**Unit 1 – Solving Systems of Linear Equations**
**Homework 1.4 Solving Word Problems**

Name: Mr. Kooy

1. Peter is looking into the cost of renting a car for the weekend. EZ Car Rental charges $80 plus $0.15/km while Kelly's Kars charge $50 plus $0.26/km. By solving the linear system for this situation, explain which company Peter should choose and why.

Let: $x$ = km
$y$ = total cost

EZ: $y = 0.15x + 80$

KK: $y = 0.26x + 50$

$0.26x + 50 = 0.15x + 80$ (−50, −0.15x)

$0.11x = 30$

$\frac{0.11x}{0.11} = \frac{30}{0.11}$

$x = 272.\overline{72}$

$\therefore$

$y = 0.15\left(\frac{30}{0.11}\right) + 80$

$y = 120.\overline{90}$

2. Farmer Brown has 55 animals in his farm, consisting of sheep and chicken. He tells you that there are a total of 148 legs. How many sheep and chicken does Farmer Brown have?

Let: $x$ = sheep
$y$ = chicken

animals: $x + y = 55$ → $y = 55 - x$

legs: $4x + 2y = 148$

$4x + 2(55 - x) = 148$

$4x + 110 - 2x = 148$ (−110)

$2x = 38$

$\frac{2x}{2} = \frac{38}{2}$

$x = 19$

$y = 55 - 19$

$y = 36$

3. Mrs. Templeton needs to make 5 L of 18% hydrochloric acid solution. She has one bottle of 25% hydrochloric acid solution and another bottle with 15% hydrochloric acid. How many litres of each solution must she use to make the 18% solution?

Let: $x$ = # of L of 25%
$y$ = # of L of 15%

volume: $x + y = 5$ → $y = 5 - x$

mixture: $0.25x + 0.15y = 0.18(5)$

$0.25x + 0.15(5 - x) = 0.9$

$0.25x + 0.75 - 0.15x = 0.9$ (−0.75)

$0.1x = 0.15$

$\frac{0.1x}{0.1} = \frac{0.15}{0.1}$

$x = 1.5$

$y = 5 - 1.5$

$y = 3.5$

– 4. A health-food company packs almond butter in jars. Some jars hold 250 g. Other jars hold 500 g. On Tuesday, the company packed 183.75 kg of almond butter in 471 jars. How many jars of each size did they pack?

↳ 183750 g

Let: $x$: # of 250 jars
$y$ = # of 500 jars

jars amount: $x + y = 471$ → $y = 471 - x$

mix of jars: $250x + 500y = 183750$

$250x + 500(471 - x) = 183750$
$250x + 235500 - 500x = 183750$ (−235500)
$-250x = -51750$
$x = 207$

$y = 471 - 207$
$y = 264$

5. Isaac works a day job and night job, for a total of 40 hours a week. He earns $15/h for the day job and $11/h for the night job. He earns $540 in a week. How many daytime and nighttime hours does he work?

Let: $x$ = day hours
$y$ = night hours

hours: $x + y = 40$ → $y = 40 - x$

pay: $15x + 11y = 540$

$15x + 11(40 - x) = 540$
$15x + 440 - 11x = 540$ (−440)
$\frac{4x}{4} = \frac{100}{4}$
$x = 25$

$y = 40 - 25$
$y = 15$

6. Jessica and Scott are selling flower bulbs for a school fundraiser. Customers can buy packages of tulip bulbs and packages of crocus bulbs. Jessica sold 3 packages of tulip bulbs and 12 packages of crocus bulbs for a total of $261. Scott sold 10 packages of tulip bulbs and 2 packages of crocus bulbs for a total of $110. What is the cost each of one package of tulips bulbs and one package of crocus bulbs?

Let: $x$ = tulip cost
$y$ = crocus cost

Jess. $3x + 12y = 261$
Scotty $10x + 2y = 110$ (×−6)

$3x + 12y = 261$
$+ \quad -60x - 12y = -660$
$\frac{-57x}{-57} \quad \& \quad \frac{-399}{-57}$
$x = 7$

$10(7) + 2y = 110$
$70 + 2y = 110$ (−70)
$\frac{2y}{2} = \frac{40}{2}$
$y = 20$

7. Your car broke down and you call two mechanics. The Slow Fix auto shop charges $28 for parts and $48/h for labour. The We Work Cheaper auto shop charges $59 for parts and $44.90 per hour of labour for the same job. After how many hours do they charge the same total amount?

