KENYA NATIONAL EXAMINATION COUNCIL
REVISION MOCK EXAMS 2016
TOP NATIONAL SCHOOLS

MANG'U BOYS HIGH SCHOOL

MATHEMATICS

PAPER 1

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MANG'U BOYS HIGH SCHOOL KCSE TRIAL AND PRACTICE EXAM 2016

PAPER 1

MARKING SCHEME

SECTION I:

1. $\dfrac{4\times 4+20}{-6\times 2-6}$ — M1 ✓ Operation in numerator minatory

$=\dfrac{36}{-18}$ — M1 ✓ Operation in denominator

= -2 — A1 C.A.O

3

2. (a) Time from 1945hrs to 0320hrs.

= (2400 – 1945) + (0320 – 0000) — M1 ✓ + and –

= 0415 + 0320

= 4hrs 15mins + 3hrs 20mins

= 7hrs 35mins — A1

(b) Time of departure = 0320 + 1hr 30mins = 0450hrs

Arrival time = 4hrs 50mins + 10hrs 15mins — M1

= 15hrs 05mins

Time 1505hrs (3.05pm afternoon) — A1

4

3.

$$\frac{\frac{3}{4}+\frac{12^{3}}{7_{1}}\times\frac{7^{1}}{4_{1}}\times\frac{3}{7}}{\left(\frac{10}{7}-\frac{5}{8}\right)\times\frac{2}{3}}=\frac{\frac{3}{4}+\frac{9}{7}}{\left(\frac{80-35}{56}\right)\times\frac{2}{3}}$$

$=\dfrac{21+36}{\frac{15\cancel{45}}{\cancel{56}_{28}}\times\frac{{}^{1}\cancel{2}}{\cancel{3}_{1}}}$ — M1 ✓ Numerator

M1 ✓ Denominator

$=\dfrac{\frac{57}{28}}{\frac{15}{28}}$

$=\dfrac{{}^{19}\cancel{57}}{\cancel{28}_{1}}\times\dfrac{\cancel{28}^{1}}{\cancel{15}_{5}}$

$=\frac{19}{5}$

$=3\frac{4}{5}$ — A1 AO if $\frac{19}{5}$ given

3

4. Normal ratio: $\dfrac{M}{F}=\frac{2}{3}\Rightarrow M=\frac{2}{3}F$ — B1

Sunday service ratio: $\dfrac{M-10}{F+6}=\frac{1}{3}$ — B1

$\therefore$ 3M = F + 36 — Accept alternative methods

$3\times\frac{2}{3}$F = F + 36

F = 36, M = 24

Members = 60 — B1

5. (i) QS $= \sqrt{1.8^2 + 2.4^2}$ M1

$= \sqrt{9}$

= 3m A1

(ii) PS $= \sqrt{5^2 - 3^2}$ M1

$= \sqrt{16}$

= 4m

Hence PR = 2×4 = 8m A1

4

6. (i) % Profit= $\frac{(520 - 2250)}{2250} \times 100$ M1

= 12% A1

(ii) $\frac{120}{100} \times 2250 = \underline{sh.2700}$ B1

3

7. y = $-3/2\,\chi + 3$

Gradient of AB = $-3/2$

∵ Gradient of AD = $2/3$ B1

∵ Equation of AD: $\frac{y-4}{\chi+2} = 2/3$ M1

3y – 12 = 2χ + 4

3y - 2χ = 16 A1

Accept: -2χ + 3y = 16 or

2χ - 3y = -16

3

8. $\angle$MNO = $\angle$NML = 54º B1

$\angle$PNM = 180º - 54º = 126º

$\angle$NPM = $\angle$NMP = 180º - 126º

= 27º M1

$\angle$PML = 54º - 27º

Hence $\angle$LPM = 180º - (27º + 50º)

= 103º A1

ALT.

