PAVEMENT FORM 4 TRIAL 1 EXAMINATION 2021/2022

Kenya Certificate of Secondary Education (K.C.S.E)

121/2

MATHEMATICS PAPER 2

MARKING SCHEME

1.	No. Log 32.95 1.5179 5.25 0.7202 + 0.069 $\bar{2}.8388 \times \frac{1}{2}$ $\bar{2} + 1.5590 = \bar{1}.7795$ 1.5179 - $\bar{1}.7795$ $5.475 \times 10^{1} \leftarrow$ 1.7384 54.75	M1 M1 M1 A1	All correct logs Multiplication by ½ Addition & subtraction
			4 Marks
2	$x + y = 9$ .....(i) $10y + x - (10x + y) = 9$ $10y - y + x - 10x = 9$ $9y - 9x = 9$ $y - x = 1$ .....(ii) $x + y = 9 \rightarrow x = 9 - y$ $y - (9 - y) = 1$ $y - (9 + y) = 1$ $2y = 10$ $y = 4$ $x = 4$ Number is 45	M1 M1 A1	Equation (i) and (ii) Solving the two equations
			3 Marks
3	$120 - (40 + 21) = 59m$		

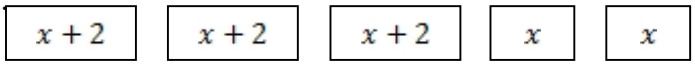
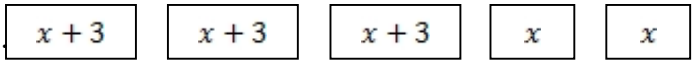
	$59^2 = 40^2 + 21^2 - 2(40)(21)\ Cos\theta$ $3481 = 1600 + 441 - 1680\ Cos\ \theta$ $1440 = -1680\ Cos\ \theta$ $\frac{1440}{-1680} = Cos\ \theta$ $Cos^{1} - 0.8571 = 149°$	M1 M1 A1	
			3 Marks
4	$\log_{10}(3x+4) - \log_{10}(3-x) = \log_{10} 10$ $\frac{3x+4}{3-x} = 10$ $3x + 4 = 30 - 10x$ $13x = 26$ $x = 2$	M1 M1 A1	
			3 Marks
5	$3(2i - 3j + k) - (3i - 4j - k) + j + 3k$ $OR = 6i - 9j + 3k - 3i + 4j + k + j + 3k$ $OR = 3i - 4j + 7k$ $\|OR\| = \sqrt{3^2 + (-4)^2 + 7^2}$ $\sqrt{74}$ $= 8.6023$ $= 8.60$ 3sf	M1 M1 A1	CAO
			3 Marks
6	$3y - y = \frac{P}{q + \frac{1}{x}}$ $2y = \frac{P}{q + \frac{1}{x}}$ $2yq + {}^{2y}/_{x} = P$ ${}^{2y}/_{x} = P - 2yq$ ${}^{x}/_{2y} = \frac{1}{P - 2yq}$ $x = \frac{2y}{P - 2yq}$	M1 M1 A1	
			3 Marks

7	$P\ (Consonant) \times P\ (Vowel)$ $= \frac{5}{9} \times \frac{4}{8} = \frac{20}{72} = \frac{5}{18}$	M1 A1	
			2 Marks
8	$(x+3)x = (6+3)6$ $x^2 + 3x = 54$ $x^2 + 3x - 54 = 0$ $(x^2 + 9x) - (6x - 54 = 0$ $x(x+9) - 6(x+9) = 0$ $x = -9, x = 6$ $x = 6cm$	 M1 M1 A1	
			3 Marks
9	$\frac{1+\sqrt{5}}{2+\sqrt{5}} + \frac{1-\sqrt{5}}{2-\sqrt{5}} \times \frac{2+\sqrt{5}}{2+\sqrt{5}}$ $\frac{(1+\sqrt{5})(2-\sqrt{5})}{(2)^2 - (\sqrt{5})^2} + \frac{(1-\sqrt{5})(2+\sqrt{5})}{(2)^2 - (\sqrt{5})^2}$ $\frac{-3+\sqrt{5}}{-1} + \frac{-3-\sqrt{5}}{-1}$ $3 - \sqrt{5} + 3 + \sqrt{5}$ $= 6$	M1 M1 A1	
			3 Marks
10	$\frac{100 \times 480\ 000}{96} = Sh.500{,}000$ $500\ 000 = 800\ 000\ (1 + {}^{R}/_{100})^5$ $0.625 = (1 + {}^{R}/_{100})^5$ $\sqrt[5]{0.625} = 1 + \frac{R}{100}$ $0.91028 = 1 + \frac{R}{100}$ $0.91028 - 1 = \frac{R}{100}$ $0.08971 \times 100 = 8.971\%$	M1 M1 A1	
			3 Marks
11	$(1)^6 + 6(1)^5(3x) + 15(1)^4(3x)^2 + 20(1)^3(3x)^3$ $1 + 18x + 135x^2 + 540x^3$ $1.3 = 1 + 3x$ $0.3 = 3x$ $0.1 = x$	M1 A1	

