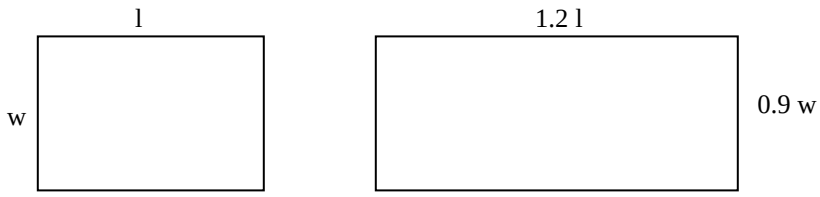
2. Rates Ratio and percentages

1.	Let ten shillings coins be t $\therefore$ five shilling cion 2t $\therefore$ one shilling coins 21 – 3t (10xt) + (5x2t)+1(21-3t)=72 20t+21-3t = 72 17t = 51 t = 3	 **B1** **M1** **A1**	
		03	
2.	(a) ¼ : ½ : $^1/_5$ = 5 : 10 : 4 ¼ = $^5/_{19}$ x 1000 = 263 ½ = $^{10}/_{19}$ x 1000 = 526 $^1/_5$ = $^4/_{119}$ x 1000 = 710 (b) Let volume of 45% concentration be x Therefore 25% wwill be (100 – x) $\frac{0.45x + 0.25(100 - x)}{100} = 30\%$ 0.45x – 0.25x + 25 = 30 0.20x = 5.0 x = $^{50}/_2$ x = 25cm^3 vol of 45% = 25cm^3 vol of 25% = 75cm^3 ration 1 : 3 (c) (i) Cost of 1 kg mixture $^2/_5$ x 140 + $^3/_5$ x 160 152 Profit = 240 – 152 = sh 88 Gain $^{88}/_{152}$ x 100 = 57.9% (ii) 140 160 148 12 8 3 : 2	 **B1** **B1** **B1** **M1** **A1** **B1** **M1** **A1** **B1** **B1**	 Follow through for alternative
		10	
3.	(a) $V = \pi r^2 h = \frac{22}{7} \times 7 \times 7 \times 3.5$ $= 539 m^3$ $= 539000000 cm^3$ $capacity = \frac{539000000}{1000}$ $= 539{,}000 litres$ (b) Daily use (6 x 20) + 80 + 50 = 250L No. of days = $\frac{539000}{250}$	 **M1** **A1** **B1** **B1** **M1**	

	= 2156 days (c) 1st 90 days 4 members (4 x 20) + 40 + 80 = 200L Water used in 90 days = 90 x 200L = 1800L Rem in tank 539000 – 1800L = 537,200 No. of days to use 537200L = $\frac{537200}{250}$ = 2148.8 Total days = 2148.8 + 90 = 2238 days	**A1** **M1** **M1** **M1** **A1**	
		10	
4.	 $\%\Delta = \frac{1.2 \times 0.9l - wl}{wl} \times 100$ $= (1.08 - 1)100$ $= 8\%$ *increase*	M_1 $\frac{A_1}{2}$	
6.	(a) Senjeni = 120000x 3years = 360000 Mkimwa = 150000 x 3years = 450000 Kuku = 90000 x 2 years = 180000 Ratio of Constribution Mkimwa Senjeni Kuku 450000 : 360000 : 180000 5 : 4 : 2 (b) Amount to be shared $\frac{70}{100} \times sh187000$ Sh 130,900 Kuku's share = $^2/_{11}$ x sh 130900 = sh 23800 Mkimwa's share = $^5/_{11}$ x 130900 = sh 59500 Senjeni's share = $^4/_{11}$ x sh 130900 = sh 47600 (c) Mkimwa = sh 450000 + sh 59500 = sh 509500 Kuku = sh 180000 + sh 23800 = sh 203800 Senjeni = sh 360000 + sh 47600 = sh 407600	M1 M1 M1 M1 M1 M1 M1 M1 A1	
		10	
8.	*M* *Hrs* *Days* 15 8 24 16 ? 20 Number of hours reduces in ratio 15:16 from increase in the number of men. No. of hrs increase in ratio 24:20 from reduction in the days	 **M1** **M1**	Both ratio

