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| |  |  |  | | --- | --- | --- | |  |  |  | | МИНОБРНАУКИ РОССИИ | | | | Федеральное государственное бюджетное образовательное учреждение  высшего образования  **«МИРЭА – Российский технологический университет»**  **РТУ МИРЭА** | | |   Институт Информационных технологий | |
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| Кафедра Математического обеспечения и стандартизации информационных технологий | |
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| --- | --- |
| **Практическая работа № 4** | |
| **по дисциплине** | |
| **«**Конфигурационное управление**»** | |
|  | |
| Выполнил студент группы | . |
| Принял преподаватель | . |

|  |  |  |
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| Лабораторная работа выполнена | «\_\_»\_\_\_\_\_\_\_202\_\_ г. | *(подпись студента)* |
|  |  |  |
| «Зачтено» | «\_\_»\_\_\_\_\_\_\_202\_\_ г. | *(подпись руководителя)* |

Москва 2023

**Оглавление**

[**Задача 1** 5](#_Toc150546498)

[**Задача 2** 11](#_Toc150546499)

[**Задача 3** 19](#_Toc150546500)

[**Задача 4** 28](#_Toc150546501)

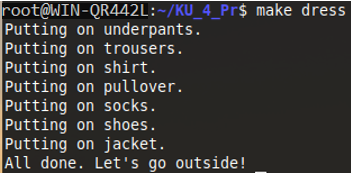
Создать приведенный Makefile и проверить его работоспособность.

|  |
| --- |
| dress: trousers shoes jacket  @echo "All done. Let's go outside!"  jacket: pullover  @echo "Putting on jacket."  pullover: shirt  @echo "Putting on pullover."  shirt:  @echo "Putting on shirt."  trousers: underpants  @echo "Putting on trousers."  underpants:  @echo "Putting on underpants."  shoes: socks  @echo "Putting on shoes."  socks: pullover  @echo "Putting on socks." |

Визуализировать файл [civgraph.txt](https://github.com/true-grue/kisscm/blob/main/pract/civgraph.txt).

***Решение:***

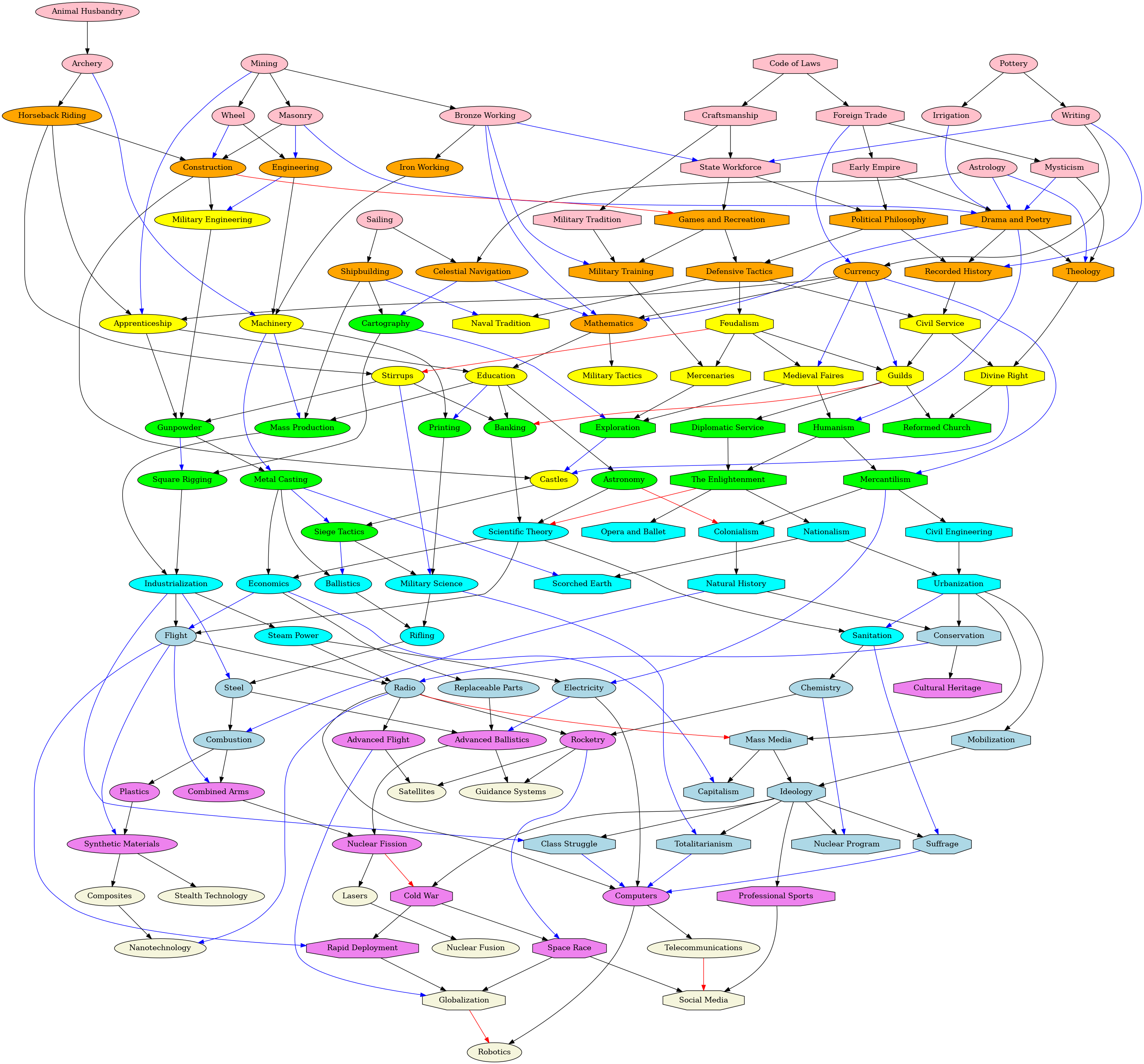
Тестирование примера dress:



Подготовленный Makefile для civgraph.txt:

|  |
| --- |
| **dress**: **trousers shoes jacket**  @echo "All done. Let's go outside!"  **jacket**: **pullover**  @echo "Putting on jacket."  **pullover**: **shirt**  @echo "Putting on pullover."  **shirt**:  @echo "Putting on shirt."  **trousers**: **underpants**  @echo "Putting on trousers."  **underpants**:  @echo "Putting on underpants."  **shoes**: **socks**  @echo "Putting on shoes."  **socks**: **pullover**  @echo "Putting on socks."  **cv**:  dot -Tpng -O civgraph.gv  open civgraph.gv.png |

Тестирование для civgraph.txt:



# **Задача 1**

Написать программу на Питоне, которая транслирует граф зависимостей civgraph в makefile в духе примера выше. Для мало знакомых с Питоном используется упрощенный вариант civgraph: [civgraph.json](https://github.com/true-grue/kisscm/blob/main/pract/civgraph.json).

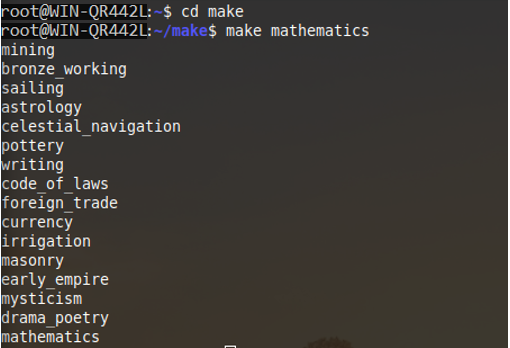
***Решение:***

Python-код генератора Makefile:

|  |
| --- |
| json = {"pottery": [], "irrigation": ["pottery"], "writing": ["pottery"], "animal\_husbandry": [], "archery": ["animal\_husbandry"], "mining": [], "masonry": ["mining"], "bronze\_working": ["mining"], "the\_wheel": ["mining"], "apprenticeship": ["mining", "currency", "horseback\_riding"], "sailing": [], "celestial\_navigation": ["sailing", "astrology"], "shipbuilding": ["sailing"], "astrology": [], "drama\_poetry": ["astrology", "irrigation", "masonry", "early\_empire", "mysticism"], "theology": ["astrology", "mysticism", "drama\_poetry"], "horseback\_riding": ["archery"], "machinery": ["archery", "iron\_working", "engineering"], "currency": ["writing", "foreign\_trade"], "state\_workforce": ["writing", "bronze\_working", "craftsmanship"], "recorded\_history": ["writing", "political\_philosophy", "drama\_poetry"], "construction": ["masonry", "the\_wheel", "horseback\_riding"], "engineering": ["masonry", "the\_wheel"], "iron\_working": ["bronze\_working"], "mathematics": ["bronze\_working", "celestial\_navigation", "currency", "drama\_poetry"], "military\_training": ["bronze\_working", "military\_tradition", "games\_recreation"], "cartography": ["celestial\_navigation", "shipbuilding"], "medieval\_faires": ["currency", "feudalism"], "guilds": ["currency", "feudalism", "civil\_service"], "mercantilism": ["currency", "humanism"], "stirrups": ["horseback\_riding", "feudalism"], "mass\_production": ["shipbuilding", "machinery", "education"], "naval\_tradition": ["shipbuilding", "defensive\_tactics"], "military\_tactics": ["mathematics"], "education": ["mathematics", "apprenticeship"], "military\_engineering": ["construction", "engineering"], "castles": ["construction", "divine\_right", "exploration"], "games\_recreation": ["construction", "state\_workforce"], "gunpowder": ["apprenticeship", "stirrups", "military\_engineering"], "printing": ["machinery", "education"], "metal\_casting": ["machinery", "gunpowder"], "banking": ["education", "stirrups", "guilds"], "astronomy": ["education"], "military\_science": ["stirrups", "printing", "siege\_tactics"], "siege\_tactics": ["castles", "metal\_casting"], "square\_rigging": ["cartography", "gunpowder"], "exploration": ["cartography", "mercenaries", "medieval\_faires"], "industrialization": ["mass\_production", "square\_rigging"], "scientific\_theory": ["banking", "astronomy", "the\_enlightenment"], "colonialism": ["astronomy", "mercantilism"], "ballistics": ["metal\_casting", "siege\_tactics"], "economics": ["metal\_casting", "scientific\_theory"], "scorched\_earth": ["metal\_casting", "nationalism"], "steam\_power": ["industrialization"], "flight": ["industrialization", "scientific\_theory", "economics"], "steel": ["industrialization", "rifling"], "class\_struggle": ["industrialization", "ideology"], "sanitation": ["scientific\_theory", "urbanization"], "rifling": ["ballistics", "military\_science"], "totalitarianism": ["military\_science", "ideology"], "electricity": ["steam\_power", "mercantilism"], "radio": ["steam\_power", "flight", "conservation"], "chemistry": ["sanitation"], "suffrage": ["sanitation", "ideology"], "replaceable\_parts": ["economics"], "capitalism": ["economics", "mass\_media"], "combined\_arms": ["flight", "combustion"], "synthetic\_materials": ["flight", "plastics"], "rapid\_deployment": ["flight", "cold\_war"], "advanced\_ballistics": ["replaceable\_parts", "steel", "electricity"], "combustion": ["steel", "natural\_history"], "computers": ["electricity", "radio", "suffrage", "totalitarianism", "class\_struggle"], "advanced\_flight": ["radio"], "rocketry": ["radio", "chemistry"], "nanotechnology": ["radio", "composites"], "mass\_media": ["radio", "urbanization"], "nuclear\_program": ["chemistry", "ideology"], "plastics": ["combustion"], "satellites": ["advanced\_flight", "rocketry"], "globalization": ["advanced\_flight", "rapid\_deployment", "space\_race"], "guidance\_systems": ["rocketry", "advanced\_ballistics"], "space\_race": ["rocketry", "cold\_war"], "nuclear\_fission": ["advanced\_ballistics", "combined\_arms"], "telecommunications": ["computers"], "robotics": ["computers", "globalization"], "lasers": ["nuclear\_fission"], "cold\_war": ["nuclear\_fission", "ideology"], "composites": ["synthetic\_materials"], "stealth\_technology": ["synthetic\_materials"], "social\_media": ["telecommunications", "professional\_sports", "space\_race"], "nuclear\_fusion": ["lasers"], "code\_of\_laws": [], "craftsmanship": ["code\_of\_laws"], "foreign\_trade": ["code\_of\_laws"], "military\_tradition": ["craftsmanship"], "early\_empire": ["foreign\_trade"], "mysticism": ["foreign\_trade"], "political\_philosophy": ["state\_workforce", "early\_empire"], "defensive\_tactics": ["games\_recreation", "political\_philosophy"], "humanism": ["drama\_poetry", "medieval\_faires"], "mercenaries": ["military\_training", "feudalism"], "feudalism": ["defensive\_tactics"], "civil\_service": ["defensive\_tactics", "recorded\_history"], "divine\_right": ["theology", "civil\_service"], "diplomatic\_service": ["guilds"], "reformed\_church": ["guilds", "divine\_right"], "the\_enlightenment": ["humanism", "diplomatic\_service"], "civil\_engineering": ["mercantilism"], "nationalism": ["the\_enlightenment"], "opera\_ballet": ["the\_enlightenment"], "natural\_history": ["colonialism"], "urbanization": ["civil\_engineering", "nationalism"], "conservation": ["natural\_history", "urbanization"], "mobilization": ["urbanization"], "cultural\_heritage": ["conservation"], "ideology": ["mass\_media", "mobilization"], "professional\_sports": ["ideology"]}  f = open("Makefile","w")  content = ""  **for** key **in** json:  content = content + key[:len(key)] + ":" + " ".join(json[key])+"**\n**"  content = content + "**\t**"+ "@echo " + key + "**\n**"  f.write(content)  f.close() |

Сформированный Makefile:

|  |
| --- |
| **pottery**:  @echo pottery  **irrigation**:**pottery**  @echo irrigation  **writing**:**pottery**  @echo writing  **animal\_husbandry**:  @echo animal\_husbandry  **archery**:**animal\_husbandry**  @echo archery  **mining**:  @echo mining  **masonry**:**mining**  @echo masonry  **bronze\_working**:**mining**  @echo bronze\_working  **the\_wheel**:**mining**  @echo the\_wheel  **apprenticeship**:**mining currency horseback\_riding**  @echo apprenticeship  **sailing**:  @echo sailing  **celestial\_navigation**:**sailing astrology**  @echo celestial\_navigation  **shipbuilding**:**sailing**  @echo shipbuilding  **astrology**:  @echo astrology  **drama\_poetry**:**astrology irrigation masonry early\_empire mysticism**  @echo drama\_poetry  **theology**:**astrology mysticism drama\_poetry**  @echo theology  **horseback\_riding**:**archery**  @echo horseback\_riding  **machinery**:**archery iron\_working engineering**  @echo machinery  **currency**:**writing foreign\_trade**  @echo currency  **state\_workforce**:**writing bronze\_working craftsmanship**  @echo state\_workforce  **recorded\_history**:**writing political\_philosophy drama\_poetry**  @echo recorded\_history  **construction**:**masonry the\_wheel horseback\_riding**  @echo construction  **engineering**:**masonry the\_wheel**  @echo engineering  **iron\_working**:**bronze\_working**  @echo iron\_working  **mathematics**:**bronze\_working celestial\_navigation currency drama\_poetry**  @echo mathematics  **military\_training**:**bronze\_working military\_tradition games\_recreation**  @echo military\_training  **cartography**:**celestial\_navigation shipbuilding**  @echo cartography  **medieval\_faires**:**currency feudalism**  @echo medieval\_faires  **guilds**:**currency feudalism civil\_service**  @echo guilds  **mercantilism**:**currency humanism**  @echo mercantilism  **stirrups**:**horseback\_riding feudalism**  @echo stirrups  **mass\_production**:**shipbuilding machinery education**  @echo mass\_production  **naval\_tradition**:**shipbuilding defensive\_tactics**  @echo naval\_tradition  **military\_tactics**:**mathematics**  @echo military\_tactics  **education**:**mathematics apprenticeship**  @echo education  **military\_engineering**:**construction engineering**  @echo military\_engineering  **castles**:**construction divine\_right exploration**  @echo castles  **games\_recreation**:**construction state\_workforce**  @echo games\_recreation  **gunpowder**:**apprenticeship stirrups military\_engineering**  @echo gunpowder  **printing**:**machinery education**  @echo printing  **metal\_casting**:**machinery gunpowder**  @echo metal\_casting  **banking**:**education stirrups guilds**  @echo banking  **astronomy**:**education**  @echo astronomy  **military\_science**:**stirrups printing siege\_tactics**  @echo military\_science  **siege\_tactics**:**castles metal\_casting**  @echo siege\_tactics  **square\_rigging**:**cartography gunpowder**  @echo square\_rigging  **exploration**:**cartography mercenaries medieval\_faires**  @echo exploration  **industrialization**:**mass\_production square\_rigging**  @echo industrialization  **scientific\_theory**:**banking astronomy the\_enlightenment**  @echo scientific\_theory  **colonialism**:**astronomy mercantilism**  @echo colonialism  **ballistics**:**metal\_casting siege\_tactics**  @echo ballistics  **economics**:**metal\_casting scientific\_theory**  @echo economics  **scorched\_earth**:**metal\_casting nationalism**  @echo scorched\_earth  **steam\_power**:**industrialization**  @echo steam\_power  **flight**:**industrialization scientific\_theory economics**  @echo flight  **steel**:**industrialization rifling**  @echo steel  **class\_struggle**:**industrialization ideology**  @echo class\_struggle  **sanitation**:**scientific\_theory urbanization**  @echo sanitation  **rifling**:**ballistics military\_science**  @echo rifling  **totalitarianism**:**military\_science ideology**  @echo totalitarianism  **electricity**:**steam\_power mercantilism**  @echo electricity  **radio**:**steam\_power flight conservation**  @echo radio  **chemistry**:**sanitation**  @echo chemistry  **suffrage**:**sanitation ideology**  @echo suffrage  **replaceable\_parts**:**economics**  @echo replaceable\_parts  **capitalism**:**economics mass\_media**  @echo capitalism  **combined\_arms**:**flight combustion**  @echo combined\_arms  **synthetic\_materials**:**flight plastics**  @echo synthetic\_materials  **rapid\_deployment**:**flight cold\_war**  @echo rapid\_deployment  **advanced\_ballistics**:**replaceable\_parts steel electricity**  @echo advanced\_ballistics  **combustion**:**steel natural\_history**  @echo combustion  **computers**:**electricity radio suffrage totalitarianism class\_struggle**  @echo computers  **advanced\_flight**:**radio**  @echo advanced\_flight  **rocketry**:**radio chemistry**  @echo rocketry  **nanotechnology**:**radio composites**  @echo nanotechnology  **mass\_media**:**radio urbanization**  @echo mass\_media  **nuclear\_program**:**chemistry ideology**  @echo nuclear\_program  **plastics**:**combustion**  @echo plastics  **satellites**:**advanced\_flight rocketry**  @echo satellites  **globalization**:**advanced\_flight rapid\_deployment space\_race**  @echo globalization  **guidance\_systems**:**rocketry advanced\_ballistics**  @echo guidance\_systems  **space\_race**:**rocketry cold\_war**  @echo space\_race  **nuclear\_fission**:**advanced\_ballistics combined\_arms**  @echo nuclear\_fission  **telecommunications**:**computers**  @echo telecommunications  **robotics**:**computers globalization**  @echo robotics  **lasers**:**nuclear\_fission**  @echo lasers  **cold\_war**:**nuclear\_fission ideology**  @echo cold\_war  **composites**:**synthetic\_materials**  @echo composites  **stealth\_technology**:**synthetic\_materials**  @echo stealth\_technology  **social\_media**:**telecommunications professional\_sports space\_race**  @echo social\_media  **nuclear\_fusion**:**lasers**  @echo nuclear\_fusion  **code\_of\_laws**:  @echo code\_of\_laws  **craftsmanship**:**code\_of\_laws**  @echo craftsmanship  **foreign\_trade**:**code\_of\_laws**  @echo foreign\_trade  **military\_tradition**:**craftsmanship**  @echo military\_tradition  **early\_empire**:**foreign\_trade**  @echo early\_empire  **mysticism**:**foreign\_trade**  @echo mysticism  **political\_philosophy**:**state\_workforce early\_empire**  @echo political\_philosophy  **defensive\_tactics**:**games\_recreation political\_philosophy**  @echo defensive\_tactics  **humanism**:**drama\_poetry medieval\_faires**  @echo humanism  **mercenaries**:**military\_training feudalism**  @echo mercenaries  **feudalism**:**defensive\_tactics**  @echo feudalism  **civil\_service**:**defensive\_tactics recorded\_history**  @echo civil\_service  **divine\_right**:**theology civil\_service**  @echo divine\_right  **diplomatic\_service**:**guilds**  @echo diplomatic\_service  **reformed\_church**:**guilds divine\_right**  @echo reformed\_church  **the\_enlightenment**:**humanism diplomatic\_service**  @echo the\_enlightenment  **civil\_engineering**:**mercantilism**  @echo civil\_engineering  **nationalism**:**the\_enlightenment**  @echo nationalism  **opera\_ballet**:**the\_enlightenment**  @echo opera\_ballet  **natural\_history**:**colonialism**  @echo natural\_history  **urbanization**:**civil\_engineering nationalism**  @echo urbanization  **conservation**:**natural\_history urbanization**  @echo conservation  **mobilization**:**urbanization**  @echo mobilization  **cultural\_heritage**:**conservation**  @echo cultural\_heritage  **ideology**:**mass\_media mobilization**  @echo ideology  **professional\_sports**:**ideology**  @echo professional\_sports |

Тестирование посредством сборки для “mathematics”:

# **Задача 2**

Реализовать вариант трансляции, при котором повторный запуск make не выводит для civgraph на экран уже выполненные "задачи".

***Решение:***

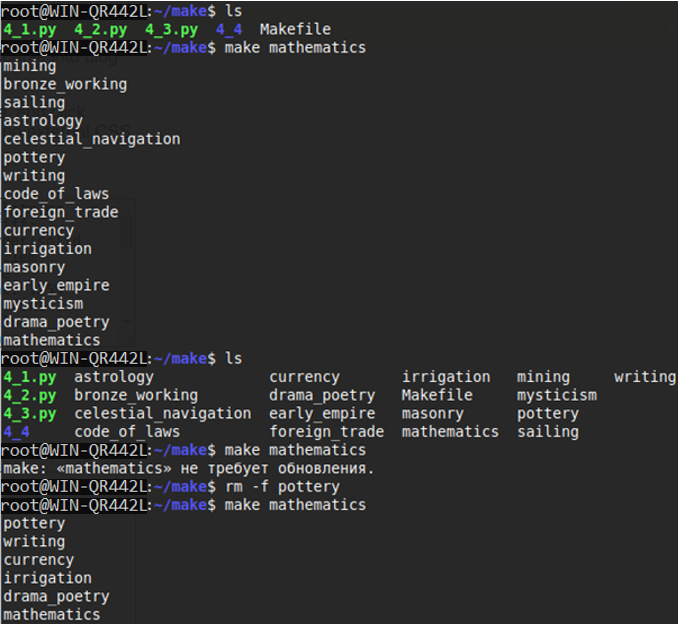
Python-код генератора Makefile:

|  |
| --- |
| json = {"pottery": [], "irrigation": ["pottery"], "writing": ["pottery"], "animal\_husbandry": [], "archery": ["animal\_husbandry"], "mining": [], "masonry": ["mining"], "bronze\_working": ["mining"], "the\_wheel": ["mining"], "apprenticeship": ["mining", "currency", "horseback\_riding"], "sailing": [], "celestial\_navigation": ["sailing", "astrology"], "shipbuilding": ["sailing"], "astrology": [], "drama\_poetry": ["astrology", "irrigation", "masonry", "early\_empire", "mysticism"], "theology": ["astrology", "mysticism", "drama\_poetry"], "horseback\_riding": ["archery"], "machinery": ["archery", "iron\_working", "engineering"], "currency": ["writing", "foreign\_trade"], "state\_workforce": ["writing", "bronze\_working", "craftsmanship"], "recorded\_history": ["writing", "political\_philosophy", "drama\_poetry"], "construction": ["masonry", "the\_wheel", "horseback\_riding"], "engineering": ["masonry", "the\_wheel"], "iron\_working": ["bronze\_working"], "mathematics": ["bronze\_working", "celestial\_navigation", "currency", "drama\_poetry"], "military\_training": ["bronze\_working", "military\_tradition", "games\_recreation"], "cartography": ["celestial\_navigation", "shipbuilding"], "medieval\_faires": ["currency", "feudalism"], "guilds": ["currency", "feudalism", "civil\_service"], "mercantilism": ["currency", "humanism"], "stirrups": ["horseback\_riding", "feudalism"], "mass\_production": ["shipbuilding", "machinery", "education"], "naval\_tradition": ["shipbuilding", "defensive\_tactics"], "military\_tactics": ["mathematics"], "education": ["mathematics", "apprenticeship"], "military\_engineering": ["construction", "engineering"], "castles": ["construction", "divine\_right", "exploration"], "games\_recreation": ["construction", "state\_workforce"], "gunpowder": ["apprenticeship", "stirrups", "military\_engineering"], "printing": ["machinery", "education"], "metal\_casting": ["machinery", "gunpowder"], "banking": ["education", "stirrups", "guilds"], "astronomy": ["education"], "military\_science": ["stirrups", "printing", "siege\_tactics"], "siege\_tactics": ["castles", "metal\_casting"], "square\_rigging": ["cartography", "gunpowder"], "exploration": ["cartography", "mercenaries", "medieval\_faires"], "industrialization": ["mass\_production", "square\_rigging"], "scientific\_theory": ["banking", "astronomy", "the\_enlightenment"], "colonialism": ["astronomy", "mercantilism"], "ballistics": ["metal\_casting", "siege\_tactics"], "economics": ["metal\_casting", "scientific\_theory"], "scorched\_earth": ["metal\_casting", "nationalism"], "steam\_power": ["industrialization"], "flight": ["industrialization", "scientific\_theory", "economics"], "steel": ["industrialization", "rifling"], "class\_struggle": ["industrialization", "ideology"], "sanitation": ["scientific\_theory", "urbanization"], "rifling": ["ballistics", "military\_science"], "totalitarianism": ["military\_science", "ideology"], "electricity": ["steam\_power", "mercantilism"], "radio": ["steam\_power", "flight", "conservation"], "chemistry": ["sanitation"], "suffrage": ["sanitation", "ideology"], "replaceable\_parts": ["economics"], "capitalism": ["economics", "mass\_media"], "combined\_arms": ["flight", "combustion"], "synthetic\_materials": ["flight", "plastics"], "rapid\_deployment": ["flight", "cold\_war"], "advanced\_ballistics": ["replaceable\_parts", "steel", "electricity"], "combustion": ["steel", "natural\_history"], "computers": ["electricity", "radio", "suffrage", "totalitarianism", "class\_struggle"], "advanced\_flight": ["radio"], "rocketry": ["radio", "chemistry"], "nanotechnology": ["radio", "composites"], "mass\_media": ["radio", "urbanization"], "nuclear\_program": ["chemistry", "ideology"], "plastics": ["combustion"], "satellites": ["advanced\_flight", "rocketry"], "globalization": ["advanced\_flight", "rapid\_deployment", "space\_race"], "guidance\_systems": ["rocketry", "advanced\_ballistics"], "space\_race": ["rocketry", "cold\_war"], "nuclear\_fission": ["advanced\_ballistics", "combined\_arms"], "telecommunications": ["computers"], "robotics": ["computers", "globalization"], "lasers": ["nuclear\_fission"], "cold\_war": ["nuclear\_fission", "ideology"], "composites": ["synthetic\_materials"], "stealth\_technology": ["synthetic\_materials"], "social\_media": ["telecommunications", "professional\_sports", "space\_race"], "nuclear\_fusion": ["lasers"], "code\_of\_laws": [], "craftsmanship": ["code\_of\_laws"], "foreign\_trade": ["code\_of\_laws"], "military\_tradition": ["craftsmanship"], "early\_empire": ["foreign\_trade"], "mysticism": ["foreign\_trade"], "political\_philosophy": ["state\_workforce", "early\_empire"], "defensive\_tactics": ["games\_recreation", "political\_philosophy"], "humanism": ["drama\_poetry", "medieval\_faires"], "mercenaries": ["military\_training", "feudalism"], "feudalism": ["defensive\_tactics"], "civil\_service": ["defensive\_tactics", "recorded\_history"], "divine\_right": ["theology", "civil\_service"], "diplomatic\_service": ["guilds"], "reformed\_church": ["guilds", "divine\_right"], "the\_enlightenment": ["humanism", "diplomatic\_service"], "civil\_engineering": ["mercantilism"], "nationalism": ["the\_enlightenment"], "opera\_ballet": ["the\_enlightenment"], "natural\_history": ["colonialism"], "urbanization": ["civil\_engineering", "nationalism"], "conservation": ["natural\_history", "urbanization"], "mobilization": ["urbanization"], "cultural\_heritage": ["conservation"], "ideology": ["mass\_media", "mobilization"], "professional\_sports": ["ideology"]}  f = open("Makefile","w")  content = ""  **for** key **in** json:  content = content + key[:len(key)] + ": " + " ".join(json[key])+"**\n**"  content = content + "**\t**"+ "@echo " + key + "**\n**"  content = content + "**\t**"+ "@echo " + " ".join(json[key]) + " > " + key + "**\n**"  f.write(content)  f.close() |

Сформированный Makefile:

|  |
| --- |
| **pottery**:  @echo pottery  @echo > pottery  **irrigation**: **pottery**  @echo irrigation  @echo pottery > irrigation  **writing**: **pottery**  @echo writing  @echo pottery > writing  **animal\_husbandry**:  @echo animal\_husbandry  @echo > animal\_husbandry  **archery**: **animal\_husbandry**  @echo archery  @echo animal\_husbandry > archery  **mining**:  @echo mining  @echo > mining  **masonry**: **mining**  @echo masonry  @echo mining > masonry  **bronze\_working**: **mining**  @echo bronze\_working  @echo mining > bronze\_working  **the\_wheel**: **mining**  @echo the\_wheel  @echo mining > the\_wheel  **apprenticeship**: **mining currency horseback\_riding**  @echo apprenticeship  @echo mining currency horseback\_riding > apprenticeship  **sailing**:  @echo sailing  @echo > sailing  **celestial\_navigation**: **sailing astrology**  @echo celestial\_navigation  @echo sailing astrology > celestial\_navigation  **shipbuilding**: **sailing**  @echo shipbuilding  @echo sailing > shipbuilding  **astrology**:  @echo astrology  @echo > astrology  **drama\_poetry**: **astrology irrigation masonry early\_empire mysticism**  @echo drama\_poetry  @echo astrology irrigation masonry early\_empire mysticism > drama\_poetry  **theology**: **astrology mysticism drama\_poetry**  @echo theology  @echo astrology mysticism drama\_poetry > theology  **horseback\_riding**: **archery**  @echo horseback\_riding  @echo archery > horseback\_riding  **machinery**: **archery iron\_working engineering**  @echo machinery  @echo archery iron\_working engineering > machinery  **currency**: **writing foreign\_trade**  @echo currency  @echo writing foreign\_trade > currency  **state\_workforce**: **writing bronze\_working craftsmanship**  @echo state\_workforce  @echo writing bronze\_working craftsmanship > state\_workforce  **recorded\_history**: **writing political\_philosophy drama\_poetry**  @echo recorded\_history  @echo writing political\_philosophy drama\_poetry > recorded\_history  **construction**: **masonry the\_wheel horseback\_riding**  @echo construction  @echo masonry the\_wheel horseback\_riding > construction  **engineering**: **masonry the\_wheel**  @echo engineering  @echo masonry the\_wheel > engineering  **iron\_working**: **bronze\_working**  @echo iron\_working  @echo bronze\_working > iron\_working  **mathematics**: **bronze\_working celestial\_navigation currency drama\_poetry**  @echo mathematics  @echo bronze\_working celestial\_navigation currency drama\_poetry > mathematics  **military\_training**: **bronze\_working military\_tradition games\_recreation**  @echo military\_training  @echo bronze\_working military\_tradition games\_recreation > military\_training  **cartography**: **celestial\_navigation shipbuilding**  @echo cartography  @echo celestial\_navigation shipbuilding > cartography  **medieval\_faires**: **currency feudalism**  @echo medieval\_faires  @echo currency feudalism > medieval\_faires  **guilds**: **currency feudalism civil\_service**  @echo guilds  @echo currency feudalism civil\_service > guilds  **mercantilism**: **currency humanism**  @echo mercantilism  @echo currency humanism > mercantilism  **stirrups**: **horseback\_riding feudalism**  @echo stirrups  @echo horseback\_riding feudalism > stirrups  **mass\_production**: **shipbuilding machinery education**  @echo mass\_production  @echo shipbuilding machinery education > mass\_production  **naval\_tradition**: **shipbuilding defensive\_tactics**  @echo naval\_tradition  @echo shipbuilding defensive\_tactics > naval\_tradition  **military\_tactics**: **mathematics**  @echo military\_tactics  @echo mathematics > military\_tactics  **education**: **mathematics apprenticeship**  @echo education  @echo mathematics apprenticeship > education  **military\_engineering**: **construction engineering**  @echo military\_engineering  @echo construction engineering > military\_engineering  **castles**: **construction divine\_right exploration**  @echo castles  @echo construction divine\_right exploration > castles  **games\_recreation**: **construction state\_workforce**  @echo games\_recreation  @echo construction state\_workforce > games\_recreation  **gunpowder**: **apprenticeship stirrups military\_engineering**  @echo gunpowder  @echo apprenticeship stirrups military\_engineering > gunpowder  **printing**: **machinery education**  @echo printing  @echo machinery education > printing  **metal\_casting**: **machinery gunpowder**  @echo metal\_casting  @echo machinery gunpowder > metal\_casting  **banking**: **education stirrups guilds**  @echo banking  @echo education stirrups guilds > banking  **astronomy**: **education**  @echo astronomy  @echo education > astronomy  **military\_science**: **stirrups printing siege\_tactics**  @echo military\_science  @echo stirrups printing siege\_tactics > military\_science  **siege\_tactics**: **castles metal\_casting**  @echo siege\_tactics  @echo castles metal\_casting > siege\_tactics  **square\_rigging**: **cartography gunpowder**  @echo square\_rigging  @echo cartography gunpowder > square\_rigging  **exploration**: **cartography mercenaries medieval\_faires**  @echo exploration  @echo cartography mercenaries medieval\_faires > exploration  **industrialization**: **mass\_production square\_rigging**  @echo industrialization  @echo mass\_production square\_rigging > industrialization  **scientific\_theory**: **banking astronomy the\_enlightenment**  @echo scientific\_theory  @echo banking astronomy the\_enlightenment > scientific\_theory  **colonialism**: **astronomy mercantilism**  @echo colonialism  @echo astronomy mercantilism > colonialism  **ballistics**: **metal\_casting siege\_tactics**  @echo ballistics  @echo metal\_casting siege\_tactics > ballistics  **economics**: **metal\_casting scientific\_theory**  @echo economics  @echo metal\_casting scientific\_theory > economics  **scorched\_earth**: **metal\_casting nationalism**  @echo scorched\_earth  @echo metal\_casting nationalism > scorched\_earth  **steam\_power**: **industrialization**  @echo steam\_power  @echo industrialization > steam\_power  **flight**: **industrialization scientific\_theory economics**  @echo flight  @echo industrialization scientific\_theory economics > flight  **steel**: **industrialization rifling**  @echo steel  @echo industrialization rifling > steel  **class\_struggle**: **industrialization ideology**  @echo class\_struggle  @echo industrialization ideology > class\_struggle  **sanitation**: **scientific\_theory urbanization**  @echo sanitation  @echo scientific\_theory urbanization > sanitation  **rifling**: **ballistics military\_science**  @echo rifling  @echo ballistics military\_science > rifling  **totalitarianism**: **military\_science ideology**  @echo totalitarianism  @echo military\_science ideology > totalitarianism  **electricity**: **steam\_power mercantilism**  @echo electricity  @echo steam\_power mercantilism > electricity  **radio**: **steam\_power flight conservation**  @echo radio  @echo steam\_power flight conservation > radio  **chemistry**: **sanitation**  @echo chemistry  @echo sanitation > chemistry  **suffrage**: **sanitation ideology**  @echo suffrage  @echo sanitation ideology > suffrage  **replaceable\_parts**: **economics**  @echo replaceable\_parts  @echo economics > replaceable\_parts  **capitalism**: **economics mass\_media**  @echo capitalism  @echo economics mass\_media > capitalism  **combined\_arms**: **flight combustion**  @echo combined\_arms  @echo flight combustion > combined\_arms  **synthetic\_materials**: **flight plastics**  @echo synthetic\_materials  @echo flight plastics > synthetic\_materials  **rapid\_deployment**: **flight cold\_war**  @echo rapid\_deployment  @echo flight cold\_war > rapid\_deployment  **advanced\_ballistics**: **replaceable\_parts steel electricity**  @echo advanced\_ballistics  @echo replaceable\_parts steel electricity > advanced\_ballistics  **combustion**: **steel natural\_history**  @echo combustion  @echo steel natural\_history > combustion  **computers**: **electricity radio suffrage totalitarianism class\_struggle**  @echo computers  @echo electricity radio suffrage totalitarianism class\_struggle > computers  **advanced\_flight**: **radio**  @echo advanced\_flight  @echo radio > advanced\_flight  **rocketry**: **radio chemistry**  @echo rocketry  @echo radio chemistry > rocketry  **nanotechnology**: **radio composites**  @echo nanotechnology  @echo radio composites > nanotechnology  **mass\_media**: **radio urbanization**  @echo mass\_media  @echo radio urbanization > mass\_media  **nuclear\_program**: **chemistry ideology**  @echo nuclear\_program  @echo chemistry ideology > nuclear\_program  **plastics**: **combustion**  @echo plastics  @echo combustion > plastics  **satellites**: **advanced\_flight rocketry**  @echo satellites  @echo advanced\_flight rocketry > satellites  **globalization**: **advanced\_flight rapid\_deployment space\_race**  @echo globalization  @echo advanced\_flight rapid\_deployment space\_race > globalization  **guidance\_systems**: **rocketry advanced\_ballistics**  @echo guidance\_systems  @echo rocketry advanced\_ballistics > guidance\_systems  **space\_race**: **rocketry cold\_war**  @echo space\_race  @echo rocketry cold\_war > space\_race  **nuclear\_fission**: **advanced\_ballistics combined\_arms**  @echo nuclear\_fission  @echo advanced\_ballistics combined\_arms > nuclear\_fission  **telecommunications**: **computers**  @echo telecommunications  @echo computers > telecommunications  **robotics**: **computers globalization**  @echo robotics  @echo computers globalization > robotics  **lasers**: **nuclear\_fission**  @echo lasers  @echo nuclear\_fission > lasers  **cold\_war**: **nuclear\_fission ideology**  @echo cold\_war  @echo nuclear\_fission ideology > cold\_war  **composites**: **synthetic\_materials**  @echo composites  @echo synthetic\_materials > composites  **stealth\_technology**: **synthetic\_materials**  @echo stealth\_technology  @echo synthetic\_materials > stealth\_technology  **social\_media**: **telecommunications professional\_sports space\_race**  @echo social\_media  @echo telecommunications professional\_sports space\_race > social\_media  **nuclear\_fusion**: **lasers**  @echo nuclear\_fusion  @echo lasers > nuclear\_fusion  **code\_of\_laws**:  @echo code\_of\_laws  @echo > code\_of\_laws  **craftsmanship**: **code\_of\_laws**  @echo craftsmanship  @echo code\_of\_laws > craftsmanship  **foreign\_trade**: **code\_of\_laws**  @echo foreign\_trade  @echo code\_of\_laws > foreign\_trade  **military\_tradition**: **craftsmanship**  @echo military\_tradition  @echo craftsmanship > military\_tradition  **early\_empire**: **foreign\_trade**  @echo early\_empire  @echo foreign\_trade > early\_empire  **mysticism**: **foreign\_trade**  @echo mysticism  @echo foreign\_trade > mysticism  **political\_philosophy**: **state\_workforce early\_empire**  @echo political\_philosophy  @echo state\_workforce early\_empire > political\_philosophy  **defensive\_tactics**: **games\_recreation political\_philosophy**  @echo defensive\_tactics  @echo games\_recreation political\_philosophy > defensive\_tactics  **humanism**: **drama\_poetry medieval\_faires**  @echo humanism  @echo drama\_poetry medieval\_faires > humanism  **mercenaries**: **military\_training feudalism**  @echo mercenaries  @echo military\_training feudalism > mercenaries  **feudalism**: **defensive\_tactics**  @echo feudalism  @echo defensive\_tactics > feudalism  **civil\_service**: **defensive\_tactics recorded\_history**  @echo civil\_service  @echo defensive\_tactics recorded\_history > civil\_service  **divine\_right**: **theology civil\_service**  @echo divine\_right  @echo theology civil\_service > divine\_right  **diplomatic\_service**: **guilds**  @echo diplomatic\_service  @echo guilds > diplomatic\_service  **reformed\_church**: **guilds divine\_right**  @echo reformed\_church  @echo guilds divine\_right > reformed\_church  **the\_enlightenment**: **humanism diplomatic\_service**  @echo the\_enlightenment  @echo humanism diplomatic\_service > the\_enlightenment  **civil\_engineering**: **mercantilism**  @echo civil\_engineering  @echo mercantilism > civil\_engineering  **nationalism**: **the\_enlightenment**  @echo nationalism  @echo the\_enlightenment > nationalism  **opera\_ballet**: **the\_enlightenment**  @echo opera\_ballet  @echo the\_enlightenment > opera\_ballet  **natural\_history**: **colonialism**  @echo natural\_history  @echo colonialism > natural\_history  **urbanization**: **civil\_engineering nationalism**  @echo urbanization  @echo civil\_engineering nationalism > urbanization  **conservation**: **natural\_history urbanization**  @echo conservation  @echo natural\_history urbanization > conservation  **mobilization**: **urbanization**  @echo mobilization  @echo urbanization > mobilization  **cultural\_heritage**: **conservation**  @echo cultural\_heritage  @echo conservation > cultural\_heritage  **ideology**: **mass\_media mobilization**  @echo ideology  @echo mass\_media mobilization > ideology  **professional\_sports**: **ideology**  @echo professional\_sports  @echo ideology > professional\_sports |

Тестирование посредством сборки для “mathematics”:



# **Задача 3**

Добавить цель clean, не забыв и про "животное".