	$1+18(0.1)+135(0.1)^2+540(0.1)^3$ $1+1.8+1.35+0.54=4.69$ $=4.7$	M1 A1	 C.A.O.
			3 Marks
12	$\frac{140\times5+160\times3}{5+3}=Sh.147.50$ $180-147.50=32.5$ $\frac{32.5}{147.50}\times100=22.03\%$	M1 M1 A1	
			3 Marks
13	$\frac{360}{n}-\frac{360}{3n}=8$ $\frac{1080-360}{3n}=8$ $720=24n$ $30=n$	M1 M1 A1	
			3 Marks
14	$P=K+N\sqrt{Q}$ $5m+k=20$ $\underline{7m+k=30}$ $-2m=-10$ $m=5$ $25+k=20$ $k=-5$	A1 M1 A1	
			3 Marks
15	$5x-7y=1 \qquad -4x-5y=-2$ $\begin{pmatrix}5&-7\\-4&-5\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}1\\-2\end{pmatrix}$ $(5x-5)-(-7x-4)=-53$ $-1/53\begin{pmatrix}-5&7\\4&5\end{pmatrix}=\begin{pmatrix}5/53&-7/53\\-4/53&-5/53\end{pmatrix}$ $\begin{pmatrix}5/53&-7/53\\-4/53&-5/53\end{pmatrix}\begin{pmatrix}5&-7\\-4&-5\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}5/53&-7/53\\-4/53&-5/53\end{pmatrix}\begin{pmatrix}1\\-2\end{pmatrix}$	 M1 M1	

	$\begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}{}^{19}/_{53}\\ {}^{6}/_{53}\end{pmatrix}$ $x={}^{19}/_{53},\quad y={}^{6}/_{53}$	A1	
			3 Marks
16	$2x^2+2y^2-12x-20y=-60$ $x^2+y^2-6x-10y=-30$ $x^2-6x+C_1+y^2-10y+C_2=-30+C_1+C_2$ $C_1=9 \qquad C_2=25$ $x^2-6x+9+y^2-10y+25=-30+9+25$ $(x-3)^2+(y-5)^2=2^2$ $a=3 \qquad b=5$	M1 M1 A1	
			3 Marks

SECTION II: 50 Marks

17	a)  No of rows = $\frac{468}{5x+6}$ Of benches	M1 A1
	b)  No of rows = $\frac{468}{5x+9}$ Of benches	M1 A1
	c) $\frac{468}{5x+6}-\frac{268}{5x+9}=1$ $(\cancel{5x+6})(5x+9)\frac{468}{\cancel{5x+6}}-(5x+6)(\cancel{5x+10})\frac{468}{\cancel{5x+9}}=(5x+6)(5x+9)$ $1404=25x^2+75x+54$	M1 M1

	$25x^2 + 75x - 1350 = 0$ $x = -9 \ \ or \ x = 6$ $\therefore x = 6$ $original \ no.of \ people \ per \ row = 5x + 6$ $= 5(6) + 6 = 36$	M1 M1 A1
		10 Marks

18	a) $^{8}/_{32} \times {}^{7}/_{31} = {}^{7}/_{124}$	M1 A1
	b) $= {}^{14}/_{32} \times {}^{13}/_{31}$ $= {}^{91}/_{496}$	M1 A1
	c) $= {}^{1}/_{4} \times {}^{4}/_{10} \times {}^{3}/_{9}$ $= {}^{1}/_{30}$	M1 A1
	d) ${}^{18}/_{32} \times {}^{17}/_{31} + {}^{8}/_{32} \times {}^{7}/_{31}$ $= \frac{306}{992} + \frac{56}{992}$ $= \frac{181}{496}$	M1 M1 M1 A1

