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!

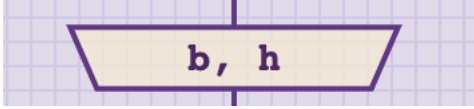| 1	What is the difference between **INFORMATION SCIENCE** and **INFORMATICS**?
A	There is no difference. Informatics is a synonym for information science.
B	Informatics is an applied form of information science.
C	The main difference is that information science includes any kind of information system, while informatics includes only those systems realized using computers.
D	The main difference is the way we store information and more precisely numeral values. Information science used binary, decimal and hexadecimal values, while informatics uses only binary values.

2	Place **OPERATING SYSTEM** (e.g. Windows, Mac OS, Android) in the appropriate category:
A	hardware
B	system software
C	programming software
D	application software

3	Which information can be copied without incurring quality degradation?
A	Analog information
B	Digital information
C	Both analog and digital information can be copied without incurring quality degradation.
D	After copying either analog or digital information, the result will always suffer from quality degradation.

4	Which of the following is a disadvantage of an analog signal?	
	A	An analog signal is easily distorted or affected by interference.
	B	An analog signal takes more memory than a digital signal.
	C	An analog signal cannot be interpreted by humans.
	D	An analog signal is restricted to 1 and 0 values only.

5	Google Chrome and Internet Explorer (both Internet browsers) are categorized as _____	
	A	System software
	B	Application software
	C	Programming software
	D	Compilers

6	A step-by-step method to solve a problem in a finite number of steps is called:	
	A	An algorithm
	B	A flowchart
	C	Pseudocode
	D	An IDE (integrated development environment)

7	The following symbol in the flowchart indicates one step in the algorithm where …
A	… variables **b** and **h** get values from the standard input.
B	… variables **b** and **h** print values to the standard output.
C	… variable **b** is assigned the value variable **h** holds.
D	… variables **b** and **h** are concatenated.

8	If A = 21 and B = 5, what is the value of variable C, after executing the following line in Python: C = A % B
A	4
B	4.20
C	1
D	None of the above

9	If we categorize algorithms according to the <u>way the steps are executed</u>, which characteristic groups can we identify?
A	linear, logarithmic and exponential algorithms.
B	$O(n)$, $O(\log n)$, $O(n^2)$, $O(2^n)$
C	linear and recursive algorithms.
D	linear, branching and cyclic algorithms.

10	Convert the decimal number 711_{10} to hexadecimal.	
	A	2127_{16}
	B	$2C7_{16}$
	C	$7C2_{16}$
	D	7122_{16}

11	What is the base in a numeral system?	
	A	Base is another name for dividend in floor division.
	B	Values can be divided using floor and float division. When using floor division, we may get remainder. That remainder represents a base.
	C	Base represents how the values are evaluated in numeral systems. For example, in the roman numeral system, the base indicates that every symbol is added to another, unless a symbol with a lower value is used in front of a symbol with larger value, when we use subtraction instead.
	D	The base equals the number of different symbols – digits (and letters) used to represent numbers.

12	Solve the following addition: $110_2 + 111_2 = ?$	
	A	12_{10}
	B	1011_2
	C	1111_2
	D	13_{10}

13	Romans used the following symbols to represent values: M – 1000, L – 500, C – 100, D – 50, X – 10, V – 10, I – 1. If you see the following symbols: **M C D X I X**, what is the value you would read?
A	1419
B	1421
C	1619
D	1621

14	If a binary number ends with 0, it must be …
A	an odd number.
B	an even number.
C	a prime number
D	an irrational number.

