



MURANG'A UNIVERSITY COLLEGE (MRUC)
A Constituent College of Jomo Kenyatta University of Agriculture & Technology

SMA 2104: MATHEMATICS FOR SCIENCE

SUPPLIMENTARY/ SPECIAL EXAM

DATE

TIME

Question one

a. Members – 1 2 3 4 5 6 7 8 9 10.

$$\begin{aligned}\text{No. of ways } & 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 \\ & = 10! \\ & 2 \times 1 = 2!\end{aligned}$$

$$\begin{aligned}\text{No. of ways} & = 10! \times 2! \\ & = 7,257,600\end{aligned}$$

b. $4x^2 - 18x + 3 = 0$

$$x^2 - \frac{18x}{4} + \frac{3}{4} = 0 \quad \text{dividing through by 4}$$

$$x^2 - \frac{9x}{2} = \frac{-3}{4} \quad \text{taking constant to R.H.S}$$

$$x^2 - \frac{9x}{2} + 1\left(\frac{-9}{2}\right)^2 = \frac{-3}{4} + \left(\frac{-9}{2}\right)^2 \quad \text{Composing the square in left hand side.}$$

$$\left(x - \frac{9}{2}\right)^2 = \frac{-3}{4} + \frac{81}{4}$$

$$x - \frac{9}{2} = \sqrt{\frac{78}{4}}$$

$$x = 4.5 \pm 4.41$$

$$x = 4.5 + 4.41 = 8.91$$

or

$$x = 4.5 - 4.41 = 0.09$$

c. $B = 35$, $b = 7$, $c = 5$

sine rules

$$\frac{7}{\sin B} = \frac{5}{\sin c} \implies \sin c = \frac{5 \sin B}{7} = c = 24.1$$

$$A + B + C = 180$$

$$A = 180 - (B + C)$$

$$= 180 - (35 + 24.19)$$

$$= 120.81$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} \implies a = \frac{b}{\sin B} \times \sin A.$$

$$= \frac{7 \times \sin 120.81}{\sin 35}$$

$$\sin 35$$

$$= 10.48$$

$$\approx 10.5.$$

$$d. \tan x \sin x + \cos x = 88cx$$

$$\begin{aligned}
 &= \frac{\sin x}{\cos x} \sin x + \cos x = 3 \\
 &= \frac{\sin^2 x}{\cos x} + \cos x \\
 &= \frac{\sin^2 x + \cos^2 x}{\cos x} = \frac{1}{\cos x} \\
 &= 50cx
 \end{aligned}$$

$$\begin{aligned}
 e. & \frac{4 + 3\sqrt{2}}{6 - 5\sqrt{6}} \\
 &= \frac{4 + 3\sqrt{2}}{6 - 5\sqrt{6}} \times \frac{6 + 5\sqrt{6}}{6 + 5\sqrt{6}} \\
 &= \frac{24 + 20\sqrt{6} + 18\sqrt{2} + 15\sqrt{16}}{36 + 30\sqrt{6} - 30\sqrt{6} - 25 \cdot 36} \\
 &= \frac{24 + 20\sqrt{6} + 18\sqrt{2} + 30\sqrt{3}}{36 - 150} \\
 &= \frac{24 + 18\sqrt{2} + 30\sqrt{3} + 20\sqrt{6}}{-114}
 \end{aligned}$$

Question Two

a) $x = 6, 9, 12, 13, 14, 16, 17, 18, 19, 22, 23$

(i) $M\&x = A^{1/2} \{A + 1\}^t$ Values

$$\begin{aligned}
 &= \left(\frac{13}{2}\right)^t \text{Values} \\
 &= 7.5^t \text{Values} \\
 &= 17.5
 \end{aligned}$$

(ii) $12R = 2_3 - 2_1$

$$2_3 = \frac{3}{4}(n + 1)^u \text{ value}$$

$$\begin{aligned}
 &= 9.75^u \text{ value} \\
 &= 9^t \text{ value} + 0.75(10u - 9^{CR}) \\
 &= 18 + 0.75(19 - 18) \\
 &= 18.75 \\
 1Qn &= 18.75 - 12.25 \\
 &= 6.5
 \end{aligned}$$

$$O_1 = \frac{1}{y}(13)^t \text{ values.}$$

$$\begin{aligned}
 &= 3.25^t \text{ value} \\
 &= 3^{\text{rd}} \text{ values} + 0.25(4 - 13d) \\
 &= 12 + 0.25(13 - 12) \\
 &= 12.25.
 \end{aligned}$$

b. $\tan^2 x = \frac{\sin^2 x}{\cos^2 x + 1}$

$$\frac{\left(\frac{\sin x}{\cos x}\right)^2}{\left(\frac{\sin n}{\cos n}\right)^2 + 1} = \frac{\left(\frac{\sin^2 x}{\cos^2 x}\right)}{\left(\frac{\sin^2 n}{\cos^2 n}\right) + 1} =$$

$$= \frac{\frac{\sin^2 x}{\cos^2 n}}{\frac{\sin^2 n + \cos^2 n}{\cos^2 n}}$$

$$= \frac{\frac{\sin^2 n}{\cos^2 x}}{\frac{1}{\cos^2 n}} = \frac{\sin^2 x + \cancel{\cos^2 x}}{\cancel{\cos^2 x} \cdot 1} = \sin^2 n$$

iii. $m \sin 9n \frac{6 + 9 + \sqrt{\dots} + 19 + 22 + 23}{12} = 15.8$

x	x - \bar{n}	pc - $\bar{x}1$	
6	-9.58	9.58	
9	-6.58	6.58	
12	-3.58	3.58	
13	-2.58	2.58	
14	-1.58	1.58	
16	0.42	0.42	$\Sigma(n - \bar{n}) = 47.84$
17	1.42	1.42	
18	2.42	2.42	M.AD = $\frac{47.84}{12}$
18	2.42	2.42	
19	3.42	3.42	
22	6.42	6.42	=3.99
23	7.42	7.42	≈ 4.

