WAKISSHA JOINT MOCK EXAMINATIONS 2015
UGANDA ADVANCED CERTIFICATE OF EDUCATION
MARKING GUIDE
P425/2
MATHEMATICS
PAPER 2
JULY/AUGUST 2015

1.	$P(A\cup B) = \frac{1}{3} = P(A)$	
	$P(A\cap B^1) = \frac{5}{8}P(A^1)$	
	$P(A^1) = P(A^1\cap B) + P(A^1B^1)$	
	$P\ (A^1) = \frac{5}{8}P(A^1) + \frac{3}{20}$	M1
	$\frac{3}{8}P(A^1) = \frac{3}{20}$	
	$P(A^1) = \frac{3}{20} X \frac{8}{3}$	
	$= \frac{2}{5}$	B1
	$P(A^1) + P(A) = 1$	
	$P(A) = 1 - \frac{2}{5}$	
	$= \frac{3}{5}$	A1
	$P(A^1B) = \frac{5}{8}P(A^1)$	
	$= \frac{5}{8} X \frac{2}{5}$	
	$= \frac{1}{4}$	
	$P(A\cup B^1) + P(A\cup B) = P(A)$	
	$P(A\cup B^1) = P(A) - P(A\cup B)$	
	$= \frac{3}{5} - \frac{1}{3} X \frac{3}{5}$	M1
	$= \frac{2}{5}$	A1
2.	For AB	
	$U = 2, a = 0.5, t = T$	
	$V = 2 + \frac{T}{2}$ ……………………….(i)	
	For CB	B1
	$U = 6, a = -2\ t = T + 1$	
	$v = 6 - 2(T + 1)$ ……………..(ii)	
	$2 + \frac{T}{2} = 6 - 2(T + I)$	M1
	$T = \frac{4}{5} seconds$	A1
	$BC = 6 - \frac{1}{2}\ (2)(1.8)^2$	
	$= 2.76m$	A1
		05

3.

Food (x)	200g	300g	350g	450g
Egg (y)	1.6m	1.9m	2.4m	2.8m

200g	272g	300g
1.6m	y	1.9m

B1

$\frac{1.9-1.6}{300g-200g} = \frac{y-1.6}{272g-200g}$ M1

$y - 1.6 = 0.216$

$y = 0.216 + 1.6$

$= 1.816cm$ A1

ii)

350	450	x
2.4	2.8	3.1

$\frac{x-350}{3.1-2.4} = \frac{450-350}{2.8-2.4}$ M1

$x = 525grams$ A1

4. Let X be the random variable for the number of defective nails

$n = 10, p = 0.4 \;\; q = 0.6$

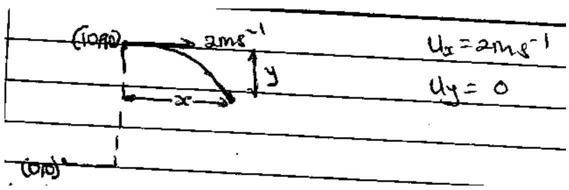
$p(x = 0) = 0.0060\ (tab)$ M1A1

$p(x > 5) = p(x > ,6)$

$= 0.1662(tab)$ M1A1

05

5.



$let\ x\ and\ y\ be\ displacements\ horizontally\ and\ vertically\ respectively, after\ 4\ seconds$

$from\ s = ut + \frac{1}{2}at^2$

$x = 2x4 = 8m$ B1

$y = -\frac{1}{2}x9.8\ x\ (4^2)$

$= -\frac{1}{2}x9.8\ x16$

$= -78.4m$ B1

After 4 seconds the particle will be at point

(10+8, 90-78.4) B1

= (18, 11.6)

Distance from origin

$= \sqrt{18^2 + 11.6^2}$ M1

$= \sqrt{458.56}$

$= 21.4\text{m}$ A1

05

6.

