JINJA JOINT EXAMINATIONS BOARD

MARKING GUIDE 2019

P425/2 FOR PAPER 2 MATHEMATICS

SECTION A (40 MARKS)

1. P(2R, 1G) = p(RRG) + P(RGR) + p(GRR)

B1 B1 B1

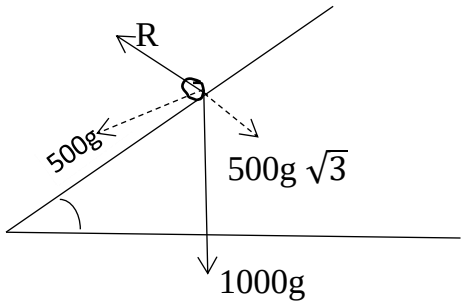
$$= \frac{6}{10} \times \frac{5}{9} \times \frac{3}{8} + \frac{6}{10} \times \frac{3}{9} \times \frac{5}{8} + \frac{3}{10} \times \frac{6}{9} \times \frac{5}{8}$$ M1

$$= \frac{3}{8}$$ A1

05

2. $90kmh^{-1}$ $= 90 \times \frac{1000}{3600}$

$= 25ms^{-1}$ B1



B1

30^0

At maxm speed, tractive force = resistance

Resistance = 500g B1

But max speed $= \frac{\text{power}}{\text{tractive force}}$

25 $= \frac{\text{power}}{500g}$ M1

Power = 28 x 500g

= 122500 warts A1

05

3.

5.4	5.56	5.7
1.686	y	1.740

B1

$$\frac{5.7-5.4}{1.740-1.686} = \frac{5.7-5.56}{1.740-y}$$ M1

Y = 1.7148 A1

$$\frac{5.2-5.0}{1.647-1.609} = \frac{5.0-x}{1.609-1.575}$$ M1

X = 4.83 A1

05

---

4. P = 0.25, q = 0.75, n = 80

= np $= \sqrt{npq}$

= 80 x 0.025 $= \sqrt{80 \times 0.25 \times 0.75}$

= 20 = 3.873 or $\sqrt{15}$ B1

B1 M1 M1

$P(14 < x \leq 18) = P\left(\frac{14.5-20}{\sqrt{15}} < Z < \frac{18.5-20}{\sqrt{15}}\right)$

$= P(-1.42 < Z < -0.516)$

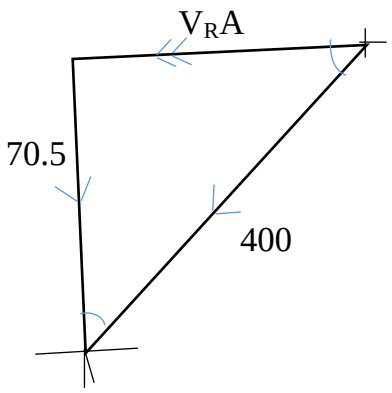
$= 0.4222 - 0.1971$

= 0.2251 A1

05

---

5. θ



B1

$V_R^2 = 70.5^2 + 400^2 - 2(70.5)(400)\cos 80^0$ M1

$V_R = 393.92$ kmh^{-1} B1

$\therefore \frac{\sin\theta}{70.5} = \frac{\sin 80}{393.92}$ M1

$\theta = 10.15°$

$\Rightarrow$direction is S90.15^0 w A1

05

---

6. But P $= \frac{0.38}{4.28} - \frac{0.30}{2.14}$

Pmin $= \frac{0.375}{4.285} - \frac{0.305}{2.135}$

$= -0.05534$ M1

Pmax $= \frac{0.385}{4.285} - \frac{0.295}{2.145}$

$= -0.04747$ M1

Max possible error = ½ [$-0.04747 + 0.05634$] M1

$= 0.003935$ B1

$\therefore -0.0514 \leq P \leq -0.04354$ A1 _____

05

7.