	$\frac{15}{16}\times\frac{24}{20}\times 8$ 3×3 $=9\,hrs$	**A1**	
		03	

9.	Mwashuma takes X days Mwandime takes X – 2 days $\frac{1}{x} + \frac{1}{x-2} = \frac{5}{12}$ $5x^2 - 34x + 24 = 0$ $x = \frac{34 \pm 26}{10}$ $= \frac{60}{10}$ or $\frac{8}{10}$ Ignore $= 6$ Mwandime 6 – 2 = 4 days	M1 M1 M1 A1 4

10	$=\frac{4\times 20}{8}=$ 10 hours	M1 A1	

11.

Men

cottages days

5 2 21

x 6 21

$x = \left(\frac{6}{2} \times \frac{21}{21} \times 5\right) = 15$

more men = 15 – 5 = 10

12. a) i) In 1 hr; Tap A fills $^1/_3$

13. Max Perimeter = 2(18.5 + 12.5)

= 62 cm

Working Perimeter = 2(18 +12)

= 60 cm

% error = $\frac{2}{60}$ X 100 = 3.33%

B - ¼

Capacity filled in 1 hr = $^1/_3$ + ¼

$= {}^{7}/_{12}$

${}^{7}/_{12} = 1$ hr

$1 = 1 \times 1 \times {}^{12}/_{7}$

$= 1\ {}^{5}/_{7}$ hrs.

ii) ${}^{1}/_{3} + ¼ - {}^{1}/_{6} = {}^{5}/_{12} \Rightarrow$ in one hr

${}^{5}/_{12} = 1$hr

$1 = 1 \times 1 \times {}^{12}/_{5}$

$= 2\ {}^{2}/_{5}$ hrs

14. (a) $\frac{144000}{n-5} - \frac{144000}{R}$

$= \frac{720{,}000}{n(n-5)}$

(b) $720{,}000 = 2400$

$n(n-5)$

$300 = n(n-5)$

$n^2 - 5n - 300 = 0$

$(n-20)(n+15) = 0$

Either $n = 20$, $n = -15$ $m = 20$

(c) contributed $= \frac{144000}{20} = 7200$

(d) % increase $= \frac{2400}{7200} \times 100 = 33.33\%$

15. (a) In 1 hour $\frac{1}{40} + \frac{1}{15} + \frac{1}{20}$ of the tank will be filled

