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Algebra and Probability

نماذج امتحانات

الصف **3** الإعدادى

الفصل الدراسى الثانى ٢٠٢١

Answer the following questions :

1 Choose the correct answer from those given :

- 1 One of the solutions for the two equations : $X - y = 2$, $X^2 + y^2 = 20$ in $\mathbb{R} \times \mathbb{R}$ is
- (a) $(-4, 2)$ (b) $(2, -4)$ (c) $(3, 1)$ (d) $(4, 2)$
- 2 If $A \cap B = \emptyset$, then $P(A - B) = \dots\dots\dots$
- (a) $P(A)$ (b) $P(B)$ (c) $P(B - A)$ (d) 1
- 3 If $X^2 + kX - 21 = (X - 3)(X + 7)$, then $k = \dots\dots\dots$
- (a) -2 (b) 4 (c) 8 (d) 20
- 4 If $\frac{1}{X} + \frac{1}{y} + \frac{1}{Xy} = \frac{k}{Xy}$, then $k = \dots\dots\dots$
- (a) 2 (b) 3 (c) $X + y + 1$ (d) $X + y$
- 5 If $5^{X-3} = 1$, then $2X^2 = \dots\dots\dots$
- (a) 36 (b) 9 (c) 18 (d) 3
- 6 If the width of the rectangle is 3 cm. , and its diagonal length is 5 cm. , then its length is cm.
- (a) 2 (b) $\frac{5}{3}$ (c) 4 (d) $\frac{3}{5}$

2 [a] By using the general formula , find in \mathbb{R} the solution set of the equation : $X(X - 2) = 1$

[b] If $n(X) = \frac{X^3 + X}{X^2 + 1} + \frac{X^2 + 2X + 4}{X^3 - 8}$, find $n(X)$ in the simplest form , showing the domain.

3 [a] If the set of zeroes of the function $f : f(X) = \frac{X^2 - aX + 9}{bX + 4}$ is $\{3\}$ and its domain is $\mathbb{R} - \{2\}$, find the value of each of a and b

[b] If $n(X) = \frac{X^3 - 8}{X^2 - 3X + 2} \div \frac{X^3 + 2X^2 + 4X}{2X^2 + X - 3}$, find $n(X)$ in the simplest form , showing the domain.

4 [a] If $n_1(X) = \frac{X^2 + 5X + 6}{X^2 + X - 2}$ and $n_2(X) = \frac{X^2 - 2X - 15}{X^2 - 6X + 5}$, is $n_1 = n_2$? and why ?

[b] If A and B are two events of the sample space of a random experiment , and

$P(A) = \frac{1}{4}$, $P(B) = \frac{1}{2}$ and $P(A \cup B) = \frac{5}{8}$, find each of the following :

- 1 $P(A \cap B)$ 2 $P(B - A)$ 3 $P(A \cup B)$

5 [a] Find algebraically in $\mathbb{R} \times \mathbb{R}$ the solution set of the following two equations :

$$x - y = 3 \quad , \quad y^2 - xy = 21$$

[b] Find in $\mathbb{R} \times \mathbb{R}$ the solution set of the following two equations algebraically or graphically : $y = x + 4 \quad , \quad x + y = 4$



Answer the following questions :

1 Choose the correct answer from those given :

- 1 In the experiment of tossing a piece of coin once , if A is the event of appearance of a head , B is the event of appearance of a tail , then $P(A \cup B) = \dots\dots\dots$
 (a) $\frac{1}{2}$ (b) 1 (c) zero (d) \emptyset
- 2 The number of solutions of the equation $x - y = 0$ in $\mathbb{R} \times \mathbb{R}$ is $\dots\dots\dots$
 (a) 1 (b) 2 (c) 3 (d) infinite
- 3 The set of zeroes of $f : f(x) = \frac{-3}{x-2}$ is $\dots\dots\dots$
 (a) $\mathbb{R} - \{2\}$ (b) $\mathbb{R} - \{3\}$ (c) $\{2\}$ (d) \emptyset
- 4 If the curve of the quadratic function f passes through the points $(-1, 0)$, $(0, -4)$, $(4, 0)$, then the solution set of the equation $f(x) = 0$ in \mathbb{R} is $\dots\dots\dots$
 (a) $\{-1, 0\}$ (b) $\{-4, 0\}$ (c) $\{-1, 4\}$ (d) $\{4, -4\}$
- 5 If $2^{x+1} = 1$, then $x \in \dots\dots\dots$
 (a) $\{0\}$ (b) $\{0, 1\}$ (c) $\{-1\}$ (d) $\mathbb{R} - \{-1\}$
- 6 If $\sqrt{x^2} = 25$, then $x = \dots\dots\dots$
 (a) 5 (b) ± 5 (c) 25 (d) ± 25