B1

Ry	7	9	2.5	8	5.5	4	2.5	1	5.5
Rx	8	7.5	7.5	1	5.5	5.5	3.5	3.5	2
d	1	1.5	−5	7	0	−1.5	−1	−2.5	3.5
d^2	1	2.25	25	49	0	2.25	1	6.25	12.25

$\sum d^2 = 99$ B1

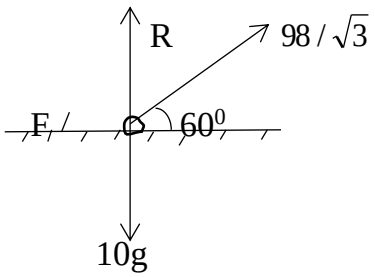
$\therefore r_s = 1 - \frac{6 \times 99}{9 \times 80}$ M1

$= 0.175$ A1

Comment: there is a positive partial correlation A1

05

8.



B1

$(\uparrow): R + \frac{98}{\sqrt{3}}.\sin 60° = 10g$ M1

$\Rightarrow R = 49$

$(\rightarrow): F = \frac{98}{\sqrt{3}} \cos 60° = \frac{98}{2\sqrt{3}} = 49/\sqrt{3}$ M1

Since particle does not move; $F \leq \mu R$

$\therefore \frac{F}{R} = \frac{49/\sqrt{3}}{49} = \frac{1}{53} \Rightarrow \mu \geq \frac{1}{\sqrt{3}}$ M1

Minimum value of μ = $1/\sqrt{3}$ or $\frac{\sqrt{3}}{3}$ A1

05

SECTION B (60 MARKS)

9. (a) μ = 55, σ = 8, n = 1000

$P(x \geq 71) = P\left(Z \geq \frac{71-55}{8}\right)$ M1

$P = (Z \geq 2)$

$= 0.5 - 0.4772$ M1

$= 0.0228$ B1

No of A - passes awarded = 0.0228 x 1000 M1

$= 22.8$ A1

(b) (i) $P(x < x) = 0.15$

$P(x < x) = P(Z < \frac{x-55}{8}) = 0.15$ M1

But Z0.35 = 1.03 B1

$\therefore \frac{x-55}{8} = -1.03$ M1

$x = 46.76$ A1

(ii) P = 0.85, q = 0.15, n = 2 B1

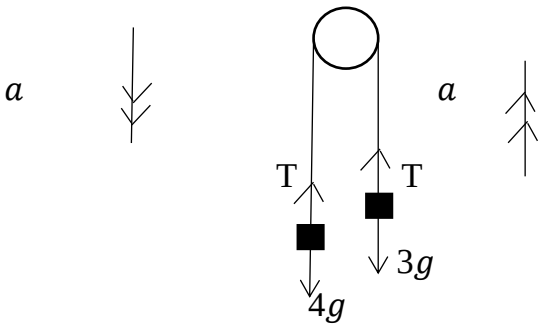
$P(x = 2) = \binom{2}{2}(0.88)^2(0.15)^0$ M1

$= 0.7225$ A1

12

---

10. (a)



B1

Pick 4kg : $4g$ – T = $4a$----------(i) M1
Pick 3kg : T – $3g$ = $3a$----------(ii)

(I) + (II): $g = 7a$ M1

(i) a = 9.8/7

= 1.4ms^{-2} A1

(ii) $\therefore T = 3\times 9.8 + 3\times 1.4$

= 33.6N A1

(b) when 3kg picks up 2 kg, the total momentum of the whole system is conserved,
if V is the speed after total pick up

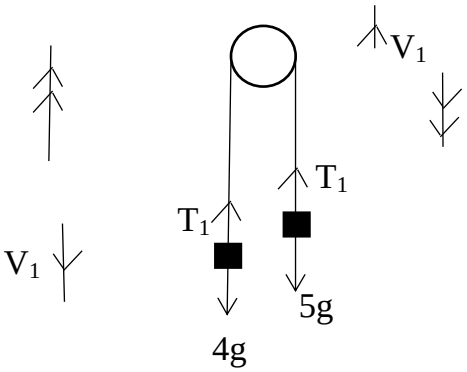
$\Rightarrow$4V + 3V = (4 + 5) V_1 M1

7 x 9 = 9V_1

V_1 = 7ms^{-1} A1

(ii) let the 5kg mass rise a distance h from A

$a_1 a_1$



B1

Equations of $T_2 - 4g = 4a_1$----------(iii) M1

Motion :

$5g - T_2 = 5a_1$----------(iv)

(III) + (IV)

