IDENTIFICATION OF THE MAIN DOSE-FORMING RADIONUCLIDES IN NPP EMISSIONS

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The main dose-forming radionuclides must be taken into account in order to determine the impact of radiation on man and the environment [1]. They are not known at present. One reason for the impossibility of picking them is that only a limited number of radionuclides are controlled in NPP emissions. In Russia, the emissions of seven radionuclides – 134,137Cs, 58,60Co, 51Cr, 54Mn, and 131I – and the total β-activity and total emissions of inert radioactive gases [2] are controlled.

An electronic database on the radioactive emissions and discharges from NPP with different types of reactors has been developed in European countries [3]. The content of 101 radionuclides and four total indices are monitored: β-, α-activity, inert radioactive gases, and iodine isotopes (Table 1). Analysis of these data permits determining the contribution of each radionuclide to dose formation and formulating a list of radionuclides for each type of reactor that determine the 95% contribution the effective dose for the public. The results of ranking the radionuclides in the emissions from European NPP according to their contribution to the radiation exposure of the public are presented below.

The contribution of the controlled radionuclides was determined for the five most common types of reactors used in NPP: water moderated and cooled power reactors PWR, boiling water BWR, advanced gas-cooled AGR, high-power channel reactors LWGR, and heavy-water CANDU. The conditions for the formation of the radiation exposure – the relief, half-life structure, and food ration in the general population in the action zone of the emissions and the meteorological conditions – are assumed to be the same. The effective emission height in the calculation was 120 m. The activity of the radionuclides entering the atmosphere was averaged over 10 years of observations at NPP and led to the number of reactors in the sample. Thus, the average yearly activity of the emissions of each radionuclide for one reactor was obtained.

Five samples for the emissions of five types of reactors over the last 10 years of operation were formed in order to determine the dose loads on the general population: 19 NPP with PWR in France, three NPP with BWR in Sweden, eight NPP with AGR in Great Britain, one NPP with LWGR in Lithuania, and one NPP with CANDU in Rumania. Each sample included radionuclides which are monitored in at least 50% of the NPP (Table 2).

- How many parameters are under control at Russian nuclear power plants?
  - ○ In Russia nine parameters are controlled: seven radionuclides, the total β-activity and total emissions of inert radioactive gases.
  - ○ In Russia there is no limits for controlled parameters.
  - ○ In Russia only the total a- and β-activity and total emissions of inert radioactive gases are controlled.
  - ○ In Russia nuclear power plants control from seven up to fifteen radionuclides.
- How authors have got information about 101 radionuclides and other parameters?
  - ○ Authors have got the information during their experiments on the European nuclear power plants with different types of reactors
  - ○ Authors have got the information by collecting it from each European nuclear

power plant.

○ Authors have got the information from the European electronic database on the radioactive emissions and discharges from NPP with different types of reactors

- What amount of release activity have been chosen to estimate contribution of each radionuclide?

- How many types of reactors have been considered in this article?

- What is the main aim of this work?

- What conditions have been chosen to estimate radiation exposure?

  ○ Meteorological conditions were assumed the same for all cases.

  ○ All mentioned below.

  ○ Relief of environment was assumed the same for all cases.

  ○ Food ration in the general population in the action zone of the emissions was assumed the same for all cases.

- What was the effective emission height in calculations?

Вопрос 2

Пока нет ответа

Балл: 2

The derivative $f'(x)$ of the function $f(x) = x \ln(2x - 1)$ is equal to

Выберите один ответ:

○ $\ln(2x - 1) + \dfrac{x}{2x - 1}$

○ $\ln(2x - 1) + \dfrac{2x}{2x - 1}$

○ $\dfrac{x}{2x - 1}$

○ $\dfrac{2x}{2x - 1}$

Вопрос 3

Пока нет ответа

Балл: 2

The derivative $f'(x)$ of the function $f(x) = x^2 \operatorname{ctg}(2x-1)$ is equal to

