 = 13.40$$
$$-7.40 \quad -7.40$$
$$\frac{2a}{2} = \frac{6}{2}$$
$$\boxed{a = \$3.00}$$

Method 2: Elimination

- Multiply Day 2 by -1

$$-1(2a + 2c = 13.40)$$
$$-2a - 2c = -13.40$$

- Add to Day 1 sales

$$5a + 2c = 22.40$$
$$-2a - 2c = -13.40$$
$$\frac{3a}{3} = \frac{9}{3}$$
$$\boxed{a = \$3.00}$$

- Replace a in Day 2 and solve for c.

$$2a + 2c = 13.40$$
$$2(3) + 2c = 13.40$$
$$6 + 2c = 13.40$$
$$-6 \quad -6$$
$$\frac{2c}{2} = \frac{7.40}{2}$$
$$\boxed{c = \$3.70}$$

$3 per adult ticket
$3.70 per child ticket

(16) Day 1 Sales $11\$ + 14c = 194.20$

Day 2 Sales $6\$ + 2c = 86.20$

Method 1: Substitution

- Solve Day 2 for c

$6\$ + 2c = 86.20$

$-6\$ \qquad -6\$$

$\frac{2c}{2} = \frac{86.20}{2} - \frac{6\$}{2}$

$c = 43.10 - 3\$$

- Plug into Day 1 and solve for $

$11\$ + 14c = 194.20$

$11\$ + 14(43.10 - 3\$) = 194.20$

$11\$ + 603.40 - 42\$ = 194.20$

$-31\$ + 603.40 = 194.20$

$-603.40 \quad -603.40$

$\frac{-31\$}{-31} = \frac{-409.20}{-31}$

$\$ = \$13.20$

- Plug into Day 2 and solve for c

$6\$ + 2c = 86.20$

$6(13.20) + 2c = 86.20$

$79.20 + 2c = 86.20$

$-79.20 \quad -79.20$

$\frac{2c}{2} = \frac{7.00}{2}$

$c = \$3.50$

Method 2: Elimination

- Multiply Day 2 by -7

$-7(6\$ + 2c = 86.20)$

$-42\$ - 14c = -603.40$

- Add to Day 1 sales

$11\$ + 14c = 194.20$

$-42\$ - 14c = -603.40$

$\frac{-31\$}{-31} = \frac{-409.20}{-31}$

$\$ = \$13.20$

- Substitute into Day 2 and solve for c

$6\$ + 2c = 86.20$

$6(13.20) + 2c = 86.20$

$79.20 + 2c = 86.20$

$-79.20 \quad -79.20$

$\frac{2c}{2} = \frac{7.00}{2}$

$c = \$3.50$

$13.20 per Senior ticket

$3.50 per Student ticket

(17) High School A $8v + 11b = 507$

High School B $2v + 2b = 96$

Method 1: Substitution

- Solve High School B for verb

$$2v + 2b = 96$$
$$-2b \quad -2b$$
$$\frac{2v}{2} = \frac{96}{2} - \frac{2b}{2}$$
$$v = 48 - b$$

- Replace in High School A and solve for b.

$$8v + 11b = 507$$
$$8(48 - b) + 11b = 507$$
$$384 - 8b + 11b = 507$$
$$384 + 3b = 507$$
$$-384 \quad -384$$
$$\frac{3b}{3} = \frac{123}{3}$$
$$\boxed{b = 41}$$

- Replace in High School B and solve for v.

$$2v + 2b = 96$$
$$2v + 2(41) = 96$$
$$2v + 82 = 96$$
$$-82 \quad -82$$
$$\frac{2v}{2} = \frac{14}{2}$$
$$\boxed{v = 7}$$

Method 2: Elimination

- Multiply High School B by -4

$$-4(2v + 2b = 96)$$
$$-8v - 8b = -384$$

- Add to High School A

$$8v + 11b = 507$$
$$-8v - 8b = -384$$
$$\frac{3b}{3} = \frac{123}{3}$$
$$\boxed{b = 41}$$

- Plug into High School B and solve for v.

$$2v + 2b = 96$$
$$2v + 2(41) = 96$$
$$2v + 82 = 96$$
$$-82 \quad -82$$
$$\frac{2v}{2} = \frac{14}{2}$$
$$\boxed{v = 7}$$

7 passengers per van
41 passengers per bus

(18) High School A $10v + 12b = 736$
High School B $4v + 8b = 464$

Method 1: Substitution

- Solve High School B for v

$4v + 8b = 464$
$-8b \quad -8b$

$\frac{4v}{4} = \frac{464}{4} - \frac{8b}{4}$

$v = 116 - 2b$

- Replace in High School A and solve for b.

$10v + 12b = 736$
$10(116 - 2b) + 12b = 736$
$1160 - 20b + 12b = 736$
$1160 - 8b = 736$
$-1160 \quad -1160$

$\frac{-8b}{-8} = \frac{-424}{-8}$

$\boxed{b = 53}$

- Plug into High School B and solve for v

$4v + 8b = 464$
$4v + 8(53) = 464$
$4v + 424 = 464$
$-424 \quad -424$

$\frac{4v}{4} = \frac{40}{4}$

$\boxed{v = 10}$

Method 2: Elimination

- Multiply High School A by 4

$4(10v + 12b = 736)$
$40v + 48b = 2944$

- Multiply High School B by -10

$-10(4v + 8b = 464)$
$-40v - 80b = -4640$

- Add the two equations

$40v + 48b = 2944$
$-40v - 80b = -4640$

$\frac{-32b}{-32} = \frac{-1696}{-32}$

$\boxed{b = 53}$

- Plug into High School B and solve for v.

$4v + 8b = 464$
$4v + 8(53) = 464$
$4v + 424 = 464$
$-424 \quad -424$

$\frac{4v}{4} = \frac{40}{4}$

$\boxed{v = 10}$

10 passengers per van
53 passengers per bus