$= \frac{17}{120}$

In 5 hours $= \frac{17}{120} \times 5$

$= \frac{17}{24}$

(b) In two hours taps x and y

$\left(\frac{1}{40} + \frac{1}{15}\right) \times 2$ of the tank to be filled

$= \frac{11}{60}$

In 7 hours $= \left(\frac{11}{60} + \frac{17}{24}\right)$

$= \frac{107}{120}$

(c) Remaining fraction $= 1 - \frac{107}{120}$

$= \frac{13}{40}$

In $\frac{1}{}$ hour proportion, time taken

40

$= \frac{13}{120} \times 40h$

$= 4\ ^{1}/_{3}$

Time taken $= 7 + 4\ ^{1}/_{3}$ *= 11 hrs 20 min.*

Tank will be full at 8.00 + 11hrs 20 min

1920 hrs or 7.30 p.m

16. *Let Philip take x days to finish the job alone.*

$\frac{1}{x} + \frac{1}{x+5} = \frac{1}{6}$

$6(x+5)\,6x = x(x+5)$ ✓

$6x + 30 + 6x = x^2 + 5$

$x^2 - 7x - 30 = 0$

$(x-10)(x+3) = 0$ ✓

$x = 10$ *and* $x = -3$

17. *16 9 14*

X 7 12

$X = 16 \times \frac{9}{7} \times \frac{14}{12}$

= 24men

Extra men = 24 -6

= 8men

18. *a) Let the original no. of people be x*

Originally each would contribute

$\frac{180000}{X}$

New contribution per person

$\frac{180000}{X-3}$

$\frac{180000}{X-3} - \frac{180000}{x} = 3000$

$180000x - 180000x + 540000 = 30000 - 9000$

$30x^2 - 90x - 5400 = 0$

$3x^2 - 9x - 540 = 0$

$X^2 - 3x - 180 = 0$

$(x-15)(x+12) = 0$

$X = 15$ *or* -12

Original number of people 15

b) $\frac{180000}{15} = \frac{180000}{15}$

c) Original contribution per person

Shs.12000

New contribution per person

$= \frac{180000}{12} = 15000$

% increase

$\frac{15000 - 12000}{} \times 100\%$

$$\frac{3000}{12000} \times 100\%$$

$= 25\%$

19. a) cost of running the business

$$\frac{20}{100} \times 43200$$

$= Shs.8640$

b) 15% of profit

$\frac{15}{100} \times 43200 = Shs.\ 6480$

Rest of the profit

$= 43200 - (8640 + 6480) = 28080$

Ratio of contribution

$40000 : 64000$

$5 : 8$

Mue received

$\frac{1}{2} \times 6480 = Shs.3240$

$^{8}/_{13} \times 28080 = Shs.\ 17280$

$= Shs.20320$

c) Konie received

$Shs.3240 + 10800 = 14040$

$$\frac{14040}{1800} = 7.8$$

$= 7$ cows

20. $(7x - 3y) : 2x + 3y$

$x = 2 \quad y = 1$

$14 - 9 : 4 + 9$

$5 : 13$

21. a) B ___ bulls

G ___ Goats

$5B + 30G = Kshs.117000$ ……. Equation (i)

$4B + 25G = Kshs.(117000 - 22250)$

$4B + 225G = Kshs.94750$ …… Equation (ii)

From equation (i) $5B + 30G = Kshs.117000$ (dividing through by 5)

$= (B + 6G = 23400) \times 4$

$= 4B + 24G = 93600$ ……(iii)

Equation (ii) – q(iii) $= 4B + 24G = 94750$ -

$4B + 24G = 93600$

$G = 1150$

∴ 1 goat costs Kshs.1150

Substituting in (i)

5B + 30 (1150) = 117000
5B + 34500 = 117000
5B = 825000
B = Kshs.16500

b) Abduls selling price
Bull $^{140}/_{100}$ x 16500 = 23100 x 5 = Kshs.115,500

Goat $^{130}/_{100}$ x 1150 = 1495 x 30 = Kshs.44850

Total 44850 + 115500 = Kshs.160350
= Kshs.160350
Ali's selling price
Bulls $^{150}/_{100}$ x 16500= 24750 x 4 = Shs.99000

Goats $^{140}/_{100}$ x 1150 = 1610 x 25 = Shs.40250

Total 99000 + 40250 = Kshs.139,250

Profit made
Abdul _____ Kshs. (160350 – 117000) = Kshs.43350

Ali _____ Kshs. (139250 – 94750) = Kshs.44500

Ali made more profit by Kshs.1150/=

22. *Original costs*
T = $^{8}/_{24}$ x = $^{x}/_{3}$
L= $^{4}/_{24}$x = $^{x}/_{6}$
R= $^{12}/_{24}$x = $^{x}/_{2}$