		10 Marks

19	a) In 1 minute A fills $\frac{1}{16}$ In 1 minute B empty $\frac{1}{24}$ In 8 minutes both put $8\left(\frac{1}{16}-\frac{1}{24}\right)=\frac{1}{6}$ Part of tank to be filled $=\frac{6}{6}-\frac{1}{6}=\frac{5}{6}$ $\frac{1}{16} \rightarrow 1\ Minute$ $\frac{5}{6}=?$ $\frac{5}{6}\times 16 = 13\frac{1}{3}\ Min.$ $Total\ time = 8 + 13\frac{1}{3} = 21\frac{1}{3}\ Min$ b) 1 Min $\rightarrow \frac{1}{16}$ $21\frac{1}{3}? \leftarrow$ $\frac{64}{3}\times\frac{1}{16} = {}^{4}/_{3}$ ${}^{4}/_{3} = 184000$ $1 \rightarrow ?$ $1\times {}^{3}/_{4}\times 18400$ $= 13{,}800\ L$	B1 B1 M1 M1 M1 A1 M1 M1 M1 A1
		10 Marks

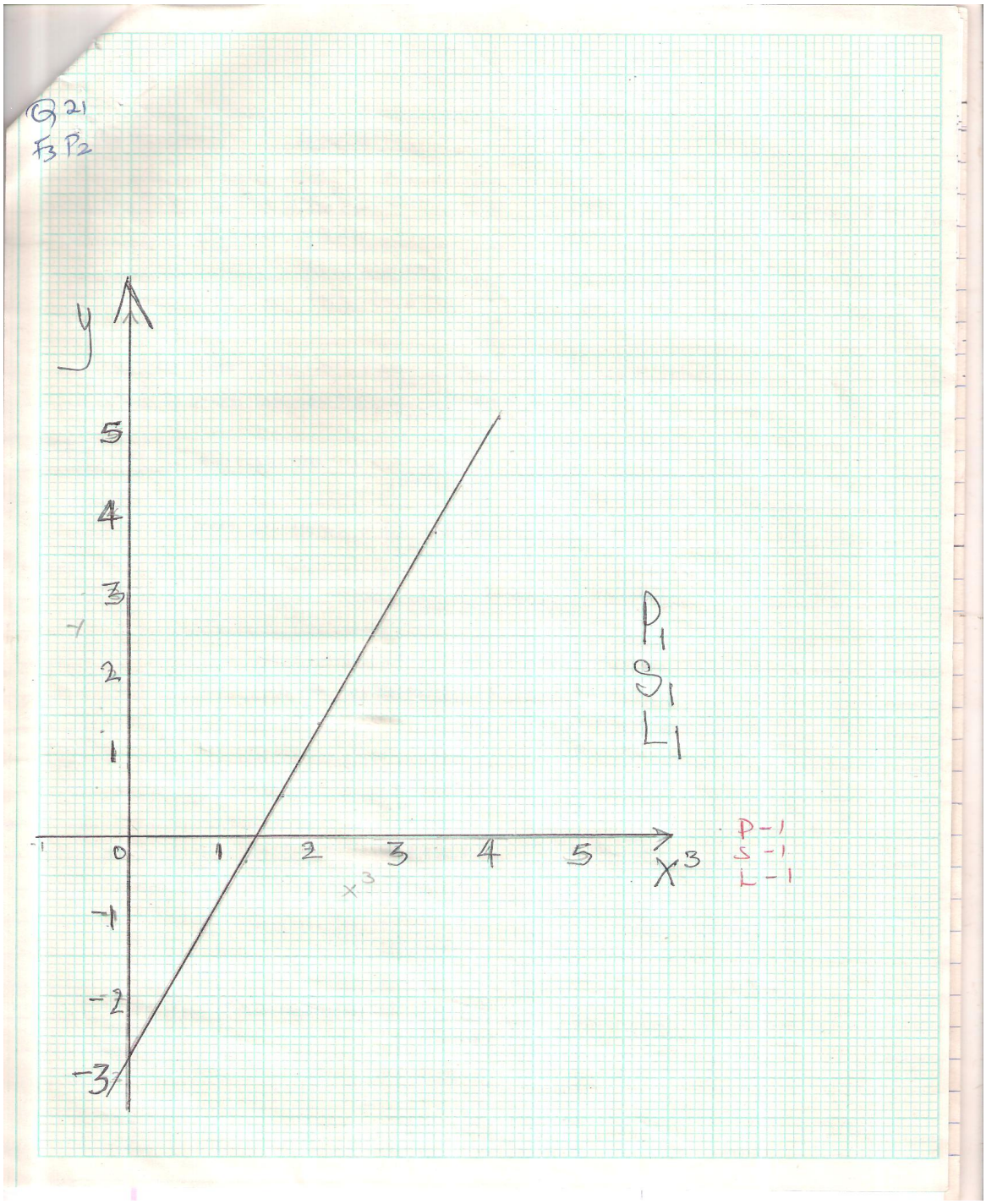
20	i) PAB =44° ∠TBA ∠TAB ii) ∠ = = $\frac{180-62}{2} = 59^{\circ}$ PBA =59 - 44 = 15° ∠ABQ iii) = 180 – (44 + 38 + 15)	B1 B1 B1 B1

