SHARP

Worksheet 6 Memo – Equations and Inequalities

Grade 10 – Mathematics

1. a) $-2x + 6 = 18$

$-2x = 18 - 6$

$-2x = 12$

$x = \frac{12}{-2}$

$\therefore x = -6$

b) $3(x - 1) = 6$

$3x - 3 = 6$

$3x = 6 + 3$

$x = \frac{9}{3}$

$\therefore x = 3$

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

$3x - 6 = 4x + 20$

$3x - 4x = 20 + 6$

$-x = 26$

$x = -26$

d) $11x - \frac{1}{2} = -121\frac{1}{2}$

$11x = -121\frac{1}{2} + \frac{1}{2}$

$11x = -121$

$x = -\frac{121}{11}$

$x = -11$

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

$2x + 24 = 3x - 30$

$2x - 3x = -30 - 24$

$-x = -54$

$\therefore x = 54$

f) $2(x - 3) + 3(2x + 8) = -3(x - 8)$

$2x - 6 + 6x + 24 = -3x + 24$

$8x + 3x = 24 - 24 + 6$

$11x = 6$

$\therefore x = \frac{6}{11}$

g) $\frac{x+3}{5} = \frac{x+1}{2}$

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

$2x + 6 = 5x + 5$

$2x - 5x = 5 - 6$

$-3x = -1$

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

$\therefore x = \frac{1}{3}$

h) $\frac{3}{x} + 7 = 10$

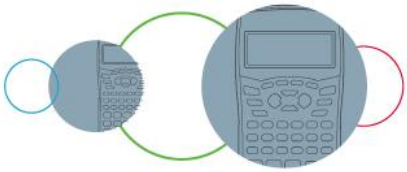
$3 + 7x = 10x$

$7x - 10x = -3$

$-3x = -3$

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

$\therefore x = 1$



i) $-\frac{1}{4}x + \frac{3x}{5} = 2.1$

$-5x + 12x = 42$

$7x = 42$

$x = \frac{42}{7}$

$\therefore x = 6$

j) $\frac{3}{4}(x-2) = \frac{4}{3}(x+7)$

$\frac{3}{4}x - \frac{3}{2} = \frac{4}{3}x + \frac{28}{3}$

$\frac{3}{4}x - \frac{4}{3}x = \frac{28}{3} + \frac{3}{2}$

$\frac{9x-16x}{12} = \frac{56+9}{6}$

$-7x = 130$

$\therefore x = -18\frac{4}{7}$

k) $\frac{2}{x-2} + \frac{3}{x+2} = \frac{4}{x-2}$

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

$2x + 4 + 3x - 6 = 4x + 8$

$5x - 2 = 4x + 8$

$5x - 4x = 8 + 2$

$\therefore x = 10$

l) $\frac{7}{(x-1)(x+3)} = \frac{4}{x+3}$

$7 = 4(x-1)$

$7 = 4x - 4$

$7 + 4 = 4x$

$11 = 4x$

$\therefore x = \frac{11}{4}$

$\therefore x = 2\frac{2}{3}$

m) $\frac{3x+4}{(x-2)(x+2)} = \frac{7}{x-2}$

$3x + 4 = 7(x+2)$

$3x + 4 = 7x + 14$

$3x - 7x = 14 - 4$

$-4x = 10$

$x = \frac{10}{-4}$

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

n) $\frac{3-2x}{(x-1)(3x-16)} + \frac{5}{x-1} = 0$

$3 - 2x + 5(3x - 16) = 0$

$3 - 2x + 15x - 80 = 0$

$13x = 77$

$x = \frac{77}{13}$

$\therefore x = 5\frac{12}{13}$

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

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

$3(x+2) = 4$

$3x + 6 = 4$

$3x = 4 - 6$

$3x = -2$

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

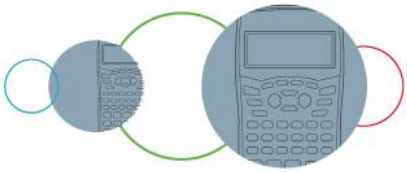
2. a) $V = \pi r^2 h$ for h

$\therefore \frac{V}{\pi r^2} = h$

b) $V = \pi r^2 h$ for r

$\frac{V}{\pi h} = r^2$

$\sqrt{\frac{V}{\pi h}} = r$



c) $A = P(1 + in)$ for i

$\frac{A}{P} = 1 + in$

$\frac{A}{P} - 1 = in$

$\therefore \frac{1}{n}\left(\frac{A}{P} - 1\right) = i$

d) $A = P(1 + i)^n$ for i

$\frac{A}{P} = (1 + i)^n$

$\sqrt[n]{\frac{A}{P}} = 1 + i$

$\therefore \sqrt[n]{\frac{A}{P}} - 1 = i$

e) $3 = \frac{-b+\sqrt{b^2-4ac}}{2a}$ for c

$6a = -b + \sqrt{b^2 - 4ac}$

$6a + b = \sqrt{b^2 - 4ac}$

$(6a + b)^2 = b^2 - 4ac$

$36a^2 + 12ab + b^2 = b^2 - 4ac$

$36a^2 + 12ab = -4ac$

$\frac{36a^2}{-4a} + \frac{12ab}{-4a} = c \rightarrow \quad \therefore -9a - 3b = c$