$\angle$PMN = $\angle$MPN = $\frac{54}{2}$

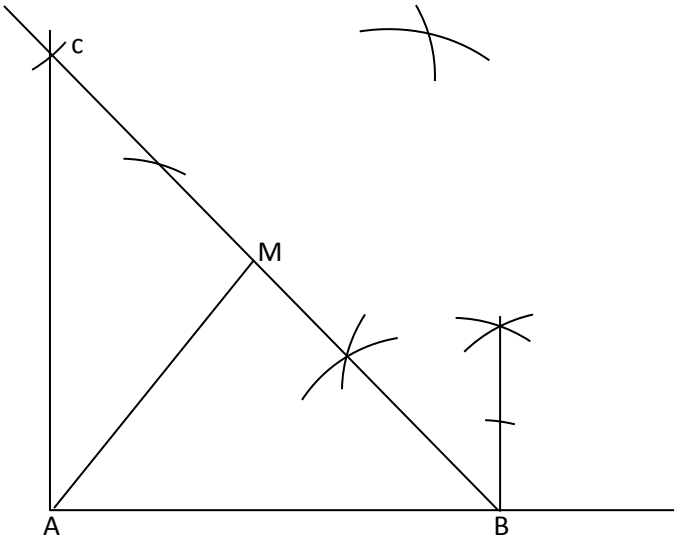
= 27º

$\angle$PML = $\angle$NPM = 27º

$\angle$LPM = 180 – (27 + 50)

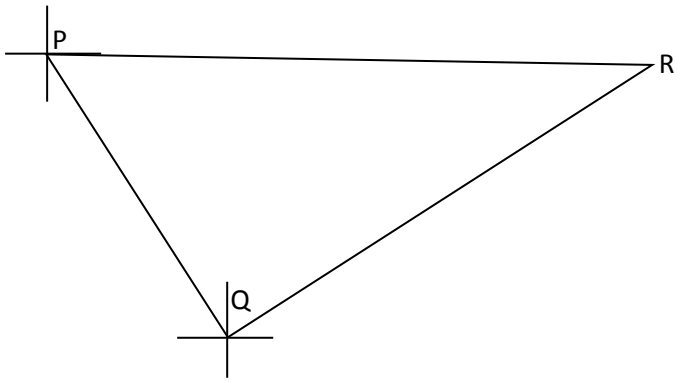
= 103º

9.



B1 Construction of 45º
B1 ✓ triangle ABC
B1 $\underline{h}$ to BC
B1 ✓ for both AM and AC
4.2m, 5.6cm
4

10. Let 1cm represent 100km



PR = 7.1cm $\pm$ 0.1
Distance PR = 710km $\pm$ 10km

11. $(1.346\times10^{-1})^{2}+\dfrac{1}{27.46\times10^{1}}$

$(1.346\times10^{-1})+(0.3642\times10^{-1})$

$(18.888\times10^{-1})+(0.3642\times10^{-1})$

= 0.2253

12. AB = $\sqrt{8^2+6^2}=\sqrt{100}=10cm$ B1

$\dfrac{Alternative}{AB=10cm}$

Let AD be χcm;

Then BD = (10 - χ)cm

$CD^2 = 6^2 - \chi^2$

Area of Δ = $\frac{1}{2}\times8\times6=24cm^2$

$CD^2 = 8^2 - (10-\chi)^2$ M1

Also

Area = $\frac{1}{2}\times10\times\overline{CD}$

$\therefore 6^2 - \chi^2 = 8^2 - (10-\chi)^2$

$\frac{1}{2} \times 10 \times \overline{CD} = 24$

$36 - \chi^2 = -36 - 20\chi - \chi^2$

$\overline{CD} = \frac{24}{5}$

χ = 3.6cm

= 4.8cm

$CD^2 = 36 - 12.96$ Accept other alternatives

$\therefore$ CD = 4.8cm A1

3

13. $2^{5t-15} \div 2^{3t-12} = 2^{6-t}$ M1 Expressing in common base

$5t - 15 - (3t - 12) = 6 - t$ M1 ✓ subtraction of indices

$2t - 3 = 6 - t$

$3t = 9$

$t = 3$ A1

3

14. $\sqrt{7^2 + 24^2}$ = 25 B1

Cos A = $\frac{-24}{25}$ - $\frac{24}{25}$ B1

2

15.

UT = $\begin{pmatrix} -3 \\ 2 \end{pmatrix} + \begin{pmatrix} 5 \\ 4 \end{pmatrix} = \begin{pmatrix} 2 \\ 6 \end{pmatrix}$ B1

RP = $\overrightarrow{UT} = \begin{pmatrix} -2 \\ -6 \end{pmatrix}$

~OR + RP = $\begin{pmatrix} 7 \\ -4 \end{pmatrix} + \begin{pmatrix} -2 \\ -6 \end{pmatrix} = \begin{pmatrix} 5 \\ -10 \end{pmatrix}$ B1

$\therefore$ P(5, -10) B1

3

16.

