KENYA NATIONAL EXAMINATION COUNCIL
REVISION MOCK EXAMS 2016
TOP NATIONAL SCHOOLS

MANG'U HIGH SCHOOL

MATHEMATICS

PAPER 2

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MANG'U HIGH SCHOOL KCSE TRIAL AND PRACTICE EXAM 2016

PAPER 2 MARKING SCHEME

1. $= \dfrac{\frac{1}{3}\times\frac{22}{7}\times 7.5^2\times 3.55 - \frac{1}{3}\times\frac{22}{7}\times 7.5^2\times 3.45}{2}$ M1 absolute error

$= \dfrac{209.1964 - 203.3035}{2}$

= 2.94545

$\% = \dfrac{2.94645}{206.25}\times 100$ $\left\{\begin{matrix} Allow for \\ Max - \min \\ Max - Actual \\ Actual - \min \end{matrix}\right\}$ M1

= 1.429 A1 3d.p.

3

2. Selling price $\dfrac{100}{120}\times 84 = 70$ M1

$60\chi + 90y = 70\chi + 70y$ M1 Allow alternative or equivalent methods

$-10\chi = -20y$

$\chi : y = 2 : 1$ A1

3

3. $(\log_2\chi)^2 - 4\log_2\chi + 3 = 0$

$(\log_2\chi)^2 - 3\log_2\chi) - \log_2\chi + 3 = 0$

$\log_2\chi(\log_2\chi - 3) - 1(\log_2\chi - 3) = 0$

$(\log_2\chi - 1)(\log_2\chi - 3) = 0$ M1 Attempt to solve

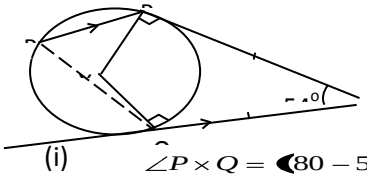
$\log_2\chi = 1 \qquad \chi = 2^1 = 2$

M1 Equating to roots or equivalent.

$\log_2\chi = 3 \qquad \chi = 2^3 = 8$

$\chi = 2, \chi = 8$ A1 for both

4.



(i) $\angle P\times Q = (80 - 54) = 126^o$

$\angle PRQ = \frac{1}{2}(26) = 63^o$ B1 Angle PRQ

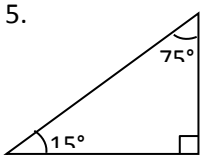
Angles subtended at the centre is twice that on the circumference. B1 Reasons

(ii) $\angle RQS = 63^o$ (Alternate to $\angle$PRQ) B1 Angle

B1 Reasons

4

5.



Tan 75° = $\dfrac{1}{2+\sqrt{3}}$ B1

$= \dfrac{(\sqrt{3})}{(+\sqrt{3})(-\sqrt{3})}$ M1 Rationalizing the denominator.

$= 2 - \sqrt{3}$ A1

3

6. $\chi = \left[\frac{1}{mp^3} - A^2\right]B$

$P^3 \frac{1}{mp^3} = \left(\frac{\chi}{B} + A^2\right)P^3$ M1 Collecting factors of P

$P^3 = \frac{1}{m\left(\frac{\chi}{B} + A^2\right)}$ M1 Cube root

$P = \sqrt[3]{\frac{B}{m(\chi + BA^2)}}$ A1

3

7. $= 3^5 + 5\binom{4}{1}\left(-\frac{1}{2}\chi\right) + 10(3)^3\left(-\frac{1}{2}\chi\right)^2 +$ B1 ✓ expansion with

$10(3)^2\left(-\frac{1}{2}\chi\right)^2 + 5\binom{1}{4}\left(-\frac{1}{2}\chi\right)^4$ with coefficients

$= 243 - \frac{405}{2}\chi + \frac{270}{4}\chi^2 - \frac{90}{8}\chi^3 + \frac{15}{16}\chi^4$ B1 ✓ simplied negatives.

