

0abc (a 0 A.D. modification)
<https://github.com/0abc/0abc-unified.git>
version 0.0.22 (Alpha XXII: Venustas)

<https://wildfiregames.com/forum/index.php?/topic/22779-0abc-mod/>
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1 Introduction

0abc is an acronym for “0 A.D. is Actually Before Christ”. Of the twelve civilizations and factions included in the default distribution, three (Britons, Gauls, Iberians) cover the whole period (c. 500–1 B.C.), three (Athenians, Persians, Spartans) the Classical period (c. 500–300 B.C.), and six (Carthaginians, Macedonians, Mauryans, Ptolemies, Romans, Seleucids) the Hellenistic period (c. 350–150 B.C.); civilizations (Armenia, Numidia, Parthia, Pontus) peaking in the last two centuries (c. 200–1 B.C.) are noticeably lacking.

This mod, however, does not include any new factions, nor icons, sounds, visual actors, etc. It merely tweaks, rebalances, and improves upon what already exists in the game without adding other content. Amongst other things, it contains a moderate bonus attack counter and penalty system.

To make it easier to maintain and update whenever a new Alpha version is released, **0abc** has been subdivided into (currently five) sub-mods. They can be used independently or in any combination or order alongside each other.

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1.1 Instructions

- Use `git clone https://github.com/0abc/0abc-unified.git` to get the repository directly or download it as a zip via `https://github.com/0abc/0abc-unified/archive/master.zip`
- Place it in your `/Oad/mods/` folder (e.g. on Fedora it is `~/local/share/Oad/mods/`)
- Launch 0 A.D., click “Tools & Options” and “Mod Selection”
- Select **0abc**, click “Enable” and “Save Configuration”
- Add, remove, or move up or down any other mods, click “Save Configuration” and “Start Mods”
- Click “Learn To Play” and “Structure Tree” to see the mod(s) implemented.

1.2 More factions (not implemented)

Add more factions to cover the 8th, 7th, 6th and the 2nd and 1st centuries B.C. (existing factions are indicated with an asterisk (*)):

Armenians (Greater Armenia, 331 BC–428 AD, peaked first half 1st C. BC) Assyrians (Neo-Assyrian Empire, 911–612), Attalids (Pergamon, 282–133), Britons*, Carthaginians* (814–146), Chaldeans (Neo-Babylonian Empire, 626–539), Epirus (330–167), Etruscans (768–264), Gauls*, Greeks (c.800–146; subdivided into four factions: Athenians/Athens*, Boeotians/Thebes, Lacedaemonians/Sparta*, and Syracuseae)¹, Iberians*, Illyrians, Lydians (unclear–546), Macedonians* (Macedon, 808–168, peaked 323), Mauryans* (India, 326–180), Nubians (Kush (Napata, Meroe), 1070 BC–350 AD, peaked c.700 BC), Numidia (202–40), Parthians (Arsacid Empire, 247 BC–224 AD, peaked middle 2nd C. BC), Persians* (Achaemenid Empire, c.550–330), Phrygians (c.800–c.600), Pontus (281 BC–66 BC/62 AD, peaked first half 1st C. BC), Ptolemies* (Egypt, 305–30), Romans* (Roman Republic, 509–27), Scythians, Seleucids* (Syria, 312–63), Thracians, Urartu (Armenia, 860–590).

1.3 Further information

People interested in Antiquity are lucky to live nowadays. Thanks to widespread digitization, availability of sources is no longer a problem; the choice of sources is. Wikipedia is a mixed blessing which has to be used with care: some articles are much better than corresponding lemmas of paper encyclopaedias, others contain outright rubbish and dangerous nonsense. *The Cambridge History of Greek and Roman Warfare* (2007) is a decent starting point. Those without access to a university library and looking for something specific can contact me.²

¹Other important local powers included Milet and Samos peaking in the Archaic period, the Acarnanians and Aetolians, Achaeans, and Rhodians peaking in the Hellenistic period, and Argos, Corinth, and Tarentum covering all periods.

²<https://wildfiregames.com/forum/index.php?/profile/21417-nescio/>

2 Units

2.1 General overview

- All soldiers (except for war dogs) require at least some metal, to encourage feminization.
- All soldiers (citizen, mercenary, and champion) can promote up to twelve times; each rank grants +5% health, attack damage, and capture attack, melee units also receive +1% movement speed and ranged units −1% spread.
Healers receive +5% health, −5% healing time, and +1 m healing range every promotion.
- Loot is standardized to 10% of costs, experience is equal to the sum of the total costs.

2.1.1 Soldier types

	infantry	camel	cavalry	biga	quadriga	war elephant
mercenary metal cost	+20.0	+25.0	+30.0	+50.0	+60.0	+75.0
champion metal cost	+100.0	+100.0	+100.0	+100.0	+100.0	+100.0
hero metal cost	+400%	+400%	+400%	+400%	+400%	+400%
mercenary wood cost	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
champion wood cost	+50.0	+50.0	+50.0	+50.0	+50.0	+50.0
hero wood cost	+400%	+400%	+400%	+400%	+400%	+400%
mercenary training time	−20%	−20%	−20%	−20%	−20%	−20%
champion training time	+150%	+150%	+150%	+150%	+150%	+150%
hero resource cost	+400%	+400%	+400%	+400%	+400%	+400%
mercenary health	+0%	+0%	+0%	+0%	+0%	+0%
champion health	+50%	+50%	+50%	+50%	+50%	+50%
hero health	+900%	+900%	+900%	+900%	+900%	+900%
mercenary armour (h, c, p)	+1.0	+1.0	+1.0	+1.0	+1.0	+1.0
champion armour (h, c, p)	+3.0	+3.0	+3.0	+3.0	+3.0	+3.0
hero armour (h, c, p)	+5.0	+5.0	+5.0	+5.0	+5.0	+5.0
mercenary attack damage	+15%	+15%	+15%	+15%	+15%	+15%
champion attack damage	+100%	+100%	+100%	+100%	+100%	+100%
hero attack damage	+400%	+400%	+400%	+400%	+400%	+400%
mercenary capture strength	+0%	+0%	+0%	+0%	+0%	+0%
champion capture strength	+100%	+100%	+100%	+100%	+100%	+100%
hero capture strength	+400%	+400%	+400%	+400%	+400%	+400%

NB: Citizen soldiers are 100%. Champions also require twice as much experience to advance in rank. (Heroes can not promote.) Other bonuses are removed.