***Решение:***

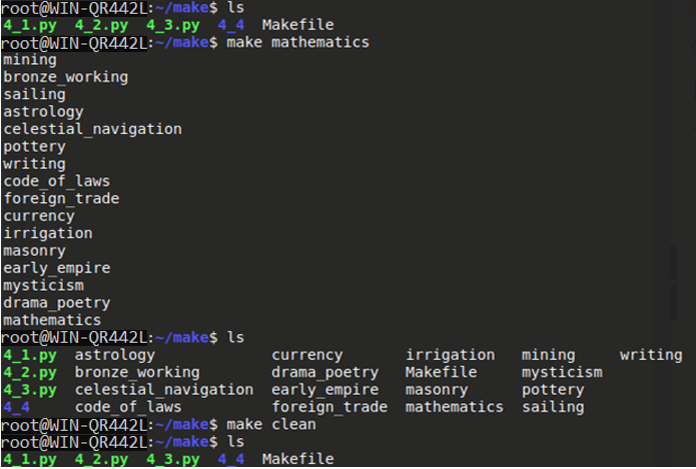
Python-код генератора Makefile:

|  |
| --- |
| json = {"pottery": [], "irrigation": ["pottery"], "writing": ["pottery"], "animal\_husbandry": [], "archery": ["animal\_husbandry"], "mining": [], "masonry": ["mining"], "bronze\_working": ["mining"], "the\_wheel": ["mining"], "apprenticeship": ["mining", "currency", "horseback\_riding"], "sailing": [], "celestial\_navigation": ["sailing", "astrology"], "shipbuilding": ["sailing"], "astrology": [], "drama\_poetry": ["astrology", "irrigation", "masonry", "early\_empire", "mysticism"], "theology": ["astrology", "mysticism", "drama\_poetry"], "horseback\_riding": ["archery"], "machinery": ["archery", "iron\_working", "engineering"], "currency": ["writing", "foreign\_trade"], "state\_workforce": ["writing", "bronze\_working", "craftsmanship"], "recorded\_history": ["writing", "political\_philosophy", "drama\_poetry"], "construction": ["masonry", "the\_wheel", "horseback\_riding"], "engineering": ["masonry", "the\_wheel"], "iron\_working": ["bronze\_working"], "mathematics": ["bronze\_working", "celestial\_navigation", "currency", "drama\_poetry"], "military\_training": ["bronze\_working", "military\_tradition", "games\_recreation"], "cartography": ["celestial\_navigation", "shipbuilding"], "medieval\_faires": ["currency", "feudalism"], "guilds": ["currency", "feudalism", "civil\_service"], "mercantilism": ["currency", "humanism"], "stirrups": ["horseback\_riding", "feudalism"], "mass\_production": ["shipbuilding", "machinery", "education"], "naval\_tradition": ["shipbuilding", "defensive\_tactics"], "military\_tactics": ["mathematics"], "education": ["mathematics", "apprenticeship"], "military\_engineering": ["construction", "engineering"], "castles": ["construction", "divine\_right", "exploration"], "games\_recreation": ["construction", "state\_workforce"], "gunpowder": ["apprenticeship", "stirrups", "military\_engineering"], "printing": ["machinery", "education"], "metal\_casting": ["machinery", "gunpowder"], "banking": ["education", "stirrups", "guilds"], "astronomy": ["education"], "military\_science": ["stirrups", "printing", "siege\_tactics"], "siege\_tactics": ["castles", "metal\_casting"], "square\_rigging": ["cartography", "gunpowder"], "exploration": ["cartography", "mercenaries", "medieval\_faires"], "industrialization": ["mass\_production", "square\_rigging"], "scientific\_theory": ["banking", "astronomy", "the\_enlightenment"], "colonialism": ["astronomy", "mercantilism"], "ballistics": ["metal\_casting", "siege\_tactics"], "economics": ["metal\_casting", "scientific\_theory"], "scorched\_earth": ["metal\_casting", "nationalism"], "steam\_power": ["industrialization"], "flight": ["industrialization", "scientific\_theory", "economics"], "steel": ["industrialization", "rifling"], "class\_struggle": ["industrialization", "ideology"], "sanitation": ["scientific\_theory", "urbanization"], "rifling": ["ballistics", "military\_science"], "totalitarianism": ["military\_science", "ideology"], "electricity": ["steam\_power", "mercantilism"], "radio": ["steam\_power", "flight", "conservation"], "chemistry": ["sanitation"], "suffrage": ["sanitation", "ideology"], "replaceable\_parts": ["economics"], "capitalism": ["economics", "mass\_media"], "combined\_arms": ["flight", "combustion"], "synthetic\_materials": ["flight", "plastics"], "rapid\_deployment": ["flight", "cold\_war"], "advanced\_ballistics": ["replaceable\_parts", "steel", "electricity"], "combustion": ["steel", "natural\_history"], "computers": ["electricity", "radio", "suffrage", "totalitarianism", "class\_struggle"], "advanced\_flight": ["radio"], "rocketry": ["radio", "chemistry"], "nanotechnology": ["radio", "composites"], "mass\_media": ["radio", "urbanization"], "nuclear\_program": ["chemistry", "ideology"], "plastics": ["combustion"], "satellites": ["advanced\_flight", "rocketry"], "globalization": ["advanced\_flight", "rapid\_deployment", "space\_race"], "guidance\_systems": ["rocketry", "advanced\_ballistics"], "space\_race": ["rocketry", "cold\_war"], "nuclear\_fission": ["advanced\_ballistics", "combined\_arms"], "telecommunications": ["computers"], "robotics": ["computers", "globalization"], "lasers": ["nuclear\_fission"], "cold\_war": ["nuclear\_fission", "ideology"], "composites": ["synthetic\_materials"], "stealth\_technology": ["synthetic\_materials"], "social\_media": ["telecommunications", "professional\_sports", "space\_race"], "nuclear\_fusion": ["lasers"], "code\_of\_laws": [], "craftsmanship": ["code\_of\_laws"], "foreign\_trade": ["code\_of\_laws"], "military\_tradition": ["craftsmanship"], "early\_empire": ["foreign\_trade"], "mysticism": ["foreign\_trade"], "political\_philosophy": ["state\_workforce", "early\_empire"], "defensive\_tactics": ["games\_recreation", "political\_philosophy"], "humanism": ["drama\_poetry", "medieval\_faires"], "mercenaries": ["military\_training", "feudalism"], "feudalism": ["defensive\_tactics"], "civil\_service": ["defensive\_tactics", "recorded\_history"], "divine\_right": ["theology", "civil\_service"], "diplomatic\_service": ["guilds"], "reformed\_church": ["guilds", "divine\_right"], "the\_enlightenment": ["humanism", "diplomatic\_service"], "civil\_engineering": ["mercantilism"], "nationalism": ["the\_enlightenment"], "opera\_ballet": ["the\_enlightenment"], "natural\_history": ["colonialism"], "urbanization": ["civil\_engineering", "nationalism"], "conservation": ["natural\_history", "urbanization"], "mobilization": ["urbanization"], "cultural\_heritage": ["conservation"], "ideology": ["mass\_media", "mobilization"], "professional\_sports": ["ideology"]}  f = open("Makefile","w")  content = ""  **for** key **in** json:  content = content + key[:len(key)] + ": " + " ".join(json[key])+"**\n**"  content = content + "**\t**"+ "@echo " + key + "**\n**"  content = content + "**\t**"+ "@echo " + " ".join(json[key]) + " > " + key + "**\n**"  content = content + ".PHONY: clean**\n**clean: **\n\t**@rm -f "  **for** key **in** json:  content = content + " ".join(json[key]) + " "  f.write(content)  f.close() |