	= 180 – 97 = 83° ∠	B1
	iv) PKB = 180 + (38 + 15) = 180 – 53 = 127° ∠	B1
	AKP = 180 – 127 = 53°	B1
	v) AK.KB = PK.KQ $3 \times 3 = 2PK$ PK= $^{9}/_{2}$ but QP = QK + KP = 2 + 4.5 = 6.5	M1 M1 A1
		10 Marks

21	a) . x_3 | 1.331 | 1.728 | 2.197 | 2.744 | 3.375 | 4.096	
	b) Line passes through (4.1, 5.2) and (1.7, 0.5) $m = \frac{5.2 - 0.5}{4.1 - 1.7}$ $= \frac{4.7}{2.4}$ ≈ 2 $\therefore a = 2$ $b = y\ intercept = -2.8$	M1 (For any two correct points) B1 B1
	c) $y = 2x^3 - 2.8$	

		B1 B1
		10 Marks

(21) Graph



22	a) .	

	42800 15000 + 2880 2664 $\frac{30}{100} \times 42800 =$ 12840 76184×12 $= 914208$	M1 (For sum and × by 12) A1
	b) First $Sh.121968 \times \frac{10}{100} = Sh.12196.8$	
	Next $Sh.114912 \times \frac{15}{100} = Sh.17236.8$	M1
	Next $Sh.114912 \times \frac{20}{100} = Sh.22982.4$	M1
	Next $Sh.114912 \times \frac{25}{100} = Sh.28728$	M1
	Remaining $Sh.447504 \times \frac{30}{100} = Sh.134251.2$	M1
	Total tax = 215 395.2 Less relief (1162×12) = 13944 Tax paid =Sh.201451.2	M1 A1
	c) Salary Increment = $\frac{50}{100} \times 33384$ = 16692	M1
	Tax increment = $\frac{30}{100} \times 16692$ =5007.6	M1
	% Tax increment = $\frac{5007.6}{201451.2} \times 100$ = 2.5%	A1
		10 Marks

23	a) i) $S = \frac{n}{2}(2a + (n-1)d)$	

	$156 = \frac{8}{2}(2(2) + (8-1)d)$ $156 = 16 + 28d$ 28d=140 $d = \frac{140}{28}$ d = 5	M1 A1
	ii) $S = \frac{n}{2}(2a + (n-1)d)$ $416 = \frac{n}{2}(2a + (n-1)d)$ $832 = 4n + 5n^2 - 5n$ $5n^2 - n - 832 = 0$ $n = 130 \ \ or - 128$ $\therefore n = 130$	 M1 M1 M1 (Simplified equation) A1
	b) i) $T_3 = a + 2d = a + 6$ $T_s = a + 4d = a + 12$ $T_8 = a + 7d = a + 21$ $\frac{a+21}{a+12} = \frac{a+12}{a+6}$ $a = -6$	 M1(For all correct values T_3, T_5 & T_8 M1 M1 (For equation and solving) A1
		10 Marks

24	a) $w \propto \frac{l^2}{\sqrt{r}}$	

	$\rightarrow w = \frac{kl^2}{\sqrt{r}}$	M1 (For correct formula)
	$l_1 = \frac{105}{100} = 1.05$	M1
	$r_1 = \frac{64}{100} = 0.64$	M1
	$w_1 = \frac{(1.05)^2}{\sqrt{0.64}}k$	
	$= 1.378125k$	M1
	$\%\ change\ in\ w = \frac{1.378125 - k}{k} \times 100$	
	$= 0.378125 \times 100$	M1
	$= 37.81\%\ increase$	
		A1
b)	$w = \frac{kl^2}{\sqrt{r}}$	
	$6 = \frac{12^2 k}{\sqrt{25}}$	
	$6 = \frac{144k}{5}$	
	$k = \frac{30}{144} = \frac{15}{72} = {}^{5}/_{24}$	
	$\rightarrow w = \frac{5l^2}{12\sqrt{r}}$	M1 (For correct value of k)
	$w = \frac{5(15)^2}{12\sqrt{81}} = \frac{5 \times 225}{12 \times 9}$	M1 (For correct equation)
	$w = 10.42N$	M1 (Correct sub)
		A1
		10 Marks