2.1.2 Worker rates

	female	slave	citizen	mercenary	champion	hero
food.grain (farm)	0.50	0.35	0.25	–	–	–
metal.ore (mine)	0.35	1.00	0.50	–	–	–
stone.rock (quarry)	0.35	1.00	0.50	–	–	–
wood.tree (lumber)	0.70	1.00	0.75	0.75	–	–
food.fruit (forage)	1.00	0.50	0.50	0.50	–	–
food.meat (hunt)	1.00	1.00	1.00	1.00	–	–
build (construct)	1.00	1.00	1.00	1.00	–	–
promote	no	no	yes	yes	yes	no
local aura	yes	no	no	no	no	yes
global aura	no	no	no	no	no	sometimes

2.1.3 Unit categories

	population slots occupied	standard food cost	food carry capacity	food.meat gather rate	vision range (metres)	promotion experience requirement
War dogs	0	75	–	–	60	75
Infantry	1	50	10	1.0	80	100
Camels	2	90	30	1.8	95	125
Cavalry	2	100	20	2.0	90	150
Bigae (two-horse chariots)	4	200	50	3.6	85	200
Quadrigae (four-horse chariots)	6	300	50	3.6	85	240
War elephants	6	300	75	3.0	100	300

2.2 Unit statistics comparison tables

NB: The new values are displayed normally, the default “0 A.D. Alpha XXII: Venustas” values are displayed for comparison between brackets ().

2.2.1 Infantry units

class	pop. size	training costs (f, w, s, m; time)	loot (f, w, s, m; exp)	vision range	speed	health	armour (h, p, c)	damage (h, p, c)	range (m)	rate (ms)	counters/ penalties
crossbow infantry ²	1 (1)	50, 25, 0, 25; 10 (50, 50, 0, 0; 10)	5, 2, 0, 3; 100 (5, 5, 0, 0; 100)	80 (80)	8+8 (8+10)	45 (50)	1, 3, 5 (1, 1, 10)	0, 5, 1 (0, 6, 0)	48 (72)	1000 (1000)	1.25× vs Archer units 0.5× vs Elephantry, Structures
archer infantry	1 (1)	50, 35, 0, 15; 10 (50, 50, 0, 0; 10)	5, 4, 0, 1; 100 (5, 5, 0, 0; 100)	80 (80)	10+8 (8+10)	50 (50)	2, 2, 2 (1, 1, 10)	0, 6, 0 (0, 6, 0)	60 (72)	1000 (1000)	1.5× vs Archer Cavalry 0.5× vs Elephantry
sling infantry	1 (1)	50, 30, 0, 20; 10 (50, 20, 30, 0; 10)	5, 3, 0, 2; 100 (5, 0, 5, 0; 100)	80 (80)	12+8 (11+13)	55 (50)	1, 2, 3 (1, 1, 10)	0, 4, 1 (0, 9.5, 1)	72 (48)	1000 (1000)	1.5× vs Archer Infantry 0.25× vs Structures
stone sling infantry ¹	1 (1)	50, 40, 0, 10; 10 (50, 20, 30, 0; 10)	5, 4, 0, 1; 100 (5, 0, 5, 0; 100)	80 (80)	12+8 (11+13)	55 (50)	1, 2, 3 (1, 1, 10)	0, 0, 6 (0, 9.5, 1)	48 (48)	1000 (1000)	1.5× vs Archer Infantry 0.25× vs Structures
javelin infantry	1 (1)	50, 45, 0, 5; 10 (50, 50, 0, 0; 10)	5, 5, 0, 0; 100 (5, 5, 0, 0; 100)	80 (80)	14+8 (13.5+10.5)	60 (50)	2, 3, 4 (1, 1, 10)	0, 10, 0 (0, 16, 0)	24 (24)	1000 (1250)	1.25× vs Archer units –
throwing axe infantry ²	1 (1)	50, 30, 0, 20; 10 (50, 50, 0, 0; 10)	5, 3, 0, 2; 100 (5, 5, 0, 0; 100)	80 (80)	13+5 (13.5+10.5)	65 (50)	3, 4, 5 (1, 1, 10)	9, 0, 0 (0, 16, 0)	18 (24)	1000 (1250)	1.5× vs Spear Infantry –
pike infantry	1 (1)	50, 45, 0, 5; 10 (50, 50, 0, 0; 10)	5, 5, 0, 0; 100 (5, 5, 0, 0; 100)	80 (80)	9+3 (7+2)	80 (100)	4, 5, 6 (10, 10, 15)	0, 5, 0 (1, 3, 0)	8 (8)	1000 (2000)	1.25× vs Chariotry, 1.5× vs Cavalry, ⁰ 1.75× vs Camelry, 2.0× vs Elephantry
axe infantry ¹	1 (1)	50, 35, 0, 15; 10 (50, 40, 0, 10; 10)	5, 4, 0, 1; 100 (5, 5, 0, 0; 100)	80 (80)	12+4 (9.5+6.5)	85 (100)	5, 5, 5 (5, 5, 15)	6, 0, 0 (5.5, 0, 0)	2 (2)	1000 (750)	1.5× vs Siege weapons, 2.0× vs Elephantry –
spear infantry	1 (1)	50, 40, 0, 10; 10 (50, 50, 0, 0; 10)	5, 4, 0, 1; 100 (5, 5, 0, 0; 100)	80 (80)	10+5 (8.5+6.5)	90 (100)	5, 6, 7 (5, 5, 15)	0, 6, 0 (3, 2.5, 0)	4 (4)	1000 (1000)	1.25× vs Javelin units ⁰ –
mace infantry ¹	1 (1)	50, 30, 0, 20; 10 (50, 40, 0, 10; 10)	5, 3, 0, 2; 100 (5, 0, 0, 5; 100)	80 (80)	9+6 (9.5+6.5)	95 (100)	4, 6, 8 (5, 5, 15)	0, 0, 6 (0, 0, 5.5)	2 (2)	1000 (750)	1.5× vs Cataphract Cavalry 0.25× vs Structures
sword infantry	1 (1)	50, 25, 0, 25; 10 (50, 40, 0, 10; 10)	5, 2, 0, 3; 100 (5, 0, 0, 5; 100)	80 (80)	10+5 (9.5+6.5)	95 (100)	6, 7, 8 (5, 5, 15)	5, 2, 0 (5.5, 0, 0)	2 (2)	1000 (750)	1.5× vs Pike Infantry –
hoplite infantry ¹	1 (1)	50, 20, 0, 30; 10 (50, 50, 0, 0; 10)	5, 2, 0, 3; 100 (5, 5, 0, 0; 100)	80 (80)	8+4 (8.5+6.5)	100 (100)	7, 8, 9 (5, 5, 15)	2, 5, 0 (3, 2.5, 0)	4 (4)	1000 (1000)	1.25× vs Ranged units ⁰ –