- 2 [a] If A , B are two events in a random experiment and $P(A) = 0.6$, $P(B) = 0.5$, $P(A \cap B) = 0.3$, find : $P(A \cup B)$, $P(\bar{B})$

[b] Simplify to the simplest form , showing the domain :

$$n(x) = \frac{x^3 - 1}{x^2 - 2x + 1} \times \frac{2x - 2}{x^2 + x + 1}$$

- 3 [a] By using the general formula , find in \mathbb{R} the solution set of the equation :

$$3x^2 - 6x = -1 \text{ (approximating the result to the nearest two decimals)}$$

- [b] If the domain of the function n is $\mathbb{R} - \{3\}$ where $n(x) = \frac{x-1}{x^2 - ax + 9}$, find the value of a

- 4 [a] Find the solution set of the following two equations together in $\mathbb{R} \times \mathbb{R}$:

$$y - x = 2 \quad , \quad x^2 + xy - 4 = 0$$

[b] Find $n(x)$ in the simplest form , showing the domain of n :

$$n(x) = \frac{x-3}{x^2 - 7x + 12} - \frac{x-3}{3-x}$$

5 [a] Two acute angles in a right-angled triangle. The difference between their measures is 50° .
Find the measure of each angle.

[b] If $n(x) = \frac{x^2 - 2x}{(x-2)(x^2+2)}$, find :

- 1** $n^{-1}(x)$ in the simplest form, showing the domain of n^{-1}
- 2** The value of x if $n^{-1}(x) = 3$



Answer the following questions :

1 Choose the correct answer from those given :

- 1 If $n(X) = \frac{X^2 - 2X}{(X-2)(X^2+2)}$, then the domain of n^{-1} is
- (a) \mathbb{R} (b) $\mathbb{R} - \{2\}$ (c) $\mathbb{R} - \{0\}$ (d) $\mathbb{R} - \{0, 2\}$
- 2 If A and B are two mutually exclusive events from the sample space S of a random experiment, then $P(A - B) = \dots\dots\dots$
- (a) $P(B)$ (b) $P(A)$ (c) $P(\bar{A})$ (d) $P(\bar{B})$
- 3 In the equation : $aX^2 + bX + c = 0$, if : $b^2 - 4ac > 0$, then the equation has
- (a) 1 (b) 2 (c) zero (d) ∞
- 4 The rule which describes the pattern $(\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \dots)$ where $n \in \mathbb{Z}_+$ is
- (a) $\frac{2}{n+1}$ (b) $n + \frac{1}{2}$ (c) $\frac{n}{n+1}$ (d) $\frac{2n-1}{n+1}$
- 5 If $2^7 \times 3^7 = 6^k$, then $k = \dots\dots\dots$
- (a) 14 (b) 7 (c) 6 (d) 5
- 6 If $3^X = 4$, $4^Y = 12$, then $\frac{Xy}{X+1} = \dots\dots\dots$
- (a) 2 (b) 1 (c) $\frac{1}{2}$ (d) $\frac{3}{4}$

2 [a] If A, B are two events from the sample space of a random experiment and

$$P(A) = 0.7, \quad P(B) = 0.5 \text{ and } P(A \cap B) = 0.3$$

, find : $P(\bar{A})$, $P(A - B)$ and $P(A \cup B)$

- [b] If the set of zeroes of the function f where $f(X) = X^2 - 10X + a$ is $\{5\}$, then find the value of a

3 [a] Find the S.S. in \mathbb{R}^2 of the two equations : $X + y = 2$, $\frac{1}{X} + \frac{1}{y} = 2$

