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Joint Admission Examination for Macao Four Higher Education Institutions (Languages and Mathematics)

2024
2024 Examination Paper and Suggested Answer

Mathematics Standard Paper

<u>第一部份</u> 選擇題。請選出每題之

$A = \{\ :\ ^2 - 3\ - 4 \le 0\}$ $B = \{\ : 3\ + a \ge 0\}$ $A \cap B = \{\ : 2 \le\ \le 4\}$

$a = (\quad)$

-12 -6 -3 6 12

$f(\ ) = f(\ +1) + 1$ $f(0) = 16$ $f(15)$ $(\quad)$

0 1 15 16 17

$4\ +5\ =\ (\ +1) - (\ -1)(\ -1)$ 4 $(\quad)$

8 4 2

4 8

$(\sqrt{\ } - 2)^5 (2\ -1)^4$ $(\quad)$

-182 -178 176 178 184

$P(2,3)$ M P M

M $(\quad)$

$^2 +\ ^2 - 13 = 0$ $^2 +\ ^2 + 4\ - 6\ = 0$ $^2 +\ ^2 + 4\ + 6\ = 0$

$^2 +\ ^2 - 4\ - 6\ = 0$ $^2 +\ ^2 - 4\ - 6\ + 13 = 0$

$\dfrac{3\quad ^{\frac{1}{2}} +\quad 16}{4 +\quad 5 - 1} = (\quad)$

1 -1 2 -2 4

2 5 9 7 10 288 20

$(\quad)$

32768 65536 131072 262144 524288

$\{\ ,\ -3,2\ + 5,4\ - 4,5\ + 10\}$ 6.8 $(\quad)$

4 5 15 0 -1

$\sqrt{1+\left(\frac{^4-1}{2\ ^2}\right)^2}=(\quad)$

$\frac{^4+2\ \ +1}{2\ ^2}$　　$\frac{^4-1}{2\ ^2}$　　$\frac{^2}{2}+\frac{1}{2\ ^2}$　　$\frac{\sqrt{\ ^2+1}}{2}$

$\triangle ABC$　　$|AB|=8\quad|AC|=7$　　$C=\frac{4\sqrt{3}}{7}$　　$|BC|=(\quad)$

6　　12　　2　　3　　5

$(\ 2,0)$　　$(6,0)$　　$(0,4)$　　$(\ ,\ )$

$(\quad)$

$\frac{8}{3}$　　$\frac{16}{3}$　　4　　8　　16

$(\quad)$　　$f(\ )=5$　　$(\ +\frac{\pi}{3})$

$\left(0,\frac{\pi}{2}\right)$　　$\left(\frac{\pi}{2},\pi\right)$　　$\left(\pi,\frac{3\pi}{2}\right)$

$\left(\frac{3\pi}{2},2\pi\right)$　　$\left(\frac{\pi}{3},\frac{5\pi}{6}\right)$

$\theta\in[0,\pi)$　　$1+\ \ \theta-2\ \ ^2\theta=0$　　$\theta=(\quad)$

$\frac{\pi}{6}\ \ \frac{5\pi}{6}$　　$\frac{\pi}{3}$　　$\frac{\pi}{6}\ \ \frac{\pi}{3}$　　$\frac{\pi}{6}\ \ \frac{\pi}{2}$　　$\frac{\pi}{3}\ \ \frac{\pi}{2}$

$^2-3\ \ +1=0$　　$^4+\frac{1}{\ _4}=(\quad)$

2　　47　　49　　79　　81

$f(\ )$　　$\mathbb{R}$　　$(-\infty,0)$　　$(\quad)$

$f(2^{-\frac{7}{3}})>f(3^{-\frac{2}{7}})>f(\ \ _3\frac{2}{7})$　　$f(3^{-\frac{2}{7}})>f(\ \ _3\frac{2}{7})>f(2^{-\frac{7}{3}})$

$f(\ \ _3\frac{2}{7})>f(2^{-\frac{7}{3}})>f(3^{-\frac{2}{7}})$　　$f(3^{-\frac{2}{7}})>f(2^{-\frac{7}{3}})>f(\ \ _3\frac{2}{7})$

$f(\ \ _3\frac{2}{7})>f(3^{-\frac{2}{7}})>f(2^{-\frac{7}{3}})$

第二部份 解答題。

$\alpha, \beta \in (0, \frac{\pi}{2})$ $\alpha = \frac{1}{5}$ $\beta = \frac{3\sqrt{13}}{13}$

$(\alpha + \beta)$

$(\alpha + 2\beta)$

$\{a_n\}_{n\geq 1}$ $a_1 = 3$ a_1 a_2 a_5

$\{a_n\}_{n\geq 1}$

S_n $\{a_n\}_{n\geq 1}$ $S_n \geq 12$ $+36$

$f(\ ) = a - |\ -3| - |\ -7|$

$a = 8$ $f(\ ) \geq 0$

$g(\ ) =\ f(\ )$ $[-1, 1]$ -1 a

$\mathcal{C} : \frac{^2}{a^2} - \frac{^2}{b^2} = 1$ $\frac{\sqrt{10}}{2}$ $A(2\sqrt{2}, 3)$ $\ell :\ =\ +$