Выберите один ответ:

- $\quad 2x\operatorname{ctg}(2x-1) + \dfrac{x^2}{\cos^2(2x-1)}$

- $\quad 2x\operatorname{ctg}(2x-1) + \dfrac{2x^2}{\sin^2(2x-1)}$

- $\quad 2x\operatorname{ctg}(2x-1) - \dfrac{2x^2}{\sin^2(2x-1)}$

- $\quad -\dfrac{4x}{\sin^2(2x-1)}$

Вопрос 4

Пока нет ответа

Балл: 2

The derivative $f'(x)$ of the function $f(x) = x3^{4-2x}$ is equal to

Выберите один ответ:

- $3^{4-2x}\ln 3$

- $3^{4-2x} + x(4-2x)3^{3-x}$

- $3^{4-2x} - x \cdot 2 \cdot 3^{3-2x}$

- $3^{4-2x}(1 - 2x\ln 3)$

Вопрос 5

Пока нет ответа

Балл: 2

$\dfrac{\partial z}{\partial x}$ function $z = 3x^3 + 4y^2 + 3$ at the point $M(1;0)$ is equal to

Выберите один ответ:

- 10
- 9
- 4
- 18

Вопрос 6

Пока нет ответа

Балл: 2

$\dfrac{\partial z}{\partial x}$ function $z = 6x^6 + 4y^2 + 6$ at the point $M(1; 0)$ is equal to
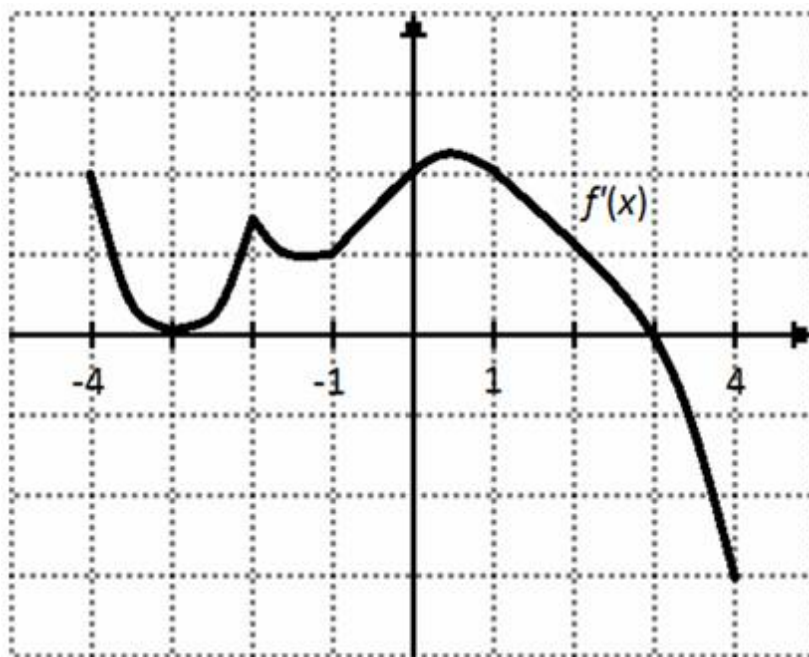
Выберите один ответ:

- ○ 16
- ○ 28
- ○ 64
- ○ 36

Вопрос 7

Пока нет ответа

Балл: 1

The picture shows a graph of the derivative $f'(x)$. Then:
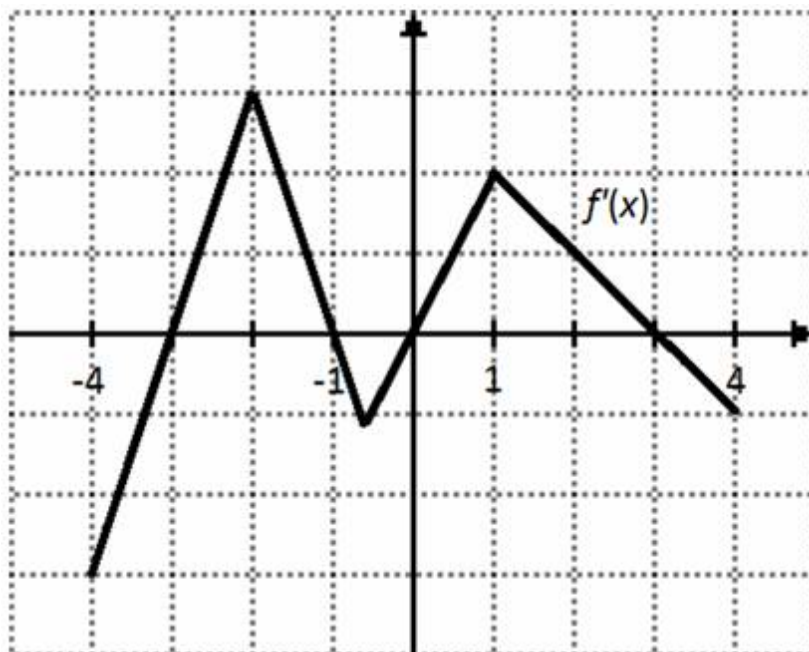

Выберите один или несколько ответов:

- ☐ function $f(x)$ increases on the interval $(-3; 3)$

- ☐ function $f(x)$ decreases on the interval $(-4; -3)$

- ☐ function $f(x)$ has in the interval $(-4; 4)$ one point of local maximum

- ☐ point $x = -3$ is the local minimum point of the function $f(x)$

- ☐ point $x = -2$ is the local minimum point of the function $f(x)$

Вопрос 8

Пока нет ответа

Балл: 1

The picture shows a graph of the derivative $f'(x)$. Then:

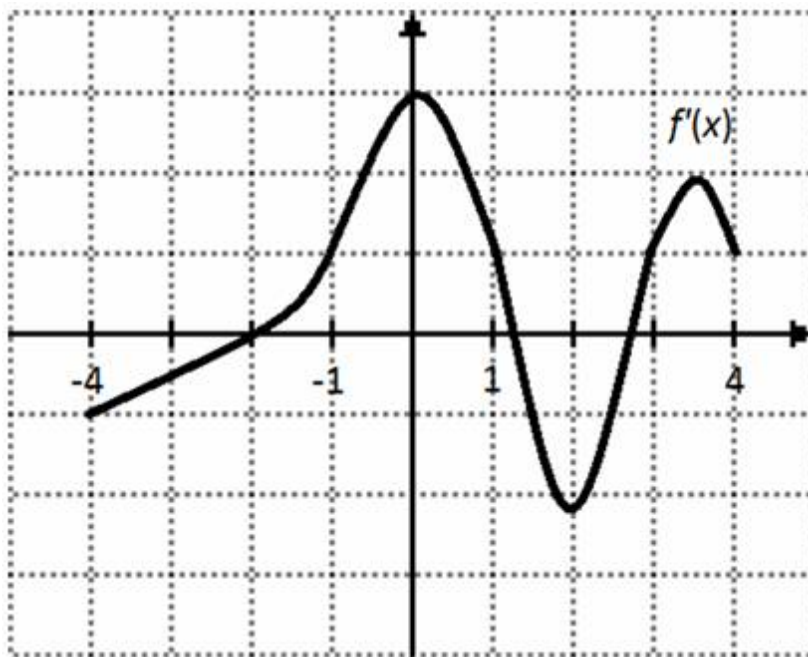Выберите один или несколько ответов:

- ☐ the function $f(x)$ increases on the interval $(-4; -3)$

- ☐ point $x = -1$ is the local maximum point of the function $f(x)$

- ☐ the function $f(x)$ has in the interval $(-4; 4)$ three points of local extremum