$g = 9a_1$

$a_1 = 9.8/9$

$= 1.0889\ ms^{-2}$, retardation B1

Using $V^2 = u^2 + 2as$,

$O^2 = 7^2 - 2x\ g\ h$ M1

9

h = 22.5m A1

12

11. (b) Let $f(x) = x^2 - sin2x$

$f(x) = 2x - 2cos2x$ M1

$$x_{n+1} = x_n - \frac{(x_n^2 - sin2x_n)}{2x_n - 2cos2x_n}$$

$x_0 = 0.94$ B1

$$x_1 = 0.94 - \frac{[(0.929)^2 - sin2(0.99)]}{2(0.94) - 2\cos 2(0.94)}$$

$= 0.922$ M1

$$x_3 = 0.922 - \frac{[(0.922)^2 - sin2(0.922)]}{2(0.922) - 2cos2(0.922)}$$

A1 B1

$= 0.9175$ $|e| = 0.0045$

$\therefore$ root = 0.92 A1

12

12.

$$P(x \leq x) = F(x) = \begin{cases} 0 & ; \quad x < 2 \\ ax - bx & ; \quad 2 \leq x \leq 5 \\ 1 & ; \quad x > 5 \end{cases}$$

$f(2) = 0;$

$\therefore 2a + \frac{b}{2} = 0 \Rightarrow b = 4a$ B1

$f(5) = 1$ B1

$\Rightarrow 5a - \frac{b}{5} = 1$ M1

$a = \frac{5}{21}$ A1

$\therefore b = \frac{20}{21}$ A1

$$f(x) = \begin{cases} 0 & ; \quad x < 2 \\ \frac{5}{21}\left(x - \frac{4}{x}\right) & ; \quad 2 \le x \le 5 \\ 1 & ; \quad x > 5 \end{cases}$$

(ii) $P(3 < x < 4) = F(4) - F(3)$

$= \frac{5}{21}\left(4 - \frac{4}{4}\right) - \frac{5}{21}\left(3 - \frac{4}{3}\right)$ M1

$= \frac{20}{63}$ A1

(iii) $f(x) = F'(x) = \frac{5}{21}\left(1 + \frac{4}{x^2}\right)$ M1

$$f(x) = \begin{cases} \frac{5}{21}\left(1 + \frac{4}{x^2}\right) & ; \quad 2 \le x \le 5 \\ 0 & ; \quad otherwise \end{cases}$$ A1