χ = -0.5

= 243 - $\frac{405}{2}\chi\binom{0.5}{1} + \frac{270}{4}\binom{0.5}{2} -$ B1 ✓ Substitution of

χ = -0.5

$\frac{90}{8}\binom{0.5}{3} + \frac{15}{10}\binom{0.5}{4}$

= 243 + 101.25 + 16.875 + 1.40625 + 0.058593

= 362.5898 A1 4 decimal places.

4

8. $500000\left(1 - \frac{10}{100}\right)^4$ M1 Depreciation

= 328,050

$328050\left(1 + \frac{4}{100}\right)^{12} = 525{,}219$ M1 Appreciation

A1 C.A.O.

3

9. $\frac{dy}{d\chi} = 3\chi^2 - 6\chi + K$ M1

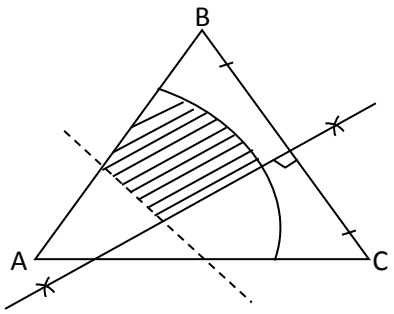
gradient of tangent = 9 M1

at χ = 0 $\frac{dy}{d\chi} = K$

$\therefore$ K = 9 A1

3

10.



B1 4.5cm from A

B1 $\perp$ bisector of BC

χ	-3	-2	-1	0	1	2	3	4	5

B1 3cm from BC (parallel)

B1 Shaded region

11. $\chi y = 24$

$4\chi - y = 10$ M1
$y = 4\chi - 10$
$\chi(4\chi - 10) = 24$
$4\chi^2 - 10\chi - 24 = 0$
Accept trials if
$4\chi^2 - 16\chi + 6\chi - 24 = 0$
at least 3 trials are
$(4\chi + 6)(\chi - 4) = 0$ M1
$\chi = 4$. $y = 6$, number 46 A1

3

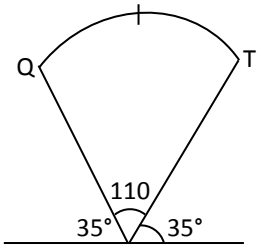
12. $\text{Sin}(3\chi + 30) = \frac{\sqrt{3}}{2}$ B1 Square root

$3\chi + 30 = 60, 120, 390, 480$ B1 for all

$\chi = 10°, 30°, 120°, 150°$ B1 For all

3

13.



$110 \times 60 = 6600$nm M1A1

2

14. R = 3i + j + 2K M1

$\overrightarrow{AR}$ = i + 2K M1

/AR/ = $\sqrt{1+4}$

= $\sqrt{5} = \underline{\underline{2.2361}}$ A1

3

15. Volume in one minute

$\frac{22}{7} \times 3.5^2 \times 300 cm$

= 11550cm² or M1
= 11.55 lines
1 min = 11.55
= 22000 = 1904 minutes
31 hours 44 minutes or A1

2

16.

$-2\chi^2$	-18	-8	-2	0	-2	-8	-18	-32	-50
4χ	-12	-8	-4	0	4	8	12	16	20
3	3	3	3	3	3	3	3	3	3
y	-27	-13	3	3	5	3	3	-13	-27