NB:

0: Replaces the default 3.0× vs Cavalry bonus

1: A new class to which existing units are reassigned

2: A new class which currently remains unused

2.2.2 Mounted units

class	pop. size	training costs (f, w, s, m; time)	loot (f, w, s, m; exp)	vision range	speed	health	armour (h, p, c)	damage (h, p, c)	range (m)	rate (ms)	counters/ penalties
war dog	0 (0)	75, 0, 0, 0; 10 (100, 0, 0, 0; 15)	8, 0, 0, 0; 75 (10, 0, 0, 0; 100)	60 (30)	15+15 (14.5+11.5)	75 (90)	1, 2, 1 (1, 2, 1)	4, 4, 0 (7, 2, 0)	4 (3)	1000 (1000)	0.75× vs Camelry, Cavalry, Chariotry, 0.5× vs Elephantry
archer camel ¹	2 (1)	90, 40, 0, 10; 12 (100, 40, 0, 0; 12)	9, 4, 0, 1; 150 (10, 0, 0, 5; 130)	95 (92)	27+8 (17.5+10.5)	110 (120)	1, 1, 5 (3, 1, 15)	0, 6, 0 (0, 7, 0)	66 (72)	1000 (1000)	1.5× vs Support units 0.5× vs Elephantry
spear camel ²	2 (1)	90, 40, 0, 10; 12 (80, 55, 0, 0; 12)	9, 4, 0, 1; 150 (10, 0, 0, 5; 130)	95 (92)	28+14 (22+18)	145 (160)	2, 3, 5 (1, 1, 10)	0, 7, 0 (6, 13, 0)	6 (6)	1000 (3500)	1.5× vs Cavalry 0.5× vs Elephantry
archer cavalry	2 (1)	100, 35, 0, 15; 14 (100, 40, 0, 0; 12)	10, 4, 0, 1; 150 (10, 0, 0, 5; 130)	90 (92)	25+5 (17.5+10.5)	120 (120)	1, 1, 7 (3, 1, 15)	0, 7, 0 (0, 7, 0)	65 (72)	1000 (1000)	1.5× vs Sword Cavalry 0.5× vs Elephantry
javelin cavalry	2 (1)	100, 40, 0, 10; 14 (100, 40, 0, 0; 12)	10, 4, 0, 1; 150 (10, 0, 0, 5; 130)	90 (92)	24+8 (17.5+10.5)	130 (120)	1, 2, 7 (3, 1, 15)	0, 12, 0 (0, 18, 0)	28 (28)	1000 (1250)	1.5× vs Chariotry –
axe cavalry ²	2 (1)	100, 35, 0, 15; 14 (80, 35, 0, 20; 12)	10, 3, 0, 2; 150 (10, 0, 0, 5; 130)	90 (92)	23+11 (20+8.75)	140 (160)	2, 2, 7 (4, 2, 15)	6, 0, 2 (6.5, 0, 0)	6 (6)	1000 (750)	2.0× vs Siege weapons 0.5× vs Elephantry ⁴
sword cavalry	2 (1)	100, 25, 0, 25; 14 (80, 35, 0, 20; 12)	10, 2, 0, 3; 150 (10, 0, 0, 5; 130)	90 (92)	22+14 (20+8.75)	150 (160)	3, 3, 7 (4, 2, 15)	8, 0, 0 (6.5, 0, 0)	6 (6)	1000 (750)	1.5× vs Siege weapons, Slin 0.5× vs Elephantry ⁴
spear cavalry	2 (1)	100, 30, 0, 20; 14 (80, 55, 0, 0; 12)	10, 3, 0, 2; 150 (10, 0, 0, 5; 130)	90 (92)	21+17 (22+18)	160 (160)	4, 4, 7 (4, 3, 15)	0, 8, 0 (6, 13, 0)	6 (6)	1000 (3500)	1.5× vs Ranged Infantry 0.5× vs Elephantry ⁴
lance cavalry ¹	2 (1)	100, 20, 0, 30; 14 (80, 55, 0, 0; 12)	10, 2, 0, 3; 150 (10, 0, 0, 5; 130)	90 (92)	20+20 (22+18)	170 (160)	5, 5, 7 (4, 3, 15)	0, 8, 2 (6, 13, 0)	6 (6)	1000 (3500)	1.5× vs Javelin units 0.5× vs Elephantry ⁴
cataphract cavalry ¹	2 (1)	100, 10, 0, 40; 14 (80, 55, 0, 0; 12)	10, 1, 0, 4; 150 (10, 0, 0, 5; 130)	90 (92)	18+18 (22+18)	180 (160)	7, 7, 7 (4, 3, 15)	0, 8, 4 (6, 13, 0)	6 (6)	1000 (3500)	1.5× vs Javelin Infantry 0.5× vs Elephantry ⁴
javelin biga chariot ³	4 (1)	200, 80, 0, 20; 16 (250, 100, 0, 100; 40)	20, 8, 0, 2; 300 (10, 10, 0, 20; 150)	85 (96)	19+6 (20.5+7.5)	214 (270)	5, 3, 9 (7, 5, 20)	0, 16, 0 (0, 36, 0)	32 (32)	1000 (1250)	1.5× vs Sword Infantry 0.5× vs Elephantry
archer biga chariot ³	4 (1)	200, 75, 0, 25; 16 (250, 100, 0, 100; 40)	20, 7, 0, 3; 300 (10, 10, 0, 20; 150)	85 (96)	19+6 (20.5+7.5)	200 (270)	5, 3, 9 (7, 5, 20)	0, 8, 0 (0, 14, 0)	64 (76)	1000 (1000)	1.5× vs Mace Infantry 0.5× vs Elephantry
scythed quadriga chariot ³	6 (1)	300, 100, 0, 50; 18 (250, 100, 0, 100; 40)	30, 10, 0, 5; 450 (10, 10, 0, 20; 150)	85 (96)	18+9 (20.5+7.5)	280 (270)	6, 3, 9 (7, 5, 20)	0, 9, 0 (0, 14, 0)	64 (76)	1000 (1000)	1.5× vs Axe Infantry 0.5× vs Elephantry
archer (Indian) war elephant ¹	6 (1)	300, 100, 0, 100; 24 (200, 80, 0, 20; 12)	30, 10, 0, 10; 500 (25, 10, 0, 5; 260)	100 (92)	9+9 (8.5+5.5)	450 (240)	4, 7, 10 (4, 3, 15)	0, 8, 0 (0, 10.5, 0)	67+5 (72)	1000 (750)	1.5× vs Camelry 0.5× vs Elephantry
North African war elephant ³	6 (3)	300, 75, 0, 150; 20 (250, 0, 0, 250; 30)	30, 8, 0, 15; 525 (10, 10, 0, 20; 150)	100 (100)	9+9 (8.5+5.5)	400 (750)	6, 9, 12 (10, 10, 25)	0, 0, 27 (20, 0, 150)	8 (8)	1000 (1500)	– 0.25× vs Structures
Indian war elephant ³	6 (3)	300, 100, 0, 200; 24 (250, 0, 0, 250; 30)	30, 10, 0, 20; 600 (10, 10, 0, 20; 150)	100 (100)	9+9 (8.5+5.5)	500 (750)	6, 9, 12 (10, 10, 25)	0, 0, 30 (20, 0, 150)	8 (8)	1000 (1500)	– 0.25× vs Structures