(i) Correct plotting of vertices B1 ✓ plotting

- Kite B1 name of polygon

(ii) Equation of line of symmetry: χ = 4 B1

3

SECTION II:

17. (a) Volume scale factor (V.S.F) = 1,000,000 = 512, 000

= 125: 64

Linear scale factor (L.S.F) = $\sqrt[3]{125} : \sqrt[3]{64}$

= 5: 4

Length of larger tank = $\frac{5}{4} \times 240cm$

= 300cm

(b) Surface area of smaller tank

Area scale factor (A.S.F) = $5^2 : 4^2$

= 25: 16

S.A of smaller tank = $\frac{16}{25} \times 1875m^2$

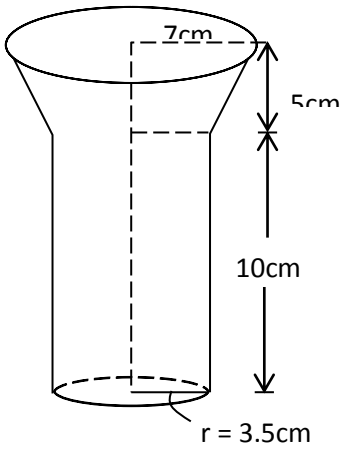
= <u>1200m²</u>

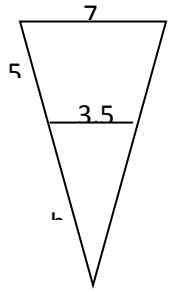
(c) V.S.F = 125:64

Mass of smaller tank

$= {}^{64}\!/_{125} \times 800kg = 409.6kg$

18.





$$\frac{5+h}{7} = \frac{h}{3.5}$$

7h = 3.5(5 + h)

7h = 17.5 + 3.5h

3.5h = 17.5

h = 5

(a) Volume of a frustum

$= \frac{1}{3}\Pi R^2 H - \frac{1}{3}\Pi\gamma^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 7^2 \times 10 - \frac{1}{3} \times \frac{22}{7} \times 3.5^2 \times 5$

