

CAML  
MCQ #2  
Friday, September the 8<sup>th</sup> 2023

1. What is the evaluation result of the following phrase?

```
let x = 3 in
  let y = 4 in
    2 * (x+3) * y ;;
```

- (a) - : int = 18
- (b) val x : int = 18
- (c) - : int = 48
- (d) val x : int = 48
- (e) An error.

2. Among the following phrases, which are improper?

- (a) let a = 1. and b = 3. in (a +. 2.) <= (4. -. b) ;;
- (b) 3 \* 1.5 ;;
- (c) (4 < 8) || ("a" = "b") ;;
- (d) let a = 1. and b = 3 in (a +. 2.) <= (4 - b) ;;
- (e) None of the above.

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

```
let f a b = a = (b + 5);;
```

- (a) val f : bool -> int -> int = <fun>
- (b) val f : int -> int -> bool = <fun>
- (c) val f : int -> int = <fun>
- (d) val f : int -> bool = <fun>

4. What should be the types of functions f and g so that the following expression is correct?

```
f ((g (3*2) 4)+1) (5 - f 1 2) ;;
```

- (a) f : int -> int and g : int -> int
- (b) f : int -> int -> int and g : int -> int -> int
- (c) f : int -> int and g : int -> int -> int
- (d) f : int -> int -> int and g : int -> int
- (e) None of the above.

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

```
let f x y =
  let f2 x y z = z = (x + y)/2 in
  let f3 = f2 x y 10 > f2 x y 8 in
    f3 < true ;;
```

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

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

```
let f x y = if x then 0 else y;;
```

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

7. What is the evaluation result of the following expression?

```
if (if 25 mod 2 = 0 then false else true) then
  42.
else
  24.;;
```

- X
- (a) - : `bool = false`
  - (b) - : `bool = true`
  - (c) - : `float = 42.`
  - (d) - : `float = 24.`
  - (e) An error.

8. 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 "two roots"
  else if delta > 0 then "a double root"
  else "no root" ;;
f 2 3 4 ;;
```

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

9. What does the following function calculate?

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

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

10. What does the following function applied to two boolean values a and b calculate?

```
let op a b = if a then true else b ;;
```

- X
- (a) `a && b`
  - (b) `a || b`
  - (c) `not a || b`
  - (d) `a = b`
  - (e) Nothing, the function is wrong.

# MCQ 2

Friday, 8 September

## Question 11

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.  $\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, e^x < e^y$
- e. None of the others

## Question 12

The property "The sum of two natural numbers is always positive" can be written with quantifiers as:

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

## Question 13

Let  $f$  be a function defined on  $\mathbb{R}$ . The negation of: " $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, x = f(y)$ " is:

- a.  $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, x \neq f(y)$
- b.  $\exists x \in \mathbb{R}, \forall y \in \mathbb{R}, x = f(y)$
- c.  $\exists x \in \mathbb{R}, \exists y \in \mathbb{R}, x \neq f(y)$
- d.  $\exists x \in \mathbb{R}, \forall y \in \mathbb{R}, x \neq f(y)$
- e. None of the others

### Question 14

Let  $f$  be a real function, defined and continuous on  $\mathbb{R}$ , whose variations are given by the following table:

$x$	$-\infty$	$-3$	$-2$	$4$	$+\infty$	
$f'(x)$		$-$	$0$	$+$	$+$	
$f(x)$	$+\infty$		$-\frac{17}{8}$	$-2$	$4$	$+\infty$

Select the correct answer(s)

- a.  $\forall x \in \mathbb{R}, f(x) \geq 0$
- b.  $\exists x \in \mathbb{R}, f(x) = 4$
- c.  $\forall x \in \mathbb{R}, x \geq 4 \implies f(x) > 0$
- d.  $\forall x \in \mathbb{R}, f(x) > 0 \implies x \geq 4$
- e. None of the others

### Question 15

Let  $x \in \mathbb{R}$  and consider the property  $P$ : " $x > 0 \implies x \geq 0$ ".

- a. The negation of  $P$  is: " $x < 0 \implies x \leq 0$ "
- b. The negation of  $P$  is: " $x > 0 \wedge x < 0$ "
- c. The contrapositive of  $P$  is: " $x < 0 \implies x \leq 0$ "
- d. The contrapositive of  $P$  is: " $x > 0 \wedge x < 0$ "
- e. None of the others

### Question 16

Let  $n$  be a natural number and consider the property  $P(n)$ : " $n^3 > 3n$ ". Then:

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

### Question 17

Let  $n$  be a natural number and  $P(n)$  a property depending on  $n$ .

- ✗
- a. If  $\exists n_0 \in \mathbb{N}$  such that  $P(n_0)$  is false, then the property " $\forall n \in \mathbb{N}, P(n)$  is true" is false.
  - b. If  $P(2)$  is true, then the property " $\forall n \in \mathbb{N}, P(n)$  is true" is true.
  - c. If, for a value  $n \in \mathbb{N}$ ,  $P(n) \implies P(n+1)$ , then the property " $\forall n \in \mathbb{N}, P(n)$  is true" is true.
  - d. None of the others

### Question 18

The negation of "Some tulips are red" is:

- ✗
- a. "No tulip is red"
  - b. "There exist red tulips"
  - c. "There exist blue tulips"
  - d. None of the others

### Question 19

Select the correct answer(s)

- ✗
- a.  $\ln(6) = \ln(2) + \ln(3)$
  - b.  $\ln(6) = \ln(2) \times \ln(3)$
  - c.  $\lim_{x \rightarrow 0^+} \ln(x) = 0$
  - d.  $\ln(e) = 1$
  - e. None of the others

### Question 20

The solution set of the inequality  $\ln(x) < 0$  is  $S = ]0, 1[$ .

- ✗
- a. True
  - b. False