Children	Family	$f \times x$	x^{2f}
1	8	8	16
2	9	18	162
3	16	48	768
4	25	100	2500
5	20	100	2000
6	12	72	864
7	6	42	252
8	4	32	128
	100	420	$\sum x^{2f=6690}$

$\bar{x} = \frac{450}{100}$ M1

$=4.2$ A1

$= \sqrt{\left(\frac{6690}{100} - 4.2^2\right)}$ M1

$=7.02$ A1

7. $y = \frac{1}{1+x^2}$ $h = \frac{1-0}{5}$

$= 0.2$ B1

x	$y_o y_n$	$y_1 \dots \dots y_{n-1}$
0	1	
0.2		0.9615
0.4		0.8621
0.6		0.73553
0.8		0.6098
1	0.5	
	1.5	3.1687

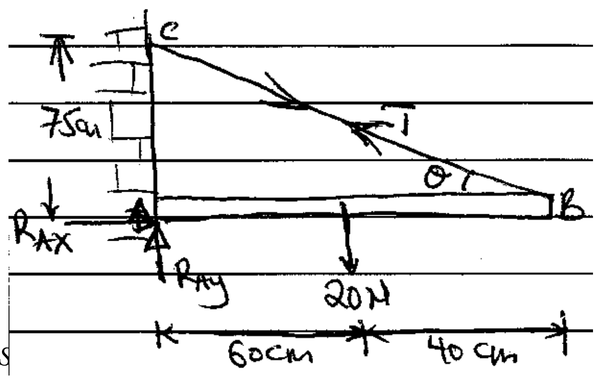
B1 B1

$\int_0^1 \frac{1}{1+x^2} dx = \frac{1}{2}(0.2)(1.5 + 2(3.1687)$ M1

$= 0.78374$

$= 0.784\ (3dp)$ A1

8.



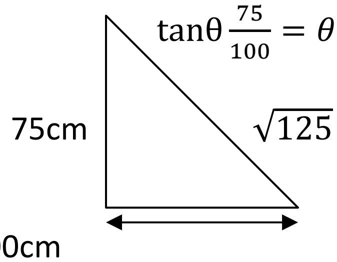
B1

Taking moments about B

Ray x 100 – 20x 40 =0 M1

Ray = 8N A1

$\tan\theta \frac{75}{100} = \theta = 36.9°$ M1



100cm

$\text{T}\cos\theta = \text{RAX}$

$T = \frac{16}{\cos 36.9°}$

$= 20\text{N}$ A1

9.

$L = 8cm \quad el = 0.5$ B1

$w = 4.2cm \quad ew = 0.005$ B1

$A = Lxw$

$Amax = Lmax\ X\ Wmin$

$= \ 8.5\ x\ 4.265$ M1

$= 36.2525$ B1

$Amin = Lmin\ x\ Wmin$

$= 7.5\ x\ 4.255$ M1

$= 31.9125$ B1

$Range\ 31.91 \leq A \leq 36.25$ A1

b)

$v = \pi r^2 l$

$V + \Delta_r = \ \pi(r + \Delta_r)^2(l + \Delta l)$ M1

$= \pi(r^2 + 2_r\Delta_r + (\Delta_r)^2)(lx\Delta l)$

$= \ \pi(lr^2 + r^2\Delta l + 2_r l\ \Delta_r + 2_r\Delta_l + l\Delta r^2 + \Delta l\ \Delta r^2)$

For small $\Delta r\ and\ \Delta h$

$\Delta r\Delta h, (\Delta r)^2\Delta h(\Delta r)^2 \simeq 0$ B1

$V + \Delta v = \pi r^2 h + \pi(r^2\Delta l + 2rh\ \Delta r)$

$|\Delta v| \leq |\pi r^2\Delta h + 2\pi rh\Delta r|$

$\left|\frac{\Delta v}{V}\right| \leq \left|\frac{\pi r^2\Delta h + 2\pi rh\Delta r}{\pi r^2 h}\right|$ M1

$\left|\frac{\Delta v}{v}\right| \leq \left|\frac{\pi r^2\Delta h}{\pi r^2 h}\right| + \left|\frac{2\pi rh\Delta r}{\pi r^2 h}\right|$

