

## 106 學年度四技二專第一次聯合模擬考試 共同科目 數學(B)卷 詳解

數學(B)卷

106-1-B

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
B	D	C	D	C	A	B	C	C	B	A	C	D	B	D	B	D	D	B	C	A	A	B	A	A

1.  $\because A(a, a+b) \in \Pi$

$$\therefore \begin{cases} a < 0 \\ a+b > 0 \end{cases} \Rightarrow \begin{cases} a < 0 \\ b > 0 \end{cases} \Rightarrow \begin{cases} ab < 0 \\ b-a > 0 \end{cases}$$

$\Rightarrow B(ab, b-a) = (-, +) \in \Pi$

2. 重心  $G(\frac{-2+5+0}{3}, \frac{(-1)+(-2)+3}{3}) = (1, 0)$

$$\overline{AG} = \sqrt{(-2-1)^2 + (-1-0)^2} = \sqrt{10}$$

3.  $r = 15, \theta = 120^\circ = \frac{2\pi}{3}, A = \frac{1}{2} \times 15 \times 15 \times \frac{2\pi}{3} = 75\pi$

4.  $\because P(\tan \theta, \sec \theta) \in \Pi$

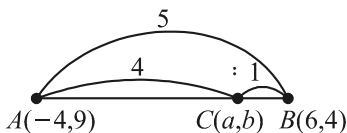
$$\therefore \begin{cases} \tan \theta < 0 \Rightarrow \theta \in \Pi, IV \\ \sec \theta > 0 \Rightarrow \theta \in I, IV \end{cases} \Rightarrow \theta \in IV$$

5. 週期  $= \frac{\pi}{\frac{1}{2}} = 2\pi$

6.  $\overline{AB} = (-5, 3), \overline{AC} = (k-2, 6)$

$$\because \overline{AB} \parallel \overline{AC}, \therefore \frac{-5}{k-2} = \frac{3}{6} \Rightarrow k = -8$$

7.  $\because \overline{AB} = 5\overline{BC} \Rightarrow \overline{AB} : \overline{BC} = 5 : 1 \Rightarrow \overline{AC} : \overline{BC} = 4 : 1$



$$\therefore a = \frac{4 \times 6 + 1 \times (-4)}{4+1} = 4, b = \frac{4 \times 4 + 1 \times 9}{4+1} = 5$$

$\Rightarrow a-b = -1$

8.  $\because P$  在  $y$  軸上

$\therefore$  設  $P(0, b) \Rightarrow a = 0$

又  $A, P, B$  三點共線

$\therefore m_{AP} = m_{AB}$

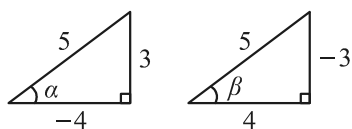
$$\Rightarrow \frac{-9-b}{-4-0} = \frac{-9-3}{-4-2} \Rightarrow b = -1$$

$\therefore a-b = 0 - (-1) = 1$

9. 原式  $= \sin 330^\circ - \cot 135^\circ + \sec 120^\circ$

$$= -\sin 30^\circ + \cot 45^\circ - \sec 60^\circ = -\frac{1}{2} + 1 - 2 = -\frac{3}{2}$$

10.



$$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$$

$$= \frac{-4}{5} \times \frac{4}{5} - \frac{3}{5} \times \frac{-3}{5} = -\frac{7}{25}$$

11. 原式  $\Rightarrow \frac{2 \sin \theta \cos \theta}{\sin \theta} = \frac{1}{2} \Rightarrow \cos \theta = \frac{1}{4}$

$$\cos 2\theta = 2 \cos^2 \theta - 1 = 2 \times \left(\frac{1}{4}\right)^2 - 1 = -\frac{7}{8}$$

12.  $s = \frac{1}{2}(5+7+8) = 10$

$$\Delta = \sqrt{10 \times 5 \times 3 \times 2} = 10\sqrt{3}$$

$$\Delta = rs \Rightarrow 10\sqrt{3} = 10r$$

$\Rightarrow r = \sqrt{3} \Rightarrow$  內切圓面積  $= (\sqrt{3})^2 \pi = 3\pi$

13.  $\angle B = 180^\circ - 60^\circ - 75^\circ = 45^\circ$

$$\frac{a}{\sin 60^\circ} = \frac{b}{\sin 45^\circ} \Rightarrow \frac{a}{b} = \frac{\sin 60^\circ}{\sin 45^\circ} = \frac{\sqrt{6}}{2}$$

14.  $\overline{BC} = \overline{AC} - \overline{AB} = (2, 4)$

$$|\overline{AB}| = \sqrt{(-5)^2 + 0^2} = 5$$

$$|\overline{AC}| = \sqrt{(-3)^2 + 4^2} = 5$$

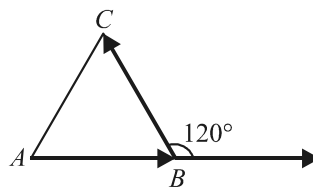
$$|\overline{BC}| = \sqrt{2^2 + 4^2} = 2\sqrt{5}$$