NB:

1: A new class to which existing units are reassigned

2: A new class which currently remains unused

3: A new class to which exclusively champion units are reassigned; comparison values are champions, default values not

4: All melee cavalry (axe, sword, spear, lance, cataphract) also has a 0.75× penalty vs Camelry and Chariotry

2.2.3 Siege weapons

class	pop. size	training costs (f, w, s, m; time)	loot (f, w, s, m; exp)	vision range	speed	health/ capture	armour (h, p, c)	damage (h, p, c)	range (m)	rate (ms)	other stats
ballista	2 (2)	0, 200, 0, 200; 20 (0, 250, 0, 250; 20)	0, 20, 0, 20; 200 (0, 10, 0, 10; 200)	100 (120)	8+4 (8+4)	200/200 (200/500)	1, 20, 2 (1, 50, 5)	0, 120, 0 (0, 150, 25)	8–80 (8–80)	3000 (4000)	linear splash damage: 0h+60p+0c (0h+75p+5c)
onager	3 (2)	0, 300, 150, 150; 30 (0, 400, 250, 0; 25)	0, 30, 15, 15; 300 (0, 20, 10, 0; 300)	100 (120)	7+3 (7+3)	300/300 (250/500)	1, 30, 3 (1, 50, 5)	0, 0, 90 (0, 10, 100)	15–90 (12–80)	3000 (5000)	circular splash damage: 0h+0p+30c (0h+15p+35c)
ram	4 (3)	0, 400, 0, 200; 40 (0, 350, 0, 200; 30)	0, 40, 0, 20; 300 (0, 50, 0, 25; 60)	40 (80)	8+4 (8+3)	400/– (400/–)	2, 40, 4 (1, 50, 5)	0, 0, 80 (0, 0, 150)	8 (6.5)	3000 (1500)	garrison limit: 10 (10)
tower	3 (6)	0, 600, 100, 300; 60 (0, 500, 0, 300; 60)	0, 60, 10, 30; 500 (0, 50, 0, 25; 60)	100 (80)	6+3 (6.5+3.5)	600/600 (500/500)	3, 60, 6 (1, 50, 5)	0, 10, 10 (0, 12, 2.5)	60+9 (55+9)	3000 (2000)	garrison limit: 20 (20) arrow count: 2–12 (0–10)

NB:

Ballista: 1.5× vs Elephantry

Onager: 1.5× vs Ships

Ram: 4.0× vs Gates, 2.0× vs other Structures

Tower: 2.0× vs Fortresses, Towers

2.2.4 Support units

class	pop. size	training costs (f, w, s, m; time)	loot (f, w, s, m; exp)	vision range	speed	health	armour (h, p, c)	build rate	other stats
female	1 (1)	50, 0, 0, 0; 8 (50, 0, 0, 0; 8)	5, 0, 0, 0; 5 (1, 1, 1, 1; 10)	50 (32)	10+5 (9.5+6.5)	25 (25)	1, 1, 1 (1, 1, 1)	1.0 (1.0)	
slave	1 (0)	50, 0, 0, 50; 8 (0, 0, 0, 50; 20)	5, 0, 0, 5; 10 (0, 1, 1, 1; 10)	50 (12)	10+5 (8+7)	50 (100)	1, 1, 1 (1, 1, 1)	1.0 (0.5)	(unhealable, –0.25 regeneration)
healer	1 (1)	50, 0, 0, 100; 8 (250, 0, 0, 0; 8)	5, 0, 0, 10; 15 (1, 1, 1, 1; 10)	75 (30)	10+5 (9+3)	75 (85)	1, 1, 1 (1, 1, 1)	– (–)	heal 1 HP per 0.5 seconds, 12 m range (5 HP/2.0 s, 12 m)
trader	1 (1)	100, 50, 0, 0; 15 (100, 0, 0, 80; 15)	5, 5, 5, 5; 20 (1, 1, 1, 1; 10)	60 (60)	10+5 (9.5+6.5)	100 (100)	1, 1, 1 (1, 1, 1)	– (–)	briable (briable)
elephant	3 (1)	300, 0, 0, 0; 12 (150, 0, 0, 0; 20)	30, 0, 0, 0; 75 (25, 0, 0, 0; 50)	60 (50)	6+6 (5.5+4.5)	300 (300)	3, 6, 9 (5, 8, 10)	3.0 (2.0)	can garrison up to 3 females (no garrison capacity)

2.3 Historical reality

2.3.1 Melee infantry

Warfare in Antiquity was often very lopsided: both sides would field heavy infantry formations against each other, until one side believed they were losing the fight, broke down, and fled; the losers would be massacred in pursuit, while the victors would win with relatively minimal casualties. Population potential generally determined the outcome of prolonged warfare: ever expanding states who could afford to lose battles (e.g. Macedon, Rome) won wars; those with stagnant growth (e.g. most Hellenistic kingdoms) often preferred to avoid all-or-nothing pitched fights and rely on naval warfare and sieges instead.

Hoplites wore a large circular shield (the *aspis*), a helmet, and a heavy, metal body armour; their primary weapon was a spear; often they also had a short sword or dagger as a secondary weapon. Hoplites were the dominant warriors of the Archaic and Classical periods. They were citizens who seldom fought more than a couple of days per year; even untrained they could easily hold their own against any opponent, thanks to their heavy armaments. The Persians often recruited large contingents of Greek mercenary hoplites; in the fourth century they even set up a corps of their own to emulate them. Their great strength was simultaneously their weakness: hoplite armour was very expensive, limiting the numbers of available troops (in city states soldiers had to provide their own weapons); inflexible, limiting their movement and speed on the battlefield; and uncomfortable, very hot in broad sunlight: hoplites would often march unarmed and only get their armour on (with the help of a servant) shortly before the actual fighting started.

Several experiments (e.g. Iphicrates) to make hoplites lighter culminated in the fourth century into the Macedonian pikemen (*phalangites*). They had long (c. 6 m) pikes (the *sarissa*), which required two hands to handle, small, crescent shaped shields (the *peltê*) attached to one arm, and often little more than a linen body armour. Although vulnerable on their own, they were invulnerable to frontal attacks when packed in their very tight (and slow) formations (unlike hoplites and swordsmen, who fought in relatively loose formations to allow moving around their weapons and falling back to ranks behind them). Soldiers were no longer independent citizens, but subjects who served for months or years and dependent on their king. The king provided them with armaments beforehand, regular meals and pay in service, and land afterwards; this allowed Macedon to quickly recruit and replace large numbers of heavy infantry. Being regular soldiers they had plenty of time to be trained, especially at forced marches; the ability to move around armies much quicker than opponents expected facilitated Alexander's world conquest.

As a result of the Celtic (Galatian) invasions of the Balkans, Greece, and Asia and directly inspired by their infantry a new, more flexible type of infantry emerged in the Greek world. Armed with a large oval shields (the *thureos*), some body armour, and short spears of various lengths and thicknesses, *thureophoroi* (medium infantry) could act both as skirmishers (light infantry), hurling javelins, and as *phalangites* (heavy infantry), forming a shieldwall and holding its ground with their thrusting spears.

In Italy, hoplite-style infantry remained in use by all peoples (Greeks, Oscans (Samnites), Umbrians (Sabines), Latins (Romans), Etruscans); a short stabbing sword (*gladius*) gradually replaced the spear (*hasta*) as the primary weapon; circular (e.g. the *clipeus*), oval, and rectangular (e.g. the *scutum*) shields were used concurrently; and the *phalanx* was abandoned in favour of similar but looser formations.

2.3.2 Ranged infantry

Standing at a relatively safe distance and hurling javelins at the opponents has been the typical form of tribal warfare throughout history everywhere in the world, from Neolithic times to 20th century Amazon, Africa, and Papua New Guinea; after a few men were wounded, one side would retreat. Although often dismissed as childlike, actually the combination of participation of the entire male population, several fights a year, and lack of modern medicine to prevent minor wounds from developing into dangerous infections, effectively results in something relatively more lethal than the Second World War was.

In Antiquity, light infantry was primarily used for harassing the enemy and other auxiliary roles. Ranged infantry was notably ineffective against heavy infantry formations; their missiles were merely a nuisance, not really deadly at all. Only when the formation broke could they kill off their opponents.