15	State the decimal representation of the hexadecimal number F.
A	6
B	10
C	15
D	16

16	The biggest number you can make with 3 binary digits is:
A	1
B	3
C	7
D	999
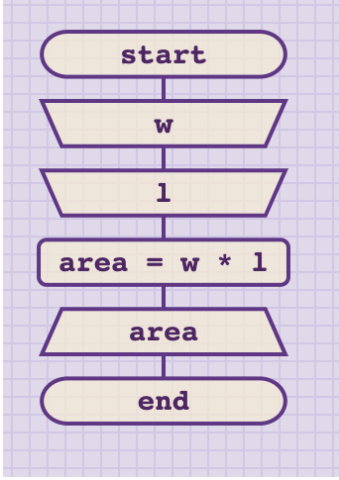
17	Which expression is wrong?
A	$2_8 = 2_{16}$
B	$8_8 = 8_{16}$
C	$10_8 = 8_{10}$
D	$7_8 = 7_{10}$

18	What does the equal "=" operator mean next to a variable in Python?
A	= is used to compare two values / variables, such as A = B. This will result in a Boolean value True or False.
B	= is used to assign the right-hand side value to the left-hand side variable. For example, A = B will result in variable A getting the value contained in variable B.
C	= is used to assign the left-hand side value to the right-hand side variable. For example, A = B will result in variable B getting the value contained in variable A.
D	= is used to equalize two variables and return the average. Thus, A = B will return the same result as (A + B) / 2

19		How many values can a variable store at one time?
	A	0 – variables only label data.
	B	1 – each variable can have one and only one value at one time.
	C	1 or more – depending on the program implementation, variable can be assigned one or more values at one time (such as when using a cycle).
	D	Cannot be determined – the number of values stored in variable is program specific and can only be determined during runtime using tracer and debugger.

20		You want to write a program that will store a person's name. What is the most appropriate data type?
	A	integer
	B	string
	C	boolean
	D	pointer

21		How can you convert an integer value, stored in variable A, to a string value in Python?
	A	int(A)
	B	str(A)
	C	convert(A)
	D	"A"

22	How many input and how many output variables have been used in the following algorithm:

	A	2 input, 1 output
	B	1 input, 2 output
	C	2 input, 3 output
	D	1 input, 4 output

23	If you want to extract the second and the third decimal digit from a variable N holding a four digit number, which formula can you use? (example: N = 1**23**4 -> 23)

	A	N // 100 % 100
	B	N % 100 // 10
	C	N // 10 % 10
	D	N // 10 % 100

24	Which of the following sentences is a statement (in Boolean logic)?
A	To get to Wijnhaven 107, exit the metro at Beurs.
B	Hello world!
C	An apple is an animal.
D	Why did the chicken cross the road?

25	The following expression is given in Python: **not (x >= 0 and y%2==0)** It is equivalent to:
A	x<=0 or y%2==0
B	x<0 or y%2==0
C	x<0 or y%2!=0
D	x<0 and y%2!=0

26	The following code is given in Python. What is the output when x is 5 and y is 11.

```python
if(x % 2 == 0):
    if(x<=10):
        print('message 1')
    else:
        print('message 2')
elif(y % 3 == 0):
    print('message 3')
else:
    print('message 4')
```

A	message 1	
B	message 2	
C	message 3	
D	message 4	

27	Consider the following statement: "**You will get a good job and will be well paid only if you master the Analysis course.**" And its propositions: P: "You will get a good job." Q: "You will be well paid." R: "You master the Analysis course." What is the correct logical expression for the above mentioned statement?

A	$(P \wedge Q) \leftrightarrow R$
B	$R \rightarrow (P \vee Q)$
C	$R \rightarrow (P \wedge Q)$
D	$(P \wedge Q) \rightarrow R$

28	What Boolean values must **P**, **Q** and **R** have in order for the following expression to return the value **True**? ¬P ∧ Q ∧ R	
	A	P = True Q = True R = True
	B	P = False Q = True R = True
	C	P = True Q = False R = True
	D	P = False Q = False R = False

29	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	FALSE
FALSE	FALSE	TRUE

	A	↓
	B	→
	C	↔
	D	∴

30	What is an inference (in logic)?	
	A	An inference 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 inference 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 inference is a process where some propositions are extracted from a linguistic phrase, and then assigned True or False values inside of truth table.
	D	An inference is a superset of all propositions.