Let: $x$ = hours
$y$ = total cost

SF: $y = 48x + 28$

WWC: $y = 44.9x + 59$

$48x + 28 = 44.9x + 59$

$-44.9x \quad -44.9x$

$\frac{3.1x}{3.1} = \frac{31}{3.1}$

$x = 10$

$y = 48(10) + 28$

$y = 480 + 28$

$y = 508$

8. Norachai asked you to make 12 L of fruit punch that contains 33% fruit juice by mixing together some amount of Brand A fruit punch and some amount of Brand B fruit punch. Brand A contains 58% fruit juice and Brand B contains 28% fruit juice. How much of each do you need?

Let: $x$ = Brand A
$y$ = Brand B

amount: $x + y = 12$ → $y = 12 - x$

mix: $0.58x + 0.28y = 0.33(12)$

$0.58x + 0.28(12 - x) = 3.96$

$0.58x + 3.36 - 0.28x = 3.96$

$-3.36 \quad -3.36$

$\frac{0.3x}{0.3} = \frac{0.6}{0.3}$

$x = 2$

$y = 12 - 2$

$y = 10$

9. After a month, a tip jar at a local coffee shop had 320 coins containing only nickels and quarters (for some reason…). The total tip came out to be $59.20. How many nickels and how many quarters were there in the tip jar?

Let: $x$ = nickels
$y$ = quarters

amount: $x + y = 320$ → $y = 320 - x$

mix: $0.05x + 0.25y = 59.20$

$0.05x + 0.25(320 - x) = 59.20$

$0.05x + 80 - 0.25x = 59.20$

$-80 \quad -80$

$\frac{-0.2x}{-0.2} = \frac{-20.8}{-0.2}$

$x = 104$

$y = 320 - 104$

$y = 216$

10. Trevon and Jose are selling pies for a school fundraiser. Customers can buy cherry pies and lemon meringue pies. Trevon sold 8 cherry pies and 8 lemon meringue pies for a total of $152. Jose sold 4 cherry pies and 6 lemon meringue pies for a total of $100. What is the cost each of one cherry pie and one lemon meringue pie?

Let: $x$ = cherry pies
$y$ = lemon meringue pies

Trevon: $8x + 8y = 152$
Jose: $4x + 6y = 100$ $\times -2$

$8x + 8y = 152$
$+ \; -8x - 12y = -200$
$0 \quad -4y = -48$
$\frac{-4y}{-4} = \frac{-48}{-4}$
$y = 12$

$4x + 6(12) = 100$
$4x = 100 - 72$
$\frac{4x}{4} = \frac{28}{4}$
$x = 7$

11. Tools-R-Us rents snow blowers for a base fee of $24, plus $9/h. XYZ Rentals rents snow blowers for a base fee of $18, plus $11/h. After how many hours is the cost the same?

Let: $x$ = hours
$y$ = total cost

Tools: $y = 9x + 24$
XYZ: $y = 11x + 18$

$9x + 24 = 11x + 18$
$11x - 9x = 24 - 18$
$\frac{2x}{2} = \frac{6}{2}$
$x = 3$

$y = 9(3) + 24$
$y = 27 + 24$
$y = 51$

12. At Jessica's Java, a new blend of coffee is featured each week. This week, Jessica is creating a low-caffeine espresso blend from Brazilian and Ethiopian beans. She wants to make 200 kg of this blend and sell it for $15/kg. On their own, the Brazilian beans sell for $12/kg, and the Ethiopian beans sell for $17/kg. How many kilograms of each kind of bean must Jessica use to make 200 kg of her new blend of the week?

Let: $x$ = brazilian
$y$ = ethiopian

amount: $x + y = 200$ $\rightarrow y = 200 - x$
price: $12x + 17y = 15(200)$

$12x + 17(200 - x) = 3000$
$12x + 3400 - 17x = 3000$ (−3400)
$-5x = -400$
$\frac{-5x}{-5} = \frac{-400}{-5}$
$x = 80$

$y = 200 - 80$
$y = 120$

13. Yellowstone National Park 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 10 buses with 530 students. High School B rented and filled 7 vans and 4 buses with 263 students. Each van and each bus carried the same number of students. Find the number of students in each van and in each bus.

Let: $x$ = van capacity
$y$ = bus capacity

HSA: $10x + 10y = 530$ $\times 2$
HSB: $7x + 4y = 263$ $\times -5$

$20x + 20y = 1060$
$+ \quad -35x - 20y = -1315$
$-15x + 0 = -255$
$\frac{-15x}{-15} = \frac{-255}{-15}$
$x = 17$

$10(17) + 10y = 530$
$170 - 170 + 10y = 530 - 170$
$\frac{10y}{10} = \frac{360}{10}$
$y = 36$

14. Joanna is considering two job offers. Phoenix Fashions offers $1500/month plus 2.5% commission. Styles by Rebecca offers $1250/month plus 5.5% commission.