Thracian style peltasts, armed with a light, crescent shaped, goatskin shield (*peltê*), two javelins (*akontia*), and a short slashing sword as a secondary weapon, were the skirmishers *par excellence* in Classical Greece; quick and agile, they excelled at ambushing and occupying, defending, or assaulting important points; unlike other light units they could fight in melee, if necessary. Although easily chased away by infantry charges or cavalry on flat terrain, they could hold their own on rough terrain (most of Armenia and Greece) and occasionally massacre cavalry or even hoplites. Their effectiveness, relatively cheapness of equipment (especially when compared to hoplites), and easy skills (hurling javelins can be learned in a day) resulted in them being the most common and popular mercenary type.

Archery has been practiced since prehistoric times to the present day. Archers have to be subdivided into three categories, depending on the type of bow.

Simple, self, flat, or longbows are basically long wooden sticks (up to 2 m) to which a bowstring is attached; they are cheap and easy to produce; many types of wood can be used, although yew (*taxus*) seems to have been preferred in Europe and bamboo in South, Southeast, and East Asia; using them requires great strength, practice, and experience.

Composite bows were invented in the late third or second millenium and could be curved or recurved; they were neither cheap nor durable: manufactured by laminating layers of horn, sinew, and wood sinew, a difficult and time consuming process, and sensitive to moisture (which explains why they never became common in Europe). Using composite bows required years of experience and significantly more skill than shooting a simple bow. The great advantage was their strength, being much shorter but at least as powerful as longbows. Composite bows were *the* weapon of choice for charioteers and horse archers, and also used by (As)syrian, Indo-Iranian (e.g. Vedic (Indic) Aryans, Medes, Parthians, Persians, Scythians, etc.), Hunnic, Turkic, and Mongol foot archers. Massed foot archers were the most effective counter against cavalry archers: they could shoot standing, sitting, hiding in the bushes, making them small targets, and from there rain down arrows on the horses, who were much smaller targets.

Composite bows existed in Mycenaean Greece, but disappeared in the Dark Ages; the archery tradition was continued in Crete and from there reintroduced to mainland Greece in the Classical times. Although Scythian and other mercenary archers were used, the Cretans were the most famous and desired archers; so great was their fame and skill that occasionally “Cretan” was used as a general Greek term for “archer” (likewise “Syrian” could be used as a general Latin term for “archer” in Imperial Roman sources).

Composite bows had an effective range of about 60 metres against individuals and over 150 metres against formations; maximum (inaccurate) range might occasionally exceed 300 metres, depending on the terrain, weather, bow, and archer. It is important to realize arrows could not penetrate body armour or heavy shields; furthermore, even hoplites could cover the effective range distance in only seconds on flat terrain.

Crossbows were invented independently in China and in the Greek world in the fifth century at the latest; the Chinese version later led to the invention of repeated crossbows, the Greek version to the ballista, catapult, and similar forms of artillery, first constructed in Syracuse in the early fourth century, and spreading from there. Strictly speaking crossbowmen are not true archers, since they do not shoot arrows, but much shorter and heavier bolts or stones instead. Greek hand-held crossbows (*gastraphetes* “belly-releaser”) were only used in siege warfare. Unlike traditional archery, skillfully using a crossbow could be learned in a week or two (which explains their popularity in the European Middle Ages (A.D.)); their much lower rate of fire (a skilled archer could perhaps launch up to a dozen arrows in the time a crossbowman required to reload and shoot once) was not really an issue during sieges.

Slinging is a skill now lost, which makes it difficult for people nowadays to get a clear idea of its effectiveness. However, Greek sources repeatedly stress that slingers had an effective range of over 200 metres and could easily outdistance and outshoot archers.

Slings were used everywhere in the Mediterranean from Neolithic times to Late Antiquity; however, it was generally the least prestigious weapon (hoplites, chariots, javelins, and archers all feature prominently in Homer’s *Iliad*; slings do not appear); a sling was an extremely cheap weapon, everyone could afford it; slingers were usually of low status, very poor, and considered rustic. Of course, there are always exceptions: the Balearic peoples, Acarnanians, Rhodians, and Judaeans were all famous for their exceptional slinging skills (boys practised from early childhood), they were proud of it, and sought after as mercenaries.

Slingers could use various forms of ammunition. Everything from fist-sized rocks of up to 500 grammes to small pebbles as light as 50 grammes could be used, rough ones picked up at the battlefield or more effective smooth stones collected in advance in river beds; Celtic hill forts with stocks of tens of thousands of sling stones are not uncommon archaeological sites in Northwestern Europe. Clay projectiles of various sizes first appear in Early Bronze Age Mesopotamia and were still produced in the Roman Empire. Small leaden bullets (of 20 to 50 grammes) were produced by Assyrians, Greeks, Romans, and others; they had the greatest range and penetrative power and were very hard to see or dodge; they were ineffective against full hoplite armour but dangerous for everyone with lighter protection.

Massed slingers, although not packed as closely as foot archers (because their slings needed space for swinging) could rain down projectiles on heavy infantry formations, forcing them to stay put, hiding behind their shields for cover. Small groups of slingers were used to chase away other slingers or archers, who lacked shields and body armour and were thus always vulnerable to projectiles.

2.3.3 Chariotry

The first clear evidence of animals in warfare were the donkey carts used by the Sumerians; these were undoubtedly slow, but given that everyone else was on foot, this was not a problem.

Horses were domesticated and (spoked-wheel) chariots invented in what is now Ukraine and Southern Russia; from there they were spread by the Indo-Europeans (“Aryans”) throughout Eurasia, to China in the East, the British isles in the West, and Egypt in the South; the horse-and-chariot was very fast and dominated battlefields everywhere: it was the “fighter aircraft” of the Bronze Age.

In the Hellenistic period there were many attempts to (re)introduce scythed chariots, but these remained ultimately unsuccessful.

