SMK TINGGI BUKIT MERTAJAM (2005)
MATHEMATICS T (PAPER 1)

1. (a) Prove that for any set of A and B, $A \cap (B - C) = (A \cap B) - (A \cap C)$. [4]

   (b) Express $z = \dfrac{1+i}{3-2i}$ in the form of $a + bi$, where $a, b \in \mathcal{R}$.

   Hence, find the argument for z^2. [4]

2. Find the solution set of $|x + 2| < 2x + 1$ for al real values of x. [6]

3. The rth term of the series 6 + 17 + 34 + ... is $A + Br + Cr^2$. Determine the values of A, B and C. Hence, find the sum of the first n terms of the series. [7]

4. The roots of the equation $x^2 + ax + b = 0$ are α and β.
   Find both the roots of the equation $4bx^2 + 2ax + 1 = 0$ in terms of α and β. [5]

5. $P(cp, \frac{c}{p})$ is a point on the curve $xy = c^2$. Find the equation of the tangent to the curve at P. The perpendicular from origin O meets this tangent at T. Find the locus of T as P changes. [6]

6. Use the trapezium rule with 7 ordinates to find an approximate value for
   $\int_0^3 \ln(x + 3)\, dx$. [5]

7. If x is so small that higher powers of x more than x^2 can be neglected, and
   $\dfrac{\sqrt{1-4x}\,\sqrt[3]{1+3x}}{\sqrt{1+x}} - 1 \approx px + qx^2$, find the values of p and q. [6]

8. Water is pour into an inverted right circular cone whose base radius is 8 cm at a constant rate, and it takes 135 seconds to fill up. If the semi vertical angle at the vertex is 30°, find the rate at which the water level is rising at the 40th second. [7]

9 (a) Express $f(x) = 4x^4 - 4x^3 - 23x^2 + 12x + 36$ in the form $(ax^2 - x - b)^2$ and determine the value of a and b. Hence, find all the roots of the equation $f(x) = 0$. [4]

   (b) If $1 + \sqrt{3}$ is a root of the equation $x^3 + px^2 + qx + 6 = 0$, find the values of the real numbers p and q. Hence, find the solution set for which
   $x^3 + px^2 + qx + 6 > x - 3$. [7]

10. Given that $\mathbf{M} = \begin{pmatrix} 2 & 3 & 1 \\ -1 & 0 & 4 \\ 1 & -1 & 1 \end{pmatrix}$, find k if $\mathbf{M}^3 - 3\mathbf{M}^2 + 8\mathbf{M} + k\mathbf{I} = 0$. Deduce $\mathbf{M}^{-1}$. [7]

    Hence, solve the simultaneous equations $2x + 3y + z = 18$, $x - 4z = -2$, $x - y + z = 6$. [5]

11. Sketch the curve $y = \dfrac{x^2+4}{x^2-4}$, showing clearly the asymptotes and the turning point. [8]

    Determine the set of values of k such that the equation
    $x^2 + 4 = (k - 1)(x^2 - 4)$ has real roots. [4]

12. (a) Evaluate $\int_1^3 x^2 \ln x\, dx$. [6]

    (b) Sketch the curves $y = e^{-x} + 1$ and $y = e^x - \frac{1}{2}$ on the same coordinate system. [4]

    Find the area of the region bounded by these two curves and the y–axis. [4]

MATHEMATICS T (PAPER 2)

1. Given that $y = \cos 2x + \sin x$, $0 < x < 2\pi$. Find correct to two decimal places, the values of x for which the graph of y has stationary points. [4]

2. Solve the differential equation $y \cos^2 x \dfrac{dy}{dx} = \tan x + 2$, given that $y = 2$ when $x = \frac{\pi}{4}$. [4]

3. Obtain an expression for $\tan(A + B + C)$ in terms of $\tan A$, $\tan B$ and $\tan C$. [4]

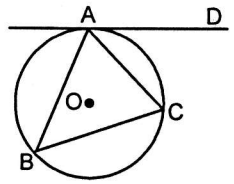
   If A, B and C are angles of a triangle, prove that

   (a) $\tan A + \tan B + \tan C = \tan A \tan B \tan C$. [3]

   (b) $\cot\frac{A}{2} + \cot\frac{B}{2} + \cot\frac{C}{2} = \cot\frac{A}{2}\cot\frac{B}{2}\cot\frac{C}{2}$. [5]

4. (a) Given a triangle ABC where D is the midpoint of AB. E lies on AC such that $AE = \frac{2}{3}AC$. If BE and CD meet at O, show that BE = 4 OE. [4]

   (b)



   O is the centre of the circle passing through A, B and C. Given that ∠DAC = ∠ABC. Prove that AD is a tangent to the circle. [4]

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5. At time t (in years), the population of a bird species living in a national park is x. The rate of increase in x as a result of new births is bx, while the rate of decrease in x as a result of death is $mx + \frac{1}{4}cx^2$, where b, c and m are constant.

