

CAML
MCQ #3
Monday, September the 11th 2023

1. What will be the last result after successive evaluations of the following phrases?

```
let f a b c =  
  let delta = b * b - 4 * a * c in  
  if delta < 0 then "no root"  
  else if delta > 0 then "two roots"  
  else "a double root" ;;  
f 2 3 4 ;;
```

- X (a) - : string = "no root"
(b) - : string = "two roots"
(c) - : string = "a double root"
(d) An error.

2. What does the following function calculate?

```
let f a b c = if a > b then if b < c then b  
              else c else if a > c then c else a ;;
```

- (a) The maximum value of the three parameters.
(b) The middle value of the three parameters.
X (c) The minimum value of the three parameters.
(d) Nothing, the function is wrong.

3. What is the evaluation result of the following definition?

```
let f x = match x with  
  | 0 -> 42 / 0  
  | _ -> failwith "error" ;;
```

- X (a) val f : int -> int = <fun>
(b) val f : int -> float = <fun>
(c) val f : int -> invalid_arg = <fun>
(d) val f : int -> error = <fun>
(e) An error.

4. What is the result of the application of f (question 3) to the value 0?

- (a) - : int = 0
(b) - : int = infinity
X (c) Exception: Division_by_zero.
(d) Exception: Invalid_argument "error".
(e) No result, the function is wrong!

5. What is the evaluation result of the following definition?

```
let f x = match x with  
  | true -> 42  
  | y -> 24 ;;
```

- (a) ... Unbound value y
(b) val f : bool -> bool -> int = <fun>
X (c) val f : bool -> int = <fun>
(d) val f : int -> bool -> int = <fun>
(e) Another error message.

6. What does the evaluation result of the following phrase contain?

```
let square x = match x with
  x when x > 0 -> x * x
  | y -> invalid_arg "x has to be positive" ;;
```

- (a) `val square : int -> string = <fun>`
 - X (b) `val square : int -> int = <fun>`
 - (c) ... `Warning ...: this pattern-matching is not exhaustive...`
 - (d) ... `Warning ...: this match case is unused.`
 - (e) Another "Warning".
-

7. What does the evaluation result of the following phrase contain?

```
let g n = match n mod 10 with
  | 0 | 2 | 4 | 6 | 8 -> true
  | 1 | 3 | 5 | 7 | 9 -> false ;;
```

- (a) `val g : int -> int = <fun>`
 - X (b) `val g : int -> bool = <fun>`
 - (c) ... `Warning ...: this match case is unused.`
 - X (d) ... `Warning ...: this pattern-matching is not exhaustive...`
 - (e) Another "Warning".
-

8. What is the result of the application of `g` (question 7) to the value 13?

- (a) - : `bool = true`
 - X (b) - : `bool = false`
 - (c) - : `int = 1`
 - (d) Exception: `Match_failure ("", ..., ...)`.
-

9. Let the function `g`, be defined as follows. Which statements are true?

```
let g x y = match x with
  0 -> 0
  | y -> 1
  | x -> -1 ;;
```

- (a) The two parameters (`x` and `y`) have to be of the same type.
 - X (b) `y` can be of any type.
 - (c) `x` can be of any type.
 - X (d) The function never returns -1.
 - (e) If $x \neq 0$ and $x \neq y$, the function returns -1.
-

10. What does the evaluation result of the function `g`, from previous question, contain?

- (a) `val g : int -> int -> int = <fun>`
 - X (b) `val g : int -> 'a -> int = <fun>`
 - (c) ... `Warning ...: this pattern-matching is not exhaustive.`
 - X (d) ... `Warning ...: this match case is unused.`
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MCQ 3

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Question 11

Which of these expressions define(s) a set?

- a. $E = \{1, 2\}$
- b. $F = \{1, 3, 2\}$
- c. $G = 1, 2$
- d. $H = (1, 2)$
- e. None of these expressions

Question 12

Consider the set $E = \{0, 1, 2, 3\}$. Select the correct answer(s):

- a. $1 \subset E$
- b. $3 \in E$
- c. $\{0\} \in E$
- d. $\{0, 2\} \subset E$
- e. None of the others

Question 13

Select the correct answer(s):

- a. $\{x \in \mathbb{N}, -1 < x \leq 3\} =]-1, 3]$
- b. $\{x \in \mathbb{N}, 0 < x < 4\} = \{1, 2, 3\}$
- c. $\{x \in \mathbb{R}, x^2 = 4\} = \{16\}$
- d. $\{x \in \mathbb{R}, x^2 = 4\} = \{2, -2\}$
- e. None of the others

Question 14

Let $A = \{0, 2, 3\}$ and $B = \{1, 2, 4\}$. Then:

- × a. $A \cup B = \{0, 1, 2, 3, 4\}$
 b. $A \cup B = \{2\}$
 c. $A \cap B = \{0, 1, 2, 3, 4\}$
 × d. $A \cap B = \{2\}$
 e. None of the others

Question 15

Let $E = \{(0, 1), (0, 2), (0, 3), (1, 1), (1, 2), (1, 3)\}$. Then $E = A \times B$ with

- a. $A = B = \{0, 1, 2, 3\}$
 b. $A = \{1, 2, 3\}$ and $B = \{0, 1\}$
 × c. $A = \{0, 1\}$ and $B = \{1, 2, 3\}$
 d. We cannot know what A and B are.

Question 16

Let A and B be two subsets of a set E . Assume that $A \subset B$. Then:

- a. $A \cup B = A$
 × b. $A \cup B = B$
 × c. $A \cap B = A$
 d. $A \cap B = B$
 e. None of the others

Question 17

In \mathbb{R} , consider the subsets $A = [0, 6[$ and $B = \{n \in \mathbb{N}, n \leq 10\}$. Then:

- a. $A \subset B$
 b. $A \cap B = [0, 5]$
 × c. $4 \in A \cap B$
 × d. $10 \in A \cup B$
 e. None of the others

Question 18

The translation in mathematical language, with quantifiers, of the property "If the sum of two natural numbers is zero, then both natural numbers are zero" is:

- a. $\exists n \in \mathbb{N}, \exists m \in \mathbb{N}, n + m = 0$ and $n = m = 0$
- b. $\forall n \in \mathbb{N}, \forall m \in \mathbb{N}, n + m = 0$ and $n = m = 0$
- c. $\forall n \in \mathbb{N}, \forall m \in \mathbb{N}, n + m = 0 \implies n = m = 0$
- d. $n + m = 0 \implies n = m = 0$
- e. None of the others

Question 19

For all natural number n , consider the property $P(n)$: " $n^3 > 3n$ ". Then:

- a. $P(0)$ is true.
- b. $P(1)$ is true.
- c. $P(n+1)$ is: " $(n+1)^3 > 3n+3$ "
- d. None of the others

Question 20

Select the correct answer(s)

- a. $\forall x \in \mathbb{R}, e^x > 0$
- b. $\exists x \in \mathbb{R}, e^x \geq 0$
- c. $\exists y \in \mathbb{R}, \forall x \in \mathbb{R}, e^x = y$
- d. $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, x < y \implies e^x < e^y$
- e. None of the others