f) $s = ut + \frac{1}{2}at^2$ for a

$s - ut = \frac{1}{2}at^2$

$2(s - ut) = at^2$

$\frac{2}{t^2}(s - ut) = a$

$\therefore \frac{2s}{t^2} - \frac{2u}{t} = a$

g) $s = ut + \frac{1}{2}at^2$ for u

$s - \frac{1}{2}at^2 = ut$

$\frac{1}{t}\left(s - \frac{1}{2}at^2\right) = u$

$\therefore \frac{s}{t} - \frac{at}{2} = u$

h) $SA = 2(lb + lh + bh)$ for h

$\frac{SA}{2} = lb + lh + bh$

$\frac{SA}{2} - lb = h(l + b)$

$\therefore \frac{\frac{SA}{2}-lb}{l+b} = h$

i) $0 = ax^2 + bx + c$ for a

$-bx - c = ax^2$

$a = \frac{-bx-c}{x^2}$

$\therefore a = -\frac{b}{x} - \frac{c}{x^2}$

j) $T_n = a(r)^{n-1}$ for r

$\frac{T_n}{a} = (r)^{n-1}$

$\therefore r = \sqrt[n-1]{\frac{T_n}{a}}$

3. a) $(4x - 1)(x - 3) = -7$

$4x^2 - 12x - x + 3 + 7 = 0$

$4x^2 - 13x + 10 = 0$

$(4x - 5)(x - 2) = 0$

$\therefore 4x = 5 \quad OR \quad x = 2$

$\therefore x = \frac{5}{4}$

b) $x^2 - x - 12 = 0$

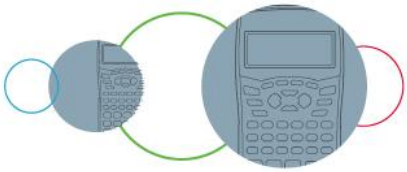
$(x - 4)(x + 3) = 0$

$\therefore x = 4 \quad OR \quad x = -3$

d) $x^2 - 4x = -4x + 9$

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

$x^2 - 9 = 0$



c) $(3x-5)(x+2)=0$

$\therefore 3x=5 \quad OR \quad x=-2$

$\therefore x=\frac{5}{3}$

e) $(x-7)(x+5)=-11$

$x^2+5x-7x-35+11=0$

$x^2-2x-24=0$

$(x-6)(x+4)=0$

$\therefore x=6 \quad OR \quad x=-4$

g) $x^2+13x+40=0$

$(x+5)(x+8)=0$

$\therefore x=-5 \quad OR \quad x=-8$

i) $4\left(x^2-2x+\frac{1}{2}\right)=x$

$4x^2-8x-2-x=0$

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

$(4x-1)(x-2)=0$

$\therefore 4x=1 \quad Or \quad x=2$

$\therefore x=\frac{1}{4}$

k) $4x^2-8x-32=0$

$4(x^2-2x-8)=0$

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

$(x-4)(x+2)=0$

$\therefore x=4 \quad OR \quad x=-2$

m) $(3x-8)(x+2)=-8$

$3x^2+6x-8x-16+8=0$

$3x^2-2x-8=0$

$(3x+4)(x-2)=0$

$\therefore 3x=-4 \quad OR \quad x=2$

$\therefore x=-\frac{4}{3}$

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

$\therefore x=3 \quad OR \quad x=-3$

f) $x^2-8x+15=0$

$(x-3)(x-5)=0$

$\therefore x=3 \quad OR \quad x=5$

h) $(x-4)(x+3)-8=0$

$x^2+3x-4x-12-8=0$

