# Ռեսուրսների բաշխման խնդիր (Առաջադրանք 5.2)

Կառավարման կենտրոնը իր տրամադրության տակ ունի S=36 ռեսուրս։ Անհրաժեշտ է ռեսուրսներն բաշխել n=9 արտադրությունների միջև, որպեսզի գումարային եկամուտը լինի առավելագույնը, ընդ որում յուրաքանչյուր արտադրության եկամուտի ֆունկցիան որոշվում է հետևյալ կերպ․

***,***

X - արտադրությանը տրամադրված ռեսուրսի քանակն է,

, – հաստատուն գործակիցներ են։

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
|  | 3 | 4 | 5.5 | 3 | 4.5 | 2.5 | 4 | 5 | 4.5 |

**Խնդրի մաթեմատիկական մոդելը՝**

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**Եկամտի քանակը արտադրությունների համար համապատասխան քանակությամբ ռեսուսների դեպքում`**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **i=1** | **i=2** | **i=3** | **i=4** | **i=5** | **i=6** | **i=7** | **i=8** | **i=9** |
| c=0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| c=1 | 0.25 | 0.07 | 0.04 | 0.4 | 0.03 | 0.57 | 0.04 | 0.05 | 0.03 |
| c=2 | 1.98 | 1.01 | 1.24 | 3.17 | 0.6 | 3.44 | 0.5 | 1.26 | 0.6 |
| c=3 | 3.74 | 2.4 | 4.07 | 5.98 | 1.59 | 5.73 | 1.2 | 3.73 | 1.59 |
| c=4 | 4.61 | 3.36 | 6.88 | 7.38 | 2.38 | 6.67 | 1.68 | 5.93 | 2.38 |
| c=5 | 4.91 | 3.8 | 8.68 | 7.85 | 2.78 | 6.93 | 1.9 | 7.19 | 2.78 |
| c=6 | 4.98 | 3.95 | 9.53 | 7.97 | 2.94 | 6.99 | 1.97 | 7.74 | 2.94 |
| c=7 | 5 | 3.99 | 9.86 | 7.99 | 2.98 | 7 | 1.99 | 7.93 | 2.98 |
| c=8 | 5 | 4 | 9.96 | 8 | 3 | 7 | 2 | 7.98 | 3 |
| c=9 | 5 | 4 | 9.99 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=10 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=11 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=12 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=13 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=14 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=15 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=16 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=17 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=18 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=19 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=20 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=21 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=22 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=23 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=24 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=25 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=26 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=27 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=28 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=29 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=30 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=31 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=32 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=33 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=34 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=35 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |
| c=36 | 5 | 4 | 10 | 8 | 3 | 7 | 2 | 8 | 3 |

Կազմենք անդրադարձ բանաձևը․

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Օգտագործելով անդրադարձ բանաձևը որոշենք ներդրումների պայմանական օպտիմալ բաշխումները։

|  |  |  |
| --- | --- | --- |
| **Z=1** |  |  |
| 0 | 0 | 0 |
| 1 | 0.248935342 | 1 |
| 2 | 1.98236626 | 2 |
| 3 | 3.737097711 | 3 |
| 4 | 4.6124754 | 4 |
| 5 | 4.906511227 | 5 |
| 6 | 4.981446092 | 6 |
| 7 | 4.996874489 | 7 |
| 8 | 4.999542794 | 8 |
| 9 | 4.99994091 | 9 |
| 10 | 4.999993161 | 10 |
| 11 | 4.999999283 | 11 |
| 12 | 4.999999931 | 12 |
| 13 | 4.999999994 | 13 |
| 14 | 5 | 14 |
| 15 | 5 | 15 |
| 16 | 5 | 16 |
| 17 | 5 | 17 |
| 18 | 5 | 18 |
| 19 | 5 | 19 |
| 20 | 5 | 20 |
| 21 | 5 | 20 |
| 22 | 5 | 20 |
| 23 | 5 | 20 |
| 24 | 5 | 20 |
| 25 | 5 | 20 |
| 26 | 5 | 20 |
| 27 | 5 | 20 |
| 28 | 5 | 20 |
| 29 | 5 | 20 |
| 30 | 5 | 20 |
| 31 | 5 | 20 |
| 32 | 5 | 20 |
| 33 | 5 | 20 |
| 34 | 5 | 20 |
| 35 | 5 | 20 |
| 36 | 5 | 20 |