Let: $x$ = sales $
$y$ = total pay

Phoenix: $y = 0.025x + 1500$
SbR: $y = 0.055x + 1250$

$0.025x + 1500 = 0.055x + 1250$
$1500 - 1250 = 0.055x - 0.025x$
$\frac{250}{0.03} = \frac{0.03x}{0.03}$
$x = 8333.\dot{3}$

$y = 0.025\left(\frac{250}{0.03}\right) + 1500$
$y = 1708.\dot{3}$

15. The difference of two numbers is 6. Their sum is 82. Find the numbers.

Let: $x$ = #1
$y$ = #2

Sum: $x + y = 82$
difference: $x - y = 6$

$2x = 88$
$\frac{2x}{2} = \frac{88}{2}$
$x = 44$

$44 + y = 82$ $-44$ $-44$
$y = 38$

16. Jerry and Jenny each improved their yards by planting hostas and ivy. They bought their supplies from the same store. Jerry spent $214 on 14 hostas and 12 pots of ivy. Jenny spent $125 on 10 hostas and 3 pots of ivy. What is the cost of one hosta and the cost of one pot of ivy?

Let: $x$ = hosta cost

$y$ = ivy cost

Jerry: $14x + 12y = 214$

Jenny: $10x + 3y = 125$ $\times -4$

$14x + 12y = 214$

$+ -40x - 12y = -500$

$-26x \quad \emptyset = -286$

$\frac{-26x}{-26} \quad \frac{\emptyset = -286}{-26}$

$x = 11$

$10(11) + 3y = 125$

$110 - 110 + 3y = 125 - 110$

$\frac{3y}{3} = \frac{15}{3}$

$y = 5$

17. A test has twenty questions worth 100 points. The test consists of True/False questions worth 3 points each and multiple choice questions worth 11 points each. How many multiple choice questions are on the test?

Let: $x$ = T/F #

$y$ = MC #

$y = 20 - x$

Questions #: $x + y = 20$

Value: $3x + 11y = 100$

$3x + 11(20 - x) = 100$

$3x + 220 - 11x = 100$ $-220$ $-220$

$-8x = -120$

$\frac{-8x}{-8} = \frac{-120}{-8}$

$x = 15$

$y = 20 - 15$

$y = 5$

18. Michaela's mom is trying to decide between two plumber companies to fix her sink. The first company charges $50 for a service call, plus an additional $36 per hour for labor. The second company charges $35 for a service call, plus an additional $39 per hour of labor. At how many hours will the two companies charge the same amount of money?

Let: $x$ = hours

$y$ = total cost

Comp1: $y = 36x + 50$

Comp2: $y = 39x + 36$

$36x + 50 = 39x + 35$

$50 - 35 = 39x - 36x$

$\frac{15}{3} = \frac{3x}{3}$

$x = 5$

$y = 36(5) + 50$

$y = 180 + 50$

$y = 230$

19. Tom pays a one-time registration charge and regular monthly fees to belong to a fitness club. After four months, he had paid $420. After nine months, he had paid $795. Determine the registration charge and the monthly fee.

let: $x$ = monthly fee
$y$ = registration charge

4 months: $4x + y = 420$
9 months: $9x + y = 795$

$9x + y = 795$
$+ \quad -4x - y = -420$
$5x \quad \emptyset = 375$

$\frac{5x}{5} = \frac{375}{5}$

$x = 75$

$y = 420 - 4(75)$
$y = 420 - 300$
$y = 120$

20. Ralph needs 500g of chocolate that is 86% cocoa for a truffle recipe. He has one kind of chocolate that is 99% cocoa and another kind that is 70% cocoa. How much of each kind does Ralph need to make the 86% cocoa blend? Round your answer to the nearest gram.

let: $x$ = 99% cocoa amount
$y$ = 70% cocoa amount

amount: $x + y = 500$ → $y = 500 - x$
blend: $0.99x + 0.7y = 0.86(500)$

$0.99x + 0.7(500 - x) = 430$
$0.99x + 350 - 0.7x = 430$ (−350, −350)
$0.29x = 80$

$\frac{0.29x}{0.29} = \frac{80}{0.29}$

$x \doteq 275.86$

$y = 500 - 275.86$
$y \doteq 224.14$