Question three

Using synthetic division/long division.

5	0	-4	4	-4	7
-3	-15	45	-123	+357	-1083
5	-15	41	-119	+361	1097

$F(-3) = 1097$

b.

$$\begin{aligned} \alpha^2 &= b^2 + e^2 - 2bc \cos A \\ 8^2 &= 10^2 + 3^2 - 2(30) \cos A \\ 64 - 100 - 9 &= -60 \cos A \end{aligned}$$

$$60 \cos A = 45$$

$$\cos A = \frac{45}{60} = 0.75 = 41.41^\circ$$

$$\begin{aligned} \frac{\sin \alpha}{a} &= \frac{\sin B}{b} \\ \sin B &= \frac{b \sin A}{a} \\ &= \frac{10 \times \sin A}{8} \\ &= 53.77 \end{aligned}$$

$$A + B + C = 180.$$

=??

$$\begin{aligned} \text{C. } \int (3x^2 + 4x - 7) dx &= \frac{3x^3}{3} + \frac{4x^2}{2} - 7x + c \\ &= x^3 + 2x^2 - 7x + c \\ (64) + 32 - 28 + e - [8 + 8 - 14 + c] &= 66 \\ 68 + e - 2 - c &= 66 \end{aligned}$$

Question four

$$\begin{aligned} (x+5)^{15} &= x^{15} + 15x^{14} + 15c_2 x^{13}5^2 + 15c_3 x^{12}5^3 \\ &= x^{15} + 75x^{14} + 2625x^{13} + 56875x^{12} \end{aligned}$$

$$\begin{aligned} (x+5)^{15} &= (5+0.2) \Rightarrow x = 0.02 \\ &= 0.02^{15} + 725(0.02)^{14} + 2625(0.02)^{13} + 5675(0.02)^{12} \dots \end{aligned}$$

$$\text{b. } 10c_3 \times 15c_4 = 360,360$$

digit 4 digit

c. digit 1 2 3 4 (3)
 2 4 3 3

Five digit 2 3 4 3 (3)
 4 3 2 3

Six digit
 1 2 3 4 5 6² (3)
 4 3 2 2 1 3

$$3\left(\frac{\quad}{5 - \cdot}\right)$$

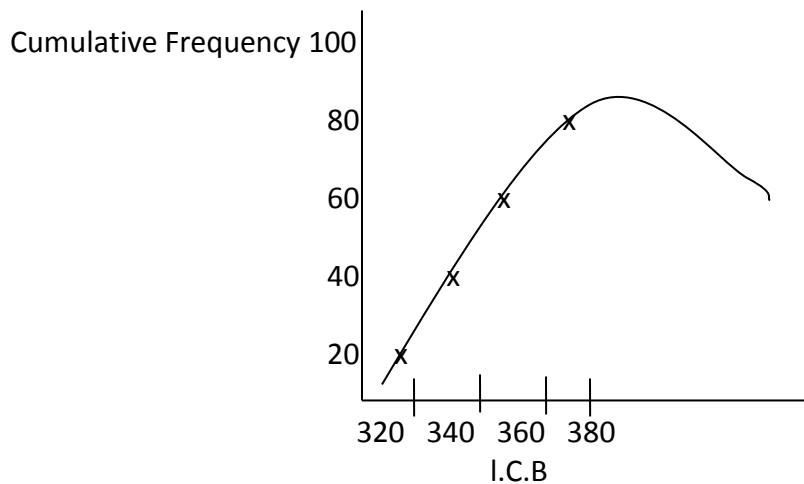
$$\begin{aligned} \text{Medium} &= \text{L.C.B.} + \frac{(n - pcf)}{2} \\ &= 360.5 + \frac{(50 - 42) \times 20}{33} \\ &= 365.34. \end{aligned}$$

$$\frac{3(366.9 - 365.34)}{20.17}$$

$$= 0.2320$$

Question five

x	f	c.f	L.C.B	$d = \frac{x-A}{c}$	fd	fd ²
330.5	15	15	320.5	-2	-30	60
350.5	27	42	340.5	-1	-27	27
370.5	33	75	360.5	0	0	0
390.5	25	100	380.5	1	25	25



$$\text{Mean} = 360.5 + 20^1 \frac{(32)}{108} \\ 5 \\ = 366.9$$

$$\text{s.d} = c \sqrt{\frac{\sum fd^2}{\sum f} - \left(\frac{\sum fd}{\sum f}\right)^2}$$

$$= 20 \sqrt{\frac{112}{100} - \left(\frac{-32}{100}\right)^2}$$

$$= ??$$