- ☐ the function $f(x)$ decreases on the interval $(-1; 0)$

Вопрос 9

Пока нет ответа

Балл: 1

The picture shows a graph of the derivative $f'(x)$. Then:

Выберите один или несколько ответов:

- ☐ function $f(x)$ has in the interval $(1; 3)$ one local minimum point and one local maximum point

- ☐ point $x = -2$ is the local minimum point $f(x)$

- ☐ function $f(x)$ has in the interval $(-4; 4)$ two points of local maximum

- ☐ function $f(x)$ increases on the interval $(2; 4)$

Вопрос 10

Пока нет ответа

Балл: 1

The minimum of the function $f(x) = \dfrac{x^7}{7} + \dfrac{x^6}{6} - \dfrac{2x^5}{5}$ is equal to

Выберите один ответ:

- ○ 0

- ○ $-\dfrac{7}{18}$

- ○ $-\dfrac{2144}{105}$

- ○ $-\dfrac{19}{210}$

Вопрос 11

Пока нет ответа

Балл: 1

Intervals of increasing function $f(x) = \dfrac{x^3}{3} - x^2 - 3x + 5$ have a form

Выберите один или несколько ответов:

- ☐ $(-\infty, -1)$

- ☐ $(-\infty, -3) \cup (1, +\infty)$

- ☐ $(-1, 3)$

- ☐ $(3, +\infty)$

Вопрос 12

Пока нет ответа

Балл: 1

Determinant $\begin{vmatrix} 1 & -2 \\ -3 & 4 \end{vmatrix}$ is equal to

Выберите один ответ:

- ○ 5
- ○ 10
- ○ -2
- ○ 2

Вопрос 13

Пока нет ответа

Балл: 1

Determinant $\begin{vmatrix} 10 & 12 \\ 3 & 2 \end{vmatrix}$ is equal to

Выберите один ответ:

- ○ -16
- ○ 12
- ○ 29
- ○ 16

Вопрос 14

Пока нет ответа

Балл: 1

Determinant $\begin{vmatrix} 1 & 2 & 3 \\ 0 & 3 & 0 \\ 2 & 0 & -2 \end{vmatrix}$ is equal to

Выберите один ответ:

- ○ -8
- ○ 24
- ○ -24
- ○ 0

Вопрос 15

Пока нет ответа

Балл: 1

Matrix sum $\begin{pmatrix} 3 & 0 \\ -3 & 8 \end{pmatrix}$ and $\begin{pmatrix} 7 & 4 \\ -1 & -3 \end{pmatrix}$ is equal to

Выберите один ответ:

○ $\begin{pmatrix} 4 & 0 \\ 2 & -11 \end{pmatrix}$

○ $\begin{pmatrix} 10 & 4 \\ -4 & 5 \end{pmatrix}$

○ $\begin{pmatrix} -10 & 4 \\ 4 & 5 \end{pmatrix}$

○ $\begin{pmatrix} -4 & 0 \\ 4 & -5 \end{pmatrix}$

Вопрос 16

Пока нет ответа

Балл: 1

Matrix multiplication $\begin{pmatrix} 1 & 2 & 4 \end{pmatrix} \begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix}$

Выберите один ответ:

○   undefined

○   is equal to 12

○   is equal to $\begin{pmatrix} 2 & 4 & 8 \\ -1 & -2 & -4 \\ 3 & 6 & 12 \end{pmatrix}$

○   is equal to 3

Вопрос 17

Пока нет ответа

Балл: 1

The symbols ####, appearing in the calculations in the tabular processor, means that

Выберите один ответ:

○   the value in the cell tends to infinity

○   an error occurred while dividing by zero

○   the result does not fit in the cell, it is necessary to increase its width

○   the input does not match the cell format

Вопрос 18

Пока нет ответа

Балл: 1

To solve optimization problems in Excel, an add-in is used.