$\mathcal{C}$ P Q $OP \perp OQ$ O

$\mathcal{C}$

第一部份 選擇題。

第二部份 解答題。

X

$$P(X=2)=\frac{{}_3C_2\cdot{}_7C_2}{{}_{10}C_4}=\frac{3}{10}$$

$P(X=3)=\frac{{}_3C_3\cdot{}_7C_1}{{}_{10}C_4}=\frac{1}{30}$ $P(X\geq 2)=P(X=$

$2)+P(X=3)=\frac{3}{10}+\frac{1}{30}=\frac{1}{3}$

$$P(X=0)=\frac{{}_3C_0\cdot{}_7C_4}{{}_{10}C_4}=\frac{1}{6}$$

$P(X=1)=\frac{{}_3C_1\cdot{}_7C_3}{{}_{10}C_4}=\frac{1}{2}$ $E(X)=0\cdot P(X=$

$0)+1\cdot P(X=1)+2\cdot P(X=2)+3\cdot P(X=3)=1\cdot\frac{1}{2}+2\cdot\frac{3}{10}+3\cdot\frac{1}{30}=\frac{6}{5}$

$\beta\in(0,\frac{\pi}{2})$ $\beta=\frac{3\sqrt{13}}{13}$ $\beta=\sqrt{1-\quad{}^2\beta}=\frac{2\sqrt{13}}{13}$ $\beta=\frac{2}{3}$

$\alpha=\frac{1}{5}$ $(\alpha+\beta)=\frac{\alpha+\quad\beta}{1-\quad\alpha\quad\beta}=1$

$\alpha,\beta\in(0,\frac{\pi}{2})$ $\alpha+\beta=\frac{\pi}{4}$ $(\alpha+2\beta)=$ $[(\alpha+\beta)+\beta]=$
$(\beta+\frac{\pi}{4})=\frac{\sqrt{2}}{2}($ $\beta-$ $\beta)=\frac{\sqrt{26}}{26}$

d $a_1=3$ $a_2=3+d,a_5=3+4d$ a_1 a_2 a_5

$a_2^2=a_1a_5$ $(3+d)^2=3(3+4d)$ $d=0$ $d=6$ $a_n=3$

$a_n=3+6(\ -1)=6\ -3$

S_n n P

$-\frac{a-10}{4} \geq 1$ $a \leq 6$ $g(\ )$ $= 1$ $2+(a-10) = a-8 =$

-1 $a = 7$

$-\frac{a-10}{4} \leq -1$ $a \geq 14$ $g(\ )$ $= -1$ $2-(a-10) =$

-1 $a = 13$

$a = 10 \pm 2\sqrt{2}$

$\frac{8}{a^2} - \frac{9}{b^2} = 1$ $e = \frac{\sqrt{a^2+b^2}}{a} = \frac{\sqrt{10}}{2}$ $a^2 = 2$

$b^2 = 3$ $\frac{x^2}{2} - \frac{y^2}{3} = 1$

l $\mathcal{C}$ $P(\ _1,\ _1)$ $Q(\ _2,\ _2)$ l $\mathcal{C}$

$3\ ^2 - 2(\ +\ )^2 - 6 = 0$ $^2 - 4\ -2\ ^2 - 6 = 0$ $_1 +\ _2 = 4$

$_1\ _2 = -2\ ^2 - 6$ $OP \perp OQ$ $_1\ _2 +\ _1\ _2 = 0$ l

$(\ _1 +\ )(\ _2 +\ ) +\ _1\ _2 = 0$ $2\ _1\ _2 +\ (\ _1 +\ _2) +\ ^2 = 0$

$2(-2\ ^2 - 6) + 4\ ^2 +\ ^2 = 0$ $^2 = 12$ $= \pm 2\sqrt{3}$

$A=\{\ :\ ^2-3\ -4\le 0\}$ $B=\{\ :3\ +a\ge 0\}$ $A\cap B=\{\ :2\le\ \le 4\}$

$a=(\quad)$

-12 -6 -3 6 12

$f(\ )=f(\ +1)+1$ $f(0)=16$ $f(15)\quad(\quad)$

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$4\ +5\ =\ (\ +1)-(\ -1)(\ -1)$ 4

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$(\sqrt{\ }-2)^5(2\ -1)^4\quad(\quad)$

-182 -178 176 178 184

$P(2,3)$ M

P M $M\quad(\quad)$

$^2+\ ^2-13=0$ $^2+\ ^2+4\ -6\ =0$ $^2+\ ^2+4\ +6\ =0$

$^2+\ ^2-4\ -6\ =0$ $^2+\ ^2-4\ -6\ +13=0$

$\dfrac{3\quad\frac{1}{2}+\quad 16}{4+\quad 5-1}=(\quad)$

1 -1 2 -2 4

2 5 9 7

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$\{\ ,\ -3,2\ +5,4\ -4,5\ +10\}$ 6.8 $(\quad)$