2.3.4 Camelry

Dromedary camels were domesticated by the Bedouin (“Arab”) tribes living in and around the Syrian desert; due to their long legs dromedary camels could easily outrun horses, making them very suitable for hit-and-run raids. The

primary usage of dromedary camels, however, was maintaining supply lines and caravans in desert areas (as is still the case in the present day).

2.3.5 Cavalry

The first evidence of cavalry appeared relatively late, in the Neo-Assyrian Empire; it was apparently an evolution from earlier chariot experiments; chariot crews consisted of a driver and an archer or lancer; likewise, Assyrian cavalry was organized in teams of two: one would manage the reins of both horses, the other was an armed warrior who did the fighting.

Horseback-riding existed in Greece in the Dark Ages; however, such soldiers were actually mounted infantry rather than true cavalry: they would ride to the battlefield but descent and fight on foot when the battle started. The situation in most of Europe was probably comparable; sources implicate that during the Second Punic War it was still common for Roman horsemen to descent and fight on foot. Mounted infantry and true cavalry probably coexisted for many centuries (cf. the mounted pikemen and dragoons of the Early Modern Period (post 1500 A.D.)).

The first true cavalry (men who actually fought from horseback) in the Greek world was Thessalian, starting in the eight century; the Boeotians were also famous for their cavalry. Cavalry could be armed with throwing javelins, thrusting spears, or both, and often had a short slashing sword as a secondary weapon. Bow-and-arrows could apparently be used as well: Athens had a regular corps of 200 horse archers in 431. The lance was introduced by the Macedonians in the fourth century; Alexander seems to be the first to have used cavalry as shock troops.

The Indo-Iranian tribes (e.g. Vedic (Indic) Aryans, Medes, Parthians, Persians, Scythians, etc.) fought from horseback many centuries before: whenever they appear in historical records, they are already known and feared for their exceptional riding skills and usage of bow-and-arrow from horseback. Horse archers dominated Central Eurasian warfare until the introduction of modern rifles and cannons. They were usually light, fast, unarmoured, and could have multiple horses to be able to continue constant attacks. Much slower armoured heavy (and cataphract) horse archers (who were nearly invulnerable to arrows) developed as a counter against them and coexisted for centuries.

It is important to realize that horses throughout Antiquity were actually quite small, about the size of a pony or Przewalski's horse. Larger breeds (Nisean horses) started in the fifth century (B.C.) but remained exceptional until the European Middle Ages (A.D.).

Horses did not like the smell of camels nor the noise of chariot wheels: unused to it, they would panic at the first encounter, but could be trained to resist their unease (cf. fireworks).

2.3.6 Elephantry

Wild elephants were captured and tamed (but never domesticated) in the Indus valley as early as the fifth millennium; they were used in agriculture and as beasts of burden. An independent elephant tradition might have existed in Shang China (second millennium). True war elephants emerged in Indian warfare only in the first millennium, probably from Ceylon (Sri Lanka): the *mahout*³ tradition seemed to have originated here. (Elephants were still the primary export product from Ceylon to India in the Early Modern Period when the Dutch East India Company (VOC) tried to monopolize all trades to and from Ceylon.)

Elephants were *not* living siege weapons.⁴ Elephantry had many functions: prestige, intimidation, high and relatively safe look-out posts for generals, platforms for archers to shoot arrows from (walking towers), and protecting vulnerable infantry against cavalry charges and horse archers (horses won't charge directly at elephants and arrows had little to none effect against war elephants); direct elephant charges at infantry formations were risky and rare.

The Indian states, the Persians, Alexander, and the Seleucids all used Asian elephants (*Elephas maximus*): Sri Lankan elephants (*E. m. maximus*) were evidently the archetypical war elephants everywhere; Indian elephants (*E. m. indicus*) were probably used in large numbers as well; Syrian elephants (*E. m. asurus*), the largest in size, were occasionally also used, but their population was quite small due to habitat loss and became totally extinct by the first century.

Ptolemaic Egypt, Epirus, Carthage, Numidia, and Kush used North African elephants (now extinct) instead; they were easier and cheaper to acquire for them than the more prestigious Asian elephants; however, all sources agree they were significantly smaller and inferior; the Seleucid war elephants easily defeated their Ptolemaic counterparts whenever they met.

³Mahouts are the men who tamed, trained, cared for, and rode war elephants

⁴Have you ever seen an elephant charging head on at a large stone wall? Exactly!

2.4 New template structure tree

Located in /simulation/templates/; existing (overruled) templates are indicated with an asterisk (*).

```
template_unit.xml*
template_unit_camel.xml
template_unit_camel_melee.xml
template_unit_camel_melee_spear.xml
template_unit_camel_melee_spear_champion.xml
template_unit_camel_melee_spear_hero.xml
template_unit_camel_melee_spear_mercenary.xml
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template_unit_camel_ranged_archer.xml
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template_unit_camel_ranged_archer_mercenary.xml
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template_unit_support_female.xml
template_unit_support_healer.xml*
template_unit_support_slave.xml*
template_unit_support_trader.xml*
```

