

ICT BOOK PROJECT: GRAND PROBLEM SETS

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1 Topic 1: Programming Fundamentals

Q1

```
1 M <- 3
2 WHILE M < 9 DO
3     OUTPUT 'a'
4     M <- M + 2
```

Dry run the above algorithm, how many 'a' are output? (Reference: 2023 MCQ 27)

- A. 0
- B. 1
- C. 2
- D. 3

Q2

```
1 Algorithm 1
2
3 X <- 7
4 Y <- 1
5 REPEAT
6     X <- X + 1
7     Y <- Y + 2
8 UNTIL (X < Y)
```

```
1 Algorithm 2
2
3 X <- 7
4 Y <- 1
5 WHILE (*Missing)
6     X <- X + 1
7     Y <- Y + 2
```

If the values of A and B are the same in the above two algorithms, what is the missing part in Algorithm 2? (Reference: 2022 MCQ 28)

- A. $X < Y$
- B. $X > Y$
- C. $X \leq Y$
- D. $X \geq Y$

Q3

```
1 A <- 3
2 B <- 8
3 C <- 6
4 N <- A
5 IF B > N THEN
6     N <- B
7 IF C > N THEN
8     N <- C
9 OUTPUT N
```

What is the purpose of the algorithm?

- A. Swaps the values of A and B
- B. Swaps the values of B and C
- C. Finds the maximum value among A, B and C
- D. Finds the minimum value among A, B and C

Q4

```
1 P <- 9
2 Q <- 2
3 i <- 3
4 FOR i FROM 4 TO 6 DO
5   P <- P - Q
6 OUTPUT P
```

What is the output of the above algorithm? ¹ (Reference: 2023 MCQ 30)

- A. 7
- B. 5
- C. 3
- D. 1

Q5

Given that $X = 4$, $Y = 4$ and $Z = 5$, which of the following boolean expressions returns TRUE? (Reference: 2021 MCQ 31)

- A. $((X \neq Y) \text{ AND } (Y > 3)) \text{ OR } (Z < 3)$
- B. $((X == Y) \text{ AND } (Y > 3)) \text{ OR } (Z > 3)$
- C. $((X \neq Y) \text{ AND } (Y < 3)) \text{ AND } (Z > 3)$
- D. $((X == Y) \text{ AND } (Y > 3)) \text{ AND } (Z < 3)$

¹The FOR loop will override the initial value of i

Q6

```
1 sum <- 0
2 j <- 1
3 REPEAT
4     sum <- sum + j
5     j <- j + 2
6 UNTIL (j == 9)
7 OUTPUT sum
```

What is the output of the above algorithm? (Reference: 2021 MCQ 33)

- A. 16
- B. 9
- C. 4
- D. 1

Q7

```
1 INPUT P
2 flag <- TRUE
3 WHILE flag == TRUE DO
4     IF P == 7 THEN
5         flag <- FALSE
6     P <- P - 3
7 OUTPUT "Passed!"
```

What input value for the algorithm will output "Passed!"? (Reference: 2022 MCQ 29)

- A. 6
- B. 9
- C. 13
- D. 17

Q8

```
1 mass <- 5
2 velocity <- 3
3 momentum <- mass * velocity
4 mass <- 2
5 velocity <- 4
6 OUTPUT momentum
```

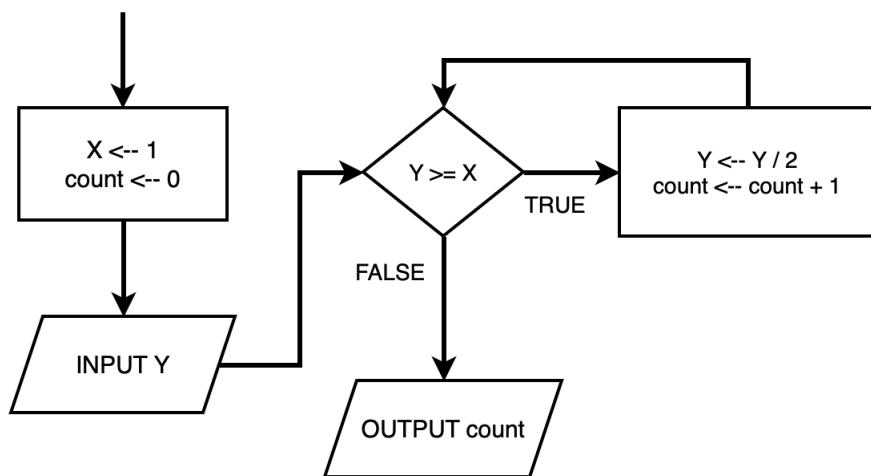
What is the output of the above algorithm? ² (Reference: 2019 MCQ 30)

