CAML
MCQ #3
Monday, September the 15th 2025

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

```
let f x y z = let res = x + z in y = 'A' && res < (x * z);;
```

(a) `val f : char -> int -> int = <fun>`

(b) `val f : string -> int -> int -> bool = <fun>`

(c) `val f : char -> int -> int -> bool = <fun>`

(d) `val f : int -> char -> int -> bool = <fun>`

(e) An error.

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2. **What does the following function calculate when applied to three integer values?**

```
let g x y z =
  let h x y = if x < y then x else y
  in
    if h (h x y) z = z then
      (x + y) * (x + y)
    else
      if y < x && z > y then
        (z + x) * (x + z)
      else
        (y + z) * (y + z) ;;
```

(a) The sum of the squares of the two largest.

(b) The square of the sum of the two largest.

(c) The square of the sum of the two smallest.

(d) The sum of the squares of the two smallest.

(e) Nothing, the function is wrong.

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

```
let f x y =
  if y = 0 then
    failwith "1"
  else
    if x / y > 100 then
      failwith "2"
    else
      x / y ;;
f 150 3 ;;
```

(a) `- : int = 0`

(b) `- : int = 50`

(c) `Exception: Failure "1".`

(d) `Exception: Failure "2".`

(e) An error.

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

```
let f x y = match y with
    0 -> x * 2
  | 1 -> x + 2
  | z when z > 2 -> x - 2
  | _ -> x / 2 ;;

f 10 2 ;;
```

(a) `- : int = 5`
(b) `- : int = 8`
(c) `- : int = 12`
(d) `- : int = 20`
(e) An error.

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5. **What is the evaluation result of the following phrase?**

```
let f x y = match (x + int_of_float y) / 2 with
              x when x >= 10 -> true
            | _              -> false ;;
```

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

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

```
let f x y = match x + y with
    0 -> 0
  | s when s < 0 -> -1
  | s -> 1
  | _ -> failwith "Unknown" ;;
```

(a) `val f : int -> int = <fun>`
(b) `val f : int -> int -> int = <fun>`
(c) `Warning ...: this match case is unused.`
(d) `Warning ...: this pattern-matching is not exhaustive.`
(e) An error.

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

```
let f x y =
  match x = 0 with
  | true -> let y = match y > 0 with
                    | true -> y + 1
                    | _ -> y - 1 in
            x + y
  | _ -> failwith "" ;;

f 0 (-12) ;;
```

(a) `- : int = 11`
(b) `- : int = -13`
(c) `- : int = -11`
(d) `- : int = 13`
(e) An error.

8. **What does the evaluation result of the following phrase contain?**

```
let g r =
  match r with
      "Admin" -> 3
    | "User"  -> 2
    | "Guest" -> 1
    | ""      -> failwith ""
in
  g "Admin" ;;
```

(a) *val g : string -> int -> int = <fun>*

(b) *- : int = 3*

(c) *Warning ...: this match case is unused.*

(d) *Warning ...: this pattern-matching is not exhaustive.*

(e) An error.

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9. **What does the evaluation result of the following phrase contain?**

```
let f x y =
  match x with
     | true -> let tmp = if y > 0 then 1 else 0 in
               (match tmp with
                | 0 -> false
                | _ -> true)
     | false -> not y ;;
```

(a) *val f : bool -> int -> int = <fun>*

(b) *val f : bool -> int -> bool = <fun>*

(c) *Warning ...: this match case is unused.*

(d) *Warning ...: this pattern-matching is not exhaustive.*

(e) An error.

