2. Commercial arithmetic

1	(a) 48, 000 – 20, 000 = 28, 000 $\frac{8}{100}x = 28{,}000$ $x = 28{,}000 \times \frac{100}{8}$ = Ksh. 350, 000 Sales 350, 000 + 100, 000 = 450, 000 (b) (i) Sales in February $\frac{118}{100} \times 450{,}000$ $= Ksh.531{,}000$ $531{,}000 - 100{,}000$ $431{,}000 \times \frac{8}{100}$ $= 34{,}480$ (ii) $\frac{75}{100} \times 531{,}000$ $= Ksh.398{,}250$ Commission $298{,}250 \times \frac{8}{100}$ $= Ksh.23{,}860$ $= Ksh.23{,}860 + 20{,}000$ $= Ksh.43{,}860$	M_1 M_1 M_1 A_1 M_1 M_1 A_1 M_1 M_1 A_1	✓exp
2	Total expense (a) $In Ush.1050000 + 60 \times Ush1016 + \frac{55}{100} \times 1050000$ $= 1050000 + 60960 + 577500$ $= Ush1688460$ $\frac{1688460}{24.83}$ In Ksh. $Ksh.68000.81$ (b) $\frac{60960 + 577500}{1688460}$ = 37.81%	M1 M1 A1 M1 A1	

	$Ksh.\frac{68000.81}{0.0714}$ (c) $=Tsh952,392.30$	M1 A1	
	(d) $\frac{68000.81-\frac{1050000}{24.83}}{\frac{105000}{24.83}}\times 100$ $=60.81\%$	M1 M1 A1	✓exp ✓attempt to simplify
3	A = 3P $\therefore 3P=P\left(1+\frac{20}{100}\right)^{n}$ 3 = (1.2)n $\log 3=n\log 1.2$ $n=\frac{\log 3}{\log 1.2}$ $=6.0254$ $\therefore 6\,years$	M1 M1 A1	
		3	
4.	100 Yens = 63.16 (Bank sold Yen) 36632.8 Yen = $\left(\frac{36632.8\times 63.16}{100}\right)$ = 23137.27648 = ksh 23137.	M1 A1	
		02	
5.	No of good eggs = 24 x 30 – 54 = 666 Total cost = 24 x 225 = shs 5400 Cost with profit of 22% expected = $\left(\frac{122}{100}\times 5400\right)$ = 6588 New price per egg = $\frac{6588}{666}$ = 9.892	M1 M1 M1	

	= sh 10.00	A1	
		04	
6.	$A = P\left(1+\frac{r}{100}\right)^n$ $n = 6\ r = 4\%\ p = 10{,}000$ $A = 10{,}000\left(1+\frac{4}{100}\right)^6$ $= 10{,}000(1.04)^6$ $= 12{,}653.19$ $\text{int}\,erest = 12{,}653 - 10{,}000$ $= sh.2{,}653$	M1 A1 M1 A1	
		04	
7	½ of 2400E = 1200E In ksh. = 1200E x 95.65 = Ksh.114,780 Number of dollar = Kshs.114,780 76.50 = sh1500.39	 M1 M1 A1	
		3	

8

SECTION B (50 MARKS)

Selling price = 88/100 of marked price

(a)

(i) 4800 = 88/100 of m.p
4800/88 x 100 = m.p
= sh.5454.54

(ii) 145/100 of buying price = 4800
buying price = $\frac{48000 \times 100}{145}$
= 3310.34

