Analysis 1-1920
Foundations of modeling

This exam consists of 40 Multiple-choice questions. For each question, only one answer is correct. Each question is worth one point. The cesuur is 26.5, which means that you need 27 points to pass.

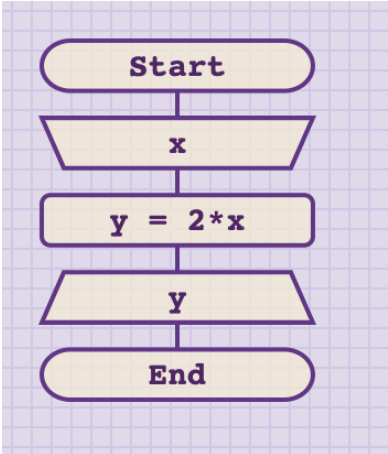
Write your answers on the answer sheet provided!

1	What is computer science?	
	A	Computer science is a set of skills and knowledge about technologies focusing on development, programming and use of computers.
	B	Computer science is a synonym for information science.
	C	Computer science is a scientific field that investigates management / governance, focusing on a system theory.
	D	Computer science is a set of skills and knowledge solely about software technologies, required to design, implement, test and maintain computer software. Hardware is the focus of information science.

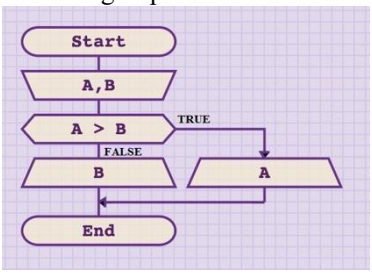
2	A **COMPILER**, used to translate a specific programming language into assembly code is:	
	A	hardware
	B	system kernel
	C	programming software
	D	application software

3	Why are digital signals more reliable in transmitting information than analog signals?	
	A	A digital signal carries less information than an analog one.
	B	A digital signal carries more information than an analog one.
	C	A digital signal suffers from more interference over a longer distance than an analog signal.
	D	A digital signal is less susceptible to interference.

4	For the same starting values (inputs), an algorithm always returns … (choose the correct answer)	
	A	… the same resulting values (outputs).
	B	… different resulting values (outputs).
	C	… an error; because for different input values you need a different algorithm.
	D	… different printouts on the standard console.

5	Which one of the given Python lines corresponds to the processing step in this flowchart?  	
	A	x= int(input())
	B	y = 2 * x
	C	print(y)
	D	print("y")

6	If A = 4 and B = 3, what is the value of variable C, after executing the following line in Python: C = A ** B	
	A	7
	B	12
	C	64
	D	There is an error in the statement, which uses two multiplication operands (‘*’) instead of one. As a consequence, Python will crash at this line and C won’t be assigned any value.

7	By categorizing algorithms according to the way the steps are executed, the algorithm given below is part of which group?  	
	A	linear algorithms
	B	branching algorithms
	C	cyclic algorithms
	D	conditioning algorithms

8	How many different digits can you have in a base 7 numeral system, and what are those digits?	
	A	7 in total. Digits: 0, 1, 2, 3, 4, 5, 6.
	B	7 in total. Digits: 1, 2, 3, 4, 5, 6, 7
	C	8 in total. Digits: 0, 1, 2, 3, 4, 5, 6, 7
	D	6 in total. Digits: 1, 2, 3, 4, 5, 6,

9	What is the purpose of 0 (ZERO) in a numeral system?	
	A	Zero is used as a placeholder only.
	B	Zero is used as no amount only.
	C	Zero is used as both a placeholder and no amount.
	D	None of the above answers are correct.

10	Which of the following statements is true:	
	A	$100_2 = 100_{16}$
	B	$100_2 = 100_{10}$
	C	$100_2 = 4_{10}$
	D	$100_2 = 2_{10}$

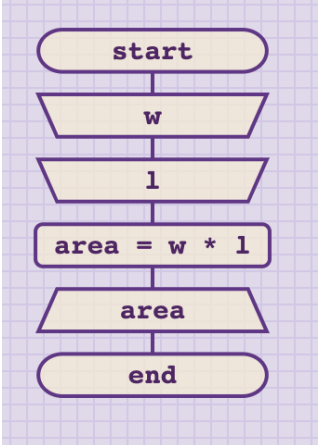
11	If a binary number ends (at the righthand end) with 1, it must be …	
	A	an odd number.
	B	an even number.
	C	a prime number
	D	an irrational number.

