# ALGO
# MCQ

1. **When we use the insertion at the leaf, the resulting binary search tree is not systematically balanced ?**

   √ (a) true
   (b) false

2. **A tree is "balanced" if the left subtree and the right subtree have the same number of elements ?**

   (a) true
   √ (b) false

3. **When using the insertion at the root, the resulting binary search tree is systematically balanced ?**

   (a) true
   √ (b) false

4. **When using deletion, the resulting binary search tree is systematically balanced ?**

   (a) true
   √ (b) false

5. **The complexity of the insertion at the leaf, for an element in a BST, ending after 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

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 depth of a BST can be ?**

   (a) a quadratic funtion of its size
   √ (b) a logarithmic funtion of its size
   √ (c) a linear funtion of its size
   (d) a exponential funtion of its size

8. **The non-degenerate binary tree $B$ whose postorder traversal is $(6, 8, 10, 12, 14, 18, 30, 32, 35, 37, 42, 45, 47)$ is a BST.**

   √ (a) Faux
   (b) Vrai

Consider the binary search tree *B2*:

$$< 14, < 10, < 6, \emptyset, \emptyset >, < 11, \emptyset, \emptyset >>, < 35, < 30, < 16, \emptyset, \emptyset >, < 33, \emptyset, \emptyset >>, \emptyset >>$$

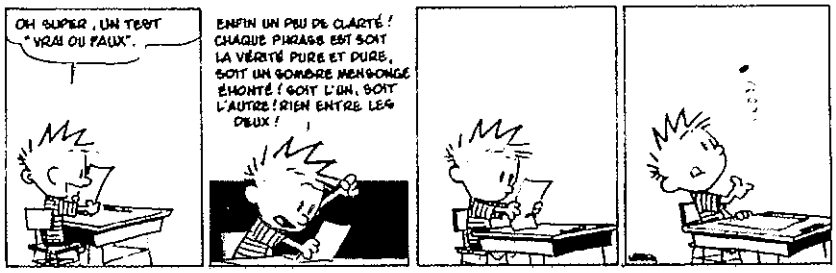
Where the numbers are the nodes and where $\emptyset$ = *emptytree*

9. **The preorder traversal of the BST *B2*, modified by deleting the value 35, is ?**

   (a) $(6, 10, 11, 14, 15, 16, 30)$
   √ (b) $(14, 10, 6, 11, 30, 16, 33)$
   (c) $(14, 10, 30, 6, 11, 16, 33)$
   (d) $(6, 11, 10, 16, 33, 30, 14)$

10. **The postorder traversal of the BST *B2*, modified by deleting the value 14, is ?**

   (a) $(6, 10, 11, 16, 30, 33, 35)$
   (b) $(11, 10, 6, 35, 30, 16, 33)$
   √ (c) $(6, 10, 16, 33, 30, 35, 11)$
   (d) $(11, 10, 35, 6, 30, 16, 33)$



# MCQ 7

Monday, 15 April

## Question 11

From the mappings below, select those which is(are) linear map(s)

a. $f: \begin{array}{ccc} \mathbb{R}^2 & \longrightarrow & \mathbb{R} \\ (x,y) & \longmapsto & x^3y \end{array}$

√ b. $g: \begin{array}{ccc} \mathbb{R}^2 & \longrightarrow & \mathbb{R}^2 \\ (x,y) & \longmapsto & (2x+y,-y) \end{array}$

√ c. $h: \begin{array}{ccc} \mathbb{R}[X] & \longrightarrow & \mathbb{R}^2 \\ P(X) & \longmapsto & (P(-1),P(3)) \end{array}$

d. $k: \begin{array}{ccc} \mathbb{R}^2 & \longrightarrow & \mathbb{R}_2[X] \\ (a,b) & \longmapsto & aX^2+bX+1 \end{array}$

e. None of them

## Question 12

Let $f \in \mathscr{L}(\mathbb{R}^2, \mathbb{R}^3)$. Select the correct way of defining the kernel of $f$.

a. $\mathrm{Ker}(f) = \left\{\forall\, u \in \mathbb{R}^2,\ f(u) = 0_{\mathbb{R}^3}\right\}$

√ b. $\mathrm{Ker}(f) = \left\{u \in \mathbb{R}^2,\ f(u) = 0_{\mathbb{R}^3}\right\}$

c. $\mathrm{Ker}(f) = \left\{\forall\, u \in \mathbb{R}^3,\ f(u) = 0_{\mathbb{R}^2}\right\}$

d. $\mathrm{Ker}(f) = \left\{u \in \mathbb{R}^3,\ f(u) = 0_{\mathbb{R}^2}\right\}$

e. None of these definitions is correct

## Question 13

Consider the linear map $f: \begin{array}{ccc} \mathbb{R}^2 & \longrightarrow & \mathbb{R} \\ (x,y) & \longmapsto & x+y \end{array}$. Then:

a. $0 \in \mathrm{Ker}(f)$

b. $(1,1) \in \mathrm{Ker}(f)$

√ c. $(2,-2) \in \mathrm{Ker}(f)$

d. None of the others



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## Question 14

Let $f \in \mathscr{L}(\mathbb{R}^3)$ such that $\text{Ker}(f) = \{(x, y, z) \in \mathbb{R}^3,\ x - 2y + z = 0\}$. Then:

a. $(1, 1, 1) \in \text{Ker}(f)$

b. $(1, 1, -1) \in \text{Ker}(f)$

c. $\text{Ker}(f)$ has dimension 1

d. $\text{Ker}(f)$ has dimension 2

e. None of the others

## Question 15

Consider the linear map $f : \begin{array}{ccc} \mathbb{R}^2 & \longrightarrow & \mathbb{R}^2 \\ (x, y) & \longmapsto & (x + y, 0) \end{array}$. Then:

a. $3 \in \text{Im}(f)$

b. $(1, 0) \in \text{Im}(f)$

c. $(0, 1) \in \text{Im}(f)$

d. None of the others

## Question 16

Let $E$ and $F$ be two vector spaces over $\mathbb{R}$ and $f \in \mathscr{L}(E, F)$. Then:

a. $f$ is injective if and only if $\text{Im}(f) = E$

b. $f$ is injective if and only if $\text{Im}(f) = F$

c. $f$ is injective if and only if $\big(\forall v \in F, \exists u \in E \text{ such that } v = f(u)\big)$

d. None of the others

## Question 17

Let $f \in \mathscr{L}(\mathbb{R}^3)$ such that $\text{Ker}(f) = \{(x, y, z) \in \mathbb{R}^3,\ x + y = 0 \text{ and } y + z = 0\}$. Then:

a. $\text{Ker}(f) = \{0_{\mathbb{R}^3}\}$

b. $\text{Ker}(f) = \text{Span}\big((1, 1, 1)\big)$

c. $\text{Ker}(f) = \text{Span}\big((-1, 1, -1)\big)$

d. None of the others

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## Question 18

From the mappings $\mathbb{R} \longrightarrow \mathbb{R}$ below, select those which is(are) linear map(s)

a. $f : x \longmapsto \sin(x)$

b. $g : x \longmapsto 2x + 1$

c. $h : x \longmapsto x^2$

d. $k : x \longmapsto e^x$

✓ e. None of these mappings is a linear map.

## Question 19

Consider a mapping $f : \mathbb{R}^3 \longrightarrow \mathbb{R}^2$ such that $f\big((0,1,0)\big) = (0,0)$. Then:

✓ a. $f$ can be a linear map from $\mathbb{R}^3$ to $\mathbb{R}^2$

b. $f$ cannot be a linear map from $\mathbb{R}^3$ to $\mathbb{R}^2$

## Question 20

Let $E$ and $F$ be two $\mathbb{R}$-vector spaces and $f : E \longrightarrow F$ a linear map. Let $(u, v) \in E^2$. Then:

a. $f(2.u) = u.f(2)$

b. $f(u + v) = u + v$

✓ c. $f(u + v) = f(u) + f(v)$

d. $f(u) - f(u) = 0_E$

e. None of the others



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# Test 2
# Computer Architecture

**Monday 15 April 2024**

**For all the questions, one or more answers are possible.**

21. A RAM device has:
    - √ A. A control bus.
    - √ B. An address bus.
    - √ C. A data bus.
    - D. None of these answers.

22. A ROM device has:
    - √ A. A control bus.
    - √ B. An address bus.
    - √ C. A data bus.
    - D. None of these answers.

23. The capacity in bits of a memory is:
    - A. Depth × Width / 8
    - √ B. Depth × Width
    - C. The size in bits of each word.
    - D. None of these answers.

24. The depth of a memory is:
    - √ A. The number of addresses.
    - B. The size in bits of each word.
    - C. The number of wires of the data bus.
    - √ D. The number of words.

25. The width of a memory is:
    - √ A. The size in bits of each word.
    - B. The number of addresses.
    - C. The number of words.
    - √ D. The number of wires of the data bus.

26. The CS input can be found on:
   A. ROM and RAM devices.
   B. ROM devices only.
   C. RAM devices only.
   D. None of these answers.

27. The WE input can be found on:
   A. ROM and RAM devices.
   B. ROM devices only.
   C. RAM devices only.
   D. None of these answers.

28. Connecting memory devices in parallel:
   A. Enlarges the width and the depth.
   B. Enlarges the width only.
   C. Enlarges the depth only.
   D. None of these answers.

29. Connecting memory devices in series:
   A. Enlarges the width and the depth.
   B. Enlarges the width only.
   C. Enlarges the depth only.
   D. None of these answers.

30. The main memory of a computer is usually made up of:
   A. SRAM devices.
   B. DRAM devices.
   C. ROM devices.
   D. None of these answers.