Write a differential equation that connects x and t. [1]

Assuming that $b = \frac{3}{2}m$ and $c = \frac{2m}{N}$, show that the differential equation can be written in the form $\frac{2}{m}\frac{dx}{dt} = x(1 - \frac{x}{N})$. [2]

Solve the differential equation if $x = \frac{N}{4}$ when $t = 0$, expressing x in terms of t. [7]

State what happens to the population of the bird species living in the national park after the passage of a large interval of time. [2]

6. The discrete random variable X has the probability function

$$P(X = x) = \begin{cases} a & , x = 0,2,4 \\ b & , x = 1,3,5 \\ 0 & , \text{otherwise} \end{cases}, \text{ and } 2P(X \geq 2) = 3P(X < 3).$$

(a) Find the values of a and b. [3]

(b) Find the probability that the sum of two independent observations from this distribution is greater than 8. [2]

7. A computer maintenance company keeps records of the length of time it takes to repair faulty computers. The time that elapses between a customer reporting a computer out of action due to a fault and the fault repaired is known as the 'repair time". The company's records show that the repair time on any particular occasion that a fault is reported may be assumed to be independent of all other repair times.

(a) The company wishes to state in its advertisement that at least 99% of all repair times will be less than a certain number of hours. Find the smallest integer that could truthfully be used in the advertisements. [3]

(b) If a repair time is exceptionally long, the maintenance company pays compensation to the customer. The rate of compensation is RM 100.00 if the repair is between 53 and 58 hours, and RM 250.00 if the repair time exceeds 58 hours. Calculate the expected amount of compensation per fault, correct to 3 significant figures. [4]

8. The numbers 4, 6, 12, 4, 10, 12, 3, x, y have a mean of 7 and a mode of 4. Find

(a) the values of the two numbers x and y, where $x > y$. [3]

(b) the median of this set of known nine numbers. [1]

When two additional numbers $(7 + n)$ and $(7 - n)$ are included, the standard deviation of all the eleven numbers is found to be 4. Write down the mean of these eleven numbers and calculate the possible values of n. [4]

9. When a consignment of belts arrives at the retailer, ten of them are tested. The whole batch is returned to the wholesaler if more than one of those selected is found to be faulty. What is the probability that the consignment will be accepted if 1.5% of the belts are faulty, correct to 4 decimal places? [4]

10. The continuous random variable X has probability density function $f(x)$ given by

$$f(x) = \begin{cases} k(3 - x) & , 2 \leq x \leq 3 \\ 0 & , \text{otherwise} \end{cases}, \text{ where } k \text{ is a constant. Calculate}$$

(a) the value of k. [3]

(b) the probability that X exceeds 2.5. [2]

(c) the semi-interquartile range of X, correct to 3 significant figures. [4]

11. 51 upper six students who attended tuition classes for mathematics were randomly picked and their for the STPM trial Mathematics Paper 2 were recorded as follows,

67	76	85	42	91	48	91	46	51	72	77	53	41
48	86	79	56	80	70	70	66	62	54	85	60	58
43	58	74	44	52	74	52	82	78	47	67	50	68
87	79	86	30	63	72	63	44	47	57	68	81	

(a) Display the data in an ordered stemplot. [2]

(b) Find the median and the quartiles of this distribution. [3]

(c) Draw a boxplot to represent the data and comment on the distribution. [4]

(d) Give one advantage of using a stemplot. [1]

(e) State the number of outliers occurred. Justify your answer with reasons. [3]

12. Four alphabets A, B , C, D and three numbers 7, 8, 9 are arranged in a row from left to right randomly. Find the probability that

(a) A and B occupying the first two positions in that order. [2]