12	State the decimal representation of the hexadecimal number B.	
	A	2
	B	10
	C	11
	D	12

13	Which data type denotes whole numbers?	
	A	integer
	B	float
	C	char
	D	boolean

14	Which of the following is NOT true for Python variables?	
	A	Variables store information.
	B	Variables label information.
	C	Variables are constant.
	D	A variable can take any type of value.

15	In your Python program, you have written the following line: A = input("Please input your age") The program has been executed, and when prompted to enter his age, the user typed ***23***. What is the data type of variable A?	
	A	string
	B	integer
	C	boolean
	D	set

16	How many times will each step in the following algorithm be executed, when the algorithm is executed once?  	
	A	Each step will be executed exactly once.
	B	Each step will be executed once or never (1 or 0).
	C	Each step will be executed at least once.
	D	Input steps will be executed once. The number of executions of the processing step depends on the result of expression: area = w * l

17	If you want to extract the second digit from the left, from a variable N holding a four digit number, which formula can you use? (example: N = 1**2**34 -> 2)	
	A	N // 100 % 10
	B	N % 100 // 10
	C	N // 100 % 100
	D	N // 10 % 100

18	Which of the following sentences is NOT a statement (non-statement in Boolean logic)?	
	A	The trains are always late.
	B	2 + 2 = 7
	C	An apple is an animal.
	D	What time is it?

19	The implication x → y is logically equivalent to:	
	A	$\neg(x \vee y)$
	B	$\neg(x \wedge y)$
	C	$\neg x \vee y$
	D	$\neg x \wedge y$

20	The following code is given in Python. What is the output if x is 4.
	
	`if(not(x>= 0 and x<=10)):`
	`  y = x**2`
	`elif(x%2 == 0):`
	`  y = x`
	`else:`
	`  y = -1`
	`print(y)`	

	A	16
	B	4
	C	-1
	D	Error

21	Consider the following statement: "***You are a good programmer if and only if you don't have bugs in your code and you know algorithms.***" And its propositions: P: "You are a good programmer." Q: "You have bugs in your code." R: "You know algorithms." What is the correct logical expression for the above mentioned statement?	
	A	$(\neg Q \wedge R) \rightarrow P$
	B	$P \rightarrow (\neg Q \wedge R)$
	C	$P \leftrightarrow (\neg Q \wedge R)$
	D	$P \rightarrow (Q \wedge R)$

22	What Boolean values must **P**, **Q**, and **R** have in order for the following expression to be **False**? **(Q ∧ ¬P) → R**	
	A	P = True Q = True R = True
	B	P = True Q = False R = False
	C	P = False Q = False R = True
	D	P = False Q = True R = False

23	Which Boolean logic operator should replace the '□' to get the following truth table? P | Q | P □ Q TRUE | TRUE | TRUE TRUE | FALSE | FALSE FALSE | TRUE | TRUE FALSE | FALSE | TRUE	
	A	↓
	B	→
	C	↔
	D	∴

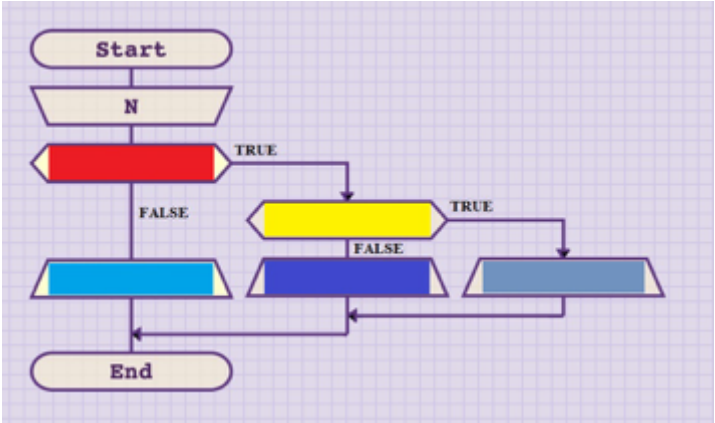
24	What is an argument (in logic)?	
	A	An argument is a process of reasoning in which a new belief is formed on the basis of or in virtue of evidence or proof supposedly provided by other beliefs.
	B	An argument is a collection of statements or propositions, some of which are intended to provide support or evidence in favor of one of the others.
	C	An argument is a collection of operations used in Boolean logic (such as NOT, AND, OR) to derive new conclusions.
	D	An argument is a collection of operations used in Boolean logic (such as NOT, AND, OR) to argue about the validity of proposed conclusions.

