

$$v = \frac{42}{17} \quad \text{and } v = 20 \text{ both work, but } \frac{42}{17} \text{ is } \sim 2.5$$

and if  $v = 2.5$ ,  $v - 6$  is negative  
 $\therefore v = 20 \text{ mph}$

Day 1 1-8 pg 348

Day 2 9-21 pg 349-350

$$1a) \frac{4(x-1)}{12} - \frac{3(2x-5)}{12} = \frac{5}{12} + \frac{2x}{12}$$

$$4(x-1) - 3(2x-5) = 5 + 2x$$

$$b) \frac{2(2x+3)}{2(x+5)} + \frac{1(x+5)}{2(x+5)} = \frac{7}{2(x+5)}$$

$$2(2x+3) + (x+5) = 7$$

$$c) \frac{4x}{(x+3)(x-3)} - \frac{5(x-3)}{(x+3)(x-3)} = \frac{2(x+3)(x-3)}{(x+3)(x-3)}$$

$$4x - 5(x-3) = 2(x+3)(x-3)$$

$$2a) \frac{3(f+3)}{6} - \frac{2(f-2)}{6} = \frac{12}{6}$$

$$(3f+9) - (2f-4) = 12$$

$$f + 13 = 12$$

$$\boxed{f = -1}$$

$$b) \frac{4(3-y)}{12y} + \frac{3y}{12y} = \frac{6}{12y}$$

$$12 - 4y + 3y = 6$$

$$-y = -6$$

$$\boxed{y = 6 \quad (y \neq 0)}$$

$$c) \frac{9(w-6)}{(w-3)(w-6)} - \frac{4(w-3)}{(w-3)(w-6)} = \frac{18}{(w-3)(w-6)}$$

$$(9w-54) - (4w-12) = 18$$

$$5w - 42 = 18$$

$$5w = 60$$

$$w = 12$$

$$\boxed{w = 12 \quad (w \neq 3, 6)}$$

$$3a) \frac{12}{2t} + \frac{t^2}{2t} = \frac{8t}{2t}$$

$$12 + t^2 = 8t$$

$$t^2 - 8t + 12 = 0$$

$$(t-6)(t-2) = 0$$

$$\boxed{t = 6 \quad t = 2 \quad t \neq 0}$$

$$b) \frac{6(c+3)}{(c+3)(c-3)} = \frac{c+3}{(c+3)(c-3)} - \frac{5(c+3)(c-3)}{(c+3)(c-3)}$$

$$6c+18 = c+3 - 5c^2+45$$

$$5c^2+5c-30=0$$

$$c^2+c-6=0$$

$$(c+3)(c-2)=0$$

$$c=-3 \quad c=2$$

$$\boxed{c=2, \quad c \neq \pm 3}$$

$$c) \frac{d(d-1)}{(d+4)(d-1)} = \frac{2-d}{(d+4)(d-1)} + \frac{d+4}{(d+4)(d-1)}$$

$$d^2-d = 2-d+d+4$$

$$d^2-d-6=0$$

$$(d-3)(d+2)=0$$

$$\boxed{d=3 \quad d=-2 \quad d \neq 1, -4}$$

$$d) \frac{(x^2+x+2)(x-1)}{(x+1)(x-1)} - \frac{x(x+1)(x-1)}{(x+1)(x-1)} = \frac{x^2-5}{(x+1)(x-1)}$$

$$x^3+x-2 - x^3+x = x^2-5$$

$$0 = x^2-2x-3$$

$$0 = (x-3)(x+1)$$

$$x=3 \quad x=-1$$

$$\boxed{x=3 \quad x \neq \pm 1}$$

4. 1 is restricted  $\rightarrow$  division by zero

$$5) a) \frac{3-x}{x^2} - \frac{2}{x} \quad \frac{3-x}{x^2} - \frac{2x}{x^2} \quad \frac{3-3x}{x^2} \quad \text{or} \quad \frac{3(1-x)}{x^2} \quad 0 < x < 3$$

$$b) A = \frac{3-x}{x^2} \left( \frac{2}{x} \right) \quad \text{or} \quad \frac{6-2x}{x^3} \quad 0 < x < 3$$

$$c) \text{ if } p=28 \quad \frac{3-x}{x^2} + \frac{2}{x} = 14$$

$$\frac{3-x}{x^2} + \frac{2x}{x^2} = \frac{14x^2}{x^2}$$

$$14x^2 = x+3$$

$$14x^2 - x - 3 = 0$$
$$(7x+3)(2x-1) = 0$$
$$x = -\frac{3}{7} \quad x = \frac{1}{2}$$

