

+1 MATHEMATICS ANSWER KEY

1, (a) $A = \{0, 1, 2, 3\}$

(b) $A \cup B = \{0, 1, 2, 3, 4, 5\}$, $A \cap B = \{2, 3\}$

2, (a) $x + 1 = 3$ $y - 2 = 1$

$x = 2$ $y = 3$

(b) $A \times B = \{(1, 5), (1, 6), (1, 7), (2, 5), (2, 6), (2, 7)\}$

$B \times A = \{(5, 1), (5, 2), (6, 1), (6, 2), (7, 1), (7, 2)\}$

3, (a) 2^8

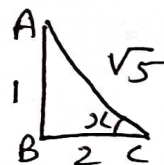
(b) $[f+g](x) = f(x) + g(x) = x^2 + x + 2$

$[fg](x) = f(x) \cdot g(x) = x^2(x+2) = x^3 + 2x^2$

4, (a) $\sin 420^\circ = \sin(360 + 60) = \sin 60^\circ = \frac{\sqrt{3}}{2}$

(b) $AC = \sqrt{1^2 + 2^2} = \sqrt{5}$

$\sin x = -\frac{1}{\sqrt{5}}$, $\cos x = -\frac{2}{\sqrt{5}}$



5, (a) $i^9 = i^8 \times i = i$, $i^{19} = i^{16} \times i^3 = -i$

$i^9 + i^{19} = i - i = 0$

(b) $z_1 + z_2 = 3 + 4i + 7 + 6i = 10 + 10i$

6, Let x be the marks in the third examination

$$\frac{62 + 48 + x}{3} \geq 60$$

$$110 + x \geq 180$$

$$x \geq 70$$

7, (a) $n = 5$, (b) $2!C_2 = 210$

$$\begin{aligned} 8, (2x+3)^5 &= {}^5C_0(2x)^5 + {}^5C_1(2x)^4 \times 3 + {}^5C_2(2x)^3 \times 3^2 + {}^5C_3(2x)^2 \times 3^3 \\ &\quad + {}^5C_4(2x) \times 3^4 + {}^5C_5(3)^5 \\ &= 32x^5 + 240x^4 + 720x^3 + 1080x^2 + 810x + 243 \end{aligned}$$

$$9, (a) A' = \{1, 3, 5, 8\}, B' = \{1, 2, 7, 8\}$$

$$(b) A \cup B = \{2, 3, 4, 5, 6, 7\}$$

$$\text{LHS} = (A \cup B)' = \{1, 8\}$$

$$\text{RHS} = A' \cap B' = \{1, 8\}$$

$$10, (a) A \cap B = \emptyset$$

$$(b) A - B = \{1, 2\}, B - A = \{7, 8\}$$

$$(ii) (A - B) \cup (B - A) = \{1, 2, 7, 8\}$$

$$11, (a) R = \{(1, 2), (2, 3), (3, 4), (4, 5), (5, 6)\}$$

$$(b) R = \{(x, y) : y = x + 1, x \in A, y \in A\}$$

$$(c) \text{domain} = \{1, 2, 3, 4, 5\}$$

$$\text{Range} = \{2, 3, 4, 5, 6\}$$

$$12, (a) \frac{2\pi}{3} \text{ radian} = \frac{2 \times 180}{3} = 120^\circ$$

$$(b) \text{LHS} = \frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \frac{2 \sin 4x \cdot \cos x}{2 \cos 4x \cdot \cos x}$$

$$= \tan 4x$$

$$13, (a) z = 2 + 2i + i - 1 = 1 + 3i$$

$$(b) \bar{z} = 1 - 3i, |z| = \sqrt{1 + 9} = \sqrt{10}$$

$$z^{-1} = \frac{\bar{z}}{|z|^2} = \frac{1 - 3i}{10} = \frac{1}{10} - \frac{3}{10}i$$

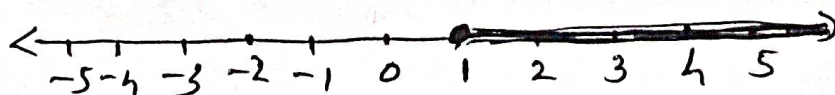
$$14, (a) \frac{3x - 4}{2} \geq \frac{x + 1}{4} - 1$$

$$\text{xing by } 8, 4(3x - 4) \geq 2(x + 1) - 8$$

$$12x - 16 \geq 2x + 2 - 8$$

$$10x \geq 10$$

$$x \geq 1$$



$$15, (a) \frac{1}{8!} + \frac{1}{9!} = \frac{x}{10!}$$

$$\frac{10!}{8!} + \frac{10!}{9!} = \frac{10! x}{10!}$$

$$9 \times 10 + 10 = x \implies x = 100$$

$$(b) \text{ Number of ways} = {}^5C_3 = 10$$

$$16, (a) 10 + 1 = 11$$

$$(b) (a+b)^4 = {}^4C_0 a^4 + {}^4C_1 a^3 b + {}^4C_2 a^2 b^2 + {}^4C_3 a b^3 + {}^4C_4 b^4$$