|  |  |  |
| --- | --- | --- |
| **Z=2** |  |  |
| 0 | 0 | 0 |
| 1 | 0.248935342 | 0 |
| 2 | 1.98236626 | 0 |
| 3 | 3.737097711 | 0 |
| 4 | 4.6124754 | 0 |
| 5 | 4.906511227 | 0 |
| 6 | 6.139724509 | 3 |
| 7 | 7.09845251 | 4 |
| 8 | 7.973830199 | 4 |
| 9 | 8.40993057 | 5 |
| 10 | 8.703966398 | 5 |
| 11 | 8.853422668 | 6 |
| 12 | 8.928357533 | 6 |
| 13 | 8.969603301 | 7 |
| 14 | 8.985031697 | 7 |
| 15 | 8.994576504 | 8 |
| 16 | 8.997244809 | 8 |
| 17 | 8.999148386 | 9 |
| 18 | 8.999546502 | 9 |
| 19 | 8.999880238 | 10 |
| 20 | 8.999932489 | 10 |
| 21 | 8.999984706 | 11 |
| 22 | 8.999992084 | 12 |
| 23 | 8.999998207 | 12 |
| 24 | 8.999999157 | 13 |
| 25 | 8.999999805 | 13 |
| 26 | 8.999999918 | 14 |
| 27 | 8.99999998 | 14 |
| 28 | 8.999999993 | 15 |
| 29 | 8.999999998 | 15 |
| 30 | 8.999999999 | 16 |
| 31 | 9 | 16 |
| 32 | 9 | 17 |
| 33 | 9 | 17 |
| 34 | 9 | 18 |
| 35 | 9 | 18 |
| 36 | 9 | 19 |

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| --- | --- | --- |
| **Z=3** |  |  |
| 0 | 0 | 0 |
| 1 | 0.248935342 | 0 |
| 2 | 1.98236626 | 0 |
| 3 | 4.070414101 | 3 |
| 4 | 6.883584229 | 4 |
| 5 | 8.678555808 | 5 |
| 6 | 9.532738108 | 6 |
| 7 | 10.66092207 | 5 |
| 8 | 12.41565352 | 5 |
| 9 | 13.29103121 | 5 |
| 10 | 14.14521351 | 6 |
| 11 | 14.81828032 | 5 |
| 12 | 15.77700832 | 5 |
| 13 | 16.65238601 | 5 |
| 14 | 17.50656831 | 6 |
| 15 | 17.94266868 | 6 |
| 16 | 18.26856515 | 7 |
| 17 | 18.56260098 | 7 |
| 18 | 18.71205725 | 7 |
| 19 | 18.81609522 | 8 |
| 20 | 18.89103009 | 8 |
| 21 | 18.93227585 | 8 |
| 22 | 18.96086544 | 9 |
| 23 | 18.97629384 | 9 |
| 24 | 18.98583865 | 9 |
| 25 | 18.99274031 | 10 |
| 26 | 18.99540861 | 10 |
| 27 | 18.99731219 | 10 |
| 28 | 18.99879842 | 11 |
| 29 | 18.99919654 | 11 |
| 30 | 18.99953028 | 11 |
| 31 | 18.99981923 | 12 |
| 32 | 18.99987148 | 12 |
| 33 | 18.9999237 | 12 |
| 34 | 18.99997491 | 13 |
| 35 | 18.99998325 | 14 |
| 36 | 18.99999062 | 14 |

|  |  |  |
| --- | --- | --- |
| **Z=4** |  |  |
| 0 | 0 | 0 |
| 1 | 0.398296547 | 1 |
| 2 | 3.171786015 | 2 |
| 3 | 5.979356337 | 3 |
| 4 | 7.37996064 | 4 |
| 5 | 8.678555808 | 0 |
| 6 | 10.05537024 | 2 |
| 7 | 12.86294057 | 3 |
| 8 | 14.65791215 | 3 |
| 9 | 16.05851645 | 4 |
| 10 | 16.91269875 | 4 |
| 11 | 18.39500986 | 3 |
| 12 | 19.79561416 | 4 |
| 13 | 20.67099185 | 4 |
| 14 | 21.52517415 | 4 |
| 15 | 22.19824096 | 4 |
| 16 | 23.15696896 | 4 |
| 17 | 24.03234665 | 4 |
| 18 | 24.88652895 | 4 |
| 19 | 25.35698627 | 5 |
| 20 | 25.79308664 | 5 |
| 21 | 26.11898312 | 5 |
| 22 | 26.41301894 | 5 |
| 23 | 26.56247521 | 5 |
| 24 | 26.682371 | 6 |
| 25 | 26.78640897 | 6 |
| 26 | 26.86134383 | 6 |
| 27 | 26.9025896 | 6 |
| 28 | 26.93117919 | 6 |
| 29 | 26.95586463 | 7 |
| 30 | 26.97129302 | 7 |
| 31 | 26.98083783 | 7 |
| 32 | 26.98773949 | 7 |
| 33 | 26.99200878 | 8 |
| 34 | 26.99467708 | 8 |
| 35 | 26.99658066 | 8 |
| 36 | 26.99806689 | 8 |

