WAKISSHA JOINT MOCK EXAMINATIONS 2015
UGANDA ADVANCED CERTIFICATE OF EDUCATION
MARKING GUIDE
S475/1
SUBSIDIARY MATHEMATICS
PAPER 1
JULY/AUGUST 2015

1.

$$log_2 x + log_2 x^2 + log_2 x^2 = 24$$

$log_2(x.x^2.x^3) = 24$ M1

$log_2(x^6) = 24$ B1

$6log_2 x = 24$

$log_2 x = {}^{24}/_{6}$ M1

$log_2 x = 4$

$x = 2^4$ B1

$x = 16$ A1

05

2. For independent events
P(AuB) = P(A).P(B) B1
But P(AuB) =P(A) +P(B)-P(AnB)
i) $p(AuB) = 0.3 + 0.2 - 0.3\ X\ 0.2$ M1

$0.5 - 0.6$

$= 0.44$

ii) $p(\overline{AuB}) = 1 - P(AnB)$
$= 1 - p(A).p(B)$
$= 1 - 0.3\ x\ 0.2$ M1

$= 1 - 0.06$

$= 0.94$ A1

05

3. $M = p^2 + 3Q - R$

$M = \begin{pmatrix} 1 & 2 \\ 4 & 5 \end{pmatrix}^2 + 3\begin{pmatrix} -1 & 1 \\ 3 & 2 \end{pmatrix} - \begin{pmatrix} 4 & 6 \\ 10 & 15 \end{pmatrix}$ M1 substituting M the subject

$= \begin{pmatrix} 1 & 2 \\ 4 & 5 \end{pmatrix}\begin{pmatrix} 1 & 2 \\ 4 & 5 \end{pmatrix} + \begin{pmatrix} -3 & 3 \\ 9 & 6 \end{pmatrix} - \begin{pmatrix} 4 & 6 \\ 10 & 15 \end{pmatrix}$

Squaring ….

Multiply matrix

$= \begin{pmatrix} 1+8 & 2+10 \\ 4+20 & 8+25 \end{pmatrix} + \begin{pmatrix} -3 & 3 \\ 9 & 6 \end{pmatrix} - \begin{pmatrix} 4 & 6 \\ 10 & 15 \end{pmatrix}$

$= \begin{pmatrix} 9 & 12 \\ 24 & 33 \end{pmatrix} + \begin{pmatrix} -3 & 3 \\ 9 & 6 \end{pmatrix} - \begin{pmatrix} 4 & 6 \\ 10 & 15 \end{pmatrix}$ M1……..

$= \begin{pmatrix} 9+-3-4 & 12+3-6 \\ 24+9-10 & 33+6-15 \end{pmatrix}$

$= \begin{pmatrix} 2 & 9 \\ 23 & 24 \end{pmatrix}$ A1

05

4.

$\frac{\text{Total}}{\text{n}} = 5$ M1

$TOTAL = 5n$

$new\ total$

$\frac{5n+13}{n+1} = 6$ M1

$6n + 6 = 5n + 13$ B1

$6n - 5n = 13 - 6$ B1

$n = 7$ A1

05

5. $\frac{dy}{dx} = \frac{x+1}{y}$

$\int ydy = \int (x+1)dx$ M1

$\frac{y^2}{2} = \frac{x^2}{2} + x + c$ B1

$for\ y = 5, x = 2$

$\frac{5^2}{2} = \frac{2^2}{2} + 2 + c$

$^{25}/_{2} = {}^{4}/_{2} + 2 + c$

$c = {}^{17}/_{2}$

$= \frac{y^2}{2} = \frac{x^2}{2} + x + {}^{17}/_{2}$ A1

05

6.