$$(a+b)^4 = a^4 + 4a^3 b + 6a^2 b^2 + 4a b^3 + b^4$$

$$(a-b)^4 = a^4 - 4a^3 b + 6a^2 b^2 - 4a b^3 + b^4$$

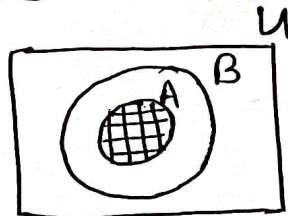
$$(a+b)^4 - (a-b)^4 = 8a^3 b + 8a b^3 = 8ab(a^2 + b^2)$$

$$(\sqrt{3} + \sqrt{2})^4 - (\sqrt{3} - \sqrt{2})^4 = 8\sqrt{2}\sqrt{3}(3+2) = 40\sqrt{6}$$

$$17, (a) (1, 3]$$

$$(b) (i) A \cap B = A$$

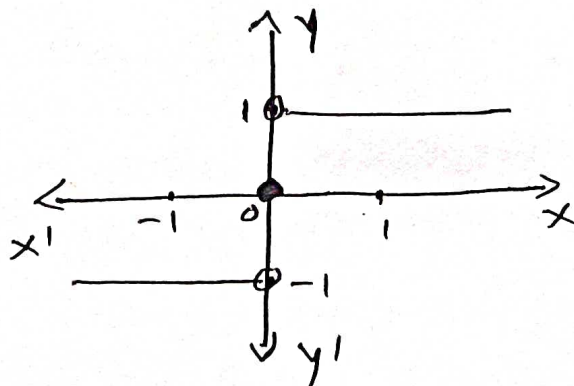
(ii)



$$(c) \emptyset, \{1\}, \{2\}, \{3\}, \{1, 2\}, \{1, 3\}, \{2, 3\}, \{1, 2, 3\}$$

$$18, (a) \text{ domain} = \mathbb{R}, \text{ Range} = \{-1, 0, 1\}$$

(b)



$$(c) f(2) = 1, f(-2) = -1 \implies f(2) + f(-2) = 0$$

$$\begin{aligned}
 19, (a) \sin 75^\circ &= \sin (45+30) \\
 &= \sin 45 \cos 30 + \cos 45 \sin 30 \\
 &= \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \cdot \frac{1}{2} = \frac{\sqrt{3}+1}{2\sqrt{2}}
 \end{aligned}$$

$$\begin{aligned}
 (b) \text{LHS} &= \cos(\pi/4 + x) + \cos(\pi/4 - x) \\
 &= \cos \pi/4 \cos x - \sin \pi/4 \sin x + \cos \pi/4 \cos x + \sin \pi/4 \sin x \\
 &= 2 \cos \pi/4 \cos x = 2 \cdot \frac{1}{\sqrt{2}} \cdot \cos x = \sqrt{2} \cos x = \text{RHS}
 \end{aligned}$$

$$\begin{aligned}
 (c) \text{Let } \tan 3x &= \tan(2x+x) \\
 \tan 3x &= \frac{\tan 2x + \tan x}{1 - \tan 2x \cdot \tan x}
 \end{aligned}$$

$$\tan 3x (1 - \tan 2x \cdot \tan x) = \tan 2x + \tan x$$

$$\tan 3x - \tan 3x \cdot \tan 2x \cdot \tan x = \tan 2x + \tan x$$

$$\tan 3x - \tan 2x - \tan x = \tan 3x \cdot \tan 2x \cdot \tan x$$

$$\begin{aligned}
 20, (a) \text{Number of 3 digits numbers} &= {}^5 P_3 \\
 &= \frac{5!}{2!} = 5+4+3 = 60
 \end{aligned}$$

$$(b) n = 11, P_1 = 2, P_2 = 2, P_3 = 2$$

$$\begin{aligned}
 \text{Total number of arrangements} &= \frac{n!}{P_1! P_2! P_3!} \\
 &= \frac{11!}{2! 2! 2!} = \frac{11!}{8} = 4989600
 \end{aligned}$$

$$\begin{aligned}
 (c) \text{Number of arrangements} &= \frac{8!}{2! 2!} \times \frac{4!}{2!} \\
 \text{in which vowels occur together} &= \\
 &= 120960
 \end{aligned}$$