Выберите один ответ:

- ○ Analysis package
- ○ Summation wizard
- ○ Finding a solution
- ○ Substitution wizard

Вопрос 19

Пока нет ответа

Балл: 1

The following MS Excel functions can be used to merge several text lines into one:

	A	B	C	D	E
1	Ivanova	Maria	Petrovna	Ivanova Maria Petrovna	
2					

Выберите один или несколько ответов:

- ☐ SUBSTITUTE
- ☐ CONCATENATE
- ☐ AND
- ☐ SYMBOL «&»

Вопрос 20

Пока нет ответа

Балл: 1

To calculate the number of the working days of t employees of the enterprise, you can use the formula:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Full Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Days worked for half a month	
2	Samsonova E. V.	x	x						x	x						x	x	10	
3																			
4	X - Weekend																		
5																			

Выберите один ответ:

- ○ =COUNTBLANK(B2:Q2)
- ○ =COUNTIF(B2:Q2;"X")
- ○ =SUMIF(B2:Q2;"=0")
- ○ =COUNTA(B2:Q2)

Вопрос 21

Пока нет ответа

Балл: 1

Calculated by the formula the value in the cell C5 is:

	A	B	C
1	PRODUCT	QUANTITY	COST
2	Product A	1	5
3	Product B	10	10
4	Product C	5	20
5			=SUMPRODUCT(B2:B4;C2:C4)
6			

Выберите один ответ:

○   51

○   1050

○   205

○   35

Вопрос 22

Пока нет ответа

Балл: 1

Calculated by the formula the value in the cell D2 is:

	A	B	C	D
1	№	Fullname	Total Points	Premium
2	1	Ivanov I. S.	120	=IF(AND(C2>=100;
3	2	Morozov V. I.	98	C2<150);10000;
4	3	Kozlov S. A.	110	IF(C2>=150;
5	4	Alekseeva S. I.	75	20000;0))
6	5	Popova O. G.	185	

Выберите один ответ:

○   0

○   12000

○   10000

○   20000

Вопрос 23

Пока нет ответа

Балл: 1

The key ... allows you to go up one screen.

Выберите один ответ:

○   Page Down

○   End

○   Home

○   Page Up

Вопрос 24

Пока нет ответа

Балл: 1

The "font size" command refers to formatting commands.

Выберите один ответ:

- ○ lists
- ○ symbols
- ○ tables
- ○ paragraphs

Вопрос 25

Пока нет ответа

Балл: 1

Text formats:

Выберите один или несколько ответов:

- ☐ bmp
- ☐ txt
- ☐ mdb
- ☐ jpg
- ☐ docx
- ☐ doc

Вопрос 26

Пока нет ответа

Балл: 1

Templates in the word processor are designed to

Выберите один ответ:

- ○ inserts into the document automatic table of contents
- ○ inserting graphic objects into a document
- ○ replacements of misspelled words
- ○ use of formatting options

Вопрос 27

Пока нет ответа

Балл: 1

As a result of marketing research on critically important parameters of content delivery, the following classes of youth users of online-service were identified:
A –by the age (1 – 12-15 years; 2 – 16-19; 3 – 20-25; 4 – 26+)
B – by type of device used (1 – laptop; 2 – stationary PC; 3 – tablet; 4 – smartphone).
C – by type of operating system (1 – Windows; 2 – MacOS; 3 – Android)
How many consumer groups (segments) need to be analyzed to make decisions about promoting a service (calculate the total capacity of the morphological set).

Вопрос 28

Пока нет ответа

Балл: 1

Calculate the breakeven point of the company according to the following data (per month). Fixed costs of the company - 100 thousand rubles per month, variable - 1 thousand rubles on one product. Sale price - 1.3 thousand rubles for one product.