$$0 < x < 3$$

$$\therefore x = \frac{1}{2}$$

$$6a) \frac{26(b-2)}{(b+5)(b-2)} = \frac{(b+5)(b-2)}{(b+5)(b-2)} + \frac{3(b+5)}{(b+5)(b-2)}$$

$$26b - 52 = b^2 + 3b - 10 + 3b + 15$$

$$b^2 - 20b + 57 = 0$$

$$b = \frac{20 \pm \sqrt{20^2 - 4(57)}}{2}$$

$$b = 16.56, \\ 3.44$$

$$b) c(c-2) - 3(c+2)(c-2) = -6$$

$$c^2 - 2c - 3c^2 + 12 + 6 = 0$$

$$-2c^2 - 2c + 18 = 0$$

$$c^2 + c - 9 = 0$$

$$c = \frac{-1 \pm \sqrt{1+36}}{2}$$

$$c = 2.54, -3.54$$

$$7. \quad \frac{L}{30} = \frac{L+30}{L}$$

$$L^2 = 30L + 900$$

$$L^2 - 30L - 900 = 0$$

$$L = \frac{30 \pm \sqrt{900 + 3600}}{2}$$

$$L = \frac{30 \pm \sqrt{4500}}{2}$$

$$L = \frac{30 \pm 30\sqrt{5}}{2}$$

$$L = 15 \pm 15\sqrt{5}$$

$$* L = 15 + 15\sqrt{5} \quad (\text{can't be negative})$$

$$L \approx 48.5 \text{ cm}$$

$$8. \quad x+y=25 \quad \frac{1}{x} + \frac{1}{y} = \frac{1}{4}$$

$$\frac{1}{x} + \frac{1}{25-x} = \frac{1}{4}$$

$$4(25-x) + (4x) = x(25-x)$$

$$100 = 25x - x^2$$

$$x^2 - 25x + 100 = 0$$

$$(x-20)(x-5) = 0$$

$$x=20 \quad x=5$$

$$y=5 \quad y=20$$

(20 and 5)

$$9. \quad \frac{x+6}{x-1} = \frac{9}{2} \quad 2x+12 = 9x-9$$

$$21 = 7x$$

$$x=3$$

(3 and 4)

10. original: students  $\times$  cost = 540

$$x \cdot C = 540$$

$$C = \frac{540}{x}$$

actual

$$(x-6)(C+3) = 540$$

$$(x-6)\left(\frac{540}{x} + 3\right) = 540$$

$$540 + 3x - \frac{3240}{x} - 18 = 540$$

$$3x - \frac{3240}{x} - 18 = 0$$

$$3x^2 - 18x - 3240 = 0$$

$$x^2 - 6x - 1080 = 0$$

$$(x-36)(x+30) = 0$$

$$x=36 \quad x=-30$$

↑

↑ can't have -30 students

36 (original)

∴ 30 students went

$$11 \quad \frac{1}{x} + \frac{1}{x+1} = \frac{11}{30} \quad \frac{x+1}{x(x+1)} + \frac{x}{x(x+1)} = \frac{11}{30} \quad \frac{2x+1}{x(x+1)} = \frac{11}{30}$$

$$11x^2 + 11x = 60x + 30$$

$$11x^2 - 49x - 30 = 0$$

$$(11x + 6)(x - 5) = 0$$

$$x = -\frac{6}{11} \quad x = 5$$

(not integer)

$$x = 5 \quad \boxed{5 \text{ and } 6}$$

12. a) less (slow tap = 2 min, both must be less than 2 min)

b)

|   |   |     |     |
|---|---|-----|-----|
| C | 2 | 1/2 | x/2 |
| H | 3 | 1/3 | x/3 |

$$c) \quad \frac{x}{2} + \frac{x}{3} = 1$$

$$\frac{3x}{6} + \frac{2x}{6} = \frac{6}{6}$$

$$5x = 6$$

$$x = \frac{6}{5}$$

$$x = 1.2 \text{ min}$$

1 min, 12 seconds.