31	What is the symbol for logical conjunction?	
	A	¬
	B	∧
	C	∨
	D	→

32	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?
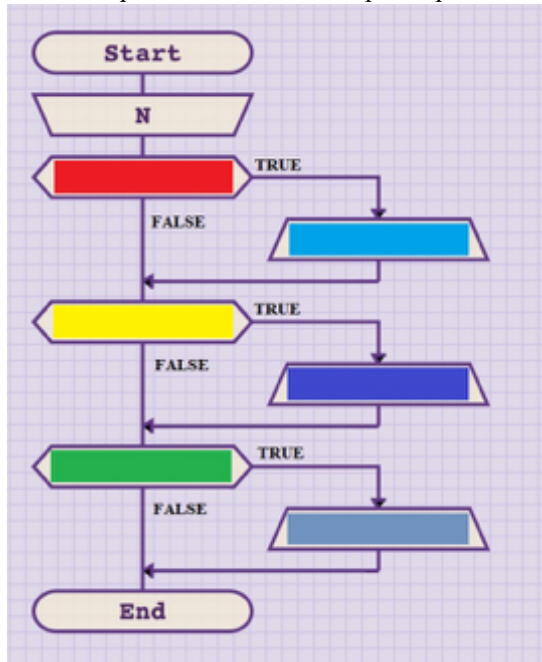
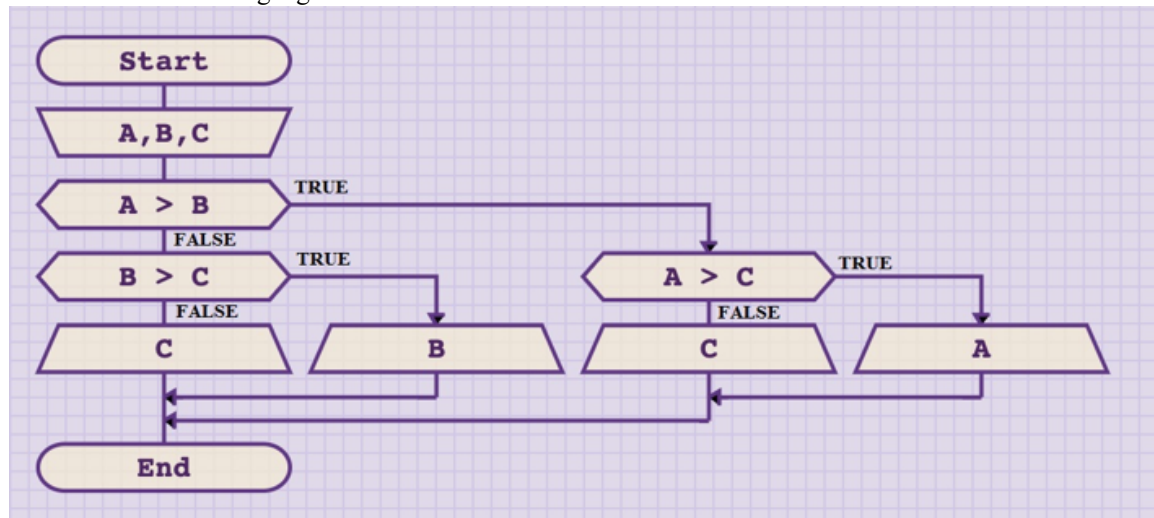| A	Minimum output steps: 0 Maximum output steps: 3
B	Minimum output steps: 1 Maximum output steps: 3
C	Minimum output steps: 1 Maximum output steps: 1
D	Minimum output steps: 0 Maximum output steps: 1

33	What does the following algorithm do?

	A	For three numbers given by the user, this algorithm prints them in the following order: C, B, C, A.
	B	For three numbers given by the user, this algorithm prints the middle number.
	C	For three numbers given by the user, this algorithm prints the biggest number.
	D	For three numbers given by the user, this algorithm prints the smallest number.