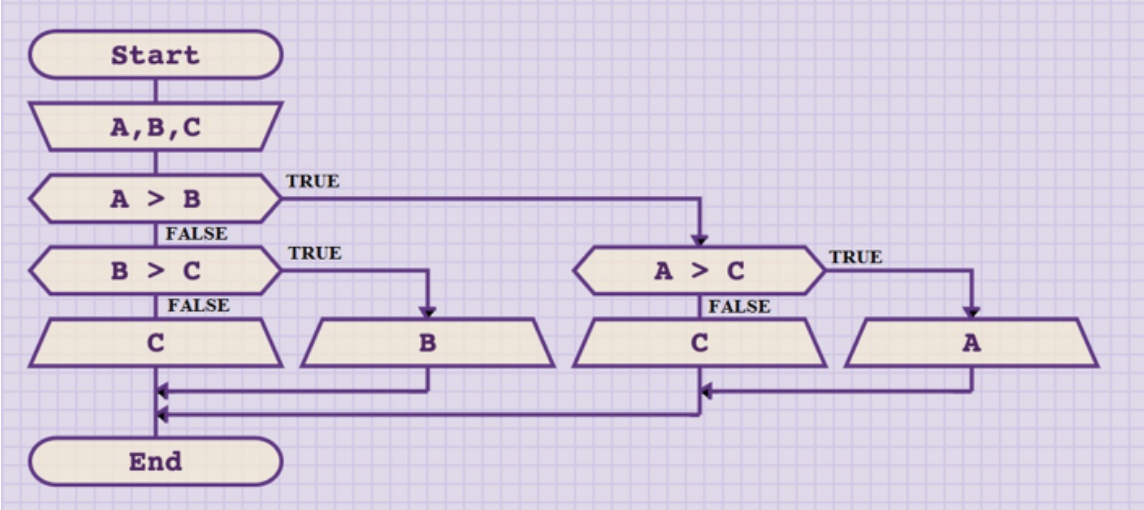
25	What is the symbol for logical disjunction?	
	A	¬
	B	∧
	C	∨
	D	→

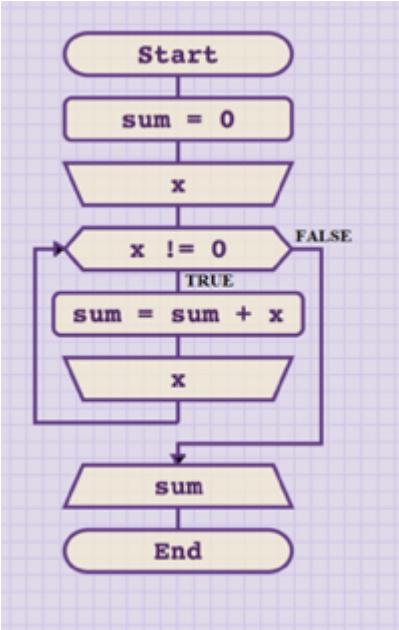
26	What is the name for the following logical expression? **P ∨ ¬P**	
	A	This is a TAUTOLOGY (assertion that is True in every possible interpretation)
	B	This is CONTRADICTION (unsatisfiable statement that is False in every possible interpretation)
	C	This is a CONTINGENCY (formula that is neither Tautology or Contradiction; can be either True of False)
	D	None of the above.

27	After executing the following Python code, what will be the values of `p` and `q`?
	`p = not False or True and False`
	`q = False and not False or True`	

	A	`p` and `q` are both `False`.
	B	`p` is `False` and `q` is `True`.
	C	`p` is `True` and `q` is `False`.
	D	`p` and `q` are both `True`.

28	If we don't know the values of the conditions in the IF statements, what is the minimum and what is the maximum possible number of output steps for the given algorithm? 	
	A	Minimum output steps: 0 Maximum output steps: 3
	B	Minimum output steps: 1 Maximum output steps: 3
	C	Minimum output steps: 1 Maximum output steps: 1
	D	Minimum output steps: 0 Maximum output steps: 1

29	Assume that the user entered the following values: **A = -100** **B = 10** **C = 0** What will be the output of the following algorithm? 	
	A	0, 10, 0, -100 – because it outputs variables in the sequence C, B, C, A.
	B	-100, 0, 10 – because it sorts values from the smallest to the largest.
	C	-100 – because it finds the largest face value ignoring the sign.
	D	10 – because it outputs the maximum of A, B, and C.

