

QCM 2

Maths

Sujet proposé par *Dara SE*

Q1 : Mr. and Mrs. Brown have two children, boy or girl. The probabilities that they have a son or a daughter are equal. Find probability that Mr. and Mrs. Brown have two sons, knowing that one of them is a boy.

- a. $1/4$
- b. $1/2$
- c. $1/3$
- d. a, b, and c are not the answer

Q2 Tom and his 3 friends, who were born in the same month of October, have a small birthday party in his house. Find probability that at last two of them we were born in the same day.

- a. 0.016
- b. 0.5
- c. 0.002
- d. a, b, and c are not the answer

Q3 Let $R_\theta = \begin{pmatrix} \cos(\theta) & -\sin(\theta) \\ \sin(\theta) & \cos(\theta) \end{pmatrix}$ be a rotation matrix that belongs to $\mathcal{M}_2(\mathbb{R})$. Suppose $\theta \in \mathbb{R} \setminus \pi\mathbb{Z}$,

- a. $Sp(R_\theta) = \{-1, 1\}$
- b. $Sp(R_\theta) = \emptyset$
- c. $Sp(R_\theta) = \{1\}$
- d. $Sp(R_\theta) = \mathbb{R}$

Q4 : Let f be a polynomial of degree 2 with integer coefficients. Suppose that $f(k)$ is divisible by 5 for every integer k .

- a. All coefficients of f are divisible by 5
- b. At last one of coefficients of f are not divisible by 5
- c. f has real roots divisible by 5
- d. a, b and c are not true

Q5 : Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a continuous function. Suppose that for any $c > 0$, the graph of f can be moved to the graph of cf using only a translation or a rotation. This implies that:

- a. $f(x) = ax + b$ for some real numbers a and b .
- b. f is not an affine function.
- c. f is a constant function.
- d. a, b and c are not true.

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Q6 : Calculate $I = \lim_{n \rightarrow +\infty} \frac{1}{n} \sqrt{\frac{(2n)!}{n!}}$

- a. $4/e$
- b. e
- c. 0
- d. $+\infty$

Q7 : Let $f : [0, 1] \rightarrow \mathbb{R}$, $x \mapsto f(x) = \begin{cases} xE\left(\frac{1}{x}\right) & \text{if } x \neq 0 \\ 1 & \text{if } x = 0 \end{cases}$

- a. $\forall x \in [0, 1], f(f(x)) = f(x) + 1$
- b. $\forall x \in [0, 1], f(f(x)) = f(x)$
- c. $\forall x \in [0, 1], f(f(x+1)) = f(x)$
- d. a, b and c are not true

Q8 : Determine, $n \in \mathbb{N}^* \lim_{n \rightarrow +\infty} \int_0^1 \sqrt{1-x^n} dx$

- a. $+\infty$
- b. 1
- c. 0
- d. a, b and c are not answers

Q9 : Let M be a $n \times n$ matrix, $M = \begin{pmatrix} 2 & -1 & 0 & \cdots & 0 & -1 \\ -1 & 2 & -1 & \cdots & 0 & 0 \\ 0 & -1 & 2 & \cdots & 0 & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & 0 & \cdots & 2 & -1 \\ -1 & 0 & 0 & \cdots & -1 & 2 \end{pmatrix}$

- a. M is an inverse matrix
- b. M is not an inverse matrix
- c. M is a nilpotent matrix
- d. a, b and c are not true.

Q10 : Let E, F and G be three vector space in \mathbb{K} , $f \in \mathcal{L}(E, F)$ and $g \in \mathcal{L}(F, G)$. Which of the following propositions is not true?

- a. $\text{Ker}(g \circ f) = f^{-1}(\text{Ker}(g))$
- b. $\text{Ker}(g \circ f) \supset \text{Ker}(f)$
- c. $\text{Im}(g \circ f) = g(\text{Im}(f))$
- d. $\text{Im}(g \circ f) \supset \text{Im}(g)$