W4 – Solving Problems Involving Linear Systems Unit 1

MPM2D

Jensen

1) Leanne works at a greenhouse. She needs to plant a total of 32 bulbs. Two types of bulbs are available. She is asked to plant three times as many crocus bulbs as tulip bulbs. How many of each should she plant?

x = # of crocus

y = # of tulip

① $x + y = 32$

$3y + y = 32$

$4y = 32$

$y = 8$

② $x = 3y$

$x = 3(8)$

$x = 24$

she should plant 24 crocus and 8 tulips.

2) James looks in his TV cabinet and finds some old Beta and VHS tapes. He has 17 tapes in all. He finds that he has three more Beta tapes than VHS tapes. How many of each type does he have?

x = # of Beta

y = # of VHS

① $x + y = 17$

$y + 3 + y = 17$

$2y = 14$

$y = 7$

② $x = y + 3$

$x = 7 + 3$

$x = 10$

James has 10 Beta and 7 VHS tapes

3) The girls' soccer team held a fundraising car wash. They charged $5 for each car and $8 for each van. They washed 44 cars and vans and collected $262. How many of each type of vehicle did they wash?

x = # of cars

y = # of vans

① $x + y = 44$

② $5x + 8y = 262$

$5 \times$ ① → $5x + 5y = 220$

② → $5x + 8y = 262$ −

$-3y = -42$

$y = 14$

sub $y = 14$ into ①

$x + y = 44$

$x + 14 = 44$

$x = 30$

They washed 30 cars and 14 vans.

4) Rehman invests his summer earnings of $3050. He invests part of the money at 8% per year, and the rest at 7.5% per year. After 1 year, these investments earn $242 in simple interest. How much did he invest at each rate?

x = amount at 8%
y = amount at 7.5%

① $x + y = 3050$
$y = 3050 - x$
$y = 3050 - 2650$
$y = 400$

② $0.08x + 0.075y = 242$
$0.08x + 0.075(3050 - x) = 242$
$0.08x + 228.75 - 0.075x = 242$
$0.005x = 13.25$
$x = 2650$

Rehman invested $2650 at 8% and $400 at 7.5%.

5) To join Karate Klub, David must pay a monthly fee of $25 and an initial fee of $200. If he chooses Kool Karate, he must pay an initial fee of only $100 but $35 per month.

a) After how many months is the cost the same at either karate club?

C = cost
m = # of months

① $C = 25m + 200$
$35m + 100 = 25m + 200$
$10m = 100$
$m = 10$

② $C = 35m + 100$
$C = 35(10) + 100$
$C = 350 + 100$
$C = 450$

After 10 months both clubs cost $450.

b) If David plans to try karate for 6 months, which club should he join?

Kool Karate.

c) If David decides to do karate for a year, which club should he join?

Karate Klub.

6) White vinegar is a solution of acetic acid in water. There are two strengths of white vinegar, a 5% solution and a 10% solution. How many ml of each solution must be mixed to make 50 ml of a 9% vinegar solution?

x = amount of 5% solution
y = amount of 10% solution

① $x + y = 50$
② $0.05x + 0.1y = 0.09(50)$

① $x + y = 50$
$10 \times$ ② $0.5x + y = 45$ −
$0.5x = 5$
$x = 10$

sub $x = 10$ into ①
$x + y = 50$
$10 + y = 50$
$y = 40$

10ml of 5% and 40ml of 10%

7) It took a patrol boat 5 hours to travel 60 km up a river against the current, and 3 hours for the return trip with the current. Find the speed of the boat in still water and the speed of the current.

x = speed in still water
y = speed of current

① $60 = 5(x - y)$
① $60 = 5x - 5y$
$60 + 5y = 5x$
$12 + y = x$
$12 + 4 = x$
$x = 16$

② $60 = 3(x + y)$
② $60 = 3x + 3y$
$60 = 3(12 + y) + 3y$
$60 = 36 + 3y + 3y$
$24 = 6y$
$y = 4$

Remember:
distance = velocity x time

Speed of boat in still water is 16 km/h
speed of current is 4 km/h.

8) Kareem took 5 hours to drive 470 km from Sudbury to Brantford. For part of the trip, he drove at 100 km/h. For the rest of the trip, he drove at 90 km/h. How far did he drive at each speed?

x = time driven at 90km/h
y = time driven at 100km/h

① $90x + 100y = 470$
② $x + y = 5$

① $90x + 100y = 470$
$100 \times$ ② $100x + 100y = 500$ −
$-10x = -30$
$x = 3$

sub $x = 3$ into ②
$x + y = 5$
$3 + y = 5$
$y = 2$

Remember:
distance = velocity x time

Distance calculations:
distance at 100 km/h
$= 100 \times 2$
$= 200$ km

distance at 90 km/h
$= 90 \times 3$
$= 270$ km

Kareem drove 200km at 100km/h and 270 km at 90km/h

Answers

1) 24 crocus bulbs and 8 tulip bulbs
2) 10 beta tapes and 7 vhs tapes
3) 30 cars and 14 vans
4) $2650 at 8%/year and $400 at 7.5%/year
5) a) 10 months b) Kool Karate c) Karate Klub
6) 10 ml of the 5% solution, 40 ml of the 10% solution
7) boat in still water 16 km/h; current 4km/h
8) 200km at 100km/h; 270 km at 90km/h