(b) either the number 8 is first or the alphabet D is last (or both). [3]

(c) no two alphabets are next to each other. [3]

(d) all the alphabets are next to each other. [3]

(e) all the alphabets are next to each other, given that at least two alphabets are next to each other. [3]

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MT1

1.(a) $A\cap(B-C) = (B\cap C')\cap A = B\cap[C'\cap A]$

$= B\cap[\phi\cup(C'\cap A)] = B\cap[(A'\cap A)\cup(C'\cap A)]$

$= B\cap[(A'\cup C')\cap A] = B\cap[A\cap(A\cap C)']$

$= (B\cap A)\cap(A\cap C)' = (A\cap B)-(A\cap C)$ #

(b) $z = \frac{1+i}{3-2i}\cdot\frac{3+2i}{3+2i} = \frac{1}{13}+\frac{5}{13}i$ #

$z^2 = (\frac{1}{13})^2(1+5i)^2 = \frac{1}{169}(-24+10i)$

$\therefore \arg(z^2) = \tan^{-1}\left[\frac{10}{-24}\right] = 2.7468$ #

2. $|x+2|<2x+1$:

$\therefore -(2x+1)<x+2$ and $x+2<2x+1$

$\therefore -1<x$ and $1<x$

$\therefore \{x: 1<x\}$ #

3. $T_r = A+Br+Cr^2$:

$T_1=6$: $A+B+C=6$ — ①

$T_2=17$: $A+2B+4C=17$ — ②

$T_3=34$: $A+3B+9C=34$ — ③

③−①: $B+3C=11$

③−②: $B+5C=17$

$\therefore 2C=6 \Rightarrow C=3 \quad \therefore B=2, A=1$ #

$\therefore S_n = \sum_{r=1}^{n}[1+2r+3r^2]$

$= n+2(\frac{n}{2})(n+1)+3(\frac{n}{6})(n+1)(2n+1)$

$= \frac{n}{2}[2n^2+5n+5]$ #

4. $x^2+ax+b=0$ (roots $=\alpha,\beta$)

$\therefore \alpha+\beta=-a,\ \alpha\beta=b$

$4bx^2+2ax+1=0$

$\therefore 4\alpha\beta x^2-2(\alpha+\beta)x+1=0$

$\therefore (2\alpha x-1)(2\beta x-1)=0$

$\therefore$ roots $=\frac{1}{2\alpha}$ and $\frac{1}{2\beta}$ #

5. $xy=c^2 \Rightarrow y=\frac{c^2}{x} \quad \therefore \frac{dy}{dx}=-\frac{c^2}{x^2}$

$P(cp,\frac{c}{p})$: $m_t = -\frac{c^2}{(cp)^2} = -\frac{1}{p^2}$

$\therefore$ tangent at P: $y-\frac{c}{p} = -\frac{1}{p^2}(x-cp)$

$\therefore p^2y+x=2cp$ # — ①

OT: $y=p^2x$ — ②

$\therefore$ ②→①: $(\frac{y^2}{x}+x)^2 = 4c^2(\frac{y}{x})$

$\therefore (x^2+y^2)^2 = 4c^2xy$ [locus of T] #

6. $\int_0^3 \ln(x+3)\,dx = \frac{1}{2}(\frac{1}{2})\left[\ln 3+\ln 6 + 2[\ln 3.5+\ln 4+\ln 4.5+\ln 5+\ln 5.5]\right] = 4.451$ #

7. $\frac{\sqrt{1-4x}\cdot\sqrt[3]{1+3x}}{\sqrt{1+x}}-1 = [1+\frac{1}{2}(-4x)+\frac{\frac{1}{2}(-\frac{1}{2})}{2!}(-4x)^2+\dots]$

$[1+\frac{1}{3}(3x)+\frac{\frac{1}{3}(-\frac{2}{3})}{2!}(3x)^2+\dots][1+(-\frac{1}{2})x+\frac{(-\frac{1}{2})(-\frac{3}{2})}{2!}(x^2)+\dots]$

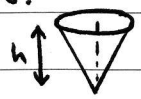
$-1 = [1-2x-2x^2+\dots][1+x-x^2+\dots][1-\frac{1}{2}x+\frac{3}{8}x^2+\dots]$

