

TALABALAR MUSTAQIL ISHINI TASHKILLASHDA MATEMATIK DASTUR  
PROGRAMMALARIDAN FOYDALANISH USLUBIYOTI

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**Annotatsiya:** *Maple, Mathematica, MATLAB va boshqalar kabi matematik dasturlar zamonaviy dunyoda muhim rol o'ynaydi, chunki ular bir qator muhim xususiyatlar va imtiyozlarni beradi. Matematik dasturiy ta'minot qo'lda ko'p vaqt va kuch talab qilishi mumkin bo'lgan murakkab matematik modellar va tenglamalarni hisoblash va tahlil qilish imkonini beradi. Maqolada iqtisodiy masalalarni Maple dastur yordamida yechish uslubi bayon etilgan.*

**Kalit so'zlar:** *tarmoq, tenglama, xarajat matritsasi, mahsulot oqimi Maple, yalpi mahsulot.*

**Аннотация.** *Математические программные обеспечения, такие как Maple, Mathematica, MATLAB и т. д., играют важную роль в современном мире, поскольку предоставляет ряд важных функций и преимуществ. Математическое программное обеспечение позволяет рассчитывать и анализировать сложные математические модели и уравнения, которые могут отнять много времени и усилий вручную. В статье описан метод решения экономических задач с помощью программы Maple.*

**Ключевые слова:** *сеть, уравнение, матрица затрат, поток продуктов Maple, валовой продукт.*

**Annotation.** *Mathematical software like Maple, Mathematica, MATLAB, etc. play an important role in today's world as it provides a number of important features and benefits. Mathematical software allows you to calculate and analyze complex mathematical models and equations that can be time-consuming and labor-intensive by hand. The article describes a method for solving economic problems using the Maple program.*

**Keywords:** *network, equation, cost matrix, Maple product flow, gross product.*

Ta'limda keng ko'lamda kredit moduli tizimining kirib kelishi bo'lajak mutaxassislarni tayyorlashda mustaqillikka alohida e'tiborni qaratdi. Talabalarda amaliy masalalarni yechish kompetentligini shakllantirish asosiy masalalardan biriga aylandi. Talaba keng ko'lamda fikrlashi, mustaqil qaror chiqarishi kelgusi haqida bashorat yuritishi zarur. Amaliy masalalar yechish kompetentligini oshirishda matematik dasturlardan foydalanish masalani yechish uchun ajratilgan vaqtni tejaydi. Masalani yechishdagi xatoliklarni kamaytiradi. Texnikaning bugungi kundagi rivojlanishi amaliy masalalarni yechish uchun alohida matematik dasturlardan

foydalanish yaxshi natijalarga olib keladi. Quyida amaliy masalalarni Maple dasturi yordamida yechish uslubiyotini ko'rib chiqaylik.

Masala. 3 tarmoqli muvozanat modelini o'rganamiz. Ma'lumotlar quyidagi jadvalda berilgan.

1-jadval

Ishlab chiqarish tarmoqlari	Iste'molchi tarmoqlar			Natijaviy mahsulot
	1	2	3	
1	0.0	0.4	0.5	200
2	0.2	0.5	0.0	150
3	0.3	0.1	0.2	300

Yechish.

1. To'liq xarajatlar matritsasini topamiz:

$W = E - A$  matritsani hisoblaymiz.

$$W = \begin{pmatrix} 1 & -0.4 & -0.5 \\ -0.2 & 0.5 & 0.0 \\ -0.3 & -0.1 & 0.8 \end{pmatrix}$$

U holda

$$W^{-1} = \begin{pmatrix} 1.516 & 1.16 & 0.948 \\ 0.607 & 2.464 & 0.375 \\ 0.64 & 0.743 & 1.653 \end{pmatrix}$$

1. Yalpi mahsulotni hisoblaymiz

$$X = W^{-1} \cdot Y = \begin{pmatrix} 1.516 & 1.16 & 0.948 \\ 0.607 & 2.464 & 0.375 \\ 0.64 & 0.743 & 1.653 \end{pmatrix} \cdot \begin{pmatrix} 200 \\ 150 \\ 300 \end{pmatrix} = \begin{pmatrix} 761.562 \\ 604.615 \\ 736.164 \end{pmatrix}$$

2. Tarmoqlar aro mahsulot oqimini hisoblaymiz.

$$X_1 = X_1 \cdot \begin{pmatrix} 0 \\ 0.2 \\ 0.3 \end{pmatrix} = 761.562 \cdot \begin{pmatrix} 0 \\ 0.2 \\ 0.3 \end{pmatrix} = \begin{pmatrix} 0 \\ 152.312 \\ 228.403 \end{pmatrix},$$

$$X_2 = X_2 \cdot \begin{pmatrix} 0.32 \\ 0.5 \\ 0.1 \end{pmatrix} = 604.625 \cdot \begin{pmatrix} 0.32 \\ 0.5 \\ 0.1 \end{pmatrix} = \begin{pmatrix} 103.48 \\ 302.312 \\ 60.462 \end{pmatrix},$$

$$X_3 = X_3 \cdot \begin{pmatrix} 0.5 \\ 0 \\ 0.2 \end{pmatrix} = 736.164 \cdot \begin{pmatrix} 0.5 \\ 0 \\ 0.2 \end{pmatrix} = \begin{pmatrix} 368.082 \\ 0 \\ 147.232 \end{pmatrix}.$$