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| **Z=5** |  |  |
| 0 | 0 | 0 |
| 1 | 0.398296547 | 0 |
| 2 | 3.171786015 | 0 |
| 3 | 5.979356337 | 0 |
| 4 | 7.37996064 | 0 |
| 5 | 8.678555808 | 0 |
| 6 | 10.05537024 | 0 |
| 7 | 12.86294057 | 0 |
| 8 | 14.65791215 | 0 |
| 9 | 16.05851645 | 0 |
| 10 | 16.91269875 | 0 |
| 11 | 18.39500986 | 0 |
| 12 | 19.79561416 | 0 |
| 13 | 20.67099185 | 0 |
| 14 | 21.52517415 | 0 |
| 15 | 22.19824096 | 0 |
| 16 | 23.15696896 | 0 |
| 17 | 24.03234665 | 0 |
| 18 | 24.88652895 | 0 |
| 19 | 25.35698627 | 0 |
| 20 | 25.79308664 | 0 |
| 21 | 26.47994376 | 3 |
| 22 | 27.26246294 | 4 |
| 23 | 27.73292027 | 4 |
| 24 | 28.16902064 | 4 |
| 25 | 28.57230143 | 5 |
| 26 | 28.8981979 | 5 |
| 27 | 29.19223373 | 5 |
| 28 | 29.34828752 | 6 |
| 29 | 29.49774379 | 6 |
| 30 | 29.61763957 | 6 |
| 31 | 29.72167754 | 6 |
| 32 | 29.79661241 | 6 |
| 33 | 29.84516568 | 7 |
| 34 | 29.88641145 | 7 |
| 35 | 29.91500104 | 7 |
| 36 | 29.93968647 | 7 |

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| --- | --- | --- |
| **Z=6** |  |  |
| 0 | 0 | 0 |
| 1 | 0.57459499 | 1 |
| 2 | 3.436472166 | 2 |
| 3 | 5.979356337 | 0 |
| 4 | 7.37996064 | 0 |
| 5 | 9.415828503 | 2 |
| 6 | 11.71412605 | 3 |
| 7 | 13.11473035 | 3 |
| 8 | 14.65791215 | 0 |
| 9 | 16.29941273 | 2 |
| 10 | 18.59771028 | 3 |
| 11 | 20.39268185 | 3 |
| 12 | 21.79328616 | 3 |
| 13 | 22.73197906 | 4 |
| 14 | 24.12977957 | 3 |
| 15 | 25.53038387 | 3 |
| 16 | 26.46907677 | 4 |
| 17 | 27.34445446 | 4 |
| 18 | 28.19863676 | 4 |
| 19 | 28.89173867 | 3 |
| 20 | 29.83043157 | 4 |
| 21 | 30.70580926 | 4 |
| 22 | 31.55999156 | 4 |
| 23 | 32.03044888 | 4 |
| 24 | 32.46654925 | 4 |
| 25 | 33.15340637 | 4 |
| 26 | 33.93592555 | 4 |
| 27 | 34.40638288 | 4 |
| 28 | 34.84248325 | 4 |
| 29 | 35.24576404 | 4 |
| 30 | 35.57166051 | 4 |
| 31 | 35.86569634 | 4 |
| 32 | 36.12621722 | 5 |
| 33 | 36.28227102 | 5 |
| 34 | 36.43172729 | 5 |
| 35 | 36.55162307 | 5 |
| 36 | 36.65566104 | 5 |

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| --- | --- | --- |
| **Z=7** |  |  |
| 0 | 0 | 0 |
| 1 | 0.57459499 | 0 |
| 2 | 3.436472166 | 0 |
| 3 | 5.979356337 | 0 |
| 4 | 7.37996064 | 0 |
| 5 | 9.415828503 | 0 |
| 6 | 11.71412605 | 0 |
| 7 | 13.11473035 | 0 |
| 8 | 14.65791215 | 0 |
| 9 | 16.29941273 | 0 |
| 10 | 18.59771028 | 0 |
| 11 | 20.39268185 | 0 |
| 12 | 21.79328616 | 0 |
| 13 | 22.73197906 | 0 |
| 14 | 24.12977957 | 0 |
| 15 | 25.53038387 | 0 |
| 16 | 26.46907677 | 0 |
| 17 | 27.34445446 | 0 |
| 18 | 28.19863676 | 0 |
| 19 | 28.89173867 | 0 |
| 20 | 29.83043157 | 0 |
| 21 | 30.70580926 | 0 |
| 22 | 31.55999156 | 0 |
| 23 | 32.03044888 | 0 |
| 24 | 32.46654925 | 0 |
| 25 | 33.15340637 | 0 |
| 26 | 33.93592555 | 0 |
| 27 | 34.40638288 | 0 |
| 28 | 34.84248325 | 0 |
| 29 | 35.24576404 | 0 |
| 30 | 35.61660295 | 4 |
| 31 | 36.08706028 | 4 |
| 32 | 36.52316065 | 4 |
| 33 | 36.92644144 | 4 |
| 34 | 37.25233791 | 4 |
| 35 | 37.54637374 | 4 |
| 36 | 37.80689462 | 4 |

