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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**

第一部份 選擇題。請選出每題之

$A = \{x : x^2 - 3x - 4 \leq 0\}$   $B = \{x : 3x + a \geq 0\}$   $A \cap B = \{x : 2 \leq x \leq 4\}$

$a = ( \quad )$

$-12$   $-6$   $-3$   $6$   $12$

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

$0$   $1$   $15$   $16$   $17$

$4^2 + 5^2 = (x + 1)^2 - (x - 1)^2$   $4$   $( \quad )$

$8$   $4$   $2$

$4$   $8$

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

$-182$   $-178$   $176$   $178$   $184$

$P(2, 3)$   $M$   $P$   $M$

$M$   $( \quad )$

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

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

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

$1$   $-1$   $2$   $-2$   $4$

$2$   $5$   $9$   $7$   $10$   $288$   $20$

$( \quad )$

$32768$   $65536$   $131072$   $262144$   $524288$

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

$4$   $5$   $15$   $0$   $-1$

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

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

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

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

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

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

$$6$$

$$12$$

$$2$$

$$3$$

$$5$$

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

$$(\quad)$$

$$\frac{8}{3}$$

$$\frac{16}{3}$$

$$4$$

$$8$$

$$16$$

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

$$(0,\frac{\pi}{2})$$

$$(\frac{\pi}{2},\pi)$$

$$(\pi,\frac{3\pi}{2})$$

$$(\frac{3\pi}{2},2\pi)$$

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

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

$$\frac{\pi}{6} \qquad \frac{5\pi}{6}$$

$$\frac{\pi}{3}$$

$$\frac{\pi}{6} \qquad \frac{\pi}{3}$$

$$\frac{\pi}{6} \qquad \frac{\pi}{2}$$

$$\frac{\pi}{3} \qquad \frac{\pi}{2}$$

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

$$2$$

$$47$$

$$49$$

$$79$$

$$81$$

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

$$f(2^{-\frac{7}{3}})>f(3^{-\frac{2}{7}})>f(\sqrt[3]{\frac{2}{7}})$$

$$f(3^{-\frac{2}{7}})>f(\sqrt[3]{\frac{2}{7}})>f(2^{-\frac{7}{3}})$$

$$f(\sqrt[3]{\frac{2}{7}})>f(2^{-\frac{7}{3}})>f(3^{-\frac{2}{7}})$$

$$f(3^{-\frac{2}{7}})>f(2^{-\frac{7}{3}})>f(\sqrt[3]{\frac{2}{7}})$$

$$f(\sqrt[3]{\frac{2}{7}})>f(3^{-\frac{2}{7}})>f(2^{-\frac{7}{3}})$$

第二部份 解答题。

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

$$\frac{(\alpha+\beta)}{(\alpha+2\beta)}$$

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

$$\frac{\{a_n\}_{n\geq 1}}{S_n-\{a_n\}_{n\geq 1}}\qquad S_n\geq 12\sqrt{n}+36$$

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

$$\frac{a=8}{g(x)=f(x)}\qquad \frac{f(x)\geq 0}{[-1,1]}\qquad x\in[-1,a]$$

$$\mathcal{C}:\frac{x^2}{a^2}-\frac{y^2}{b^2}=1\qquad \frac{\sqrt{10}}{2}\qquad A(2\sqrt{2},3)\qquad \ell:\quad x=\frac{1}{2}y+\frac{1}{2}$$
  
$$P\in\mathcal{C}\qquad Q\in\mathcal{C}\qquad OP\perp OQ\qquad O\in\mathcal{C}$$

第一部份 選擇題。

[illegible]



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

$$-1\qquad a=7$$

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

$$-1\qquad a=13$$

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

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

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

$$l\qquad \mathcal{C}\qquad P(\quad_1,\quad_1)\qquad Q(\quad_2,\quad_2)\qquad l\qquad \mathcal{C}$$

$$3\quad^2-2(\quad_+)^2-6=0\qquad \quad^2-4\quad_-2\quad^2-6=0\qquad \quad_1+\quad_2=4$$

$$\quad_1\quad_2=-2\quad^2-6\qquad OP\perp OQ\qquad \quad_1\quad_2+\quad_1\quad_2=0\qquad l$$

$$(\quad_1+\quad_1)(\quad_2+\quad_2)+\quad_1\quad_2=0\qquad 2\quad_1\quad_2+\quad_1(\quad_1+\quad_2)+\quad^2=0$$

