

1)  $a^2 - 5a = 0$

$$a(a-5) = 0$$

$$a = 0, 5$$

2)  $3a^2 = -12a$

$$3a^2 + 12a = 0$$

$$a = 0, -4$$

$$3a(a+4) = 0$$

3)  $y^2 = 27 + 6y$

$$y^2 - 6y - 27 = 0$$

$$(y-9)(y+3) = 0 \quad y = 9, -3$$

4)  $3x^2 + 5 = -16x$

$$3x^2 + 16x + 5 = 0$$

$$x = -\frac{1}{3}, -5$$

$$(3x+1)(x+5) = 0$$

5)  $\left(\frac{2x}{3} + \frac{5}{6x} = \frac{3}{2}\right) 6x$

$$4x^2 + 5 = 9x$$

$$4x^2 - 9x + 5 = 0$$

$$(4x-5)(x-1) = 0$$

$$x = \frac{5}{4}, 1; x \neq 0$$

6)  $\frac{x-5}{3x-1} = \frac{x+5}{x-4}$

$$x^2 - 9x + 20 = 3x^2 + 14x - 5$$

$$0 = 2x^2 + 23x - 25$$

$$0 = (2x+25)(x-1)$$

$$x = -\frac{25}{2}, 1; x \neq \frac{1}{3}, 4$$

7)  $\left(11 - \frac{6}{x} = 13\right) x$

$$11x - 6 = 13x$$

$$-6 = 2x$$

$$-3 = x; x \neq 0$$

8)  $\frac{2}{2x-1} + \frac{1}{2x-1} = -3$

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

$$3 = -6x + 3$$

$$0 = -6x$$

$$0 = x; x \neq \frac{1}{2}$$

9)  $\frac{2}{x+2} = \frac{5}{x+3}$

$$2x + 6 = 5x + 10$$

$$-4 = 3x$$

$$-\frac{4}{3} = x; x \neq -2, -3$$

10)  $\left(x - \frac{6}{x-2} = 7\right) (x-2)$

$$x^2 - 2x - 6 = 7x - 14$$

$$x^2 - 9x + 8 = 0$$

$$(x-8)(x-1) = 0$$

$$x = 8, 1; x \neq 2$$

$$11) \frac{2y-3}{5y+3} = \frac{2}{3}$$

$$6y-9 = 10y+6$$

$$-15 = 4y$$

$$\frac{-15}{4} = y ; y \neq \frac{-3}{5}$$

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

$$a^2-3a-4 = a^2+a-6$$

$$2 = 4a$$

$$\frac{1}{2} = a ; a \neq 2, 4$$

$$13) \left[ \frac{2}{3}(3a-2) - \frac{a+2}{2} = a \right] 6$$

$$4(3a-2) - 3(a+2) = 6a$$

$$12a-8-3a-6 = 6a$$

$$3a = 14$$

$$a = \frac{14}{3} ; \text{No Rest.}$$

$$14) \left[ \frac{a+3}{2} + \frac{3(a-1)}{5} = 2 - \frac{3(a-1)}{5} \right] 10$$

$$5(a+3) + 6(a-1) = 20 - 6(a-1)$$

$$5a+15+6a-6 = 20-6a+6$$

$$11a+9 = 26-6a$$

$$17a = 17$$

$$a = 1 ; \text{No Rest.}$$

$$15) \left[ \frac{x-2}{x} - \frac{1}{3} = \frac{4}{3x} \right] 3x$$

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

$$3x-6-x = 4$$

$$2x = 10$$

$$x = 5 ; x \neq 0$$

$$16) \frac{x-2}{x} - \frac{1}{3} = \frac{4}{3x}$$

$$17) \left[ \frac{4}{x} = \frac{2x+2}{x+1} + 2 \right] x(x+1)$$

$$4(x+1) = x(2x+2) + 2x(x+1)$$

$$4x+4 = 2x^2+2x+2x^2+2x$$

$$0 = 4x^2 - 4$$

$$4 = 4x^2$$

$$1 = x^2$$

$$\pm 1 = x \quad ; \quad x \neq 0, -1$$

$\therefore \underline{x=1}$  is the only solution

$$18) \left[ \frac{1}{(a-2)(a-1)} + \frac{a}{a-1} = \frac{2}{a-2} \right] (a-1)(a-2)$$