(iv) $E(x) = \int_2^5 \frac{5}{21}\left(x + \frac{4}{x}\right) dx$

$= \frac{5}{21}\left[\frac{x^2}{2} + 4Inx\right]_2^5$ M1

$= \frac{5}{2} + \frac{20}{21} In\frac{5}{2}$ M1

$= 3.3727$ A1

12

13. (a) $f(x) = e^{2x} + 4x - 5,$

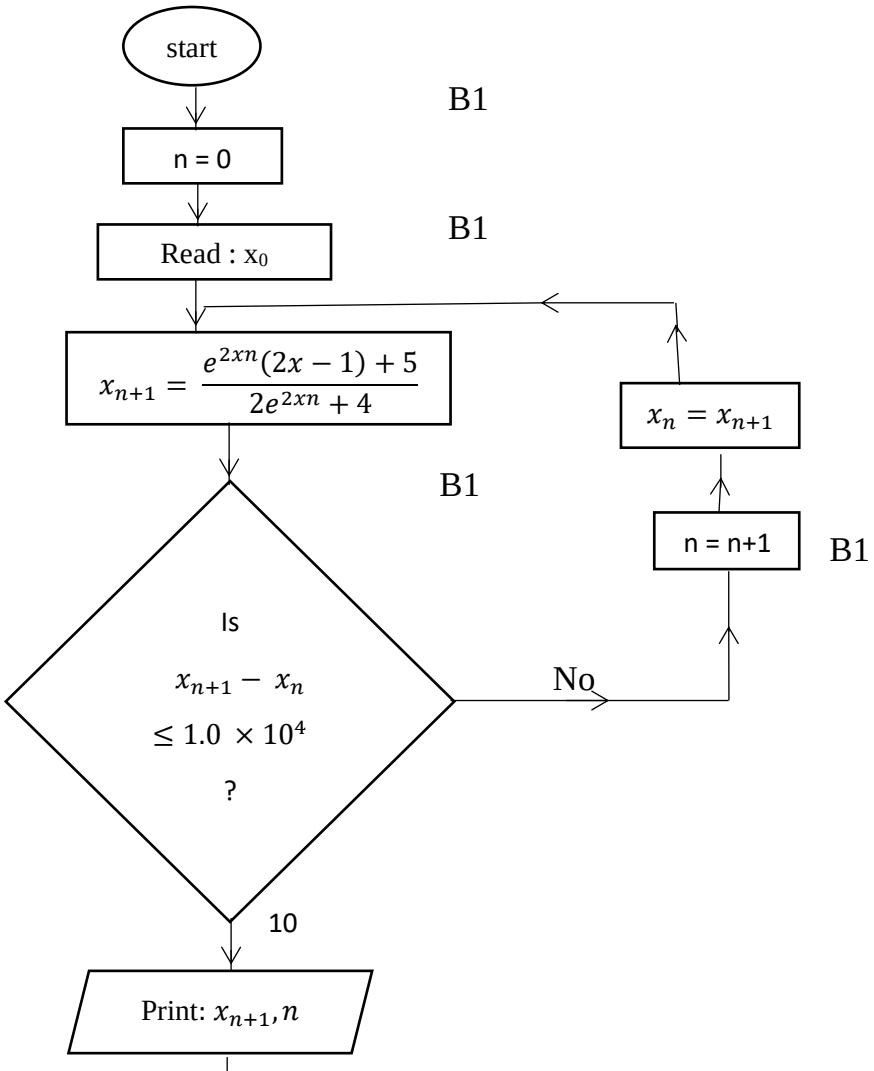
$F'(x) = 2e^{2x} + 4$ M1

$$x_{n+1} = x_n - \frac{(e^{2xn} + 4x_n - 5}{2e^{2xn} + 4}$$ M1

$$= \frac{2xn\, e^{2xn} + 4xn - e^{2xn} - 4xn \times 5}{2e^{2xn} + 4}$$

$$= \frac{2x_n e^{2xn}(2_{n+1} - 1) + 5}{2e^{2xn} + 4}$$ B1

(b) (i)



B1

B1

B1

B1

B1

Yes

B1

(ii)

n	x_n	x_{n+1}	$(x_{n+1} - x_n)$
0	0.5	0.5299	0.0299
1	0.5299	0.5293	0.0006
2	0.5293	0.5293	0.0000

B1

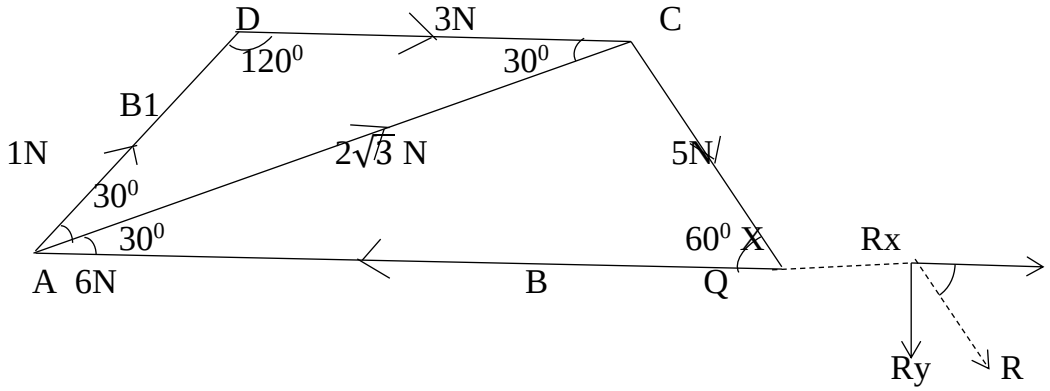
B1

∴ root = 0.53 A1

12

---

14. (a)



Rx = $1cos60^0 + 3 + 5cos60^0 - 6 + 2\sqrt{3}cos30^0$ M1

= 3N B1

Ry = $-1cos30^0 + 5cos30^0 - 2\sqrt{3}sin30^0$ M1

= $\sqrt{3}$ N B1

R = $\sqrt{3^2 + (\sqrt{3})^2}$M1 and $cos\theta = \frac{3}{2\sqrt{3}}$

= 3.4641N A1 $\theta = 30^0$

Resultant = 3.4641N at 30^0 with AB ie 30^0 to AB on opposite side to D and C A1

M1 M1

(b) M(A) : 3 $(1\ sin60^0) + 5cos30^0 \times 2 =$Ry AX M1

$3\frac{\sqrt{3}}{2} + 5\frac{\sqrt{3}}{2} \times 2 = \sqrt{3}$ AX

AX = 6.5m A1

12

15.