= 513.333 – 64.167

= <u>449.167cm³</u>

Volume of a Cylinder = $\Pi\gamma^2 h$

$= \left(\frac{22}{7} \times 3.5^2 \times 10 \right) cm^3$

= <u>385cm³</u>

Volume of model = (449.167 + 385) cm³

= <u>834.167cm³</u>

(b) L.S.F = $\frac{6000}{15} = 400$

V.S.F = (L.S.F)³ = (400)³

Volume of Material used = 834.167 × (400)³ = 5.3387 × 10^{10}cm³

$D = \frac{M}{V} \Rightarrow M = D \times V$

M = D × V

= 0.832g/cm³ × 5.3387 × 10^{10}cm³

= 4.4418 × 10^{10}g

In tones $= \frac{4.4418 \times 10^{10}}{10^6}$

= 44418 tonnes

19. (a) $2\chi^2 - 9\chi + 3 = 0$

$$\chi = \frac{-b \pm \sqrt{b^2 - 4ac}}{29}$$

$$= \frac{-(-9) \pm \sqrt{(-9)^2 - 4(2)(3)}}{2(2)}$$

$$= \frac{9 \pm 7.5498}{4}$$

$$\chi = \frac{16.5498}{4} \quad \text{or} \quad \chi = \frac{1.4502}{4}$$

$\chi = 4.13745$ or $\chi = 0.36255$

$= 4.137$ $\chi = 0.3626$

(b) $$\frac{(3 - 5\chi + 2\chi^2)(1 + \chi)}{16\chi^4 - 81}$$

N: $2\chi^2 - 5\chi + 3$

$2\chi^2 - 2\chi - 3\chi + 3$

$2\chi(\chi - 1) - 3(\chi - 1) = (2\chi - 3)(\chi - 1)$

N: $(2\chi - 3)(\chi - 1)(1 + \chi)$

D: $16\chi^4 - 81$

$(4\chi^2)^2 - 9^2 = (4\chi^2 - 9)(4\chi^2 + 9)$

$= [(2\chi)^2 - 3^2](4\chi^2 + 9)$

$= (2\chi - 3)(2\chi + 3)(4\chi^2 + 9)$

$$\frac{N}{D} = \frac{(\chi - 3)(\chi - 1)}{(\chi - 3)(\chi + 3)(4\chi^2 + 9)}$$

$$\frac{(\chi - 1)}{(\chi + 3)(4\chi^2 + 9)}$$

(c) $25y^2 - 70y + (16 + K) = (5y + c)^2$

$25y^2 - 70y + (16 + K) = 25y^2 + 10cy + c^2$

$10c = -70$

$c = -7$

$c^2 = (-7)^2 = 49$

$16 + K = 49$

$K = 49 - 16$

$= \underline{33}$

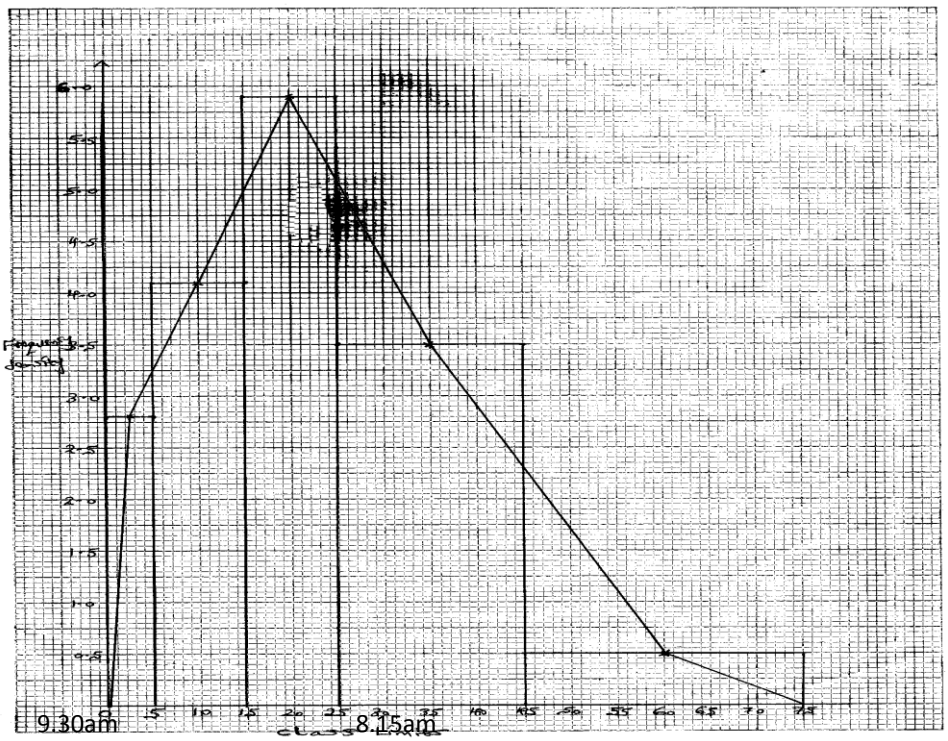
20. (a)

Age in χ years	Mid-point (f)	No. of members (s)	$f\chi$	Frequency density
0 – 5	2.5	14	35	2.8
5 – 15	10	41	410	4.1
15 – 25	20	59	1180	5.9
25 – 45	35	70	2450	3.5
45 - 75	60	15	900	0.5
		$\sum f = 199$	$\sum f\chi = 4975$	

Mean age = $\frac{\Sigma f\chi}{\Sigma f} = \frac{4975}{199} = 25$

(c) The modal class

Is $25 \leq \chi < 4$



21. 9.30am 8.15am

Car 100km/hr Lorry

→ →

250km 250km

(a) Time = $\frac{500km}{100km/h}$ = 5hr

Time of arrival in Nairobi 9.30

5.00 +

2.30pm

(b) Time taken by lorry 14.30

- 8.15

6.15

6hr 15min

Speed of lorry = $\frac{D}{T} = 250 \times \frac{4}{25} = 40km/h$

Relative speed of car to lorry = 100 – 40 = 60km/h

(c) Distance by the car = S × T

$= 100 \times \frac{13}{4}$

= 325km from Eldoret

Distance by the lorry = S × T

$= 40 \times \frac{9}{2}$

= 180km from Nakuru

Distance apart at 12.45pm = 430 – 325

= 105km

22. (a) $y = -\chi^2 + 2\chi + 6$

χ	-2	-1	0	1	2	3	4	5	6
$-\chi^2$	-4	-1	0	-1	-4	-9	-16	-25	-36
$2\chi + 6$	2	4	6	8	10	12	14	16	18
y	-2	3	6	7	6	3	-2	-9	-18