B2 For all ✓

B1 At least five correct

$$\frac{y-6.5}{\chi-2.5}=-\frac{1}{3}$$

$3y - 19.5 = -\chi + 2.5$

$3y + \chi = 22$

$$\frac{y-9}{\chi-3.5}=-\frac{1}{2}$$ M1

$2y - 18 = -\chi + 3.5$

$2y + \chi = 21.5$ M1

$3y + \chi = 22$

$$\frac{2y+\chi=21.5}{y=0.5}\ -$$ M1

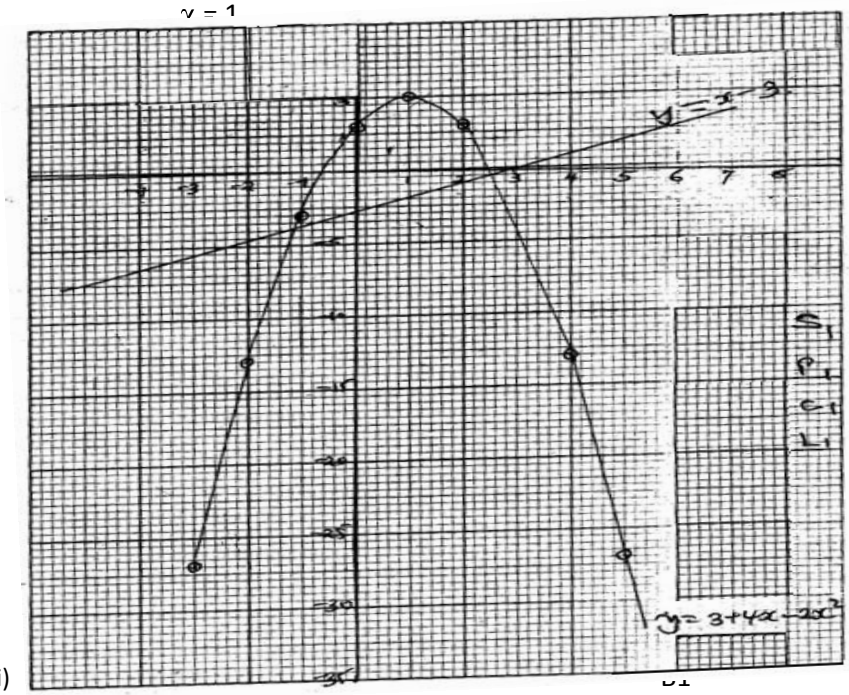
$\chi = 20.5$

Centre $(\chi, y) = (20.5, 0.5)$ B1

17. (a) $y = 3 + 4\chi - 2\chi^2$ $-3 \leq x \leq 5$

(b) T.P $\Rightarrow -4\chi + 4 = 0$ $4\chi = 4$

$\chi = 1$



(c) (i) B1

(ii) $0 = 2\chi^2 - 3\chi - 6$ ------⑦

$y = -2\chi^2 + 4\chi + 3$ ----⑧ +

$y = \chi - 3$

$$\frac{y}{-3}-\frac{\chi}{-3}=\frac{-3}{-3}\Rightarrow\frac{-\chi}{3}-\frac{y}{3}=1$$

χ - intercept (3, 0), y – intercept (0, 3)

χ = -1.1 or 2.5 ✓ B1

(d) y = 5 ✓ B1

18. $P = K\frac{Q^2}{\sqrt{R}}, K - constant$

(i) $K = \frac{P\sqrt{R}}{Q^2} = \frac{12 \times \sqrt{36}}{24^2} = \frac{1}{8}$ M1 ✓ constant

Hence P = $\frac{1}{8} - \frac{Q^2}{\sqrt{R}}$

When Q = 27, R = 121 M1 Substitution

P = $\frac{1}{8} \times \frac{27^2}{\sqrt{121}} = \frac{729}{88}$ A1

(ii) $Q_1 = 1.21Q^2$

$R_1 = 0.866025403\sqrt{R}$

P_1 = K $\times \frac{1.21Q^2}{\sqrt{0.75R}} = 1.397187651$ K $\frac{Q^2}{\sqrt{R}}$ M1 New values of R and Q

New change = $\frac{(1.397187651 - 1)\frac{KQ^2}{\sqrt{R}}}{\frac{KQ^2}{\sqrt{R}}} \times 100\%$ M1 Substitution M1 %

exp.