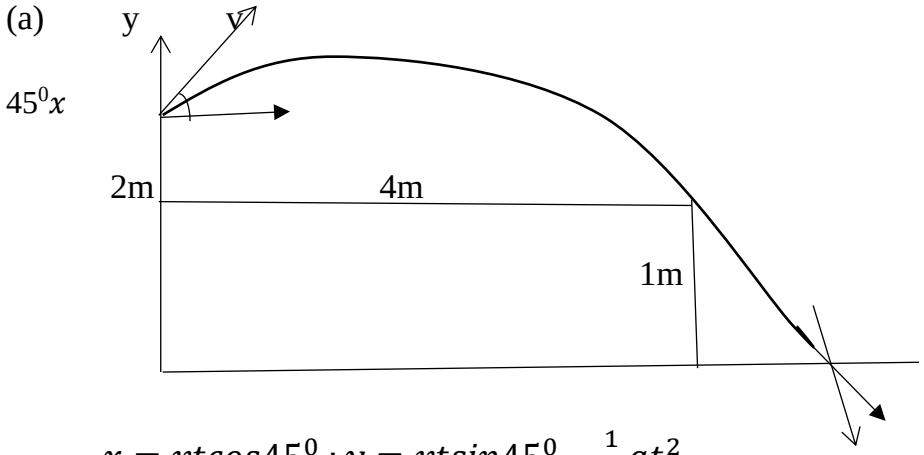
Distance	f	X	Xf	X^2F	F
31 – 40	10	35.5	355	12,602.5	10
41 – 45	15	43	645	27,735	25
46 – 50	20	48	960	46,080	45
51 – 55	70	53	3710	196,630	115
56 – 57	64	56.5	3616	204,304	179
58 – 60	24	59	1416	83,544	203
61 – 70	20	65.5	1310	85,805	223
71 – 90	10	80.5	805	64,802.5	233
sum	233		12817	721,503	
			B1	B1	B1

(a) S.D = $\sqrt{\frac{721,503}{233} - (55.0086)^2}$ M1

= 8.4044 A1

---

16. (a)



$x = vtcos45^0 \; ; y = vtsin45^0 - \frac{1}{2}gt^2$ B1

$= \frac{vt}{\sqrt{2}}$ $= \frac{vt}{\sqrt{2}} - \frac{1}{2}gt^2$

$\therefore y = x - \frac{gx^2}{v^2}$ ------$* t = x\frac{\sqrt{2}}{v}$

When $x = 4, b = -1$

$\Rightarrow -1 = 4 - \frac{gx^2}{v^2}$

$\therefore \; v^2 = \frac{16g}{5}$ B1

From equation $*$

$y = x - \frac{gx^2}{16g/5}$ M1

$\Rightarrow 16y = 16x - 5x^2$ B1

(b) (i) when $y = -2$

$\Rightarrow 16(-2) = 16x - 5x^2$

$5x^2 - 16x - 32 = 0$

$x = \frac{16 \pm 29.9332}{10}$ M1

$= 4.5933$ or -1.39333

$\therefore x = 4.59333m$ hence ball strikes ground 0.59m beyond the wall A1

(ii) using $v^2 = u^2 - 2gy$

$v^2 = 32 - 2g(-1)$

$v = 8.5ms^{-1}$ B1

From equation $y = x - \frac{5x^2}{16}$

$\frac{dy}{dx} = 1 - \frac{5}{8}x$

$= 1 - \frac{5}{8}(4.5933)$ M1

$\therefore \tan\theta = -1.8708$

$\theta = -61.87^0$ B1

$\therefore$ velocity = $8.5ms^{-1}$, direction is 61.9^0 below the horizontal A1

12