$-1 = [1+x(1-2)+x^2(-1-2-2)+\dots][1-\frac{1}{2}x+\frac{3}{8}x^2+\dots]-1$

$= 1+x(-\frac{1}{2}-1)+x^2(\frac{3}{8}+\frac{1}{2}-5)+\dots-1$

$\approx -\frac{3}{2}x-\frac{33}{8}x^2 \quad \therefore p=-\frac{3}{2},\ q=-\frac{33}{8}$ #

8. $V=\frac{1}{3}\pi h(\frac{h}{\sqrt{3}})^2 = \frac{\pi h^3}{9} \quad \therefore \frac{dV}{dh}=\frac{\pi h^2}{3}$



$\frac{dV}{dt} = \frac{V_{full}}{125} = \frac{1}{125}(\frac{\pi}{9})(8\sqrt{3})^3$

$= \frac{512\sqrt{3}\pi}{405}\ cm^3s^{-1}$

at $t=40$: $V=40(\frac{512\sqrt{3}\pi}{405}) = \frac{\pi h^2}{9}$

$\therefore h^3 = \frac{4096}{3\sqrt{3}} \Rightarrow h=\frac{16}{\sqrt{3}}$

$\frac{dh}{dt}\times\frac{dV}{dh}=\frac{dV}{dt}$: $\frac{dh}{dt}\times\frac{\pi}{3}(\frac{16}{\sqrt{3}})^3 = \frac{512\sqrt{3}\pi}{405}$

$\therefore \frac{dh}{dt} = \frac{1}{120}\ cms^{-1}$ #

9.(a) $f(x)=4x^4-4x^3-23x^2+12x+36$

$=(2x^2-x-6)^2 \quad \therefore a=2, b=6$ #

$\therefore f(x)=(2x+3)^2(x-2)^2$

$\therefore$ Roots for $f(x)=0$ are $-\frac{3}{2},-\frac{3}{2},2,2$ #

(b) $(1+\sqrt{3})$ is a root of $x^3+px^2+qx+6=0$

$\Rightarrow (1-\sqrt{3})$ is also a root

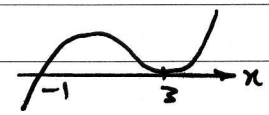
$\therefore x^3+px^2+qx+6=(x^2-2x-2)(x-3)$

$\therefore p=-5$ and $q=4$ #

$\therefore x^3+px^2+qx+6>x-3$

$\therefore (x-3)(x^2-2x-3)>0$

$\therefore (x-3)^2(x+1)>0$



$\{x: -1<x<3 \text{ or } 3<x\}$ #

10. $M^2=\begin{pmatrix}2&5&15\\3&-7&3\\4&2&-2\end{pmatrix}$, $M^3=\begin{pmatrix}14&-9&37\\14&3&-23\\4&14&10\end{pmatrix}$

$\therefore M^3-3M^2+8M=\begin{pmatrix}24&0&0\\0&24&0\\0&0&24\end{pmatrix}=24I \quad \therefore k=-24$ #

$\therefore M^3-3M+8I-24M^{-1}=0$

$\therefore M^{-1}=\frac{1}{24}\begin{bmatrix}4&-4&12\\5&1&-9\\1&5&3\end{bmatrix}$ #

$\left.\begin{array}{l}2x+3y+z=18\\x\quad-4z=-2\\x-y+z=6\end{array}\right\}$ $M\begin{pmatrix}x\\y\\z\end{pmatrix}=\begin{pmatrix}18\\2\\6\end{pmatrix}\Rightarrow\begin{pmatrix}x\\y\\z\end{pmatrix}=M^{-1}\begin{pmatrix}18\\2\\6\end{pmatrix}$

$\therefore \begin{pmatrix}x\\y\\z\end{pmatrix}=\frac{1}{24}\begin{pmatrix}4&-4&12\\5&1&-9\\1&5&3\end{pmatrix}\begin{pmatrix}18\\2\\6\end{pmatrix}$

$\therefore \begin{pmatrix}x\\y\\z\end{pmatrix}=\frac{1}{12}\begin{pmatrix}68\\19\\23\end{pmatrix} \quad \therefore x=\frac{17}{3},\ y=\frac{19}{12},\ z=\frac{23}{12}$ #

