

Review: Related Rates & Mixture Applications

1.) In Colorado Creek, Darrell can row 24 km downstream in 6 hours. The return trip took him 8 hours. Find the rate he rows in still water and the rate of the current.

$r = \text{row rate}$	Up	$r - c$	8	24	$8r - 8c = 24$
$C = \text{Current}$	Down	$r + c$	6	24	$6r + 6c = 24$

$$r - c = 3$$

$$r + c = 4$$

$$2r = 7$$

$$r = 3\frac{1}{2} \text{ km/hr}$$

$$3\frac{1}{2} - c = 3$$

$$-c = -\frac{1}{2}$$

$$c = \frac{1}{2}$$

Row rate =  $3\frac{1}{2}$  km/hr

Current rate =  $\frac{1}{2}$  km/hr

2.) Candy worth \$0.95/kg was mixed with candy worth \$1.85/kg to produce a mixture worth \$1.45/kg. How many kilograms of each kind of candy were used to make 27 kg of the mixture?

$$x = \text{kg of } \$0.95$$

$$y = \text{kg of } \$1.85$$

$$(x + y = 27) \cdot .95$$

$$.95x + 1.85y = 39.15$$

$$-.95x - .95y = 25.65$$

$$.90y = 13.50 \quad y = 15$$

.95/kg	x	.95	.95x
1.85/kg	y	1.85	1.85x
Mix	27	1.45	$1.45(27) = 39.15$

$$x + 15 = 27$$

$$x = 12$$

12 kg of \$0.95/kg candy  
15 kg of \$1.85/kg candy

3.) Bill flew his small airplane 459 km in  $4\frac{1}{2}$  hours flying with the wind. He flew 480 km against the wind in 6 hours. Find the rate at which he flew in still air and the rate of the wind.

$$A = \text{still air rate}$$

$$W = \text{wind rate}$$

With wind	A+W	$4\frac{1}{2}$	459
Against	A-W	6	480

$$4.5A + 4.5W = 459$$

$$6A - 6W = 480$$

$$A + W = 102$$

$$A - W = 80$$

$$2A = 182$$

$$A = 91$$

$$91 + W = 102$$

$$W = 11$$

91 km/hr rate of plane  
11 km/hr rate of wind

4.) Peanuts worth \$2.95/kg were mixed with cashews worth \$6.25/kg to produce a mixture worth \$5.00/kg. How many kilograms of each kind of nuts were used to make 33 kg of the mixture?

P = kg of peanuts  
C = kg of cashews

Peanuts	P	2.95	2.95P
Cashews	C	6.25	6.25C
Mixture	33	5.00	5.00(33) = 165

$$(P+C=33) \cdot 2.95$$

$$2.95P + 6.25C = 165$$

$$-2.95P - 2.95C = -97.35$$

$$3.3C = 67.65$$

$$C = 20.5$$

$$P + 20.5 = 33$$

$$P = 12.5$$

20.5 kg of cashews  
12.5 kg of peanuts

5.) A 9% solution of sulfuric acid was mixed with a 30% solution of sulfuric acid to produce an 18% solution. How much 9% solution and how much 30% solution were used to make 21 L of 18% solution?

x = L of 9%

y = L of 30%

9%	x	.09	.09x
30%	y	.30	.30y
Mix	21	.18	.18(21) = 3.78

$$(x+y=21) \cdot .09$$

$$.09x + .30y = 3.78$$

$$-.09x - .09y = -1.89$$

$$.21y = 1.89$$

$$y = 9$$

$$x + 9 = 21$$

$$x = 12$$

12 L of 9% solution  
9 L of 30% solution

6.) Two motorcycles left home and traveled in opposite directions for 8 hours. One motorcycle traveled 2 mi/hr faster than the other. After 8 hours they were 640 miles apart. What was the speed of each motorcycle?

x = rate of faster

y = rate of slower

faster	x	8	8x
slower	y	8	8y
			640

$$8x + 8y = 640$$

$$x = y + 2$$

$$8(y+2) + 8y = 640$$

$$8y + 16 + 8y = 640$$

$$16y + 16 = 640$$

$$16y = 624 \quad y = 39$$

$$x = 39 + 2$$

$$x = 41$$

Faster motor cycle  
41 mi/hr

Slower motor cycle  
39 mi/hr