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| --- | --- | --- |
| **Z=8** |  |  |
| 0 | 0 | 0 |
| 1 | 0.57459499 | 0 |
| 2 | 3.436472166 | 0 |
| 3 | 5.979356337 | 0 |
| 4 | 7.37996064 | 0 |
| 5 | 9.415828503 | 0 |
| 6 | 11.71412605 | 0 |
| 7 | 13.11473035 | 0 |
| 8 | 14.65791215 | 0 |
| 9 | 16.29941273 | 0 |
| 10 | 18.59771028 | 0 |
| 11 | 20.39268185 | 0 |
| 12 | 21.79328616 | 0 |
| 13 | 22.73197906 | 0 |
| 14 | 24.52444813 | 4 |
| 15 | 26.31941971 | 4 |
| 16 | 27.72002401 | 4 |
| 17 | 28.98588463 | 5 |
| 18 | 30.05651742 | 4 |
| 19 | 31.45712172 | 4 |
| 20 | 32.72298235 | 5 |
| 21 | 33.66167525 | 5 |
| 22 | 34.53705294 | 5 |
| 23 | 35.39123524 | 5 |
| 24 | 36.08433715 | 5 |
| 25 | 37.02303005 | 5 |
| 26 | 37.89840774 | 5 |
| 27 | 38.75259004 | 5 |
| 28 | 39.2986352 | 6 |
| 29 | 39.76909253 | 6 |
| 30 | 40.34600485 | 5 |
| 31 | 41.12852403 | 5 |
| 32 | 41.6745692 | 6 |
| 33 | 42.14502652 | 6 |
| 34 | 42.58112689 | 6 |
| 35 | 42.98440768 | 6 |
| 36 | 43.3552466 | 6 |

|  |  |  |
| --- | --- | --- |
| **Z=9** |  |  |
| 0 | 0 | 0 |
| 1 | 0.57459499 | 0 |
| 2 | 3.436472166 | 0 |
| 3 | 5.979356337 | 0 |
| 4 | 7.37996064 | 0 |
| 5 | 9.415828503 | 0 |
| 6 | 11.71412605 | 0 |
| 7 | 13.11473035 | 0 |
| 8 | 14.65791215 | 0 |
| 9 | 16.29941273 | 0 |
| 10 | 18.59771028 | 0 |
| 11 | 20.39268185 | 0 |
| 12 | 21.79328616 | 0 |
| 13 | 22.73197906 | 0 |
| 14 | 24.52444813 | 0 |
| 15 | 26.31941971 | 0 |
| 16 | 27.72002401 | 0 |
| 17 | 28.98588463 | 0 |
| 18 | 30.05651742 | 0 |
| 19 | 31.45712172 | 0 |
| 20 | 32.72298235 | 0 |
| 21 | 33.66167525 | 0 |
| 22 | 34.53705294 | 0 |
| 23 | 35.39123524 | 0 |
| 24 | 36.08433715 | 0 |
| 25 | 37.02303005 | 0 |
| 26 | 37.89840774 | 0 |
| 27 | 38.75259004 | 0 |
| 28 | 39.2986352 | 0 |
| 29 | 39.76909253 | 0 |
| 30 | 40.34600485 | 0 |
| 31 | 41.12852403 | 0 |
| 32 | 41.6745692 | 0 |
| 33 | 42.14502652 | 4 |
| 34 | 42.72193885 | 3 |
| 35 | 43.50445803 | 4 |
| 36 | 44.05050319 | 4 |

Առավել մանրամասն հաշվարկները կարող եք տեսնել հետևյալ հղմամբ` <https://github.com/hakobyyan/hvgh/blob/master/kursayin/Distributor_calculations.pdf>

Օպտիմալ բաշխումները՝  
Արտադրություն 1: 4 ռեսուրս -> Եկամուտ: 4.61  
Արտադրություն 2: 4 ռեսուրս -> Եկամուտ: 3.36  
Արտադրություն 3: 6 ռեսուրս -> Եկամուտ: 9.53  
Արտադրություն 4: 4 ռեսուրս -> Եկամուտ: 7.38  
Արտադրություն 5: 4 ռեսուրս -> Եկամուտ: 2.38  
Արտադրություն 6: 4 ռեսուրս -> Եկամուտ: 6.67  
Արտադրություն 7: 0 ռեսուրս -> Եկամուտ: 0  
Արտադրություն 8: 6 ռեսուրս -> Եկամուտ: 7.74  
Արտադրություն 9: 4 ռեսուրս -> Եկամուտ: 2.38  
Առավելագույն եկամուտը՝ 44.05