$\leq \left|\frac{\Delta h}{h}\right| + 2\left|\frac{\Delta r}{r}\right|$ B1

$= \left|\frac{\Delta h}{h}\right| + 2\left|\frac{\Delta r}{r}\right|$ B1

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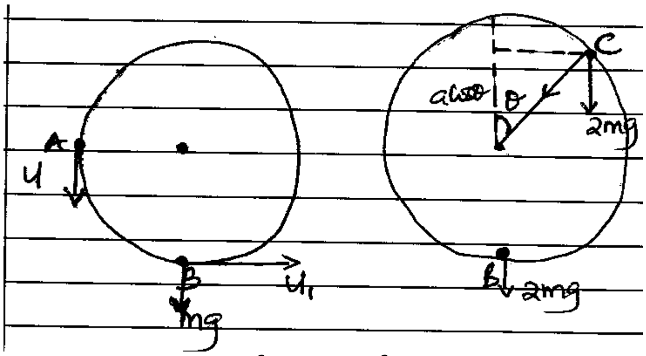
10.



By conversation of energy from A to B

$\frac{1}{2}m(\sqrt{14\,ag})^2 + mga = \frac{1}{2}mu_1^2$ M1

$$\frac{1}{2}(14\,ga) + ga = \frac{1}{2}u_1^2$$

$\frac{u^2}{2} = 8ga$ M1

$$u^2 = 16ga$$

$u = 4\sqrt{ga}ms^{-2}$ A1

A to B

By conservation of linear momentum

$m\left(4\sqrt{ga}\right) + 0 = 2mu_2$ M1

$u_2 = 2\sqrt{ga}ms^{-2}$ A1

From B to C

$\frac{1}{2}(2m)(2\sqrt{ga})^2 = \frac{1}{2}(2m)v^2 + 2mga(1+\cos\theta)$ M1

$$4ga = v^2 + 2ga\,(1 + cos\theta) \dots\dots\dots (1)$$

By Newton's laws of motion

$2mgcos\theta = {2mv^2}/{a}$ M1

$v^2 = ga\,cos\theta \dots\dots\dots\dots (2)$ B1

2 into 1

$$4ag = gacos\theta + 2ga + 2gacos\theta$$

$$2ag = 3gacos\theta$$

$$cos\theta = \frac{2ag}{3ag} = \frac{2}{3}$$

The particle leaves the surface at a $\cos\theta = {2}/{3}\,xa$ M1

$= {2}/{3}\,a$ A1

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11.

For $1 \le x \le 2, f(2) = {2}/{3} + b$

For $x \geq 2\ f(2) = 1$

$^2/_3 + b = 1$ M1

$b = {}^1/_3$ A1

$3a = 1 + 3({}^1/_3)$ M1

$a = {}^2/_3$ A1

b)

$$f(x) = f^1(x)$$

$for\ 0 \leq x \leq 1, f(x) = a = {}^2/_3$ B1

$for\ 1 \leq x \leq 2\ f(x) = {}^1/_3$ B1

$$\mathrm{P}(\ \mathrm{X}\ 4.5/\mathrm{x} > 1) = \frac{\mathrm{P}(1 < x4.5)}{\mathrm{P}(\mathrm{x} > 1)}$$

$= \frac{F(1.5) - f(1)}{1 - f(1)}$ B1

$= \frac{\frac{1.5}{3} + {}^1/_3 - {}^2/_3}{\frac{1}{3}}$ M1

$$= \frac{{}^1/_6}{{}^1/_3}$$

$$= {}^1/_6\, x\, \frac{3}{1}$$

$= {}^1/_2$ A1

$$E(x) = \int_0^1 \frac{2x}{3} dx + \int_1^2 \frac{1}{3} x dx$$

$= \frac{1}{3}\frac{x^2}{} \int_0^1 + \frac{1x^2}{6} \int_1^2$ M1

$= \left(\frac{1}{2} - 0\right) + \left(\frac{4}{6} - \frac{1}{6}\right)$ M1

$= \frac{5}{6}$ A1

12

12.