$\therefore \Delta ABC$  周長  $= 5 + 5 + 2\sqrt{5} = 10 + 2\sqrt{5}$

15.  $\overline{AB} = (-4, -3) \Rightarrow |\overline{AB}| = \sqrt{(-4)^2 + (-3)^2} = 5$

$$\vec{v} = -10 \times \frac{(-4, -3)}{5} = (8, 6)$$

16. 如下圖所示



$$\overline{AB} \cdot \overline{BC} = |\overline{AB}| |\overline{BC}| \cos 120^\circ = 2 \times 2 \times \left(-\frac{1}{2}\right) = -2$$

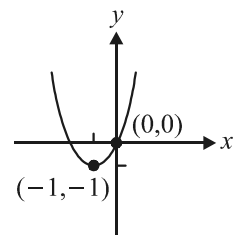
17.  $f(x) = (x^2 + 2x + 1) - 1$

$$= (x+1)^2 - 1$$

頂點  $(-1, -1)$ ，開口向上

又  $f(0) = 0 \Rightarrow$  通過  $(0, 0)$

故  $f(x)$  圖形不通過第四象限



18.  $a = \sin 1130^\circ = \sin 50^\circ < 1$

$$b = \cos(-430^\circ) = \cos 70^\circ = \sin 20^\circ < 1$$

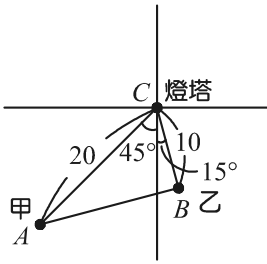
$$c = \tan 415^\circ = \tan 55^\circ > \tan 45^\circ = 1$$

$\therefore c > a > b$

19. 如下圖所示

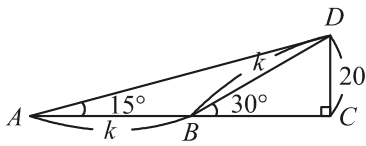
$$\overline{AB}^2 = 20^2 + 10^2 - 2 \times 20 \times 10 \times \cos 60^\circ = 300$$

$$\therefore \overline{AB} = 10\sqrt{3}$$



20. 在  $\triangle ABD$  中,  $\angle ADB = 15^\circ = \angle DAB \Rightarrow \overline{BD} = \overline{AB} = k$

在  $\triangle BCD$  中,  $\sin 30^\circ = \frac{20}{k} = \frac{1}{2} \Rightarrow k = 40$



21.  $\vec{a} \cdot \vec{b} = |\vec{a}| |\vec{b}| \cos 120^\circ = 2 \times 1 \times (-\frac{1}{2}) = -1$

$$|\vec{a} + 2\vec{b}|^2 = |\vec{a}|^2 + 4\vec{a} \cdot \vec{b} + 4|\vec{b}|^2 = 4 - 4 + 4 = 4$$

$$\Rightarrow |\vec{a} + 2\vec{b}| = \sqrt{4} = 2$$

22. 設  $L: \frac{x}{a} + \frac{y}{4-a} = 1$

過  $(3, 0)$  代入:  $\frac{3}{a} = 1 \Rightarrow a = 3$

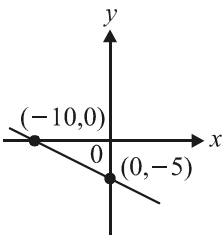
$$\therefore L: \frac{x}{3} + \frac{y}{1} = 1 \Rightarrow x + 3y - 3 = 0$$

$$\therefore a = 1, c = -3 \Rightarrow a + c = -2$$

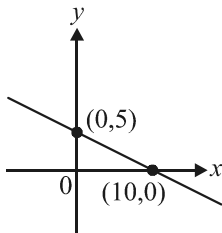
23. 設  $L: x + 2y + k = 0$

$$d = \frac{|k|}{\sqrt{1^2 + 2^2}} = 2\sqrt{5} \Rightarrow |k| = 10 \Rightarrow k = \pm 10$$

①  $k = 10$  時,  $L: x + 2y + 10 = 0$  (不合)



②  $k = -10$  時,  $L: x + 2y - 10 = 0$  (合)



$$\Rightarrow b = 2, c = -10 \Rightarrow b + c = -8$$

24.  $(\sin \theta - \cos \theta)^2 = (\frac{1}{2})^2 \Rightarrow 1 - 2 \sin \theta \cos \theta = \frac{1}{4}$

$$\Rightarrow \sin \theta \cos \theta = \frac{3}{8}$$

$$(\sin \theta + \cos \theta)^2 = 1 + 2 \sin \theta \cos \theta = \frac{7}{4}$$

$$\Rightarrow \sin \theta + \cos \theta = \pm \frac{\sqrt{7}}{2}$$

$\because \theta \in \text{III}, \therefore \sin \theta < 0, \cos \theta < 0$

$$\Rightarrow \sin \theta + \cos \theta = -\frac{\sqrt{7}}{2}$$

25.  $|2\vec{a} - \vec{b}|^2 = |\vec{c}|^2 \Rightarrow 4|\vec{a}|^2 - 4\vec{a} \cdot \vec{b} + |\vec{b}|^2 = |\vec{c}|^2$

$$\Rightarrow 12 - 4\vec{a} \cdot \vec{b} + 1 = 7 \Rightarrow \vec{a} \cdot \vec{b} = \frac{3}{2}$$

$$\Rightarrow \cos \theta = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| |\vec{b}|} = \frac{\frac{3}{2}}{\sqrt{3} \times 1} = \frac{\sqrt{3}}{2} \Rightarrow \theta = \frac{\pi}{6}$$