# ALGO
# MCQ

1. **In a 2.3.4 tree, a k-Node does have ?**
   - (a) k-1 children
   - ✓ (b) k-1 elements
   - ✓ (c) k children
   - (d) k elements

2. **In a 2.3.4 tree, the minimum value is ?**
   - (a) the first key of the root of the tree
   - (b) the last key of the right-most leaf of the tree
   - ✓ (c) the first key of the left-most leaf of the tree
   - (d) the last key of the left-most leaf of the tree
   - (e) the first key of the right-most leaf of the tree

3. **A 2.3.4 tree is ?**
   - ✓ (a) a search tree
   - (b) a binary search tree
   - (c) an A-V.L.

4. **A left-left rotation is a _____ rotation?**
   - (a) single
   - (b) double
   - (c) triple
   - ✓ (d) that does not exist

5. **When using the insertion of an element in an A-V.L. tree, the resulting tree is systematically unbalanced?**
   - (a) Yes
   - ✓ (b) No
   - (c) It depends

6. **The complexity of the positive search, for an element in a BST, ending on a node v is?**
   - ✓ (a) 2*depth(v)+1
   - (b) 2*depth(v)+2
   - (c) depth(v)+1
   - (d) depth(v)+2
   - (e) None of the four previous answers

7. **The properties of a 2.3.4 tree are ?**

   (a) a B-tree of order 4

✓ (b) all its leaves are at the same depth

   (c) the keys are in descreasing order in the same node

✓ (d) for each key x, the keys of the right subtree are strictly greater than x

   (e) for each key x, the keys of the left subtree are strictly less than x

8. **A binary search tree T=<r,L,R> H-balanced is a tree ?**

✓ (a) labeled

✓ (b) fitted with an order relation

✓ (c) such that at any node $h(G) - h(D) \in [-1, 1]$

9. **the transformation of the tree $< a, \emptyset, < b, \emptyset, \emptyset >>$ to the tree $< b, < a, \emptyset, \emptyset >, \emptyset >$, where the letters are the nodes and $\emptyset = arbrevide$, is done using ?**

✓ (a) a left rotation

   (b) a right rotation

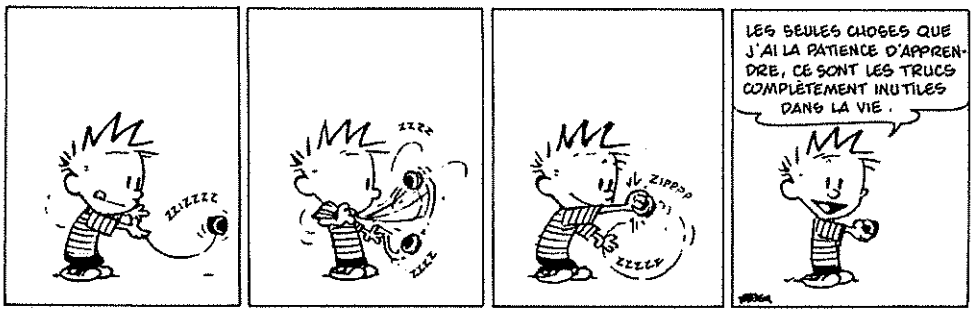
   (c) a left-right rotation

   (d) a right-left rotation

10. **A balanced search tree is always binary?**

   (a) true

✓ (b) false



# MCQ 8

Monday, 20 May

## Question 11

Let $A = \begin{pmatrix} 1 & -1 \\ -3 & 2 \end{pmatrix}$, $B = \begin{pmatrix} -4 & -1 \\ 0 & -3 \end{pmatrix}$ and $C = \begin{pmatrix} 1 & -1 & 0 \\ -3 & -2 & 5 \end{pmatrix}$.

√ a. $A+B$ exists and its value is $A+B = \begin{pmatrix} -3 & -2 \\ -3 & -1 \end{pmatrix}$

b. $A+C$ exists and its value is $A+C = \begin{pmatrix} 2 & -2 & 0 \\ -6 & 0 & 5 \end{pmatrix}$

√ c. $A+B$ and $B+A$ both exist and $A+B = B+A$

d. $A+C$ and $C+A$ both exist and $A+C = C+A$

e. None of the others

## Question 12

Let $A = \begin{pmatrix} 1 & -1 \\ -3 & 2 \end{pmatrix}$, $B = \begin{pmatrix} -4 & -1 \\ 0 & -3 \end{pmatrix}$ and $C = \begin{pmatrix} 1 & -1 & 0 \\ -3 & -2 & 5 \end{pmatrix}$.