Month	Price	Moving totals	4pt moving average	
Jan	4500			
Feb	5000			B1
Mar	5200	20200	5050	B1
Apr	5500	21200	2300	B1
May	6000	23200	5800	B1
Jun	6500	23700	5925	B1
Jul	5700	25200	6300	B1
Aug	7000			

05

7. $\sin(x+60)+\sin(x-120)=0$

$\sin xcox60 + cosx\ sin60 + sinx\ cos120 - cosxsin120$ B_1B_1

$sin60 = sin120$ B1

$$cos60 = -cos120$$

$$(sinxcos60 - sinx\ cos60) + (cosxsin60 - cosxsin60) = 0$$

8.

$$using\ s = ut + {}^1/_2\, at^2$$

$$consider\ motion\ between\ AB$$

$$40 = 12u + {}^1/_2\, a(12)^2$$

$$40 = 12u + 72a$$

$$10 = 34 + 18a \ldots\ldots (i)$$

$$consider\ montion\ between\ AC$$

$$60 = 20u + {}^1/_2\, a(20)^2$$

$$60 = 20u + 200a$$

$$3 = u + 10a \ldots\ldots\ldots (ii)$$

$$(i) - 3(ii)$$

$$1 = -72a$$

$$a = {}^{-1}/_{72}\ or - 0.0139ms^{-2}$$

$from(ii)$

$a = 3 - 10a$

$3 - \frac{10}{72}$

$\frac{103}{36} or\ 2.8611ms^{-1}$ A1 _____

05 _____

SECTION B

9.

a)

Masses (kg)	Tally	Freq (f)	C.f	C.b
85-89	////	4	4	84.5-89.5
90-94	//// //	6	10	89.5-94.5
95-99	///// //	7	17	94.5-99.5
100-104	//// //// /// //	13	30	99.5-104.5
105-109	///// /////	10	40	104.5-109.5
110-114	//// /	5	45	109.5-119.5
115-119	//// /	5	50	114.5-119.5
		$\sum f = 50$		

B1 - f

B1 - cf

B1 –C.B

b) $L_1 = 99.5$

$D_1 = 13 - 7 = 6$

$D_2 = 13 - 10 = 3$

$mode = 99.5 + (\frac{6}{6+3})^5$ M1

$= 99.5 + \frac{30}{9}$

$= 102.833kg$ A1

10.

a) $2x^2 - 3x - 5 = 0$

$x^2 - {}^3/_2 x - {}^5/_2$

$(x^2 - \frac{3}{2}x + ({}^{-3}/_4)^2 - {}^5/_2 - ({}^{-3}/_4)^2$ M1

$(x - {}^3/_4)^2 = \frac{49}{16}$

$x - {}^3/_2 = \pm\frac{7}{4}$

$x = {}^{3}/_{2} \pm {}^{7}/_{4}$ M1

$x = {}^{3}/_{2} - {}^{7}/_{4}$ M1

$= \frac{1}{4}$ A1

$x = \frac{3}{4} + \frac{7}{4}$ M1

$= \frac{13}{4}$ A1

b) Rots; $sum\ of\ roots = {}^{3}/_{2} + {}^{1}/_{2}$ B1

$= 2$

$product\ of\ roots = \left({}^{3}/_{2}\right)\left({}^{1}/_{2}\right)$ B1

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

$x^2 - (2)x + \frac{3}{4} = 0$ M1A1

$or\ 4x^2 - 8x + 3 = 0$

c) $3x^2 + 2x - 4 = 0$ $Roots\ a\ and\ b.$

$x^2 + {}^{2}/_{3}\,x - {}^{4}/_{3} = 0$

$sum\ of\ roots = a + b = {}^{-2}/_{3}$

$product\ of\ roots = ab = {}^{-4}/_{3}$ B1

$Roots; {}^{1}/_{a}\ and\ {}^{1}/_{b}$

$sum = {}^{1}/_{a} + {}^{1}/_{b}$

$= \frac{a+b}{ab}$

$= \frac{{}^{-2}/_{3}}{{}^{-4}/_{3}} = {}^{1}/_{2}$ B1

$product = \frac{1}{a} x \frac{1}{b}$

$= \frac{1}{ab}$

$= \frac{1}{(-4/3)}$

$= -3/4$ B1

$from\ x^2 - (sum)x + (product) = 0$

$x^2 - 1/2\,x + -3/4 = 0$ M1A1

$or\ 4x^2 - 2x - 3 = 0$

15

11. let x be no. of stdts offering submaths.