Demak

$$X = \begin{pmatrix} 0 & 103.48 & 368.082 \\ 152.312 & 302.312 & 0 \\ 228.463 & 60.462 & 147.232 \end{pmatrix}.$$

3. Shartli toza mahsulot birligini hisoblaymiz.

$$Z_1 = 761.562 - (0 + 152.312 + 228.463) = 380.781,$$

$$Z_2 = 604.625 - (193.48 + 302.312 + 60.462) = 48.37,$$

$$Z_3 = 736.134 - (368.082 + 147.233) = 220.849$$

Demak

$$Z = \begin{pmatrix} 380.781 \\ 48.37 \\ 220.849 \end{pmatrix}.$$

Masalani Maple dasturida ko'ramiz:

> *restart; with(linalg) : A := matrix([[0, 0.32, 0.5], [0.2, 0.5, 0], [0.3, 0.1, 0.2]])*

$$A := \begin{bmatrix} 0 & 0.32 & 0.5 \\ 0.2 & 0.5 & 0 \\ 0.3 & 0.1 & 0.2 \end{bmatrix}$$

> *E := matrix([[1, 0, 0], [0, 1, 0], [0, 0, 1]])*

$$E := \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

> *W := evalm(E - A);*

$$W := \begin{bmatrix} 1 & -0.32 & -0.5 \\ -0.2 & 0.5 & 0 \\ -0.3 & -0.1 & 0.8 \end{bmatrix}$$

> *X := matrix([[200], [150], [300]]);*

$$X := \begin{bmatrix} 200 \\ 150 \\ 300 \end{bmatrix}$$

> *H := inverse(W)*

$$H := \begin{bmatrix} 1.516300227 & 1.159969674 & 0.9476876422 \\ 0.6065200910 & 2.463987870 & 0.3790750569 \\ 0.6444275967 & 0.7429871114 & 1.652767248 \end{bmatrix}$$

> *Y := multiply(H, X);*

$$Y := \begin{bmatrix} 761.5617892 \\ 604.6247158 \\ 736.1637604 \end{bmatrix}$$

$$> X1 := \text{matrix}([ [0], [0.2], [0.3] ])$$

$$X1 := \begin{bmatrix} 0 \\ 0.2 \\ 0.3 \end{bmatrix}$$

$$> A1 := \text{evalm}(761.561 \cdot X1);$$

$$A1 := \begin{bmatrix} 0. \\ 152.3122 \\ 228.4683 \end{bmatrix}$$

$$> X2 := \text{matrix}([ [0.32], [0.5], [0.1] ])$$

$$X2 := \begin{bmatrix} 0.32 \\ 0.5 \\ 0.1 \end{bmatrix}$$

$$> A2 := \text{evalm}(604.6247 \cdot X2)$$

$$A2 := \begin{bmatrix} 193.479904 \\ 302.31235 \\ 60.46247 \end{bmatrix}$$

$$> X3 := \text{matrix}([ [0.5], [0], [0.2] ])$$

$$X3 := \begin{bmatrix} 0.5 \\ 0 \\ 0.2 \end{bmatrix}$$

$$> A3 := \text{evalm}(736.164 \cdot X3)$$

$$A3 := \begin{bmatrix} 368.0820 \\ 0. \\ 147.2328 \end{bmatrix}$$

$$> Z1 := \text{evalm}(761.561 - (0 + 152.3122 + 228.4683));$$

$$Z1 := 380.7805$$

$$> Z2 := \text{evalm}(604.6247 - (193.4799 + 302.3123 + 60.4625))$$

$$Z2 := 48.3700$$

$$> Z3 := \text{evalm}(736.164 - (368.0820 + 0 + 147.2328))$$

$$Z3 := 220.8492$$

$$> Z := \text{matrix}([ [Z1], [Z2], [Z3] ])$$

$$Z := \begin{bmatrix} 380.7805 \\ 48.3700 \\ 220.8492 \end{bmatrix}$$

Ishlab chiqarish tarmoqlari	Iste'molchi tarmoqlar			Natijaviy mahsulot	Yalpi mahsulot
	1	2	3		
1	0	193.48	368.083	200	761.562
2	152.312	302.312	0	150	604.623
3	238.459	60.462	147.233	300	736.164
Shartli toza mahsulot	380.781	48.37	220.849		
Yalpi mahsulot	761.562	604.673	736.164		

Maple dasturi fan va texnikaning turli sohalarida hisoblash ishlarini bajarish uchun kuchli vositadir. Maple dasturidan foydalanish bo'yicha ba'zi xulosalar chiqarish mumkin.

Maple keng matematik va algoritmik funksiyalarni taqdim etadi, algebra va differentsial tenglamalardan statistika va optimallashtirishgacha bo'lgan muammolarni hal qilish imkonini beradi.

Maple turli xil operatsion tizimlarda ishlaydi, bu esa hisob-kitoblarni bajarishni tanlashda moslashuvchanlikni beradi.

Shunday qilib, Maple dasturiy ta'minotidan foydalanish keng funkcionallik, foydalanish qulayligi va moslashuvchanligini ta'minlovchi turli sohalarda hisoblash ishlarini bajarishning samarali usuli hisoblanadi.

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