(b) $\frac{5454.54 - 3310.34}{3310.34} \times 100$

= 0.6477 x 100
= 64.77%

	C) $\frac{87.5}{100}$ of 3310.34 = 2,896.55		
10	$\frac{100}{72} \times 1440 = 2000$ $\frac{100}{2000} \times 100$ 5%	M_1 M_1 $\frac{A_1}{3}$	
11	200s + 600t = 22 000 250s + 510t = 22 700 1000s + 3000t = 110 000 1000s + 2040t = 90800 960t = 19 200 t = 20 s = 40 (0.5 × 200 × 20) + (0.3 × 510 × 40) 2500 + 6120 = 8620 $(0.5\times200\times20)_+ (0.3\times600\times40)$ 2000×7200 $\frac{9200}{48000}\times100$ % 19%	B1 M1 A1 B1 M1 M1 A1 M1 M1 M1	For both Elim For shorts For trousers
12.	(a) Cost of tonne of rice is US $ 500 Shipping cost of rice = 20/100 x US$ 500 = US$ 100 Transport to Nairobi = 5/100 x US$ 500 = US$ 25 Custom duty = 10/100 x US$500 = US$ 500 = US$ 50 Total cost in dollars = 500 + 100 + 50 + 25 = US$ 675	B1 B1 B1 A1 B1	

	Converting this to ksh = 76.60 x 675 = ksh 51705 (b) To make profit of 20% he must sell rice at 120% of the cost price per tonne Selling price of a tonne of rice = 120/100 x sh 51705 = ksh 62046 1 tonne has 1000kg, selling price of 1kg of rice = 62.046 = sh 62.00 (c) Total collection = sh 62046 in US dollars this becomes $= \frac{62046}{78.20}$ = US$ 793.4271 Actual profit = US$ 793.4271 – 675 = 118.4271 Actual percentage = 118.4271/625 x 100 = 17.545%	B1 B1 B1 B1 A1	
		10	

15. Total exp = 600000 + 100000 M1
= Sh. 700000
Profit = 108000 – 700000
% profit = $\frac{380000}{60000}$ x 100
$63^{1}/_{3}$ % A1

3

16. (a) Swiss Franc = $^{52}/_{1.28}$ M1
= 40.625 A1

(b) Kenya shillings = 40.625 x 45.21
= 1837 B1

3

17.	Let the rates be x% and y% respectively $\frac{x}{100}$ x 50000 = 2250 $\frac{y}{100}$ x 45000 = 2250 ∴x = 4.5% y = 5%	M1 M1 A1	
		03	
18.	Sitienei – x Lagat – 1.1x Rotich – 1.155x	M1 M1	

	Diff = 1.155x – 1.1x = 0.55x = 110,000 X = 2,000,000 Rotic paid 1.155 x 200,000 = 231000	A1	
		03	
19.	5000 x 84.15 = sh. 420750 420750 – 289850 = sh. 130900 Amount = $\frac{130900}{65.45}$ x 100 = 200,000 Japanese Yen	**M1** **M1** **A1**	
		03	

20 a.)	$A = 1200000\ (1 - {}^{8}/_{100})^2$ $1200000\ (0.92)^2$ = 1,051,680 $1015680\ (1-{}^{12}/_{100})^4$ $1015680\ (0.88)^4$ = 609098.58	M1 M1 M1 A1	
b.)	${}^{125}/_{100}$ x 609098.58 = 761373.23 $761373.23 = 1200000(1- {}^{r}/_{100})^{72}$ $(1/ {}^{r}/_{100})^{72} = 0.6344776$ ${}^{72}/_{72} \log (1- {}^{r}/_{100}) = {}^{-0.1975836}/_{72}$ $\text{Log}(1- {}^{r}/_{100}) = {}^{-} 0.0027442173$ $1-{}^{r}/_{100} = 0.9937011$ ${}^{r}/_{100} = 0.0062988$ r = 0.62988 % p.m.	M1 A1 M1 M1 M1 A1 10	Follow thro' if A1 is missing A1√ if A above is lost.