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Uni

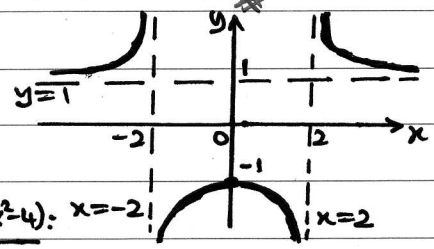
11. $y=\frac{x^2+4}{x^2-4}=1+\frac{8}{x^2-4} \Rightarrow \frac{dy}{dx}=\frac{-8(2x)}{(x^2-4)^2}$

$\therefore$ asymptotes: $y=1, x=\pm 2$

For s.p: $\frac{dy}{dx}=0$

$\therefore x=0$

$\therefore (0,-1)$



For $x^2+4=(k-1)(x^2-4)$: $\frac{x^2+4}{x^2-4}=k-1=y$

To have real roots: exists intersection points between the two graphs.

$\therefore$ $k-1\le -1$ or $1<k-1$

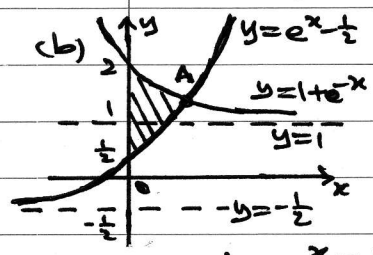
$\therefore$ $\{k: k\le 0 \text{ or } 2<k\}$

12. (a) $\int_1^3 x^2\ln x\,dx=\left[\frac{x^3}{3}\ln x\right]_1^3-\int_1^3\frac{x^3}{3}\left(\frac{1}{x}\right)dx$

$=[9\ln 3-0]-\frac{1}{9}[x^3]_1^3$

$=9\ln 3-\frac{1}{9}(27-1)=9\ln 3-\frac{26}{9}$

(b)



For A: $e^x-\frac{1}{2}=1+e^{-x}$

$\therefore 2e^{2x}-3e^x-2=0$

$\therefore (2e^x+1)(e^x-2)=0$

$[\because e^x>0, \forall x\in\mathbb{R}]$

$\therefore e^x=2 \Rightarrow x=\ln 2$

$\therefore$ Area $=\int_0^{\ln 2}\left[1+e^{-x}-\left(e^x-\frac{1}{2}\right)\right]dx$

$=\left[\frac{3}{2}x-e^{-x}-e^x\right]_0^{\ln 2}$

$=\frac{3}{2}(\ln 2-0)-\left(\frac{1}{2}-1\right)-[2-1]$

$=\frac{1}{2}[3\ln 2-1]$

1. $y=\cos 2x+\sin x \Rightarrow \frac{dy}{dx}=-2\sin 2x+\cos x$

For s. points: $\frac{dy}{dx}=0 \Rightarrow -4\sin x\cos x+\cos x=0$

$\therefore \cos x=0$ or $\sin x=\frac{1}{4}$

$\therefore x=1.5708, 4.7124, 0.2527, 2.8889$

2. $y\cos^2 x\frac{dy}{dx}=\tan x+2$

$\therefore \int_2^y y\,dy=\int_{\frac{\pi}{4}}^x[\tan x+2]\sec^2 x\,dx$

$\therefore \frac{1}{2}[y^2]_2^y=\left[\frac{1}{2}\tan^3 x+2\tan x\right]_{\pi/4}^x$

$\therefore \frac{1}{2}[y^2-4]=\left(\frac{1}{2}\tan^2 x+2\tan x\right)-\left(\frac{1}{2}+2\right)$

$\therefore y^2=\tan^2 x+4\tan x-1$

$t\to\infty$: $\lim_{t\to\infty}x=N/1+0=N$

population approaches N when $t\to\infty$

3. $\tan(A+B+C)=\frac{\tan(A+B)+\tan C}{1-\tan(A+B)\tan C}$

$=\frac{\frac{\tan A+\tan B}{1-\tan A\tan B}+\tan C}{1-\tan C\left(\frac{\tan A+\tan B}{1-\tan A\tan B}\right)}$

$=\frac{\tan A+\tan B+\tan C-\tan A\tan B\tan C}{1-\tan A\tan B-\tan B\tan C-\tan C\tan A}$