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

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$A = \{ \text{ } : \text{ }^2 - 3 \text{ } - 4 \leq 0 \}$   $B = \{ \text{ } : 3 \text{ } + a \geq 0 \}$   $A \cap B = \{ \text{ } : 2 \leq \text{ } \leq 4 \}$

$a = ( \text{ } )$

$-12 \qquad \qquad \qquad -6 \qquad \qquad \qquad -3 \qquad \qquad \qquad 6 \qquad \qquad \qquad 12$

$f( \text{ } ) = f( \text{ } + 1) + 1$   $f(0) = 16$   $f(15) = ( \text{ } )$

$0 \qquad \qquad \qquad 1 \qquad \qquad \qquad 15 \qquad \qquad \qquad 16 \qquad \qquad \qquad 17$

$4 \text{ } + 5 \text{ } = ( \text{ } + 1) - ( \text{ } - 1)( \text{ } - 1)$   $4$

$( \text{ } )$

$8 \qquad \qquad \qquad 4 \qquad \qquad \qquad 2$

$4 \qquad \qquad \qquad 8$

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

$-182 \qquad \qquad \qquad -178 \qquad \qquad \qquad 176 \qquad \qquad \qquad 178 \qquad \qquad \qquad 184$

$P(2,3)$   $M$

$P \qquad \qquad \qquad M \qquad \qquad \qquad M = ( \text{ } )$

$\text{ }^2 + \text{ }^2 - 13 = 0$   $\text{ }^2 + \text{ }^2 + 4 \text{ } - 6 \text{ } = 0$   $\text{ }^2 + \text{ }^2 + 4 \text{ } + 6 \text{ } = 0$

$\text{ }^2 + \text{ }^2 - 4 \text{ } - 6 \text{ } = 0$   $\text{ }^2 + \text{ }^2 - 4 \text{ } - 6 \text{ } + 13 = 0$

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

$1 \qquad \qquad \qquad -1 \qquad \qquad \qquad 2 \qquad \qquad \qquad -2 \qquad \qquad \qquad 4$

$2 \qquad \qquad \qquad 5 \qquad \qquad \qquad 9 \qquad \qquad \qquad 7$

$10 \qquad \qquad \qquad 288 \qquad \qquad \qquad 20 \qquad \qquad \qquad ( \text{ } )$

$32768 \qquad \qquad \qquad 65536 \qquad \qquad \qquad 131072 \qquad \qquad \qquad 262144 \qquad \qquad \qquad 524288$

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

$4 \qquad \qquad \qquad 5 \qquad \qquad \qquad 15 \qquad \qquad \qquad 0 \qquad \qquad \qquad -1$



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

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

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

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

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

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

$$6$$

$$12$$

$$2$$

$$3$$

$$5$$

$$\begin{array}{ccc} (2,0) & (6,0) & (0,4) \\ ( & ) & ( \quad , \quad ) \end{array}$$

$$\frac{8}{3}$$

$$\frac{16}{3}$$

$$4$$

$$8$$

$$16$$

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

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

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

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

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

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

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

$$\frac{\pi}{6}-\frac{5\pi}{6}$$

$$\frac{\pi}{3}$$

$$\frac{\pi}{6}-\frac{\pi}{3}$$

$$\frac{\pi}{6}-\frac{\pi}{2}$$

$$\frac{\pi}{3}-\frac{\pi}{2}$$

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

$$2$$

$$47$$

$$49$$

$$79$$

$$81$$

$$f(\quad)$$

$$\mathbb{R}$$

$$(-\infty,0)$$

$$(\quad)$$

$$f(2^{-\frac{7}{3}})>f(3^{-\frac{2}{7}})>f(\sqrt[3]{\frac{2}{7}})$$

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

$$\frac{(\alpha+\beta)}{(\alpha+2\beta)}$$

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

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

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

$$\begin{array}{l} a=8\\ a \end{array} \qquad \begin{array}{l} f(\;)\geq 0\\ g(\;)=\;f(\;) \end{array} \qquad \begin{array}{l} -1\\ \end{array} \qquad \begin{array}{l} \\ [-1,1] \end{array}$$