= 39.7187651%

Hence increase of 39.72% A1

(iii) $Q = K\frac{1}{\sqrt{P}},$

K = $Q\sqrt{P}$

= $3\sqrt{4}$ M1

= 6 Eqn = Q = $6\frac{1}{\sqrt{P}}$

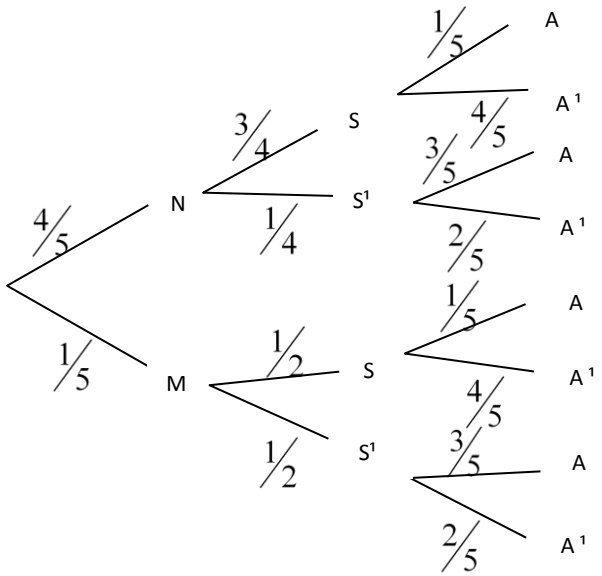
P = $\left(K\frac{1}{Q}\right)^2$ M1

= $\left(6 \times \frac{1}{8}\right)^2 = \left(\frac{6}{8}\right)^2$

= $\frac{9}{16}$ A1

10

19.



(i) P(SA) = $\left(\frac{4}{5}\times\frac{3}{4}\times\frac{1}{5}\right)+\left(\frac{1}{5}\times\frac{1}{2}\times\frac{1}{5}\right)$ M1

= $\frac{7}{50}$ A1

(ii) P(SA¹) = $\left(\frac{4}{5}\times\frac{3}{4}\times\frac{4}{5}\right)+\left(\frac{1}{5}\times\frac{1}{2}\times\frac{4}{5}\right)$ M1

= $\frac{14}{25}$ A1

(iii) P(S¹A) = $\left(\frac{4}{5}\times\frac{1}{4}\times\frac{3}{5}\right)+\left(\frac{1}{5}\times\frac{1}{2}\times\frac{3}{5}\right)$ M1

= $\frac{9}{50}$ A1

(iv) P(S¹A¹) = $\left(\frac{4}{5}\times\frac{1}{4}\times\frac{2}{5}\right)+\left(\frac{1}{5}\times\frac{1}{2}\times\frac{2}{5}\right)$ M1

= $\frac{3}{25}$ A1

r M1

(v) P(SA and SA¹) = $\frac{7}{50}+\frac{14}{25}=\frac{35}{50}$ A1

20.

Class	f	C.F	X	FX	d	d^2	fd^2
11 -20	2	2	15.5	31	-41.8	1747.24	3494.48
21 – 30	3	5	25.5	76.5	-31.8	1011.24	3033.72
31 – 40	5	10	35.5	177.5	-21.8	475.24	2376.2
41 – 50	6	16	45.5	273	-11.8	139.24	835.44
51 – 60	12	28	55.5	666	-1.8	3.24	38.88
61 – 70	10	38	65.5	655	8.2	67.24	672.4
71 – 80	6	44	75.5	453	18.2	331.24	1987.44
81 – 90	4	48	85.5	342	28.2	795.24	3180.96
91 - 100	2	50	95.5	191	38.2	1459.24	2918.48
	50			2865			18,538

(a) $Q_3 = \frac{3}{4} \times 50 = 37.5 = 60.5 + \left(\frac{37.5 - 28}{10}\right) \times 10 = 70$ M1 for Q_1

$Q_1 = \frac{1}{4} \times 50 = 12.5 = 40.5 + \left(\frac{12.5 - 10}{6}\right) \times 10 = 44.666$ M1 Q_3

Interquartile = 70 – 44.66667 = $\underline{\underline{25.3333}}$ A1

(b) Mean = $\frac{\Sigma f\chi}{\Sigma f} = \frac{2865}{50} = \underline{\underline{57.3}}$ B1 for $f\chi$

M1 Substitution

(c) $S = \sqrt{\frac{fd^2}{\Sigma f}} = \sqrt{\frac{18583}{50}} = \underline{\underline{19.2551}}$ A1