- A. 8
- B. 12
- C. 15
- D. 20

²Students should be able to recognise reassignment will not affect the result of "momentum".

Q9, 10

Study the following segment of a flowchart, and answer the questions below (Q9, 10).



Q9

If the output of the algorithm is 5, what is the input value of Y ?

- A. 16
- B. 32
- C. 64
- D. 128

Q10

What is the purpose of this algorithm?

- A. Calculates the factorial of Y .
- B. Determines the sum of all integers from 1 to Y .
- C. Calculates the binary logarithm of $2Y$.
- D. Determines the square root of Y .

Q11

```
1 INPUT N
2 sum <- 0
3 T <- 3
4 WHILE (*Missing)
5     sum <- sum + T
6     T <- T*3
7     N <- N - 1
8 OUTPUT sum
```

The above algorithm attempts to find the value of $(3^1 + 3^2 + 3^3 + 3^4 + \dots + 3^N)$. What should be the missing part? (Reference: 2018 MCQ 30)

- A. $N > 1$
- B. $N > 0$
- C. $N < 1$
- D. $N < 0$

Q12

```
1 X <- 5
2 FOR i FROM 1 TO X DO
3     FOR j FROM 1 TO i DO
4         OUTPUT '*'
```

Dry run the above algorithm, how many '*' are output? ³

- A. 6
- B. 10
- C. 15
- D. 21

Q13

```
1 IF NOT ((X AND Y) OR (Z < 15))
2     THEN OUTPUT '@@@'
```

For which of the following combinations of the values X, Y and Z will be '@@@' be output?
(Reference: 2017 MCQ 32)

- A. FALSE, TRUE, 20
- B. TRUE, TRUE, 20
- C. TRUE, FALSE, 10
- D. FALSE, FALSE, 10

Q14

```
1 S <- 2
2 J <- 1
3 WHILE (*Missing)
4     OUTPUT S
5     S <- J + S
6     J <- J + 1
7 OUTPUT J
```

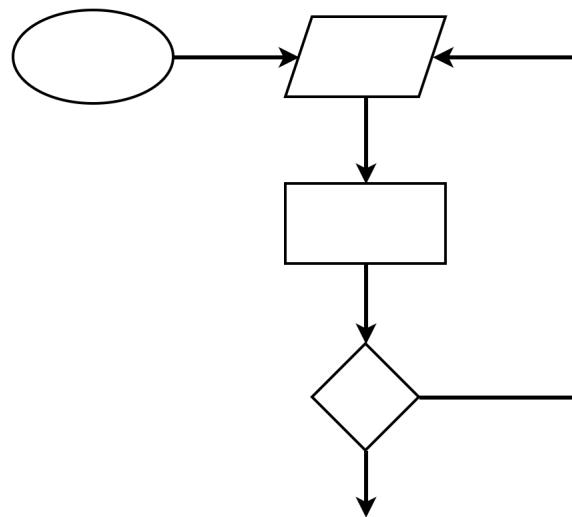
For which of the following condition(s), the algorithm output 23585?

- i $J \leq 5$
 - ii $J < 5$
 - iii $S < 8$
- A. Only (i)
 - B. Only (ii)
 - C. Only (i), (iii)
 - D. Only (ii), (iii)

³Students might find double loop challenging.

Q15

The diagram provided shows a flowchart that includes a loop structure. Determine which of the following best describes such loop.



- A. REPEAT...UNTIL
- B. WHILE loop
- C. FOR loop
- D. DO...WHILE