$x \backsim B(n, p)$

a) $E(x) = s$ $var(x) = 2.5$

$np = s \ldots\ldots(i)$ $npQ = 2.5 \ldots\ldots(ii)$ B1

$(ii) - (i)$

$\frac{npQ}{np} = \frac{2.5}{5}$ M1

$Q = 0.5$ B1

$but Q = 1 - p\ or\ p = 1 - Q$

$p = 1 - 0.5$ M1

$= 0.5$ A1

$from\ np = 5$

$0.5xn = 5$

$n = \frac{5}{0.5}$

$n = 10 students$

b)

i) $p(x = 5) = 10c_5(0.5)^5(0.5)^5$ M1

$= 0.2461$ A1

ii) $p(x = 0) = 10c_0(0.5)^0(0.5)^{10}$ M1

$= 0.0010$ A1

iii) $p(x \geq 8) = p(x = 8) + p(x = 9) + p(x = 0)$ M1

$10c_8(0.5)^8(0.5)^2 + 10c_9(0.5)^9(0.5)^1$

$+10c_{10}(0.5)^{10}(0.5)^0$

$0.0439 + 0.0098 + 0.0010$ B1

$= 0.0547$ A1

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12.

a) $y = 6 - x - x^2$

$turning\ point$

$$\frac{dy}{dx} = 0 - 1 - 2x$$

$$for\ turning\ point\ \frac{dy}{dx} = 0$$

$$0 = -1 - 2x$$

$$x = {}^{-1}/_{2}\ or\ -0.5$$

$$y = 6 - \left({}^{-1}/_{2}\right) - ({}^{-1}/_{2})^{2}$$

$$= \frac{25}{4}\ or\ 6.25$$

$turning\ point\ is\ ({}^{-1}/_{2},\ {}^{25}/_{4})or(-0.5,6.25)$ A1

$$Nature\ of\ the\ turning\ point$$

$$\frac{dy}{dx^2} = -1 - 2x$$

$\frac{d^2y}{dx^2} = 0 - 2$ M1

$$= -2$$

$since\ \frac{d^2y}{dx^2} < 0, its\ a\ maximum\ point.$ B1

$$intercepts$$

$$for\ y - intercept, x = 0.$$

$y = 6–0-0^2$

$$= 6$$

$ie\ \ (0,6)$ B1

$$for\ intecept, y = 0$$

$$0 = 6 - x - x^2$$

$$x^2 + x - 6 = 0$$

$$x + 3x - 2x - 6 = 0$$

$$(x + 3)(x - 2) = 0$$

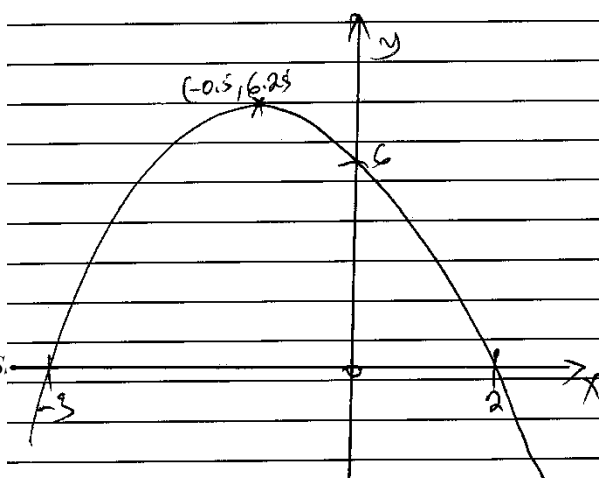
$either\ x + 3 = 0$

$$x = -3$$

$$or\ \ x - 2 = 0$$

$$x = 2$$

$ie\ (-3,0)and(2,0)$ B1



B1 - labelling

A1 - shape

b) $A = \int_{-3}^{2} y dx$

$= \int_{-3}^{2} 6 - x - x^2 \, dx$ M1

$[6x - \frac{x^2}{2} - \frac{x^3}{3}]_{-3}^{2}$ M1

$= \left[6(2) - (\frac{2}{2})^2 - (\frac{2}{3})^3\right] - \left[6(-3) - (\frac{3}{2})^2 - (\frac{-3}{3})^3\right]$ B1B1