21.	50x + 25y = 200 2x + y = 8…….(i)	M1 M1	✓eqn (i) ✓ eqn (ii)

	$50x+\frac{28}{100}+\frac{24}{100}\times 25y=53.50$ $14x+6y=53.50$ $\therefore 2x+y=8$ $14x+6y=53.50$ $\therefore 2x+y=8$ $14x+6y=53.50$ $\therefore y=2.50, x=2.75$ $milk = Ksh.2.75,\ salt = Ksh.2.50$	M1 A1	✓ solving ✓ both
		04	
22.	Yen = 1000 x 105 x $\frac{105}{100}$ + 1260 = 111510 Yen Ksh = 111510 x $\frac{63}{105}$ = Ksh. 66906	M1 A1 B1	
		03	

23	$C.P=\frac{240.50}{125}\times 100$ $=sh192.40$ R.P 240.50 – 22.90 = Sh 217.60 % profit = $\frac{217.60-192.40}{192.40}\times 100$ $=13.1\%$	M1 M1 A1	
		3	
24	$7\left[x^2-\frac{1}{4}(y+1)^2\right]$ $=7\left(x-\frac{1}{2}(y+1)\right)\left(x+\frac{1}{2}(y+1)\right)$ When x = 5 and y = 8 $7\left(5-\frac{9}{2}\right)\left(5+\frac{9}{2}\right)$ $=7\times\frac{1}{2}\times\frac{19}{2}$ $=33.25$	B1 B1 B1	
		3	
25	$1500\times 78.43=sh.117645$ $\frac{117645}{79.25}=\$1484.5$ $loss: 1500-1484.5=\$15.5$	M1 M1 A1	
		3	

26. *2x - 3y + 6 =0*

$-3y = -2x - 6$

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

When $y = 0 \quad x = -3$

$x = 0 \quad y = 2$

$\therefore$ Co-ordinate of y – intercept is (0,2)

" " x – intercept is (-3,0)

$\therefore \angle CAO = \tan^{-1} \frac{2}{3}$

$= 33.69^o$

$\therefore \angle\theta = 180 - 33.69^o$

$= 146.31^o$

27. Point $y \left(\frac{4 + -2}{2}, \frac{7 + -1}{2}\right) = (1, 3)$

grad $AB = \frac{7 + 1}{4 + 2} = \frac{8}{6}$

grad $xy = -\frac{3}{4}$

grad $xy = -\frac{3}{4}$

$\frac{y - 3}{x - 2} = -\frac{3}{4}$

$y = -\frac{3}{4}x + \frac{15}{4}$

28. $Y = 3x - 1$

$M = 3$

$M_1 m_2 = -1$

$M_2 = -\frac{1}{3}$

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

$3y - 9 = -x + 2$

$\frac{3y}{3} = \frac{-x}{3} + \frac{11}{3}$

$Y = \frac{x}{3} + \frac{11}{3}$

29. Pt T is $\left(\frac{1 + 5}{2}, \frac{4 + 10}{2}\right) = (-2, 7)$

grad. of grid $xy = \frac{10 - 4}{-5 - 1} = \frac{14}{-6} = \frac{-7}{3}$

$\therefore$ grad of $L_2 = \frac{3}{7}$

Take a general pt P(x,y) on L_2

$\Rightarrow \frac{y - 7}{x - 2} = \frac{3}{7}$

$\Rightarrow 7y - 49 = 3x + 6$

$7y = 3x + 55$

Or $y = \frac{3x}{} + \frac{55}{}$ } **Equation of L_2**

30. a, b

(c) Name : a kite

31. *(a) Grad of line QP* $= \frac{4-2}{1-3} = \frac{2}{-2} = -1$

Grad of line QR = 1
Take a pt Q(1,4) and T(x,y) on line QR
$y - 4 = 1$
$x - 1$
$y - 4 = x - 1$
$y = x + 3$ *.....equ. of QR*

(b) $y = x+3$ *...(i) Equ of QR*
$y = 3x - 7$ *...(ii) Equ. of Pr*
Solving simultaneously ;:
$x + 3 = 3x - 7$
$2x = 10$
$x = 5$
Substituting ; $y = 8$
∴R is the pt (5,8)

(c) $\underset{\sim}{PS} = \underset{\sim}{QR} = \begin{pmatrix}5\\8\end{pmatrix} - \begin{pmatrix}1\\4\end{pmatrix} = \begin{pmatrix}4\\4\end{pmatrix}$