Вопрос 29

Пока нет ответа

Балл: 1

In the information system were selected 7 atomic information objects, to which was issued an access to three types of subjects. Understanding, that each subject can see, read, modify and execute an object, calculate how many settings need to be described in the access matrix (authorization). [____]

Вопрос 30

Пока нет ответа

Балл: 1

Developing a complete life cycle information system model (IS). A medium-sized business accounting company uses IS 1C: Accounting. In connection with the increase in the volume of work, it was necessary to create a separate workplace for a payroll accountant for a new employee. The task is assigned to the IT department of the enterprise. The head chooses, which methodology (model of lifecycle of IS development) is better to use. Compare the various methodologies among themselves on the content of work at each of the stages. Choose the most complete answer to the question: How different are the contents and the list of works, performed throughout the full life cycle of IS, in various methodologies?

○ Each methodology describes life cycle trajectory, therefore, the list and content of work differs fundamentally

○ The types and content of works offered by different methodologies are close, however, they are performed in different order

○ Some types of work, the implementation of which in the framework of one methodology is necessary, as part of another methodology is not provided

○ Types, content and order of work throughout the life cycle of an IS is the same, methodologies differ from each other only in the number of stages, titles and formulation of the work

Вопрос 31

Пока нет ответа

Балл: 1

In the product life cycle model, represented by the matrix of Boston Consulting Group, each stage has its own figurative name, to which marketers have come up with many analogs. Select one incorrect stage name from the following:

○ Milch cow

○ star

○ money bag

○ skimming

Вопрос 32

Пока нет ответа

Балл: 1

In the black box model there are a number of typical elements. What element in the proposed listing does not apply to this model?

○ process in the system

○ software of system functioning

○ output

○ input

Вопрос 33

Пока нет ответа

Балл: 2

Which expression allows to display additional information about how the SELECT query will be executed? [   ]

Вопрос 34

Пока нет ответа

Балл: 2

Is SQLite a highly efficient multi-user DBMS(Database management system):

○ Yes, because it is embedded

○ No, because it is written in the PHP programming language

○ Yes, because it stores all its data in RAM

○ No, because it was designed as a single-user

Вопрос 35

Пока нет ответа

Балл: 2

Which function is NOT aggregative? [   ]

Вопрос 36

Пока нет ответа

Балл: 2

Request
UPDATE Products SET list_price=list_price*1.5

○ Raises prices by one and a half

○ Erroneous – a temporary column is required to store the intermediate result

○ Displays prices increased by one and a half, the data in the table will remain unchanged

---

Вопрос 37

Пока нет ответа

Балл: 2

Abbreviation noSQL stands for:

○ NO SQL!

○ New Order SQL

○ Not Only SQL

Вопрос 38

Пока нет ответа

Балл: 2

Which of the following types is suitable for storing the date: [   ]

Вопрос 39

Пока нет ответа

Балл: 2

Request

SELECT MIN(salary), MAX(salary), MIN(from_date), MAX(from_date) FROM salaries

○ Invalid, because it contains simultaneously different group functions

○ Returns four lines

○ Returns one line maximum and minimum for fields salary, from_date

---

Вопрос 40

Пока нет ответа

Балл: 2

What keyword is used to filter the values obtained as a result of the use of aggregation function in the query results using GROUP BY?

Вопрос 41

Пока нет ответа

Балл: 1

BPM-concept is

○ The concept of process management of the organization, considering business processes as special resources of the enterprise, continuously adapting to constant changes

○ The concept of a functional approach to the management of the organization

○ The concept of product quality management

Вопрос 42

Пока нет ответа

Балл: 1

The number of intersections and bends of the line of arrows in IDEF0 should be

---

Вопрос 43

Пока нет ответа

Балл: 1

If we use «Exclusive OR» for branching in IDEF3, so for merging we need to apply

○ «AND»

○ «OR»

○ «Exclusive OR»

Вопрос 44

Пока нет ответа

Балл: 1

Type of feedback in notation IDEF0?

○ input1-input2

○ output1-output2

○ output-input

Вопрос 45

Пока нет ответа

Балл: 1

One of the prototypes of the notation eEPC (Aris) is the method

---

Вопрос 46

Пока нет ответа

Балл: 1

How the arrow of the mechanism is related to the operation block in IDEF0 notation?