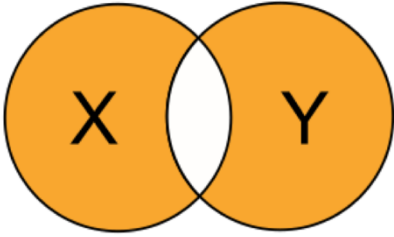| 34	If user inputs 3 for **m** and 6 for **n**, how many <u>OUTPUT steps</u> will this algorithm execute?
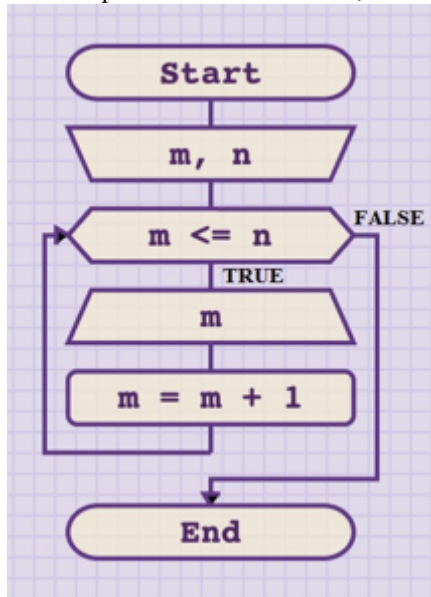
	A	3
	B	4
	C	5
	D	6

35	What kind of an algorithm is given by the flowchart below?
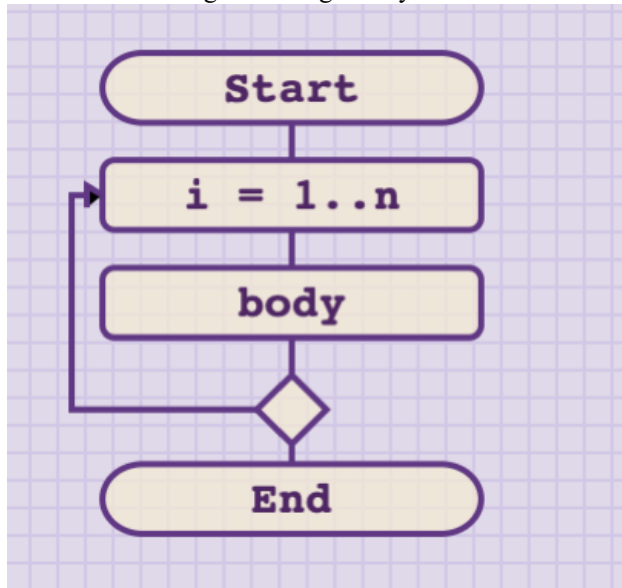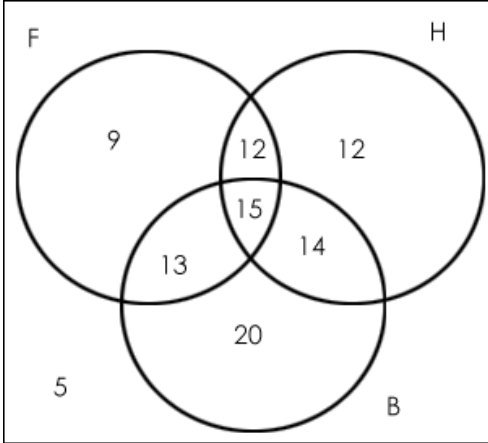
	A	This is a linear algorithm.
	B	This is a branching algorithm that uses IF statement.
	C	This is a cyclic algorithm that is using WHILE loop.
	D	This is a cyclic algorithm that is using a FOR loop.

36	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	OR
B	XOR
C	NOR
D	NAND

37	Let A = {1, 2, 3, 4, 5}. How many <u>proper</u> subsets does the set A have?
A	4
B	15
C	31
D	32

38	Let A be a set given by the following set-builder notation: $A = \{x \in Z \mid 3 < x \le 8\}$ What is the value of n(A)?
	A n(A) = 3
	B n(A) = 4
	C n(A) = 5
	D n(A) = 8

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 these three sports. How many do NOT train hockey?
	A 12
	B 41
	C 42
	D 47

40	There are 16 computers in the store. 7 have Photoshop installed. 8 have Illustrator installed. 4 computers have no program installed for picture editing. How many computers have BOTH Photoshop and Illustrator installed?
A	1
B	3
C	5
D	7

Answers:

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