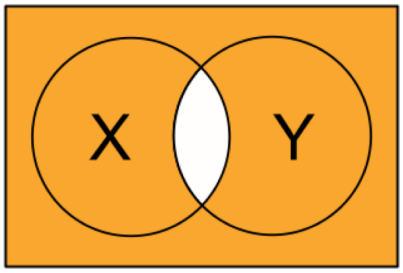
30	How many iterations can the following algorithm have?  	
	A	Depending on the given X, the statements in the body of the while loop will not be executed at all, or will be executed once or multiple times, until 0 is entered.
	B	Depending on the given X, the statements in the body of the while loop will be executed at least once, and then will keep repeating until 0 is entered.
	C	Depending on the given X, the statements in the body of while loop will be executed either once (if X is not 0) or not at all (if X is 0).
	D	If the given X is 0, then the statements in the body of while loop will not be executed at all. Otherwise, the program will be stuck in an infinite loop.

31	What will be the result of the following command: len(range(4,10,3))	
	A	7
	B	6
	C	3
	D	2

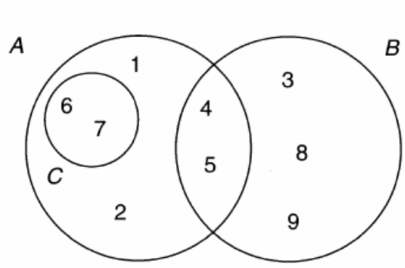
32	You entered the following line in Python: S = “Hello world!”. What is the value of S[1]	
	A	‘H’
	B	‘e’
	C	‘l’
	D	‘!’

33	How many elements does the set {1, 2, 3, 1+1, 2+2, 3+3} have?	
	A	3
	B	4
	C	5
	D	6

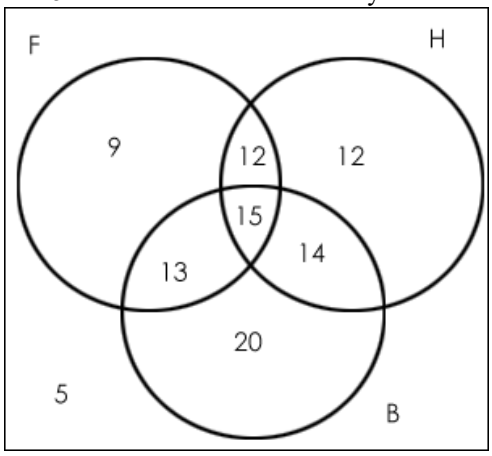
34	What is the cardinality of the empty set?	
	A	0, because there are no elements in the empty set.
	B	1, because Ø counts as one element.
	C	∞ (infinity), because each empty set can have an infinite amount of other empty sets.
	D	Cardinality is not applicable to the empty set.

35	You are given the following Boolean expression: X □ Y. Which Boolean operator needs to be written in place of □ to get the shaded area from the Venn diagram below:  	
	A	AND
	B	OR
	C	NOR
	D	NAND

36	Let A be a set given by the following set-builder notation: $A = \{x \in \mathbf{Z} \mid 2x = x^2\}$ What is the value of n(A)?	
	A	A = {2} n(A) = 1
	B	A = {0, 2} n(A) = 2
	C	A = {1, 2} n(A) = 2
	D	A = {-2, 0, 2} n(A) = 3

37	Venn diagram below depicts three sets A, B and C and their elements.  What are the elements of (A ∩ B) ∪ C ?	
	A	$(A \cap B) \cup C = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$
	B	$(A \cap B) \cup C = \{4, 5\}$
	C	$(A \cap B) \cup C = \{6, 7, 3, 8, 9\}$
	D	$(A \cap B) \cup C = \{4, 5, 6, 7\}$

38	Let A = {1, 2, 3, 4}. How many subsets are there of A that have 3 or more elements?	
	A	4
	B	5
	C	10
	D	16

39	A group of students train different sports, which include football (F), hockey (H) and basketball (B). The expressions in the Venn diagram below denote the cardinality of the respective subsets. Note: there are also 5 students that do not train any one of these three sports.  How many students train football or basketball (n(F ∪ B))?	
	A	42
	B	83
	C	88
	D	111

40	In the class of 35 students, 19 learn Spanish, 18 learn French, and 3 neither Spanish nor French. Calculate how many students take ONLY French?	
	A	13
	B	14
	C	15
	D	16

Answers:

1	A
2	C
3	D
4	A
5	B
6	C
7	B
8	A
9	C
10	C
11	A
12	C
13	A
14	C
15	A
16	A
17	A
18	D
19	C
20	B
21	C
22	D
23	B
24	B
25	C
26	A
27	D
28	C
29	D
30	A
31	D
32	B
33	C
34	A
35	D
36	B
37	D
38	B
39	B
40	A