$= \left(\frac{22}{3}\right) - (\frac{-27}{3})$

$= \frac{125}{6}$ or 20.833 A1

13.

a)

Physics(x)	Mtc	Rx	Ry	d(Rx-Ry)	d^2
55	57	5	3	2	4
54	60	4	4	0	0
35	47	1	1	0	0
62	65	6	6	0	0
87	83	8	8	0	0
53	56	3	2	1	1
71	74	7	7	0	0
50	63	2	5	-3	9
					$\sum d^2 = 14$

B1

B1 B1$n = 8$ B1

$\int = 1 - \frac{6\sum d^2}{n(n^2-1)}$

$1 - \frac{6x14}{8(8^2-1}$ M1

$1 - \frac{84}{504}$

$= 0.833$ A1

There is a very high positive relationship betweenphy and mtc. B1

b)

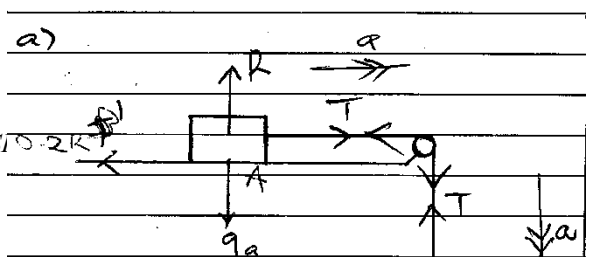
i) See the graph on the graph paper.

ii) Y=64

14.

a)

i)



B1

Resolving for 4kg mam;

$4g - T = 4a$_____(i) B1

$T - 1.8g = 9a$_____ (ii) B1

$equations: (i) + (ii)$

$4g - 1.8g = 13a$ M1

$$2.2g = 13a$$

$$a = \frac{2.2g}{13}$$

$$but\ g = 9.8ms^{-2}$$

$$a = \frac{2.2x9.8}{13}$$

$\therefore a = 1.66ms^{-2}$ A1

ii) $from\ i)$

$$4g - T = 4a$$

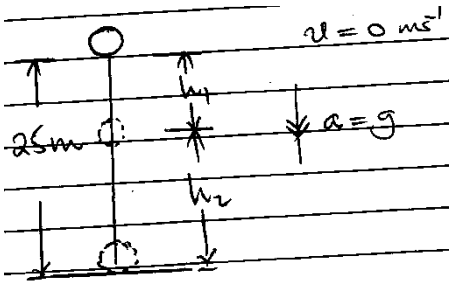
$4x9.8 - T = 4x1.66$ A1

$$39.2 - T = 6.64$$

$T = 39.2 - 6.64$

$T = 32.56N$ A1

b)



$leth_2\ be\ the\ distance\ fallen\ by\ the\ particle\ at\ the\ time, t = 25.$

$v\ be\ the\ velocity\ obtained\ in\ falling\ through\ distance, h\ from$

$$v = u + at$$

$v = 0 + 9.8$ x 2 M1

$= 19.6ms^{-1}$ B1

$$K.E = {}^{1}/_{2}\, mv^2$$

${}^{1}/_{2}\, x0.1x(19.6)^2$ B1

$$= 19.208J$$

$$P.E = mgh_2$$

$$but\ h_2 = 25 - h_1$$

$$using\ h_1 = ut + {}^{1}/_{2}\, at^2$$

$= 0 + {}^{1}/_{2}$ X 9.8 X 2^2 M1

$h_1 = 19.6m$

$h_2 = 25 - 19.6$

$h_2 = 5.4m$ B1

$\therefore P.E = mgh_2$

$= 0.1x9.8x5.4$

$P.E = 5.292J$ B1

Total Energy $=$ P. E + K. E

$= 5.292 + 19.208$ M1

$= 24.5J$ A1

15

END