- The arrow enters the upper side of the block
- The arrow enters the lower side of the block
- The arrow enters the left side of the block

Вопрос 47

Пока нет ответа

Балл: 1

What are basic standards for describing processes?

- IDEF3
- IDEF0
- DFD, WFD

Вопрос 48

Пока нет ответа

Балл: 1

Notation IDEF0 – this is an abbreviation of the name

- Information DEFinition
- Integrated Computer-Aided Manufacturing (ICAM) DEFinition
- Interface DEFinition

Вопрос 49

Пока нет ответа

Балл: 2

Choose the correct statement regarding encapsulation:

- Allows describing a new class based on an already existing class with partially or fully borrowed functionality
- Provides independence of the resulting code from the user, allows combining the data and methods in the class that works with them
- A description of the object, in which the significant properties are highlighted and other irrelevant at the moment are discarded

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Вопрос 50

Пока нет ответа

Балл: 2

What correctly describes the cyclic operator FOR?

- The initialization of the cycle parameters is performed inside the cycle body
- It is forbidden to interrupt the cycle using the keyword break or move to the next iteration using the keyword continue
- The initialization of cycle parameter is performed before cycle body
- Upper cycle end conditions are used (cycle works, if the result of the condition is false)

Вопрос 51

Пока нет ответа

Балл: 2

Choose one correct statement, concerning the properties of algorithms determinism:

- The algorithm produces the same result for the same source data
- The algorithm should include only commands from a predetermined system of commands of the contractor
- Before you perform a specific action, you must perform the previous ones
- Indicates that each step of the algorithm should be strictly defined, and cannot allow different interpretations

.

Вопрос 52

Пока нет ответа

Балл: 2

A record of a real number with a floating point is:

Вопрос 53

Пока нет ответа

Балл: 2

Indicate one correct statement, regarding the algorithm development process:

○ Choosing the best available method

○ Reducing the problem to a mathematical model, for which the solution method is known

○ The exact description of the data,the conditions of the problem and it's solutions

○ Determine the sequence of actions, leading to the results

Вопрос 54

Пока нет ответа

Балл: 2

There is a logical expression (x*x + y*y) <= 1; For which area on the plane this expression will be true?

○ For points of the plane, located inside the square with single sides

○ For points, located outside the circle with a unit radius

○ For a circle of a unit radius

○ For points of the plane, located outside the square with single sides

---

Вопрос 55

Пока нет ответа

Балл: 2

Choose the correct statement regarding the features of a static array:

○ The size of the array is set during the creation and initialization of the array during program execution

○ The size of the array must be specified at the compilation of the program

○ Array support implies an array resizing operation

.

Вопрос 56

Пока нет ответа

Балл: 2

Which of the ways to connect to the Internet provides the greatest opportunities for access to information resources

○ Permanent connection via dedicated telephone channel

○ Terminal connection via dial-up telephone channel

○ Remote access via dial-up telephone channel

○ Permanent connection over fiber channel

Вопрос 57

Пока нет ответа

Балл: 1

List the main tools and methods that are not used to estimate the cost of the project

○ Top to bottom estimation

○ Estimation by analogy

○ Mastered volume

○ Parametric estimation

Вопрос 58

Пока нет ответа

Балл: 1

List the indicators that are NOT key method in the mastered volume

○ Actual volume

○ Mastered volume

○ Cost variance

○ Schedule deviation

Вопрос 59

Пока нет ответа

Балл: 1

What is the goal of integrating project management processes?

○ Construction of integration interaction of planning processes with work execution processes

○ Ensuring the integration of planning and management processes in MS Project

○ Achievement of effective interaction of management processes, ensuring the achievement of project objectives

Вопрос 60

Пока нет ответа

Балл: 1

What tools and methods are used for quantitative risk analysis?

○ Risk register

○ Documentation analysis

○ Analogy method

○ The method of nominal groups