$(\sqrt{x})^2 = (\frac{2}{x})^2$

$x = {}^4/_{x^2}$

$x^3 = 4$

$x^3 - 4 = 0$ B1

$let\ f(x) = x^{3-4}$

$f^1(x) = 3x^2$ M1

$x_{n+1} = x_n - \frac{f(x_n)}{f^1 x_n}$

$= x_n - \frac{(x_{n-4}^3)}{3x_n^2}$ M1

$= \frac{3x^3_{n-x_n^{3+4}}}{3x_n^2}$

$= \frac{2x^3_{n+4}}{3x_n^2}$ B1

$= x_0 = 1.5$

$= \ x_1 = \frac{2(1.5)^3+4}{3(1.5)^2}$

$= 1.5926$

Testing $|1.5926 - 1.5| < 0.5x10^{-3}$

$0.0926 \nleq 0.5x10^{-3}$

$x_2 = \frac{2(1.2926)^{3+4}}{3(1.5926)^2}$ M1

$= 1.5874$

Testing $|1.584 - 1.5926| < 0.0005$

$0.0052 \nless 0.0005$

$x_2 = \frac{2(1.5874)^3+4}{3(1.5874)^2}$ M1

$= 1.5874$

The root of the equation is 1.587(4s) A1

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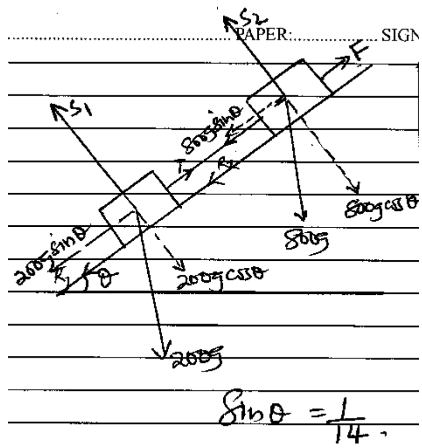
13.



B1 - ……….. (all forces)

B1 - Cor (all forces)

a) F=1KN

=100N

Considering forces acting on the whole system

F-(200g $\sin\theta + 800g\ sin\theta + R_1 + R_2) = 1000a$ M1

$1000 = 1000x9.8x\frac{1}{14} + R_1 + R_2$ M1

$1000 = 700 + R_1 + R_2$

$R_1 + R_2 = 300N$ A1

$Total\ friction\ resistance = 300N$

b) $P = 2kw$

$= 2x1000$

$= 2000w$

$v = 10ms^{-1}$

i) $F - (800g\ sin\theta + 200g\ sin\theta + (R_1 + R_2)) = 1000a$ M1

But $F = \frac{p}{v}$

$$F\frac{200}{10} = 200N$$

$$200 - \left(1000x9.8x\frac{1}{14} + 300\right) = 1000a$$

$$200 - 1000 = 1000a$$

$a = \frac{-800}{1000}$ A1

$$= -0.8ms^{-2}$$

ii) $T - (200gsin\theta + R_1) = 200a$

$T - \left(200x9.8x\frac{1}{14} + 70\right) = 200\bar{x}08$ M1

$T = -160 + 210$ M1

$= 50\text{N}$ M1

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a) Positive correlation

b)

Mock exams	28 8	34 7	36 6	42 5	48 4	52 3	54 2	60 1
Av.final exams	54 8	62 7	68 5	70 4	76 1.5	66 6	76 1.5	74 3

Let $R_X and R_y represented\ ranks\ of\ mock\ exam\ and\ av.final\ exam\ respectively.$

R_X	R_Y	d=$(R_x - R_y)$	d^2
1	3	-2	4
2	1.5	0.5	0.25
3	6	-3	9
4	1.5	2.5	6.25
5	4	1	1
6	5	1	1
7	7	0	0
8	8	0	0
			$\sum d^2 = 21.5$

B1 B1 B1

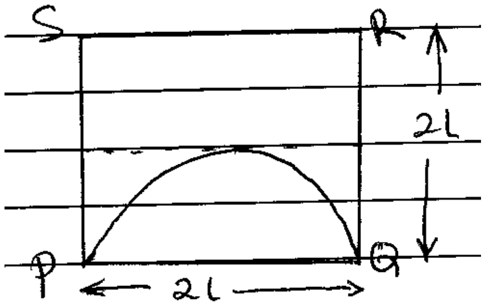
$$y = 1 - \frac{6\sum_d 2}{n(n^{2-1})}$$

$= 1 - \frac{6x21.5}{8(8^{2-1})}$ M1

$= 0.744$ A1

It is a high position correlation. B1 for comment

15.