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10. **For which value(s) of a, the call to test a returns true ?**

```
let test a =
  let f n = if n < 0 then -1 else 1
  in
  match f a * a / 10 with
        0 -> false
      | 1 | 2 | 3 | 4 -> true
      | n when n >= 10 -> false
      | _ -> true ;;
```

(a) *a = -12*

(b) *a = -5*

(c) *a = 0*

(d) *a = 4*

(e) *a = 10*

MCQ 3

Monday, 15 September

Question 11

Select the set(s) of finite cardinal number:

a. $\mathbb{N}$

b. $[0, 7]$

c. $[\![1, 6]\!]$

d. $\{f : \mathbb{R} \longrightarrow \mathbb{R},\ f(0) = 0\}$

e. None of the others

Question 12

Let $E = \{1, 2, 3\}$ and $F = \{a, b, c, d\}$. Then:

a. $(1, c) \in E \times F$

b. $\{1, c\} \subset E \times F$

c. $\{1\} \subset \mathscr{P}(E)$

d. $E \times F \in \mathscr{P}(E)$

e. None of the others

Question 13

Let $E = \{1, 2, 3, 4, 5\}$, $F = \{1, 3, 5\}$, $G = \{2, 4\}$ and $H = \{1, 2, 4\}$. Then:

a. (F, G) is a partition of E.

b. (F, H) is a partition of E.

c. (G, H) is a partition of E.

d. None of the others

Question 14

Let E and F be two finite sets such that $\text{Card}(E) = 5$, $\text{Card}(F) = 6$ and $\text{Card}(E \cup F) = 6$. Then

a. $\text{Card}(E \times F) = 11$

b. $\text{Card}(E \times E) = 25$

c. $\text{Card}(E \cap F) = 11$

d. $\text{Card}(\mathscr{P}(E)) = 25$

e. None of the others

Question 15

Let $n \in \mathbb{N}$. Note that the following implication is true:

$$2^n > n+1 \Longrightarrow 2^{n+1} > 2(n+1) \geq n+2$$

Indeed, $2(n+1) = 2n+2 = n+2+n \geq n+2$ (since $n \in \mathbb{N}$).

Now, consider the property "$P(n)$: $2^n > n+1$". Then:

a. "$P(n) \Longrightarrow P(n+1)$" is true for all $n \in \mathbb{N}$.

b. "$P(n) \Longrightarrow P(n+1)$" is not true for all $n \in \mathbb{N}$.

c. $\forall n \in \mathbb{N}$, $P(n)$ is true.

d. $\forall n \in \mathbb{N}^*$, $P(n)$ is true.

e. None of the others

Question 16

Let $n \in \mathbb{N}$. Consider the property $P(n)$ defined at all rank $n \in \mathbb{N}$ by: "$n^2 > 2n$". You are asked to prove by induction that $P(n)$ is true above a certain rank. In that purpose, you will assume that $P(n)$ is true for a value $n \in \mathbb{N}$, and you will try to prove that:

a. $n^2 + 1 > 2n + 1$

b. $(n+1)^2 > 2n + 1$

c. $(n+1)^2 > 2n + 2$

d. None of the others

Question 17

Consider a given function $f : \mathbb{R} \longrightarrow \mathbb{R}$. Suppose you have to prove that

$$\forall (x, y) \in \mathbb{R}^2,\ f(x) = f(y) \implies x = y$$

Which of these phrases can be the beginning of the proof?

a. Assume that $x = y$.

b. Assume that $f(x) = f(y)$. Let us show that $x = y$.

c. Let $(x, y) \in \mathbb{R}^2$ and assume that $f(x) = f(y)$. Let us show that $x = y$.

d. None of the others

Question 18

Consider two sets A and B. Suppose you have to show that set A is included in set B. In that purpose:

a. you can show that: $A \Longrightarrow B$

b. you can show that: $\forall x \in A,\ x \in B$.

c. you can show that: $\exists x \in A,\ x \in B$.

d. you can start your proof by: "Let $x \in A$". Then use a succession of implications leading to: $x \in B$.

e. None of the others

Question 19

The contrapositive of "If the sun is shining, then it is hot" is:

a. "The sun is shining and it is not hot"

b. "If the sun is not shining, then it is not hot"

c. "If it is not hot, then the sun is not shining"

d. None of the others

Question 20

Consider two non-zero integers a and b. The fraction $F = \dfrac{a^2}{\frac{a}{b}}$ is equal to $2b$.

a. True

b. False

ALGO	
1	D
2	B
3	B
4	A
5	B
6	BC
7	B
8	BD
9	E
10	AE

MATH PC	
11	C
12	A
13	A
14	B
15	A
16	C
17	C
18	B D
19	C
20	B