(a) $A+B+C=180^\circ$: $\tan(A+B+C)=0$

$\therefore \tan A+\tan B+\tan C=\tan A\tan B\tan C$

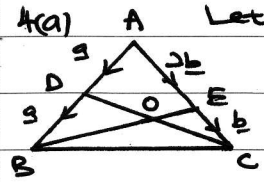
(b) $\frac{1}{2}(A+B+C)=90^\circ$: $\tan\left(\frac{A}{2}+\frac{B}{2}+\frac{C}{2}\right)=$ undefined

$\therefore 1-\tan\frac{A}{2}\tan\frac{B}{2}-\tan\frac{B}{2}\tan\frac{C}{2}-\tan\frac{C}{2}\tan\frac{A}{2}=0$

$\therefore \cot\frac{A}{2}\cot\frac{B}{2}\cot\frac{C}{2}-\cot\frac{C}{2}-\cot\frac{A}{2}-\cot\frac{B}{2}=0$

$\therefore \cot\frac{A}{2}+\cot\frac{B}{2}+\cot\frac{C}{2}=\cot\frac{A}{2}\cot\frac{B}{2}\cot\frac{C}{2}$

4(a)



Let $\overrightarrow{AB}=2\underline{a}$, $\overrightarrow{AC}=3\underline{b}$

$\overrightarrow{EO}=k\overrightarrow{EB}$, $\overrightarrow{CO}=n.\overrightarrow{CD}$

$\therefore \overrightarrow{EO}=k(\overrightarrow{EA}+\overrightarrow{AB})$

$=k[-2\underline{b}+2\underline{a}]$ — ①

$\overrightarrow{EO}=\overrightarrow{EC}+\overrightarrow{CO}=\underline{b}+n[\overrightarrow{CA}+\overrightarrow{AD}]$

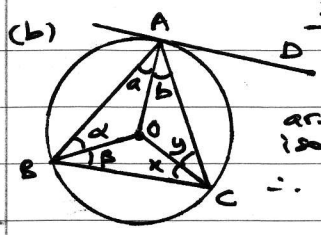
$=\underline{b}+n[-3\underline{b}+\underline{a}]=(1-3n)\underline{b}+n\underline{a}$ — ②

①≡②: $2k=n$ and $-2k=1-3n$

$\therefore -2k=1-(6k) \Rightarrow k=\frac{1}{4}$

$\therefore \overrightarrow{EO}=\frac{1}{4}\overrightarrow{EB} \Rightarrow BE=4OE$

(b)



Statements	Reasons
ΔOAB, ΔOAC, ΔOBC are all isosceles Δ	$OA=OB=OC$ = radius
$\therefore a=\alpha$, $\beta=x$, $b=y$	
$\alpha+\beta+a+b+x+y=180^\circ$	sum of angles in Δ.
$\therefore \alpha+\beta+b=90^\circ$	
$\therefore \angle DAC+b=90^\circ$	Given $\angle DAC=\angle ABC$
$\therefore AD\perp AO \Rightarrow AD$ is a tangent to circle	

5. $\frac{dx}{dt}=bx-\left(mx+\frac{cx^2}{4}\right)=(b-m)x-\frac{cx^2}{4}$

$b=\frac{2m}{2}, c=\frac{2m}{N}$: $\frac{dx}{dt}=\frac{1}{2}mx-\frac{mx^2}{2N}$

$\therefore \frac{2}{m}\frac{dx}{dt}=x\left(1-\frac{x}{N}\right)$

$\int_{N/4}^x\frac{N\,dx}{x(N-x)}=\int_0^t\frac{m}{2}\,dt$

$\therefore \int_{N/4}^x\left(\frac{1}{x}+\frac{1}{N-x}\right)dx=\frac{m}{2}[t]_0^t$

$\therefore \left[\ln\left(\frac{x}{N-x}\right)\right]_{N/4}^x=\frac{mt}{2}=\ln\left(\frac{x}{N-x}\right)-\ln\left(\frac{1}{3}\right)$

$\therefore \frac{mt}{2}=\ln\left[\frac{3x}{N-x}\right] \Rightarrow \frac{3x}{N-x}=e^{mt/2}$

$\therefore 3x=(N-x)e^{mt/2} \Rightarrow x=N/1+3e^{-mt/2}$

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6.(a) $2P(X \geq 2) = 3P(X<3)$:

$\Rightarrow [2a+2b] = 3[2a+b] \Rightarrow b = 2a$

$\Sigma P(X=x) = 1$: $3a+3b=1$

$\therefore 3a+3(2a)=1 \Rightarrow a=\frac{1}{9}$ $\therefore b=\frac{2}{9}$

(b) $P(X_1+X_2>8) = P(4,5)+P(5,4)+P(5,5)$

$= (\frac{1}{9})(\frac{2}{9})(2) + (\frac{2}{9})^2 = \frac{8}{81}$

7. Let X = repair time $X \sim N(40, 5^2)$

(a) $P(X<k) \geq 0.99 \Rightarrow P(Z < \frac{k-40}{5}) \geq 0.99$

$\therefore \frac{k-40}{5} \geq z_{0.01} = 2.326$

$\therefore k \geq 51.63 \Rightarrow k_{min} \approx 52$ hours

(b) Compensation $= 100 . P(53<X\leq 58)$

$+ 250 . P(X>58)$

$= 100 . P(\frac{13}{5} < Z < \frac{18}{5}) + 250 . P(Z > \frac{18}{5})$

$= 100[0.00466 - 0.00016] + 250(0.00016)$

$=$ RM0.490

8(a) $\bar{x}=7$: $x+y+51 = 7(9) \Rightarrow x+y=12$

mode $=4$: $y=4$ $\therefore x=8$

(b) $m = x_5 = 6$ $[3,4,4,4,6,8,10,12,12]$

$\bar{x} = 7(9)+(7-n)+(7+n)/11 = 7$

$s=4$: $16 = \frac{\Sigma x^2}{11} - 7^2 \Rightarrow \Sigma x^2 = 715$

$\therefore 545 + (49-14n+n^2) + (49+14n+n^2) = 715$

$\therefore n^2 = 36 \Rightarrow n = \pm 6$

9. Let X = no. of faulty $X \sim B(10, 0.015)$

$P(\text{accept}) = P(X=0,1)$

$= 0.985^{10} + 10(0.985)^9(0.015) = 0.9907$

10.(a) $\int_{-\infty}^{\infty} f(x)dx = 1$: $\int_2^3 k(3-x)dx = 1$

$\therefore [-\frac{k}{2}(3-x)^2]_2^3 = 1 = -\frac{k}{2}[0-1]$

$\therefore k = 2$

(b) $P(X>2.5) = \int_{2.5}^3 2(3-x)dx$

$= -[(3-x)^2]_{2.5}^3 = -[0-0.25] = 0.25$

(c) For $P(X>k) = 0.75$: $-[(3-x)^2]_k^3 = 0.75$

$\therefore (3-k)^2 = 0.75 \Rightarrow k = 2.1340$

$(\because 2<k<3)$

$\therefore$ SIQR $= \frac{1}{2}[2.5 - 2.1340] = 0.183$

11. (a)

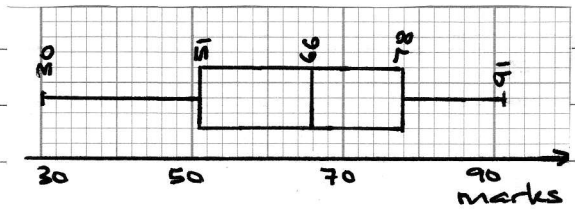
3	0
4	1 2 3 4 4 6 7 7 8 8
5	0 1 2 2 3 4 6 7 8 8
6	0 2 3 3 6 7 7 8 8
7	0 0 2 2 4 4 6 7 8 9 9
8	0 1 2 5 5 6 6 7
9	1 1

key: 3|0 means 30

(b) $m = x_{26} = 66$

$Q_1 = x_{13} = 51$, $Q_3 = x_{39} = 78$

(c)



Distribution: skewed-left (negative)

(d) Data arranged in order

(e) No outlier exists: range of boundaries: $10.5 < x < 118.5$.

12.(a) Prob. $= (\frac{1}{7})(\frac{1}{6}) = \frac{1}{42}$

(b) Prob. $= \frac{1}{7} + \frac{1}{7} - (\frac{1}{7})(\frac{1}{6}) = \frac{11}{42}$

(c) Prob. $= \frac{3!4!}{7!} = \frac{1}{35}$

(d) Prob. $= \frac{4!4!}{7!} = \frac{4}{35}$

(e) Prob(all alphabet together | ≥ 2 together)

$= \frac{4}{35} / 1 - \frac{1}{35} = \frac{2}{17}$

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