√ a. $A \times B$ exists and its value is $A \times B = \begin{pmatrix} -4 & 2 \\ 12 & -3 \end{pmatrix}$

√ b. $A \times C$ exists

c. $A \times B$ and $B \times A$ both exist and $A \times B = B \times A$

d. $A \times C$ and $C \times A$ both exist and $A \times C = C \times A$

e. None of the others

## Question 13

Consider a matrix $A \in \mathscr{M}_3(\mathbb{R})$ and let $I_3$ denote the identity matrix in $\mathscr{M}_3(\mathbb{R})$. Then:

a. $I_3 = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$

b. $A \times I_3 = I_3$

√ c. $A \times I_3 = A$

d. None of the others

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## Question 14

Let $(A, B, C) \in \left(\mathscr{M}_3(\mathbb{R})\right)^3$. Which of these properties is(are) true:

a. $(AB)C = A(BC)$

b. $(A+B)^2 = A^2 + B^2$

c. $A \times (2C) = 2(A \times C)$

d. $A \times B = 0 \implies A = 0$ or $B = 0$, where 0 denotes the zero matrix of $\mathscr{M}_3(\mathbb{R})$.

e. None of the others

## Question 15

Let $f$ be an endomorphism of $\mathbb{R}^3$ whose matrix in the standard basis of $\mathbb{R}^3$ as input and output basis is

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$$

Then we know that:

a. $f((0,1,0)) = (4,5,6)$

b. $f((0,1,0)) = (2,5,8)$

c. We cannot know the value of $f((0,1,0))$

## Question 16

Consider the linear map $f : \begin{cases} \mathbb{R}^3 & \longrightarrow & \mathbb{R}^2 \\ (x,y,z) & \longmapsto & (x+2z, -4y-z) \end{cases}$.

The matrix of $f$ in the standard basis $\mathscr{B}$ of $\mathbb{R}^3$ as input and the standard basis $\mathscr{B}'$ of $\mathbb{R}^2$ as output basis is:

a. $\mathrm{Mat}_{\mathscr{B},\mathscr{B}'}(f) = \begin{pmatrix} 1 & 0 \\ 0 & -4 \\ 2 & -1 \end{pmatrix}$

b. $\mathrm{Mat}_{\mathscr{B},\mathscr{B}'}(f) = \begin{pmatrix} 1 & 0 & 2 \\ 0 & -4 & -1 \end{pmatrix}$

c. None of these matrices

## Question 17

Let $A \in \mathscr{M}_3(\mathbb{R})$. The sense of the property "$A$ is invertible" is:

a. $\exists B \in \mathscr{M}_3(\mathbb{R})$ such that $AB = BA = A$

b. $\exists B \in \mathscr{M}_3(\mathbb{R})$ such that $AB = BA = I_3$ where $I_3$ denotes the identity matrix of $\mathscr{M}_3(\mathbb{R})$

c. $\exists B \in \mathscr{M}_3(\mathbb{R})$ such that $A + B = B + A = I_3$ where $I_3$ denotes the identity matrix of $\mathscr{M}_3(\mathbb{R})$

d. None of the others

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## Question 18

The inverse matrix of $A = \begin{pmatrix} 1 & 2 \\ 1 & 3 \end{pmatrix}$ is $A^{-1} = \begin{pmatrix} 3 & -1 \\ -2 & 1 \end{pmatrix}$

√ a. True

b. False

## Question 19

Consider a matrix $A = (a_{i,j}) \in \mathscr{M}_{n,p}(\mathbb{R})$ where $n$ and $p$ are two non-zero natural numbers. Then:

a. The coefficient $a_{1,2}$ is at the first row and second column of $A$

√ b. The coefficient $a_{1,2}$ is at the second row and first column of $A$

## Question 20

Last question of the year :) There is no trap in the question!

Find the last coefficient of the matrix $A$ below. Note the the coefficients satisfy logical connections:

$$A = \begin{pmatrix} 0 & 2 & 4 \\ 6 & 8 & 10 \\ 12 & 14 & ? \end{pmatrix}$$

a. 16

√ b. 18

c. 20

d. None of the others

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# ADP MCQ B4

## 20/5/24

Grammar

Fill in the blanks with the correct answer:

21. As soon as Betty _____ the ripe apples form her tree, she ____ them for an apple pie.

A) will pick / uses

B) will have picked / will have been using

✓ C) picks / is going to use

D) will pick / will use

22. Mona ____ on the accounts all day by the time she _____ home.

A) works / goes

B) will work / is going to go

✓ C) will have been working / goes

D) will have been working / will have been going

23. After Michel ____ the train to Los Angeles, he _____ writing his report on his laptop.

✓ A) catches / is going to finish

B) is going to catch / is going to finish

C) will have caught / will finish

D) catches / finishes

24. Robert _____ into his own apartment when he ____ a job.

A) will have moved / will find

✓ B) is going to move / finds

C) moves / will find

D) will move / will find

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25. I ____ all my files before I _____ my computer.

A) will have saved / will shut down

B) will be saving / will shut down

C) will have been saving / shut down

✓ D) will save / shut down

26. He's never going to stop talking. In 15 more minutes, we _____ to him lecture for three solid hours.

✓ A) will have been listening

B) will listen

C) will be listening

D) will have listened

27. Can you believe it? According to our grammar teacher, by the end of this semester, she _____ more than 3,000 students from 42 different countries!

A) will teach

B) will be teaching

C) will have been teaching

✓ D) will have taught

28. This is the longest flight I have ever taken. By the time we get to New Zealand, we ____ for 13 hours. I'm going to be exhausted.

✓ A) will have been flying

B) will have flown

C) will fly

D) will be flying

29. By 10:00 yesterday, she had called three new clients. Tomorrow, by 10:00, she ____ three new clients.

A) will call

✓ B) will have called

C) will be calling

D) is going to call

30. She went to lunch at noon and had a sandwich and a bowl of soup. Tomorrow she _____ at noon and _____ a sandwich and a bowl of soup.

A) will be going / will be having

✓ B) will go / will have

C) will have gone / will have

D) will go / will have had