Сформированный Makefile:

|  |
| --- |
| **pottery**:  @echo pottery  @echo > pottery  **irrigation**: **pottery**  @echo irrigation  @echo pottery > irrigation  **writing**: **pottery**  @echo writing  @echo pottery > writing  **animal\_husbandry**:  @echo animal\_husbandry  @echo > animal\_husbandry  **archery**: **animal\_husbandry**  @echo archery  @echo animal\_husbandry > archery  **mining**:  @echo mining  @echo > mining  **masonry**: **mining**  @echo masonry  @echo mining > masonry  **bronze\_working**: **mining**  @echo bronze\_working  @echo mining > bronze\_working  **the\_wheel**: **mining**  @echo the\_wheel  @echo mining > the\_wheel  **apprenticeship**: **mining currency horseback\_riding**  @echo apprenticeship  @echo mining currency horseback\_riding > apprenticeship  **sailing**:  @echo sailing  @echo > sailing  **celestial\_navigation**: **sailing astrology**  @echo celestial\_navigation  @echo sailing astrology > celestial\_navigation  **shipbuilding**: **sailing**  @echo shipbuilding  @echo sailing > shipbuilding  **astrology**:  @echo astrology  @echo > astrology  **drama\_poetry**: **astrology irrigation masonry early\_empire mysticism**  @echo drama\_poetry  @echo astrology irrigation masonry early\_empire mysticism > drama\_poetry  **theology**: **astrology mysticism drama\_poetry**  @echo theology  @echo astrology mysticism drama\_poetry > theology  **horseback\_riding**: **archery**  @echo horseback\_riding  @echo archery > horseback\_riding  **machinery**: **archery iron\_working engineering**  @echo machinery  @echo archery iron\_working engineering > machinery  **currency**: **writing foreign\_trade**  @echo currency  @echo writing foreign\_trade > currency  **state\_workforce**: **writing bronze\_working craftsmanship**  @echo state\_workforce  @echo writing bronze\_working craftsmanship > state\_workforce  **recorded\_history**: **writing political\_philosophy drama\_poetry**  @echo recorded\_history  @echo writing political\_philosophy drama\_poetry > recorded\_history  **construction**: **masonry the\_wheel horseback\_riding**  @echo construction  @echo masonry the\_wheel horseback\_riding > construction  **engineering**: **masonry the\_wheel**  @echo engineering  @echo masonry the\_wheel > engineering  **iron\_working**: **bronze\_working**  @echo iron\_working  @echo bronze\_working > iron\_working  **mathematics**: **bronze\_working celestial\_navigation currency drama\_poetry**  @echo mathematics  @echo bronze\_working celestial\_navigation currency drama\_poetry > mathematics  **military\_training**: **bronze\_working military\_tradition games\_recreation**  @echo military\_training  @echo bronze\_working military\_tradition games\_recreation > military\_training  **cartography**: **celestial\_navigation shipbuilding**  @echo cartography  @echo celestial\_navigation shipbuilding > cartography  **medieval\_faires**: **currency feudalism**  @echo medieval\_faires  @echo currency feudalism > medieval\_faires  **guilds**: **currency feudalism civil\_service**  @echo guilds  @echo currency feudalism civil\_service > guilds  **mercantilism**: **currency humanism**  @echo mercantilism  @echo currency humanism > mercantilism  **stirrups**: **horseback\_riding feudalism**  @echo stirrups  @echo horseback\_riding feudalism > stirrups  **mass\_production**: **shipbuilding machinery education**  @echo mass\_production  @echo shipbuilding machinery education > mass\_production  **naval\_tradition**: **shipbuilding defensive\_tactics**  @echo naval\_tradition  @echo shipbuilding defensive\_tactics > naval\_tradition  **military\_tactics**: **mathematics**  @echo military\_tactics  @echo mathematics > military\_tactics  **education**: **mathematics apprenticeship**  @echo education  @echo mathematics apprenticeship > education  **military\_engineering**: **construction engineering**  @echo military\_engineering  @echo construction engineering > military\_engineering  **castles**: **construction divine\_right exploration**  @echo castles  @echo construction divine\_right exploration > castles  **games\_recreation**: **construction state\_workforce**  @echo games\_recreation  @echo construction state\_workforce > games\_recreation  **gunpowder**: **apprenticeship stirrups military\_engineering**  @echo gunpowder  @echo apprenticeship stirrups military\_engineering > gunpowder  **printing**: **machinery education**  @echo printing  @echo machinery education > printing  **metal\_casting**: **machinery gunpowder**  @echo metal\_casting  @echo machinery gunpowder > metal\_casting  **banking**: **education stirrups guilds**  @echo banking  @echo education stirrups guilds > banking  **astronomy**: **education**  @echo astronomy  @echo education > astronomy  **military\_science**: **stirrups printing siege\_tactics**  @echo military\_science  @echo stirrups printing siege\_tactics > military\_science  **siege\_tactics**: **castles metal\_casting**  @echo siege\_tactics  @echo castles metal\_casting > siege\_tactics  **square\_rigging**: **cartography gunpowder**  @echo square\_rigging  @echo cartography gunpowder > square\_rigging  **exploration**: **cartography mercenaries medieval\_faires**  @echo exploration  @echo cartography mercenaries medieval\_faires > exploration  **industrialization**: **mass\_production square\_rigging**  @echo industrialization  @echo mass\_production square\_rigging > industrialization  **scientific\_theory**: **banking astronomy the\_enlightenment**  @echo scientific\_theory  @echo banking astronomy the\_enlightenment > scientific\_theory  **colonialism**: **astronomy mercantilism**  @echo colonialism  @echo astronomy mercantilism > colonialism  **ballistics**: **metal\_casting siege\_tactics**  @echo ballistics  @echo metal\_casting siege\_tactics > ballistics  **economics**: **metal\_casting scientific\_theory**  @echo economics  @echo metal\_casting scientific\_theory > economics  **scorched\_earth**: **metal\_casting nationalism**  @echo scorched\_earth  @echo metal\_casting nationalism > scorched\_earth  **steam\_power**: **industrialization**  @echo steam\_power  @echo industrialization > steam\_power  **flight**: **industrialization scientific\_theory economics**  @echo flight  @echo industrialization scientific\_theory economics > flight  **steel**: **industrialization rifling**  @echo steel  @echo industrialization rifling > steel  **class\_struggle**: **industrialization ideology**  @echo class\_struggle  @echo industrialization ideology > class\_struggle  **sanitation**: **scientific\_theory urbanization**  @echo sanitation  @echo scientific\_theory urbanization > sanitation  **rifling**: **ballistics military\_science**  @echo rifling  @echo ballistics military\_science > rifling  **totalitarianism**: **military\_science ideology**  @echo totalitarianism  @echo military\_science ideology > totalitarianism  **electricity**: **steam\_power mercantilism**  @echo electricity  @echo steam\_power mercantilism > electricity  **radio**: **steam\_power flight conservation**  @echo radio  @echo steam\_power flight conservation > radio  **chemistry**: **sanitation**  @echo chemistry  @echo sanitation > chemistry  **suffrage**: **sanitation ideology**  @echo suffrage  @echo sanitation ideology > suffrage  **replaceable\_parts**: **economics**  @echo replaceable\_parts  @echo economics > replaceable\_parts  **capitalism**: **economics mass\_media**  @echo capitalism  @echo economics mass\_media > capitalism  **combined\_arms**: **flight combustion**  @echo combined\_arms  @echo flight combustion > combined\_arms  **synthetic\_materials**: **flight plastics**  @echo synthetic\_materials  @echo flight plastics > synthetic\_materials  **rapid\_deployment**: **flight cold\_war**  @echo rapid\_deployment  @echo flight cold\_war > rapid\_deployment  **advanced\_ballistics**: **replaceable\_parts steel electricity**  @echo advanced\_ballistics  @echo replaceable\_parts steel electricity > advanced\_ballistics  **combustion**: **steel natural\_history**  @echo combustion  @echo steel natural\_history > combustion  **computers**: **electricity radio suffrage totalitarianism class\_struggle**  @echo computers  @echo electricity radio suffrage totalitarianism class\_struggle > computers  **advanced\_flight**: **radio**  @echo advanced\_flight  @echo radio > advanced\_flight  **rocketry**: **radio chemistry**  @echo rocketry  @echo radio chemistry > rocketry  **nanotechnology**: **radio composites**  @echo nanotechnology  @echo radio composites > nanotechnology  **mass\_media**: **radio urbanization**  @echo mass\_media  @echo radio urbanization > mass\_media  **nuclear\_program**: **chemistry ideology**  @echo nuclear\_program  @echo chemistry ideology > nuclear\_program  **plastics**: **combustion**  @echo plastics  @echo combustion > plastics  **satellites**: **advanced\_flight rocketry**  @echo satellites  @echo advanced\_flight rocketry > satellites  **globalization**: **advanced\_flight rapid\_deployment space\_race**  @echo globalization  @echo advanced\_flight rapid\_deployment space\_race > globalization  **guidance\_systems**: **rocketry advanced\_ballistics**  @echo guidance\_systems  @echo rocketry advanced\_ballistics > guidance\_systems  **space\_race**: **rocketry cold\_war**  @echo space\_race  @echo rocketry cold\_war > space\_race  **nuclear\_fission**: **advanced\_ballistics combined\_arms**  @echo nuclear\_fission  @echo advanced\_ballistics combined\_arms > nuclear\_fission  **telecommunications**: **computers**  @echo telecommunications  @echo computers > telecommunications  **robotics**: **computers globalization**  @echo robotics  @echo computers globalization > robotics  **lasers**: **nuclear\_fission**  @echo lasers  @echo nuclear\_fission > lasers  **cold\_war**: **nuclear\_fission ideology**  @echo cold\_war  @echo nuclear\_fission ideology > cold\_war  **composites**: **synthetic\_materials**  @echo composites  @echo synthetic\_materials > composites  **stealth\_technology**: **synthetic\_materials**  @echo stealth\_technology  @echo synthetic\_materials > stealth\_technology  **social\_media**: **telecommunications professional\_sports space\_race**  @echo social\_media  @echo telecommunications professional\_sports space\_race > social\_media  **nuclear\_fusion**: **lasers**  @echo nuclear\_fusion  @echo lasers > nuclear\_fusion  **code\_of\_laws**:  @echo code\_of\_laws  @echo > code\_of\_laws  **craftsmanship**: **code\_of\_laws**  @echo craftsmanship  @echo code\_of\_laws > craftsmanship  **foreign\_trade**: **code\_of\_laws**  @echo foreign\_trade  @echo code\_of\_laws > foreign\_trade  **military\_tradition**: **craftsmanship**  @echo military\_tradition  @echo craftsmanship > military\_tradition  **early\_empire**: **foreign\_trade**  @echo early\_empire  @echo foreign\_trade > early\_empire  **mysticism**: **foreign\_trade**  @echo mysticism  @echo foreign\_trade > mysticism  **political\_philosophy**: **state\_workforce early\_empire**  @echo political\_philosophy  @echo state\_workforce early\_empire > political\_philosophy  **defensive\_tactics**: **games\_recreation political\_philosophy**  @echo defensive\_tactics  @echo games\_recreation political\_philosophy > defensive\_tactics  **humanism**: **drama\_poetry medieval\_faires**  @echo humanism  @echo drama\_poetry medieval\_faires > humanism  **mercenaries**: **military\_training feudalism**  @echo mercenaries  @echo military\_training feudalism > mercenaries  **feudalism**: **defensive\_tactics**  @echo feudalism  @echo defensive\_tactics > feudalism  **civil\_service**: **defensive\_tactics recorded\_history**  @echo civil\_service  @echo defensive\_tactics recorded\_history > civil\_service  **divine\_right**: **theology civil\_service**  @echo divine\_right  @echo theology civil\_service > divine\_right  **diplomatic\_service**: **guilds**  @echo diplomatic\_service  @echo guilds > diplomatic\_service  **reformed\_church**: **guilds divine\_right**  @echo reformed\_church  @echo guilds divine\_right > reformed\_church  **the\_enlightenment**: **humanism diplomatic\_service**  @echo the\_enlightenment  @echo humanism diplomatic\_service > the\_enlightenment  **civil\_engineering**: **mercantilism**  @echo civil\_engineering  @echo mercantilism > civil\_engineering  **nationalism**: **the\_enlightenment**  @echo nationalism  @echo the\_enlightenment > nationalism  **opera\_ballet**: **the\_enlightenment**  @echo opera\_ballet  @echo the\_enlightenment > opera\_ballet  **natural\_history**: **colonialism**  @echo natural\_history  @echo colonialism > natural\_history  **urbanization**: **civil\_engineering nationalism**  @echo urbanization  @echo civil\_engineering nationalism > urbanization  **conservation**: **natural\_history urbanization**  @echo conservation  @echo natural\_history urbanization > conservation  **mobilization**: **urbanization**  @echo mobilization  @echo urbanization > mobilization  **cultural\_heritage**: **conservation**  @echo cultural\_heritage  @echo conservation > cultural\_heritage  **ideology**: **mass\_media mobilization**  @echo ideology  @echo mass\_media mobilization > ideology  **professional\_sports**: **ideology**  @echo professional\_sports  @echo ideology > professional\_sports  **.PHONY**: **clean**  **clean**:  @rm -f pottery pottery animal\_husbandry mining mining mining mining currency horseback\_riding sailing astrology sailing astrology irrigation masonry early\_empire mysticism astrology mysticism drama\_poetry archery archery iron\_working engineering writing foreign\_trade writing bronze\_working craftsmanship writing political\_philosophy drama\_poetry masonry the\_wheel horseback\_riding masonry the\_wheel bronze\_working bronze\_working celestial\_navigation currency drama\_poetry bronze\_working military\_tradition games\_recreation celestial\_navigation shipbuilding currency feudalism currency feudalism civil\_service currency humanism horseback\_riding feudalism shipbuilding machinery education shipbuilding defensive\_tactics mathematics mathematics apprenticeship construction engineering construction divine\_right exploration construction state\_workforce apprenticeship stirrups military\_engineering machinery education machinery gunpowder education stirrups guilds education stirrups printing siege\_tactics castles metal\_casting cartography gunpowder cartography mercenaries medieval\_faires mass\_production square\_rigging banking astronomy the\_enlightenment astronomy mercantilism metal\_casting siege\_tactics metal\_casting scientific\_theory metal\_casting nationalism industrialization industrialization scientific\_theory economics industrialization rifling industrialization ideology scientific\_theory urbanization ballistics military\_science military\_science ideology steam\_power mercantilism steam\_power flight conservation sanitation sanitation ideology economics economics mass\_media flight combustion flight plastics flight cold\_war replaceable\_parts steel electricity steel natural\_history electricity radio suffrage totalitarianism class\_struggle radio radio chemistry radio composites radio urbanization chemistry ideology combustion advanced\_flight rocketry advanced\_flight rapid\_deployment space\_race rocketry advanced\_ballistics rocketry cold\_war advanced\_ballistics combined\_arms computers computers globalization nuclear\_fission nuclear\_fission ideology synthetic\_materials synthetic\_materials telecommunications professional\_sports space\_race lasers code\_of\_laws code\_of\_laws craftsmanship foreign\_trade foreign\_trade state\_workforce early\_empire games\_recreation political\_philosophy drama\_poetry medieval\_faires military\_training feudalism defensive\_tactics defensive\_tactics recorded\_history theology civil\_service guilds guilds divine\_right humanism diplomatic\_service mercantilism the\_enlightenment the\_enlightenment colonialism civil\_engineering nationalism natural\_history urbanization urbanization conservation mass\_media mobilization ideology |