Portion	Area	Weight	c.o.g from pq
Square	$4l^2$	$4l^2w$	l
Semi-circle	$\pi/_2\, l^2$	$\pi/_2\, l^2w$	$4l/_{3\pi}$
Total	$4l^2 - \pi/_2\, l^2$	$(4l^2 - \pi/_2\, l^2)w$	$\bar{y}$

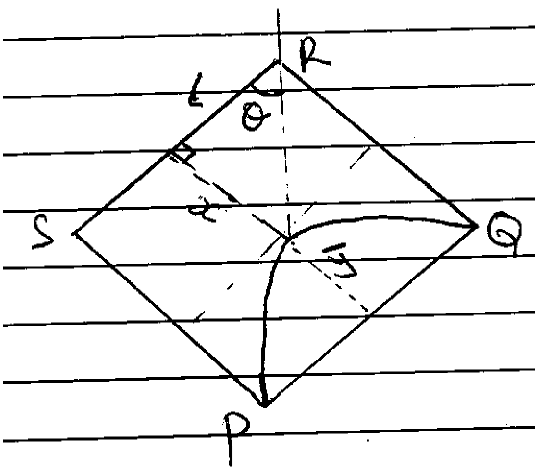
B1

B1

B1

	LHS	RHS
Taking moments about PQ	LHS	RHS
$4l^{2w.l} - \pi/_2\, l^{2w.}\, 4l/_{3\pi} = \left(4c^2 - \pi/_2\, l^2\right)w\,\bar{y}$	M1	M1
$4l - 2/_3\, l = \left(4 - \pi/_2\right)\bar{y}$		
$10l/_3 = \left(\frac{8-\pi}{2}\right)\bar{y}$	M1	

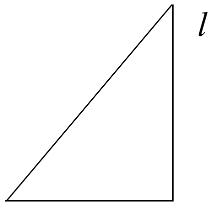
$\bar{y} = \frac{20l}{3(8-\pi)}$ B1



$x = 2l - \frac{20l}{3(8-\pi)}$ M1

$$= \frac{28l - 6l\pi}{3(8-\pi)}$$

$= \frac{2(14-3\pi)l}{3(8-\pi)}$ B1



$xTan\theta = \frac{x}{l}$ M1

$$Tan\theta = \frac{2(14-3\pi)l}{3(8-\pi)} \Big/ l$$

$= \frac{2(14-3\pi)}{3(8-\pi)}$ M1

$\theta = 32.12°$ A1

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16.

$\sum_{i=1}^{10} xi = 2.57 \ \sum_{i=1}^{10} x_i^2 = 0.6610$

$mean = \frac{\sum_{i=1}^{n} x_i}{n} = \frac{2.57}{10}$ M1

$= 0.257kg$ B1

$\Sigma = \sqrt{\frac{\sum x_i^2}{n} - (\frac{\sum xi}{n})^2}$

$= \sqrt{\frac{0.16610}{10} - (0.257)^2}$ M1

$= 0.00714kg$ B1

$1 - \propto = 95\%$

$\propto = 0.05$

$\frac{\propto}{2} = 0.025$

$Z_{0.025} = 1.96$ B1

$$\mu = \overline{X} \pm Z_{\frac{X}{2}} \Sigma \Big/ \sqrt{n}$$

$= 0.257 \pm 1.96(\frac{0.007}{\sqrt{10}})$ M1M1

$= 0.257 \pm 0.0044$

$upper\ limit = 0.261kg\ (3dp)$ A1

$lower\ limit = 0.253kg\ (3dp)$ A1

b)

$\text{P}(24.12 < \bar{x} < 26.73) =$

$\text{p}(\frac{24.12-25}{4/\sqrt{16}} < \not\geq < \frac{26.73-15}{4/\sqrt{16}})$

$= P(-0.88 < \not\geq < 1.73)$

$= 0.3106 + 0.4582$ B1

$= 0.7688$ A1

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