$$\mathcal{C} \qquad \qquad \ell: \quad = \quad + \qquad \mathcal{C} : \frac{\phantom{a}^2}{a^2} - \frac{\phantom{a}^2}{b^2} = 1 \qquad \frac{\sqrt{10}}{\frac{2}{\tilde{P}}} \qquad \begin{array}{l} A(2\sqrt{2},3) \\ OP \perp OQ \end{array} \qquad \begin{array}{l} Q \\ Q \end{array}$$

$$\mathcal{C}$$

[illegible]

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$$X$$

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

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

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

$$f(\hspace{0.05cm})\hspace{0.5cm}[-1,1]\hspace{0.5cm}f(\hspace{0.05cm})=a-(3-\hspace{0.05cm})-(7-\hspace{0.05cm})=2\hspace{0.1cm}+(a-10)$$

$$g(\hspace{0.05cm})=\hspace{0.1cm}f(\hspace{0.05cm})=2\hspace{0.1cm}^2+(a-10)\hspace{10cm}g(\hspace{0.05cm})\hspace{0.1cm}_0=-\frac{a-10}{4}$$

$$-\frac{a-10}{4}\in[-1,1]\hspace{0.5cm}a\in[6,14]\hspace{10cm}g(\hspace{0.05cm})\hspace{0.1cm}-\frac{(a-10)^2}{8}=-1$$

$$a=10\pm2\sqrt{2}$$

$$-\frac{a-10}{4}\geq1\hspace{0.5cm}a\leq6\hspace{0.5cm}g(\hspace{0.05cm})\hspace{10cm}=1\hspace{0.5cm}2+(a-10)=$$

$$a-8=-1\hspace{0.5cm}a=7$$

$$-\frac{a-10}{4}\leq-1\hspace{0.5cm}a\geq14\hspace{0.5cm}g(\hspace{0.05cm})\hspace{10cm}=-1$$

$$2-(a-10)=-1\hspace{0.5cm}a=13$$

$$a=10\pm2\sqrt{2}$$

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

$$a^2=2\hspace{0.5cm}b^2=3\hspace{10cm}\frac{x^2}{2}-\frac{y^2}{3}=1.$$

$$\hspace{10cm}l\hspace{0.5cm}\mathcal{C}\hspace{0.5cm}P(\hspace{0.05cm}_1,\hspace{0.05cm}_1)\hspace{0.5cm}Q(\hspace{0.05cm}_2,\hspace{0.05cm}_2)$$

$$\hspace{10cm}l\hspace{0.5cm}\mathcal{C}\hspace{0.5cm}3\hspace{0.1cm}^2-2(\hspace{0.05cm}+\hspace{0.05cm})^2-6=0,$$

$$\hspace{0.1cm}^2-4\hspace{0.5cm}-2\hspace{0.1cm}^2-6=0\hspace{10cm}_1+\hspace{0.05cm}_2=4\hspace{0.5cm}_1\hspace{0.05cm}_2=-2\hspace{0.1cm}^2-6$$

$$OP\perp OQ\hspace{0.5cm}_1\hspace{0.05cm}_2+\hspace{0.05cm}_1\hspace{0.05cm}_2=0\hspace{10cm}l$$

$$(\hspace{0.05cm}_1+\hspace{0.05cm})(\hspace{0.05cm}_2+\hspace{0.05cm})+\hspace{0.05cm}_1\hspace{0.05cm}_2=0.\hspace{10cm}2\hspace{0.05cm}_1\hspace{0.05cm}_2+\hspace{0.1cm}(\hspace{0.05cm}_1+\hspace{0.05cm}_2)+\hspace{0.1cm}^2=0.$$

$$2(-2\hspace{0.1cm}^2-6)+4\hspace{0.1cm}^2+\hspace{0.1cm}^2=0,\hspace{10cm}\hspace{0.1cm}^2=12\hspace{0.5cm}=\pm2\sqrt{3}$$