$\underset{\sim}{OS} = \begin{pmatrix}3\\2\end{pmatrix} + \begin{pmatrix}4\\4\end{pmatrix} = \begin{pmatrix}7\\6\end{pmatrix}$

S is the point (7,6)

32. a) *Gradient OA = Gradient of CB*

$\frac{-1-0}{2-0} = -\frac{1}{2}$

Gradient of CB

$\frac{y-3}{0-4} = -\frac{1}{2}$

$2y - 6 = 4$

$2y = 10$

$y = 5$

b) i) $AN = ON - OA = \frac{1}{2} OM - OA$

$OM = OA + \frac{1}{2} AB = (2) + \frac{1}{2}(2)$

$= 3$

$AN = \frac{1}{2} \begin{pmatrix} 3 \\ 1 \end{pmatrix} - 2 \quad = \begin{pmatrix} \frac{1}{2} \\ -\frac{1}{3} \end{pmatrix}$

$= \frac{1}{2} \begin{pmatrix} 3 \\ 1 \end{pmatrix} - \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

ii) $NC = OC - ON$

$= \begin{pmatrix} 0 \\ 5 \end{pmatrix} - \begin{pmatrix} \frac{3}{2} \\ \frac{1}{2} \end{pmatrix} = \begin{pmatrix} -\frac{3}{2} \\ \frac{1}{2} \end{pmatrix}$

iii) $AC = OC - OA = \begin{pmatrix} 0 \\ 5 \end{pmatrix} - \begin{pmatrix} 2 \\ -1 \end{pmatrix} = 2 \begin{pmatrix} -1 \\ 3 \end{pmatrix}$

c) $AN = \frac{1}{2} \begin{pmatrix} -1 \\ 3 \end{pmatrix}$

$NC = \frac{3}{2} \begin{pmatrix} -\frac{1}{3} \\ \end{pmatrix}$

4AN = AC And A is a common point hence A, N, C lie on a straight line.