$x^2-x-20=0$

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

$\therefore x=5 \quad OR \quad x=-4$

j) $(2x+1)(x-2)-7=0$

$2x^2-4x+x-2-7=0$

$2x^2-3x-9=0$

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

$\therefore 2x=-3 \quad OR \quad x=3$

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

l) $3x^2-14x-5=0$

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

$\therefore 3x=-1 \quad OR \quad x=5$

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

n) $4x^2-8x-5=0$

$(2x+1)(2x-5)=0$

$\therefore 2x=-1 \quad OR \quad 2x=5$

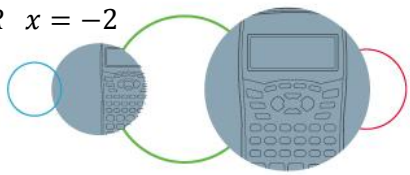
$\therefore x=-\frac{1}{2} \qquad x=\frac{5}{2}$

o) $x(x+7)+10=0$

$x^2+7x+10=0$

$(x+5)(x+2)=0$

$\therefore x=-5 \quad OR \quad x=-2$



4. a) $y = 3x + 4$ … 1 and $y = -3x - 4$ …2

Subs 1 into 2

$\therefore 3x + 4 = -3x - 4$

$\therefore 3x + 3x = -4 - 4$

$\therefore 6x = -8$

$\therefore x = -\frac{8}{6} = -\frac{4}{3}$

Subs back into 1:

$\therefore y = 3\left(-\frac{4}{3}\right) + 4$

$\therefore y = -4 + 4$

$\therefore y = 0$ $\therefore \left(-\frac{4}{3}; 0\right)$

b) $y = \frac{1}{4}x + 2$ …1 and $y = 2x - 7$ …2

Subs 1 into 2:

$\therefore \frac{1}{4}x + 2 = 2x - 7$

$\therefore \frac{1}{4}x - 2x = -7 - 2$

$\therefore -\frac{7}{4}x = -9$

$\therefore -7x = -36$

$\therefore x = \frac{36}{7} = 5\frac{1}{7}$

Subs back into 2:

$\therefore y = 2\left(5\frac{1}{7}\right) - 7$

$\therefore y = 3\frac{2}{7}$ $\therefore \left(5\frac{1}{7}; 3\frac{2}{7}\right)$

c) $y = x$ …1 and $y = \frac{2}{3}x - 1$ …2

Subs 1 into 2

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

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

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

$\therefore x = -3$

Subs back into 1:

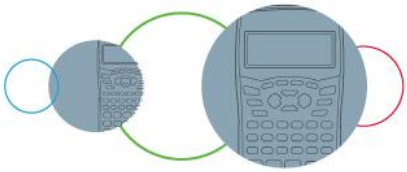
$\therefore y = -3$ $\therefore (-3; -3)$

d) $2y = -x + 2$ …1 and $y - x = 4$

$y = 4 + x$ …2

Subs 2 into 1

$\therefore 2(4 + x) = -x + 2$



$\therefore 8 + 2x = -x + 2$

$\therefore 2x + x = 2 - 8$

$\therefore 3x = -6$

$\therefore x = -2$

Subs back into 2:

$\therefore y = 4 - 2$

$\therefore y = 2$ $\therefore (-2; 2)$

e) $x - 3y = 4$ …1 and $x = 7y + 3$ …2

Subs 2 into 1

$\therefore 7y + 3 - 3y = 4$

$\therefore 4y = 4 - 3$

$\therefore 4y = 1$

$\therefore y = \frac{1}{4}$

Subs back into 2:

$\therefore x = 7\left(\frac{1}{4}\right) + 3$

$\therefore x = 4\frac{3}{4}$ $\therefore \left(4\frac{3}{4}; \frac{1}{4}\right)$

f) $2x = \frac{1}{3}y - 8$ …1 and $y = x + 9$ …2

Subs 2 into 1

$\therefore 2x = \frac{1}{3}(x + 9) - 8$

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

$\therefore 2x - \frac{1}{3}x = -5$

$\therefore \frac{5}{3}x = -5$

$\therefore 5x = -15$

$\therefore x = -3$

Subs back into 2:

$\therefore y = -3 + 9$

$\therefore y = 6$ $\therefore (-3; 6)$

g) $-3x + 6 = 2y$ …1 and $y - x = 4$

$y = 4 + x$ …2

Subs 2 into 1

$\therefore -3x + 6 = 2(4 + x)$

$\therefore -3x + 6 = 8 + 2x$

$\therefore -3x - 2x = 8 - 6$

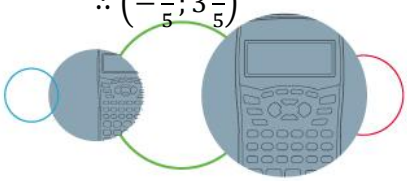
$\therefore -5x = 2$

$\therefore x = -\frac{2}{5}$

Subs back into 2:

$\therefore y = 4 - \frac{2}{5}$

$\therefore y = 3\frac{3}{5}$ $\therefore \left(-\frac{2}{5}; 3\frac{3}{5}\right)$



h) $x - 3y - 5 = 0$ and $2x + 3y + 8 = 0$ …2

$x = 3y + 5$ …1

Subs 1 into 2

$\therefore 2(3y + 5) + 3y + 8 = 0$

$\therefore 6y + 10 + 3y + 8 = 0$

$\therefore 9y = -18$

$\therefore y = -2$

Subs back into 1:

$\therefore x = 3(-2) + 5$

$\therefore x = -1$

$\therefore (-1; -2)$

i) $y - \frac{3}{5}x + 9 = 0$ and $\frac{1}{3}y = \frac{2}{3}x - 3$ …2

$y = \frac{3}{5}x - 9$ …1

Subs 1 into 2

$\therefore \frac{1}{3}\left(\frac{3}{5}x - 9\right) = \frac{2}{3}x - 3$

$\therefore \frac{1}{5}x - 3 = \frac{2}{3}x - 3$

$\therefore \frac{1}{5}x - \frac{2}{3}x = -3 + 3$

$\therefore \frac{7}{15}x = 0$

$\therefore x = 0$

Subs back into 1:

$\therefore y = \frac{3}{5}(0) - 9$

$\therefore y = -9$

$\therefore (0; -9)$

j) $5y - 3 = \frac{1}{2}x$ and $9y = 4x - 7$ …2

$10y - 6 = x$ …1

Subs 1 into 2

$\therefore 9y = 4(10y - 6) - 7$

$\therefore 9y = 40y - 24 - 7$

$\therefore 9y - 40y = -31$

$\therefore -31y = -31$

$\therefore y = 1$

Subs back into 1:

$\therefore x = 10(1) - 6$

$\therefore x = 4$

$\therefore (4; 1)$

5. a) $3x + 4 < 5$

$3x < 5 - 4$

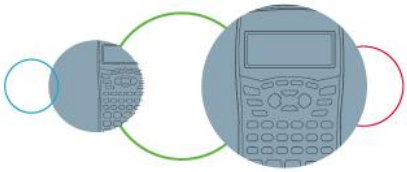
$3x < 1$

$x < \frac{1}{3}$

b) $x - \frac{1}{2} \geq 3$

$x \geq 3 + \frac{1}{2}$

$x \geq 3\frac{1}{2}$



c) $2(x-6) > 0$

$2x - 12 > 0$

$2x > 12$

$x > 6$

d) $5x + 4 \leq 3(x-1)$

$5x + 4 \leq 3x - 3$

$5x - 3x \leq -3 - 4$

$2x \leq -7$

$x \leq -\frac{7}{2}$

e) $\frac{x}{3} \geq \frac{x-1}{4}$

$4x \geq 3(x-1)$

$4x \geq 3x - 3$

$4x - 3x \geq -3$

$x \geq -3$

f) $\frac{x+2}{5} - \frac{x-3}{2} \geq 0$

$2(x+2) - 5(x-3) \geq 0$

$2x + 4 - 5x + 15 \geq 0$

$-3x + 19 \geq 0$

$-3x \geq -19$

$x \leq \frac{19}{3}$

$x \leq 6\frac{1}{3}$

g) $3(x-5) + 4(x-2) \leq -2$

$3x - 15 + 4x - 8 \leq -2$

$7x - 23 \leq -2$

$7x \leq 21$

$x \leq 3$

h) $\frac{x-1}{4} - 9 > \frac{x+3}{2}$

$x - 1 - 36 > 2(x+3)$

$x - 37 > 2x + 6$

$x - 2x > 6 + 37$

$-x > 43$

i) $3(x+6) < 2\frac{2}{3}$

$3x + 18 < 2\frac{2}{3}$

$3x < 2\frac{2}{3} - 18$

$3x < -15\frac{1}{3}$

$x < -5\frac{1}{9}$

j) $\frac{x+1}{5} - \frac{2-x}{3} \leq \frac{3+x}{2}$

$6(x+1) - 10(2-x) \leq 15(3+x)$

$6x + 6 - 20 + 10x \leq 45 + 15x$

$16x - 14 \leq 45 + 15x$

$16x - 15x \leq 45 + 14$

$x \leq 59$

6. $average\ speed = \frac{total\ distance}{total\ time}$

$116 = \frac{507+507}{x+x-1}$

$116 = \frac{1014}{2x-1}$

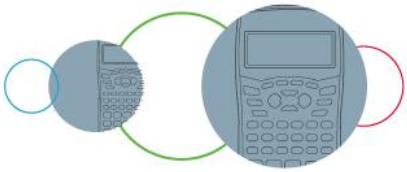
$116(2x-1) = 1014$

$232x - 116 = 1014$

$232x = 1130$

$\therefore x = 4{,}87 \approx 5\ hours$

∴ It takes George 5 hours to get to Cape town and 4 hours to go back to Beaufort West.



7. let x = chocolate milkshakes and y = toasted sandwich

$\therefore 3x + 2y = 104$ and $4y + 5x = 190$ …2

$\therefore 2y = 104 - 3x$

$\therefore y = 52 - \frac{3}{2}x$ ….1

Subs 1 into 2:

$\therefore 4\left(52 - \frac{3}{2}x\right) + 5x = 190$

$\therefore 208 - 6x + 5x = 190$

$\therefore -x = 190 - 208$

$\therefore x = 18$

Subs back into 1:

$\therefore y = 52 - \frac{3}{2}(18)$

$\therefore y = 25$

∴ The chocolate milkshake costs R18 and the the toasted sandwich costs R25.

8. $P = 2l + 2b$

$\therefore 140 = 2(x) + 2(x + 4)$

$\therefore 140 = 2x + 2x + 8$

$\therefore 140 - 8 = 4x$

$\therefore 132 = 4x$

$\therefore 33m = x$

∴ breadth = 33m + 4m

= 37m

9. $Circumference = 2\pi r$

$\therefore 31.416 = 2\pi \times r$

$\therefore \frac{31.416}{2\pi} = r$

$\therefore r = 5cm$