B1 for d^2
B1 for fd^2
M1 ✓ substitution
A1

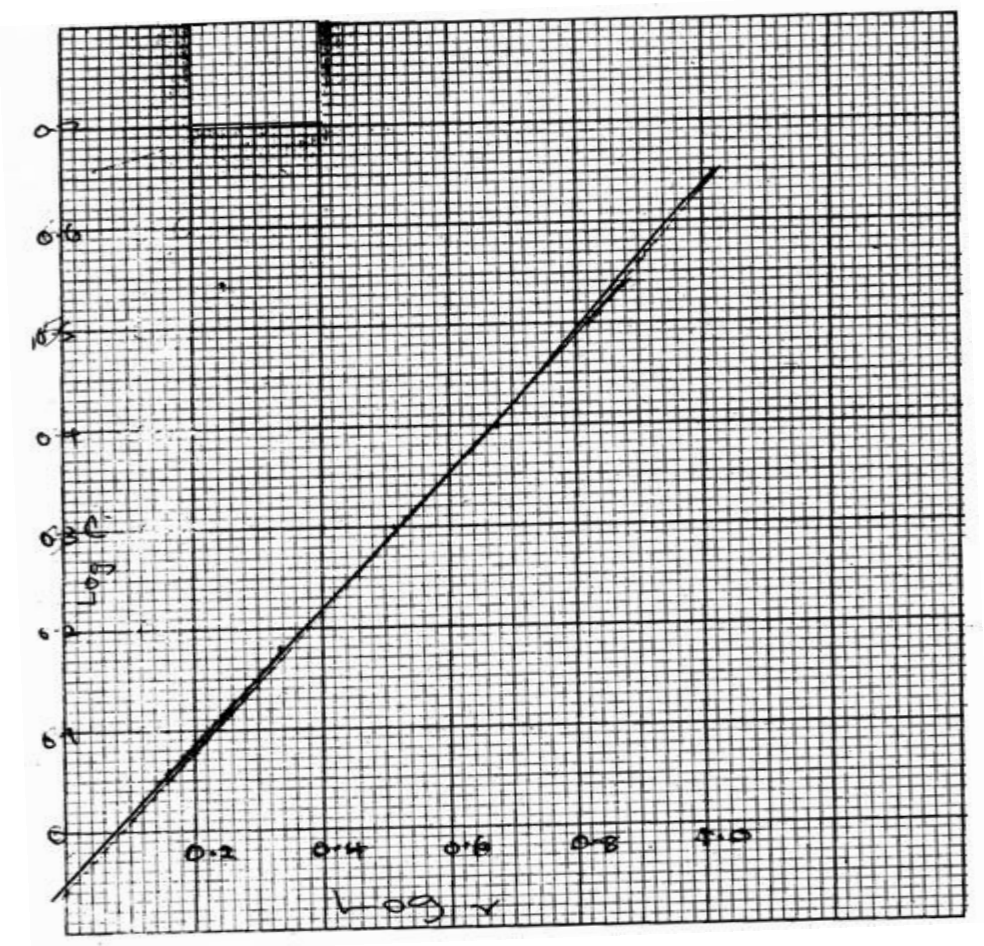
21. (a) Log P = n log r + log K B1

(b) (i)

Log P	0.08	0.18	0.30	0.40	0.54	0.65
Log r	0.20	0.35	0.53	0.68	0.90	1.06

B2 for all values ✓

Scale - S1
Plotting - P1
Line - L1



Log K = 0.05 = K = 1.122 B1

n = $\frac{2}{3} = 0.6667 \pm 0.02$ B1 grad. calculated

B1

(c) P = $1.122r^{0.6667}$ B1

22. (i) $\overrightarrow{AB} = 3\underset{\sim}{b} - 2\underset{\sim}{a}$ B1

(ii) $\overrightarrow{CN} = 2\underset{\sim}{a} + \frac{1}{3}(\underset{\sim}{b} - 2\underset{\sim}{a})$ M1