33. a) *Δ ABC line AB = 7 cm and BC = 8 cm.*

Construction of $\angle 60^o$

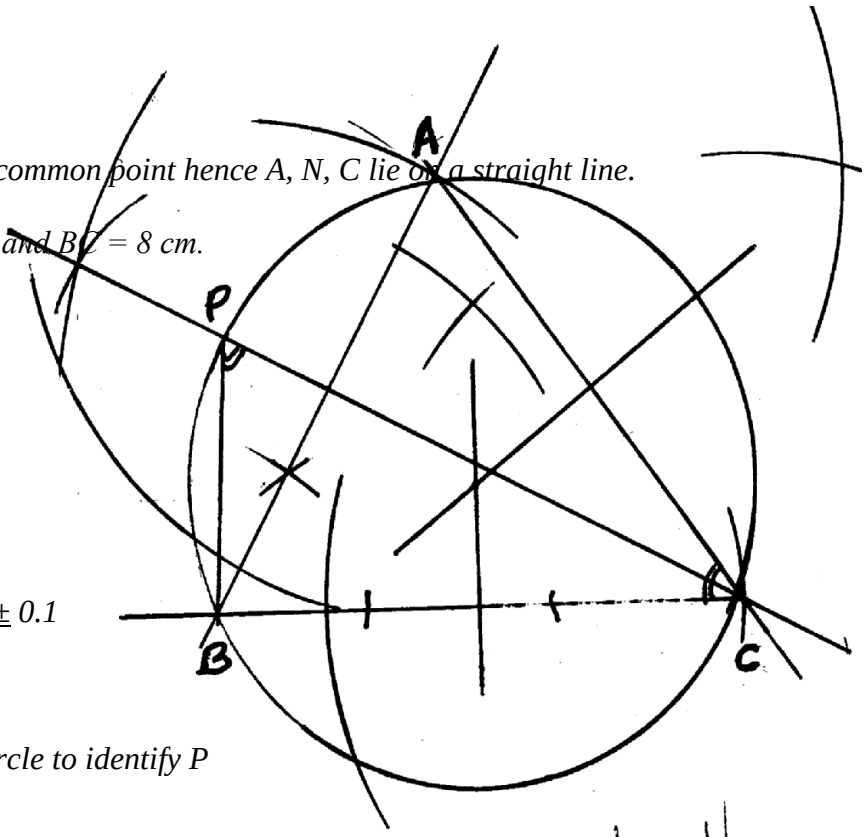
(b) AC = 7.6 ± 0.1 and

$\angle ACB = 53 \pm 1^o$

(c) 2 sides bisector 1
Circle drawn radius 4.4. ± 0.1

(d) Bisect $\angle ACB$
Bisection line to cut the circle to identify P

$\angle PBC$ *measure* $\equiv$



(a) AB = 7 cm, BC = 8 cm AB = 7cm, BC = 8cm B1 B1 Check

$\angle ABC = 60^o$

- *(b) AC = 7.6 ± 0.1 cm*

$\angle ABC = 53^o \pm 0.1$

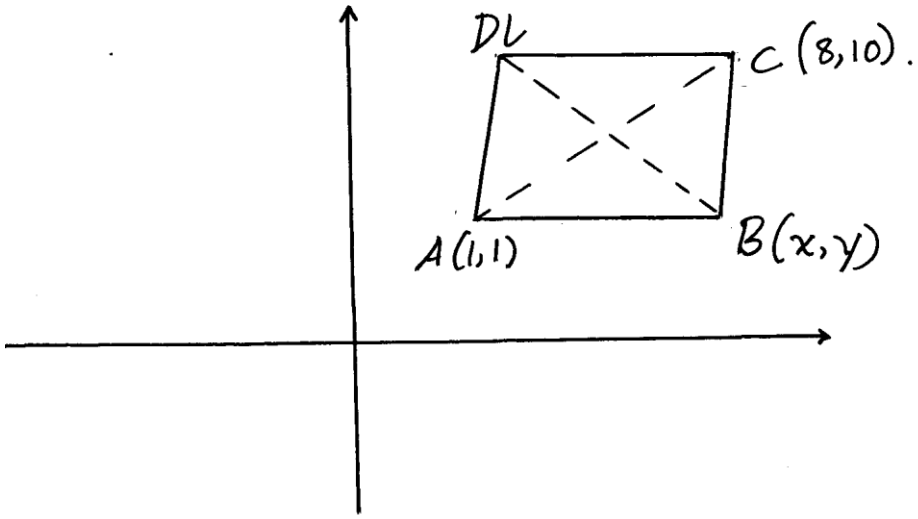
(c) Perpendicular bisectors of any two sides.
Circle drawn
Radius = 4.4.±0.1. cm

(d) $\angle$ *ACB bisected*
Bisection line drawn to cut circle at P

$\angle BPC = \angle BAC = 67^o$

$\angle PBC = 88 \pm 0.1^o$

34.



$M\left(\frac{1+8}{2}, \frac{1+10}{2}\right) = M(4.5, 5.5)$

b) AB: 4x – 5y = -1 x 2
BC: 5x – 2y = 20 x 5
8x – 10y = -2
25x – 10y = 100
-17x = -102
$x = {}^{102}/_{17} = 6.0$
24 – 5y = -1
5y = -25
Y = 5
∴ B(6,5)

$\frac{x + 6.0}{2} = 4.5$ *x = 3*

$\frac{y + 5}{2} = 5.5$ *y = 6*

2

$\therefore$ $\underline{D\ (3,6)}$

c) $AB = \sqrt{(16-1)^2 + (5-1)^2}$

$\sqrt{25 + 16}$

$\sqrt{41} = 6.40\ (units)$

35. *Mid ordinate*

Area $= 1.2\ (6.2 + 4.3 + 2.6)$

$= 15.72$