(b) $y = -\chi^2 + 2\chi + 6$

$0 = -\chi^2 + 2\chi + 6$

y = 0

χ = -1.7 or χ = 3.6

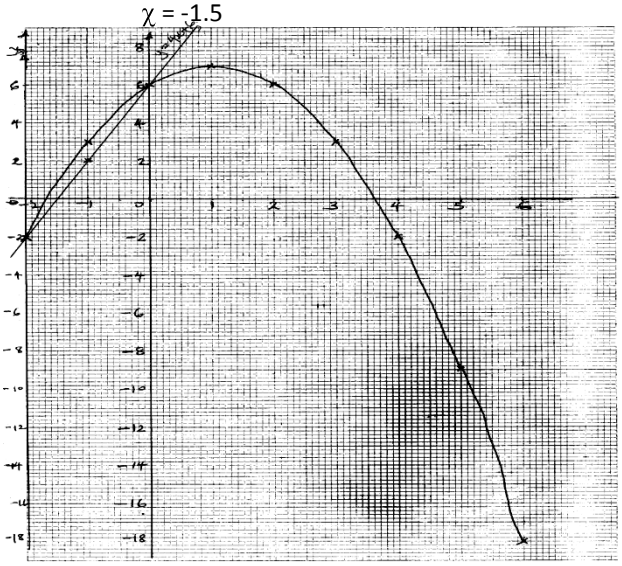
(c) $y = -\chi^2 + 2\chi + 6$

$0 = \chi^2 + 2\chi$

$y = 4\chi + 6$

χ	-2	-1	0
y	-2	-2	6

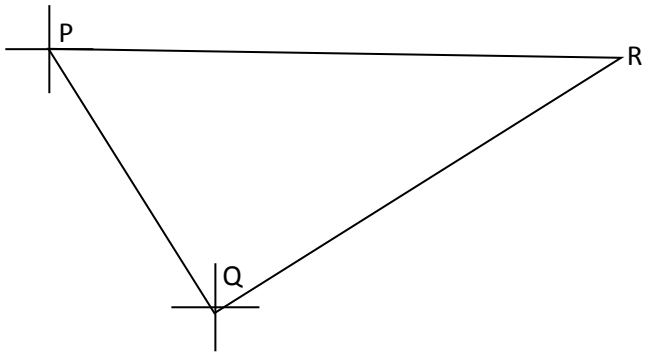
χ = -1.5



23. (a) (i) A reflection that maps ΔSCR onto ΔSTC is a reflection on the line PS.

(ii) An enlargement that maps ΔSCR onto ΔPCU is an enlargement centre C and scale factor 1.

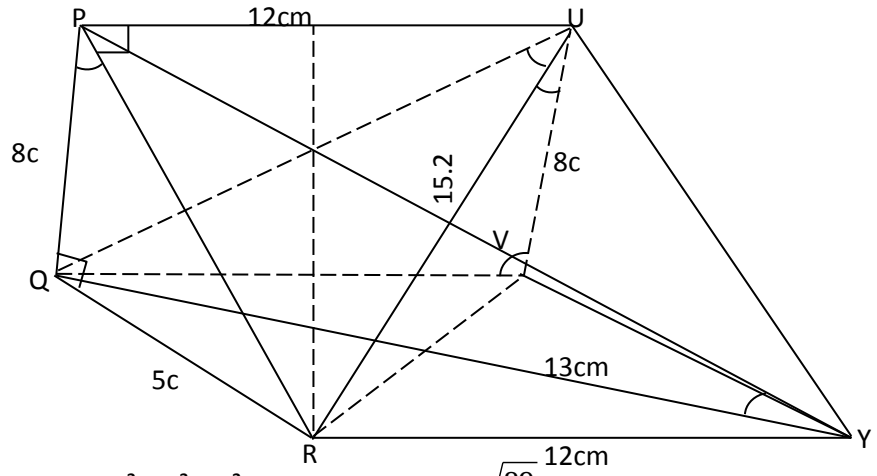
(iii) A rotation that maps ΔSCR to ΔTCU is a rotation +120º and centre C.



(b) (i) Images of P is T and image of Q is S.

(ii) Image of P is R and images of Q is Q.

24.



(a) (i) $PR^2 = 8^2 + 5^2 = 89 \quad \Rightarrow PR = \sqrt{89}$

$PR = 9.434$

$RU^2 = (9.434)^2 + 12^2 = 233$

$RU = \sqrt{233} = \underline{15.26cm}$

(ii) Sin QUR = $\frac{5}{15.26} = 0.3277$

(b) (i) $\angle QUR = 19.13º$

$QY = \sqrt{12^2+5^2} = 13$

Tan PYQ = $\frac{8}{13} = 0.6154$

$\angle PYQ = 31.61º$

(ii) Tan $\angle QPR = \frac{5}{8} = 0.625$

$\angle QPR = \underline{32.01º}$