[b] If $n_1(X) = \frac{X^2}{X^3 - X^2}$, $n_2(X) = \frac{X^3 + X^2 + X}{X^4 - X}$,

prove that : $n_1 = n_2$

4 [a] Find $n(X)$ in the simplest form and state the domain if :

$$n(X) = \frac{X^2 - 3X}{2X^2 - X - 6} \div \frac{2X^2 - 3X}{4X^2 - 9}$$

[b] Find graphically in $\mathbb{R} \times \mathbb{R}$ the solution set of the two equations :

$$x + 2y = 8 \quad , \quad 3x + y = 9$$

5 [a] Using the general rule , find the solution set of the following equation in \mathbb{R} :

$$2x^2 - 5x + 1 = 0$$

[b] Find $n(x)$ in the simplest form , showing the domain of n where :

$$n(x) = \frac{x^2 + 2x}{x^2 - 4} - \frac{2x - 6}{x^2 - 5x + 6}$$



إجابات نماذج امتحانات

الصف **3** الإعدادى

الفصل الدراسى الثانى ٢٠٢١

Answers of model 1

1

- 1 d 2 a 3 b
4 c 5 c 6 c

2

[a] $\therefore x(x-2) = 1 \quad \therefore x^2 - 2x - 1 = 0$

$\therefore a = 1, b = -2, c = -1$

$$\therefore x = \frac{2 \pm \sqrt{(-2)^2 - 4 \times 1 \times (-1)}}{2 \times 1}$$

$$= \frac{2 \pm \sqrt{8}}{2} = \frac{2 \pm 2\sqrt{2}}{2} = 1 \pm \sqrt{2}$$

$\therefore x = 1 + \sqrt{2}$ or $x = 1 - \sqrt{2}$

\therefore The S.S. = $\{1 + \sqrt{2}, 1 - \sqrt{2}\}$

[b] $\therefore n(x) = \frac{x(x^2+1)}{x^2+1} + \frac{x^2+2x+4}{(x-2)(x^2+2x+4)}$

\therefore The domain of $n = \mathbb{R} - \{2\}$

$$n(x) = x + \frac{1}{x-2} = \frac{x(x-2)+1}{x-2}$$

$$= \frac{x^2-2x+1}{x-2} = \frac{(x-1)^2}{x-2}$$

3

[a] $\therefore z(f) = \{3\} \quad \therefore$ At $x = 3$

$\therefore x^2 - ax + 9 = 0 \quad \therefore 3^2 - a \times 3 + 9 = 0$

$\therefore 9 - 3a + 9 = 0 \quad \therefore -3a = -18 \quad \therefore a = 6$

\therefore The domain of $f = \mathbb{R} - \{2\}$

\therefore At $x = 2 \quad \therefore b \times 4 = 0$

$\therefore 2b + 4 = 0 \quad \therefore 2b = -4 \quad \therefore b = -2$

[b] $\therefore n(x) = \frac{(x-2)(x^2+2x+4)}{(x-2)(x-1)} \div \frac{x(x^2+2x+4)}{(2x+3)(x-1)}$

\therefore The domain of $n = \mathbb{R} - \{2, 1, 0, -\frac{3}{2}\}$

$$n(x) = \frac{x^2+2x+4}{x-1} \times \frac{(2x+3)(x-1)}{x(x^2+2x+4)} = \frac{2x+3}{x}$$

4

[a] $\therefore n_1 = \frac{(x+3)(x+2)}{(x+2)(x-1)}$

\therefore The domain of $n_1 = \mathbb{R} - \{-2, 1\}$

$$\left. \begin{aligned} \therefore n_1(x) &= \frac{x+3}{x-1} \end{aligned} \right\} (1)$$

$\therefore \therefore n_2(x) = \frac{(x-5)(x+3)}{(x-5)(x-1)}$

\therefore The domain of $n_2 = \mathbb{R} - \{5, 1\}$

$$\left. \begin{aligned} \therefore n_2(x) &= \frac{x+3}{x-1} \end{aligned} \right\} (2)$$

From (1) and (2) $\therefore n_1 \neq n_2$

because the domain of $n_1 \neq$ the domain of n_2

[b] 1 $\therefore P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$\therefore P(A \cap B) = P(A) + P(B) - P(A \cup B)$

$$= \frac{1}{4} + \frac{1}{2} - \frac{5}{8} = \frac{1}{8}$$

2 $P(B - A) = P(B) - P(A \cap B) = \frac{1}{2} - \frac{1}{8} = \frac{3}{8}$

3 $P(A \cup B) = 1 - P(A \cap B) = 1 - \frac{1}{8} = \frac{7}{8}$

5

[a] $\therefore x - y = 3 \quad \therefore x = y + 3$ (1)

$\therefore y^2 - xy = 21$ (2)

substituting from (1) in (2):