= $\frac{4}{3}\underset{\sim}{a}+\underset{\sim}{b}$ A1 Simplified

(iii) $\overrightarrow{BR}=\frac{-2}{3}\left(\underset{\sim}{b}-2\underset{\sim}{a}\right)$

= $-2\underset{\sim}{b}+\frac{4}{3}\underset{\sim}{a}$

Or = $\frac{4}{3}\underset{\sim}{a}-2\underset{\sim}{b}$ B1 Simplified

(iv) $\overrightarrow{MR}=\underset{\sim}{a}+\frac{5}{3}\left(\underset{\sim}{b}-2\underset{\sim}{a}\right)$ M1

= $\underset{\sim}{a}+5\underset{\sim}{b}-\frac{10}{3}\underset{\sim}{a}$

= $5\underset{\sim}{b}-\frac{7}{3}\underset{\sim}{a}$ A1 Simplified

(v) Let $\overrightarrow{CK}=K\overrightarrow{CN}$

= $\frac{4}{3}K\underset{\sim}{a}+K\underset{\sim}{b}$ B1 Expanded form

Or $\overrightarrow{CK}=a+h\left(5\underset{\sim}{b}-\frac{7}{3}\underset{\sim}{a}\right)$

= $\left(1-\frac{7}{3}h\right)\underset{\sim}{a}+5hb$ B1 Expanded form

(b) $\left(1-\frac{7}{3}h\right)\underset{\sim}{a}+5h\underset{\sim}{b}=\frac{4}{3}K\underset{\sim}{a}+K\underset{\sim}{b}$ M1

$1-\frac{7}{3}h=\frac{4}{3}K$

K = 5h

Substituting h = $\frac{1}{9}, K=\frac{5}{9}$

∴ CK : KN = 5 : 4 A1 Ratio

10

23. (a) $a \times ar \times ar^2 = 729$ M1

$a^3r^3 = 729$

$ar = 9$

$r = \frac{9}{a}$ A1

(b) $a + ar + ar^2 = 39$

$a + a \times \frac{9}{a} + a \times \frac{81}{a^2} = 39$ M1 Substitution of r

$a + 9 + \frac{81}{a} = 39$

$a^2 - 30a + 81 = 0$ M1 Equation

$a^2 - 27a - 3a + 81 = 0$

$(a - 27)(a - 3) = 0$ M1 Attempt to factorize

$a = 3, a = 27$

$r = 3$ or $r = \frac{1}{3}$ A1 for both

when r = 3

	3, 9, 27, 81 --------	B1	Four terms
	27, 9, 3, 1, ---- when r = $\frac{1}{3}$	B1	four terms
	(c) ar^9		
	$8\times3^9\left(27\times\frac{1}{3}^9\right)$	M1	
	$59049 \times 0.0013717 = 8$	A1	C.A.O
		10	

24. (i) $a = \frac{dv}{dt} = 6t - 3$ M1

$\frac{dv}{dt}$ at t = 2 = (6 × 2) – 3

= 9m/s² A1

(ii) Distance = $\int_1^4 (3t^2 - 3t - 6)\,dt$

$= \left[t^3 - \frac{3t^2}{2} - 6t\right]_1^4$ M1

$= \left(4^3 - \frac{3}{2}(4)^2 - 6\times4\right) - \left(1 - \frac{3}{2} - 6\right)$ M1

$= 64 - \frac{48}{2} - 24 - 1 + \frac{3}{2} + 6$

$= 22\frac{1}{2}m$ A1

(iii) $3t^2 - 3t - 6 = 0$

(t – 2)(t + 1) = 0 M1

t = 2, t = -1

∴ t = 2sec A1

(iv) Max velocity, a = 0

6t – 3 = 0, t = $\frac{1}{2}$sec M1

Max velocity = $3\left(\frac{1}{2}\right)^2 - 3\left(\frac{1}{2}\right) - 6$ M1

$= \underline{\underline{-6\,3/4\ m/s}}$ A1

10