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

$$1 + a^2 - 2a = 2a - 2$$

$$a^2 - 4a + 3 = 0$$

$$(a-3)(a-1) = 0$$

$$a = 3, 1 \quad ; \quad a \neq 1, 2$$

$\therefore \underline{a=3}$  is the only solution

19. The two biggest lakes in Manitoba are Lake Winnipeg and Lake Winnipegosis. Their combined area is about 29 800 km<sup>2</sup>. The area of Lake Winnipegosis is 700 km<sup>2</sup> less than one quarter of the area of Lake Winnipeg. What is the area of each lake?

Let  $x$  = area of Lk. Man.

then  $29800 - x$  = area of Lk Win.

$$\left[ 29800 - x = \frac{x}{4} - 700 \right] 4$$

$$119200 - 4x = x - 2800$$

$$122000 = 5x$$

$$24400 = x$$

$\therefore$  Lake Manitoba is 24400 km<sup>2</sup>  
& Lake Winnipegosis is 5400 km<sup>2</sup>

20. Bethany and Adam ran in a 15 km race. Bethany ran one and a half times as fast as Adam. She crossed the finish line 45 minutes before Andy. Find the speed of each?

	D	R	t
Adam	15	$x$	$\ominus$
Bethany	15	$1.5x$	

$$d = rt$$

$\therefore t = \frac{d}{r}$   $\therefore$  Andy - 6.7 km/h  
& Bethany - 10 km/h

Slow - Fast = Difference in Time

$$\left[ \frac{15}{x} - \frac{15}{1.5x} = 0.75 \right] 1.5x$$

$$22.5 - 15 = 1.125x$$

$$7.5 = 1.125x$$

$$\underline{6.7 = x}$$

21. Emily flies her Cessna 500 km from Lethbridge to Moose Jaw. After a brief stopover, she returns to Lethbridge. On both trips, the air speed is 165 km/h. On the flight out there is a constant tail wind, and on the return trip a constant head wind of the same speed. Calculate the time for the round trip if the wind speed was 30 km/h.

	D	R	t
There	500	165 + 30	?
Back	500	165 - 30	?

$$\text{Time (There)} = \frac{500}{195} = 2.56 \text{ h}$$

$$\text{Time (Back)} = \frac{500}{135} = 3.70 \text{ h}$$

$$\therefore 6.26 \text{ hrs travel time}$$

$$[6 \text{ h } 16 \text{ min}]$$

22. A plane travels 5 times as fast as a train. The train takes 8 hours more than the plane to travel 800 km. Determine the speed of the plane and the train.

	D	R	t
Train	800	x	⊖ 8 hrs
Plane	800	5x	

$$\text{Slow} - \text{Fast} = \text{Difference}$$

$$\left[ \frac{800}{x} - \frac{800}{5x} = 8 \right] 5x$$

$$4000 - 800 = 40x$$

$$3200 = 40x$$

$$\underline{80 = x}$$

$$\therefore \text{Train} - 80 \text{ km/h}$$

$$\text{Plane} - 400 \text{ km/h}$$

23. Xena jogs 3 km, then walk 2 km farther than she jogged. She jogs twice as fast as she walks. The total time is two hours. How fast does Xena walk?

	D	R	t
Walk	5	x	⊕
Jog	3	2x	

$$\left[ \frac{5}{x} + \frac{3}{2x} = 2 \right] 2x$$

$$10 + 3 = 4x$$

$$13 = 4x$$

$$\underline{3.25 = x}$$

$$\therefore \text{Walks} - 3.25 \text{ km/h}$$