4 5 15 0 -1

$\sqrt{1+\left(\frac{^4-1}{2\ ^2}\right)^2}=(\quad)$

$\frac{^4+2\ \ +1}{2\ ^2}$ $\frac{^4-1}{2\ ^2}$ $\frac{^2}{2}+\frac{1}{2\ ^2}$

$\frac{\sqrt{\ ^2+1}}{2}$

$\triangle ABC\ \ |AB|=8\ \ |AC|=7\qquad C=\frac{4\sqrt{3}}{7}\qquad |BC|=(\quad)$

6 12 2 3 5

$(\ 2,0)\qquad (6,0)\qquad (0,4)\qquad (\quad,\quad)$
$(\quad)$

$\frac{8}{3}$ $\frac{16}{3}$ 4 8 16

$(\quad)\qquad f(\ )=5\qquad (\ +\frac{\pi}{3})$

$\left(0,\frac{\pi}{2}\right)$ $\left(\frac{\pi}{2},\pi\right)$ $\left(\pi,\frac{3\pi}{2}\right)$

$\left(\frac{3\pi}{2},2\pi\right)$ $\left(\frac{\pi}{3},\frac{5\pi}{6}\right)$

$\theta\in[0,\pi)\qquad 1+\quad \theta-2\quad ^2\theta=0\qquad \theta=(\quad)$

$\frac{\pi}{6}\quad\frac{5\pi}{6}$ $\frac{\pi}{3}$ $\frac{\pi}{6}\quad\frac{\pi}{3}$ $\frac{\pi}{6}\quad\frac{\pi}{2}$ $\frac{\pi}{3}\quad\frac{\pi}{2}$

$^2-3\ \ +1=0\qquad ^4+\frac{1}{_4}=(\quad)$

2 47 49 79 81

$f(\ )\qquad \mathbb{R}\qquad (-\infty,0)\qquad (\quad)$

$f(2^{-\frac{7}{3}})>f(3^{-\frac{2}{7}})>f(\quad_3\frac{2}{7})$ $f(3^{-\frac{2}{7}})>f(\quad_3\frac{2}{7})>f(2^{-\frac{7}{3}})$

$f(\quad_3\frac{2}{7})>f(2^{-\frac{7}{3}})>f(3^{-\frac{2}{7}})$ $f(3^{-\frac{2}{7}})>f(2^{-\frac{7}{3}})>f(\quad_3\frac{2}{7})$

$f(\quad_3\frac{2}{7})>f(3^{-\frac{2}{7}})>f(2^{-\frac{7}{3}})$

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$g(\ ) = \ f(\ )$ -1 $[-1, 1]$

a

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$\mathcal{C}$ $\ell : \ = \ +$ $\mathcal{C}$ P Q $OP \perp OQ$ Q

$\mathcal{C}$

X

$$P(X = 2) = \frac{{}_3C_2 \cdot {}_7C_2}{{}_{10}C_4} = \frac{3}{10}$$

$$P(X = 3) = \frac{{}_3C_3 \cdot {}_7C_1}{{}_{10}C_4} = \frac{1}{30}$$

$$P(X \geq 2) = P(X$$

$f(\ )$ $[-1,1]$ $f(\ ) = a - (3 - \ ) - (7 - \ ) = 2\ \ + (a-10)$

$g(\ ) = \ \ f(\ ) = 2\ \ ^2 + (a-10)$ $g(\ )\ \ _0 = -\dfrac{a-10}{4}$

$-\dfrac{a-10}{4} \in [-1,1]$ $a \in [6,14]$ $g(\ )\ \ -\dfrac{(a-10)^2}{8} = -1$

$a = 10 \pm 2\sqrt{2}$

$-\dfrac{a-10}{4} \geq 1$ $a \leq 6$ $g(\ )$ $= 1$ $2+(a-10) =$

$a - 8 = -1$ $a = 7$

$-\dfrac{a-10}{4} \leq -1$ $a \geq 14$ $g(\ )$ $= -1$

$2 - (a-10) = -1$ $a = 13$

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$\frac{8}{a^2} - \frac{9}{b^2} = 1.$ $e = \frac{\sqrt{a^2+b^2}}{a} = \frac{\sqrt{10}}{2}$

$a^2 = 2$ $b^2 = 3$ $\frac{x^2}{2} - \frac{y^2}{3} = 1.$

l $\mathcal{C}$ $P(\ _1,\ _1)$ $Q(\ _2,\ _2)$

l $\mathcal{C}$ $3\ \ ^2 - 2(\ \ +\ \ )^2 - 6 = 0,$

$^2 - 4\ \ \ - 2\ \ ^2 - 6 = 0$ $_1 +\ \ _2 = 4$ $_1\ \ _2 = -2\ \ ^2 - 6$

$OP \perp OQ$ $_1\ \ _2 +\ \ _1\ \ _2 = 0$ l

$(\ _1 +\ \ )(\ _2 +\ \ ) +\ \ _1\ \ _2 = 0.$ $2\ \ _1\ \ _2 +\ \ (\ _1 +\ \ _2) +\ \ ^2 = 0.$

$2(-2\ \ ^2 - 6) + 4\ \ ^2 +\ \ ^2 = 0,$ $^2 = 12$ $= \pm 2\sqrt{3}$