New T = $^{x}/_{3}$ x 1.12 = 0.3733x
L = $^{x}/_{6}$ x 1.18 = 0.1967x
R = $^{x}/_{2}$ x 1.4 = 0.7x
Therefore % change

$$\frac{(0.3733x + 0.967x + 0.7x) - x}{X} \times 100$$

= 0.27 x 100
= 27%

23. *Let Mary's yrs be x*
Mothers age = 2 ½ x
4yrs ago Mary was x – 4
4yrs ago mother was 2 ½ x – 4

$$\frac{2½\,x - 4}{x - 4} = \frac{3}{1}$$

$^{5}/_{2}$ x – 3x = -12
- ½ x = -12
x = 24yrs
mother's age is =($^{5}/_{2}$ x 24)
= 60yrs

24. $\frac{16 \times 9 \times 14}{7 \times 12}$

$= 24$

Extra men $= 24 - 16$

B1= 8more men

25.. Ratio K : B = 3 : 4

a) Kongo got $\frac{3}{7} \times \frac{35}{100} \times 181300 = 27195/=$

Beatrice got $\frac{4}{7} \times \frac{35}{100} \times 181300 = 36260/=$

b) Kongo got $\frac{3}{7} \times \frac{60}{100} \times 181300 + 9000$

$= 136,620/=$

Beatrice got $\frac{4}{7} \times \frac{60}{100} \times 181300 + 120000$

$= \underline{182,160/=}$

26. Let no. be mn

$M + n = 9...(i)$

$10m + n$, reversed $10n + m$

$10n + m - 10m + n = 27$

$1n - 9m$

27. $V1 = \pi r^2 h$

$R = 130r = 1.3r$

$H = \frac{80}{100}h = 0.8h$

$V_2 = \pi R^2 h = (1.3r)^2 \times 0.8h$

$= 1.352V_1$

$\% \text{ change} = \frac{V_2 - V_1}{V_1} \times 100$

$= \frac{(1.352 - 1) V_1}{V_1} \times 100$

$0.352 \times 100 = 35.2\%$

28. In 1hr both fills $= 1 + 1 - 10 = 23$

Tina to fill $= 120 = 5\ 5/23$

5hrs 13min

29. $\frac{16}{X} \quad \frac{9}{7} \quad \frac{14}{12}$

$X = 16 \times \frac{9}{7} \times \frac{14}{12}$

$= 24\text{men}$

Extra men $= 24 - 6$

$= 8\text{men}$

30. a) Expenses $= \frac{30}{100} \times 600,000$

$= \text{sh. } 180,000$

Business = $\frac{15}{100}$ x 420,000
= sh. 63,000
Rest of profit = 357,000
Ratio 160 : 200 : 240
4 : 5 : 6

(i) Langat received = sh $\frac{4}{15}$ x 357,000
= sh 95,200
(ii) Korir received = sh $\frac{5}{15}$ x 357,000
= sh119,000

(iii) Koech received = sh $\frac{6}{15}$ x 357,000
= 142,800

(b) % = $\frac{119,000}{600,000}$ x 100
= 19.83

31. *a) 125 :100 = 5:4*

b) $^{5}/_{4}$ x 400 = 500

32. *Alcohol A = $^{25}/_{120}$*
= 30cm^3
Alcohol in B = $^{20}/_{100}$ x 180
= 36cm^3
Results = $\frac{36 + 30}{120 + 180}$
= $\frac{66}{300}$ x 100
=22%
Remaining = 300-x
Volume of alcohol = (300 –x) x $^{22}/_{100}$ = 66-0.22x
Total volume of alcohol = 66-0.22x + x
= 66 + 0.78x
% alcohol = $\frac{66 + 0.78x \times 100}{300}$ = 35
= 66 + 0.78x = 105
0.78x=39
x=50

33. *Max Perimeter = 2(18.5 + 12.5)*
= 62 cm
Working Perimeter = 2(18 +12)
= 60 cm
% error = $\frac{2}{}$ X 100 = 3.33%

34. *a :b = 1:2*
b : c = 3:4

$a:b = 3:6$

$b:c = 6:8$

$\therefore a:b:c = 3:6:8$