13. Time to Fill    Fraction filled in 1    Fraction filled in x

|      |   |     |     |
|------|---|-----|-----|
| A    | 3 | 1/3 | x/3 |
| B    | x | 1/x | 1   |
| Both | 2 | 1/2 | x/2 |

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

$$\frac{3x}{6} - \frac{2x}{6} = \frac{6}{6}$$

$$x = 6 \quad 6 \text{ hours.}$$

14 a) down    18    v+3     $\frac{18}{v+3}$   
               up    8    v-3     $\frac{8}{v-3}$

$$b) \quad \frac{18}{v+3} = \frac{8}{v-3}$$

$$c) \quad 18v - 54 = 8v + 24$$

$$10v = 78$$

$$v = 7.8 \text{ km/h}$$

$$d) \quad v \neq \pm 3$$

|     |           | time | per hr         | fraction<br>in x hrs |
|-----|-----------|------|----------------|----------------------|
| 15. | Nik. fa   | 72   | $\frac{1}{72}$ | $\frac{x}{72}$       |
|     | Neighbour | 48   | $\frac{1}{48}$ | $\frac{x}{48}$       |
|     | together  | x    | $\frac{1}{x}$  | 1                    |

$$\frac{x}{72} + \frac{x}{48} = 1$$

$$\frac{2x}{144} + \frac{3x}{144} = \frac{144}{144}$$

$$5x = 144$$

$$x = \frac{144}{5}$$

$$x = 28.8 \text{ hours}$$

28 hr 48 min

16.  $v = \frac{d}{t}$   $t = \frac{d}{v}$  to Forde lake

$$\frac{70}{v-5} - \frac{60}{v} = 4(24)$$

$$70v - 60(v-5) = 96v(v-5)$$

$$70v - 60v + 300 = 96v^2 - 480v$$

$$96v^2 - 490v - 300 = 0$$

$$v = \frac{490 \pm \sqrt{490^2 + 4(96)(300)}}{192}$$

$$v = \cancel{1111} 5.7, -0.6$$

$$\therefore v = 5.7 \text{ km/h}$$

17. W E

$$\frac{275}{v-10} - \frac{300}{v} = 0.5$$

$$275v - 300(v-10) = 0.5v(v-10)$$

$$275v - 300v + 3000 = 0.5v^2 - 5v$$

$$0 = 0.5v^2 + 20v - 3000$$

$$0 = v^2 + 40v - 6000$$

$$0 = (v+100)(v-60)$$

$$\begin{matrix} \uparrow & \uparrow \\ v = -100 & v = 60 \end{matrix}$$

60 km/h East  
50 km/h West

$$18. \frac{2}{6+c} + \frac{2}{6-c} = 1$$

$$2(6-c) + 2(6+c) = (6+c)(6-c)$$

$$12 - 2c + 12 + 2c = 36 - c^2$$

$$c^2 - 12 = 0$$

$$c = \sqrt{12}$$

$$c = 2\sqrt{3} \approx 3.5 \text{ km/h}$$

|                          | rate   | pgs | # of days          |
|--------------------------|--------|-----|--------------------|
| 19. 1 <sup>st</sup> half | $x$    | 259 | $\frac{259}{x}$    |
| 2 <sup>nd</sup> half     | $x+12$ | 259 | $\frac{259}{x+12}$ |

$$\frac{259}{x} + \frac{259}{x+12} = 21$$

$$259(x+12) + 259x = 21x(x+12)$$

$$259x + 3108 + 259x = 21x^2 + 252x$$

$$0 = 21x^2 - 266x - 3108$$

$$x = \frac{266 \pm \sqrt{266^2 + 4(21)(3108)}}{42}$$

$$x \approx 20, -7.4$$

$x \approx 20$  pgs/day for 1<sup>st</sup> half

$$20a) A = 0.3$$

$$S = 1$$

$$C = 0.1$$

$$0.1 = \frac{0.3}{1+W}$$

$$1+W$$

$$.1 + .1W = 0.3$$

$$.1W = 0.2 \quad W = 2 \quad 2 \text{ litres}$$

$$b) A = 0.1$$

$$S = 0.5$$

$$C = 0.02$$

$$0.02 = \frac{0.1}{.5+W}$$

$$.5+W$$

$$.01 + .02W = 0.1$$

$$.02W = 0.09 \quad W = 4.5 \quad 4.5 \text{ litres}$$

$$21. \frac{\frac{1}{a} - \frac{1}{1/a}}{\frac{1}{a} + \frac{1}{1/a}} = \frac{4}{5}$$

$$\frac{\frac{1}{a} - a}{\frac{1}{a} + a} = \frac{4}{5}$$

$$\frac{\frac{1}{a} - \frac{a^2}{a}}{\frac{1}{a} + \frac{a^2}{a}} = \frac{4}{5}$$

$$\frac{\frac{1-a^2}{a}}{\frac{1+a^2}{a}} = \frac{4}{5}$$

$$\frac{1-a^2}{a} \cdot \frac{a}{1+a^2} = \frac{4}{5}$$

$$\frac{1-a^2}{1+a^2} = \frac{4}{5}$$

$$5 - 5a^2 = 4 + 4a^2$$

$$1 = 9a^2$$

$$\frac{1}{9} = a^2$$

$$a = \pm \frac{1}{3}$$