$\therefore y^2 - (y+3)y = 21 \quad \therefore y^2 - y^2 - 3y = 21$

$\therefore -3y = 21 \quad \therefore y = -7$

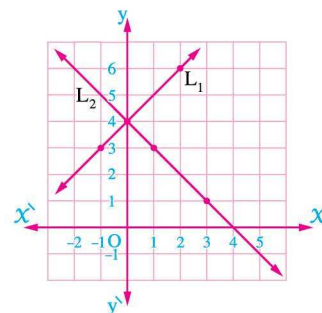
substituting in (1) $\therefore x = -4$

\therefore The S.S. = $\{-4, -7\}$

[b] $y = x + 4 \quad , \quad x = 4 - y$

x	-1	0	2
y	3	4	6

x	3	1	0
y	1	3	4



From the graph \therefore The S.S. = $\{(0, 4)\}$

Answers of model 2

1

- 1 b 2 d 3 d
4 c 5 c 6 d

Substituting in (1) from (2) : $\therefore 2 = 2xy$

$$\therefore xy = 1 \qquad \therefore x = \frac{1}{y}$$

Substituting in (1) : $\therefore \frac{1}{y} + y = 2$

Multiplying by y : $\therefore 1 + y^2 = 2y$

$$\therefore y^2 - 2y + 1 = 0 \qquad \therefore (y - 1)^2 = 0$$

$$\therefore y = 1$$

Substituting in (1) : $\therefore x = 1$

$$\therefore \text{The S.S.} = \{(1, 1)\}$$

[b] $\therefore n_1(x) = \frac{x^2}{x^2(x-1)}$

$$\therefore \text{The domain of } n_1 = \mathbb{R} - \{0, 1\} \quad \left. \vphantom{\frac{x^2}{x^2(x-1)}} \right\} (1)$$

$$\therefore n_1(x) = \frac{1}{x-1}$$

$$\begin{aligned} \therefore n_2(x) &= \frac{x(x^2 + x + 1)}{x(x^3 - 1)} \\ &= \frac{x(x^2 + x + 1)}{x(x-1)(x^2 + x + 1)} \end{aligned}$$

$$\therefore \text{The domain of } n_2 = \mathbb{R} - \{0, 1\} \quad \left. \vphantom{\frac{x(x^2 + x + 1)}{x(x-1)(x^2 + x + 1)}} \right\} (2)$$

From (1) and (2) : $\therefore n_1 = n_2$

4

[a] $\therefore n(x) = \frac{x(x-3)}{(2x+3)(x-2)} \div \frac{x(2x-3)}{(2x-3)(2x+3)}$

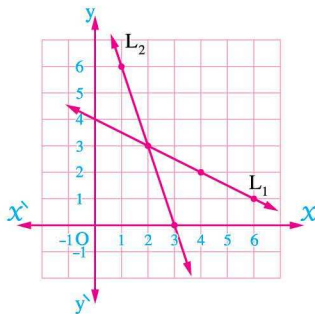
$$\therefore \text{The domain of } n = \mathbb{R} - \left\{-\frac{3}{2}, 2, 0, \frac{3}{2}\right\}$$

$$\begin{aligned} \therefore n(x) &= \frac{x(x-3)}{(2x+3)(x-2)} \times \frac{(2x-3)(2x+3)}{x(2x-3)} \\ &= \frac{x-3}{x-2} \end{aligned}$$

[b] $x = 8 - 2y \qquad , \qquad y = 9 - 3x$

x	6	4	2
y	1	2	3

x	1	2	3
y	6	3	0



From the graph : $\therefore \text{The S.S.} = \{(2, 3)\}$

5

[a] $\therefore 2x^2 - 5x + 1 = 0$

$$\therefore a = 2, b = -5, c = 1$$

$$\therefore x = \frac{5 \pm \sqrt{(-5)^2 - 4 \times 2 \times 1}}{2 \times 2} = \frac{5 \pm \sqrt{17}}{4}$$

$$\therefore \text{The S.S.} = \left\{ \frac{5 + \sqrt{17}}{4}, \frac{5 - \sqrt{17}}{4} \right\}$$

[b] $\therefore n(x) = \frac{x(x+2)}{(x+2)(x-2)} - \frac{2(x-3)}{(x-2)(x-3)}$

$$\therefore \text{The domain of } n = \mathbb{R} - \{-2, 2, 3\}$$

$$\therefore n(x) = \frac{x}{x-2} - \frac{2}{x-2} = \frac{x-2}{x-2} = 1$$