Тестирование посредством сборки для “mathematics” и последующей очисткой clean:



# **Задача 4**

Написать makefile для следующего скрипта сборки:

|  |
| --- |
| gcc prog.c data.c -o prog  dir /B > files.lst  7z a distr.zip \*.\* |

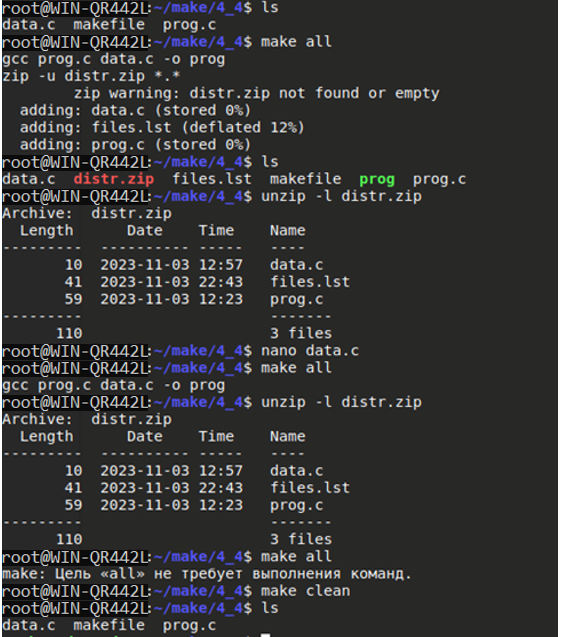
Вместо gcc можно использовать другой компилятор командной строки, но на вход ему должны подаваться два модуля: prog и data. Если используете не Windows, то исправьте вызовы команд на их эквиваленты из вашей ОС. В makefile должны быть, как минимум, следующие задачи: all, clean, archive. Обязательно покажите на примере, что уже сделанные подзадачи у вас не перестраиваются.

***Решение:***

Подготовленный Makefile:

|  |
| --- |
| **.PHONY**: **all clean**  **all**: **prog files.lst distr.zip**  **clean**:  @rm -rf prog files.lst distr.zip  **prog**: **prog.c data.c**  gcc prog.c data.c -o prog  **files.lst**:  @dir > files.lst  **distr.zip**:  zip -u distr.zip \*.\* |

Тестирование посредством сборки проекта (make all) и очистки clean:



Содержимое файла data.c до вызова команды “nano data.c” (редактирование):



Содержимое файла data.c после вызова команды “nano data.c” (после редактирования):