3 Structures

3.1 General templates

- Barracks have build time increased to 200 (from 150), food cost increased to 100 (from 0), loot changed to 10 food, 30 wood, 0 stone, and 0 metal (from 0, 30, 10, 0).
- Civic centres have build time increased to 600 (from 500), food cost increased to 500 (from 0), food loot increased to 200 (from 0), experience increased to 400 (from 200), population bonus increased to 25 (from 20), garrison capacity increased to 25 (from 20), capture points increased to 3000 (from 2500), attack pierce damage decreased to 9 (from 12), default arrow count reduced to 2 (from 3), vision range increased to 100 (from 90); and can no longer train cavalry.
- Military colonies have cost changed to 250 food, wood, stone, and metal (from 0, 200, 200, 200), food loot increased to 100 (from 0), experience increased to 200 (from 100), population bonus decreased to 15 (from 20), garrison capacity decreased to 15 (from 20), and capture points decreased to 2000 (from 2500).
- Fortresses have build time decreased to 450 (from 500), cost changed to 200 food, 400 wood, 800 stone, 100 metal (instead of only 1000 stone), loot changed to 20 food, 40 wood, 80 stone, 10 metal, and 300 experience (from 0), hit points increased to 4500 (from 4200), capture points increased to 4500 (from 4000), attack pierce damage decreased to 12 (from 16), maximum arrow count of 18 (new), and vision range increased to 100 (from 80).
- Defensive towers have food cost increased by 50 (in addition to 100 wood, 100 stone, and 150 build time), loot changed to 5 food, 10 wood, 10 stone, 0 metal, and 125 experience (from 0, 0, 20, 0, and 100), hit points increased to 1500 (from 1000), capture points increased to 1000 (from 500), attack pierce damage decreased to 10 (from 12), attack range decreased to 10-76+12 (from 10-76+15), vision increased to 100 (from 80), and require City phase (from Town) to be constructed.
- Sentry towers have build time increased to 80 (from 40), loot changed to 5 food, 10 wood, 0 stone, 0 metal, and 100 experience (from 0, 0, 20, 0, and 100), hit points increased to 1000 (from 250), crush, hack, and pierce armour changed to 2, 15, 25 (from 1, 20, 25), capture points decreased to 750 (from 800), attack pierce damage increased to 10 (from 9), a minimum range of 10 (from 0), vision increased to 100 (from 80), require Town phase (from Village) to be constructed; individual upgrades to Defense tower require City phase (from Town).
- Outposts have wood cost decreased to 75 (from 80), loot changed to 8 wood and 75 experience (from 8, 100), hit points decreased to 750 (from 800), minimum distance requirement of 60 to other towers (from 50 to outposts), attack pierce damage decreased to 10 (from 16), attack range increased to 10-64+6 (from 13-55), vision increased to 100 (from 80); can be upgraded individually in Town phase to Sentry towers at cost of 50 food, 75 wood, and 50 time (new).
- City walls can be constructed in neutral territory, require City phase (from Town), and are more expensive:
 - Short walls have health increased to 2000 (from 1000), build time increased to 30 (from 15), cost increased to 20 wood and 60 stone (from 0, 15), and loot increased to 2 wood and 6 stone (from 0, 15);
 - Medium walls have health increased to 3000 (from 2000), build time increased to 45 (from 30), cost increased to 30 wood and 90 stone (from 0, 22), and loot increased to 3 wood and 9 stone (from 0, 15);
 - Long walls have health increased to 4000 (from 3000), build time increased to 60 (from 45), cost increased to 40 wood and 120 stone (from 0, 28), and loot increased to 4 wood and 12 stone (from 0, 15);
 - Upgrade to gate costs 0 food, 40 wood, 0 stone, 40 metal (from 0, 0, 60, 0) and 15 time (from 10);
 - Wall turrets have health increased to 5000 (from 4000), build time increased to 75 (from 80), cost increased to 50 wood and 150 stone (from 0, 90), and loot increased to 5 wood and 15 stone (from 0, 15).
- Temples have additional cost of 100 wood (in addition to 300 stone), loot changed to 0 food, 10 wood, 30 stone, and 0 metal (from 0, 0, 50, 50), and health increased to 2500 (from 2000).
- Armoury can be constructed in village phase, costs 200 wood, 100 metal, and 150 time (from 200, 0, 200).
- Corral, farmstead, field, and storehouse can be constructed in neutral territory; field has 300 health (from 250), corral 600 (from 500), storehouse 750 (from 800), farmstead 900 (unchanged); loot is reduced to just 10 wood (except for field).
- Docks have loot reduced to 0 food, 20 wood (from 30 each), and are bribable.
- Markets have loot reduced to 15 food, wood, stone, and metal (from 25 each), and are bribable.

3.2 Other changes

- Civic centres, embassies, libraries, theatres, and wonders are bribable.
- Libraries (each) reduce the construction time of structures by -10% (instead of -10% technology costs) and the research time of technologies by -10%
- Athenian `special_long_walls` increases the health and resource costs of stone walls by $+20\%$ (instead of allowing them to be build in neutral territory)
- Athenians and Spartans (in addition to Carthaginians) also have access to the “Colonization” technology (civic structures have -25% construction time).
- Athenians no longer gain $+10\%$ metal.ore mining gather rate per phase advance.
- Briton Crannog can no longer train cavalry javelinists.
- Briton Kennel costs 50 food, wood, stone, and metal (instead of 0, 50, 50, 200), has loot changed to 5 food, wood, stone, and metal (instead of 0, 10, 10, 0), and is available in Village phase (from Town).
- Carthaginian heroes (Hamilcar, Hannibal, Maharbal) can be recruited at the Civic Centre instead of the Fortress (cf. Ptolemies, Seleucids).
- Mauryan Civic Centre can no longer train worker elephants.
- Mauryan Elephant Stables cost 100 food, wood, stone, and metal (instead of 0, 0, 200, 200), requires Village phase (instead of Town phase), and have loot changed to 10 food, wood, stone, and metal (instead of 0, 0, 50, 50).
- Macedonian heroes (Philip, Alexander, Demetrius) can be recruited at the Civic Centre instead of the Fortress (cf. Ptolemies, Seleucids).
- Ptolemic Civic Centre can train slingers instead of javelinists.
- Roman heroes (Marcellus, Maximus, Scipio) can be recruited at the Civic Centre instead of the Fortress (cf. Ptolemies, Seleucids).

4 Technologies

The new values are displayed on each first row, the default “0 A.D. Alpha XXII: Venustas” values are displayed for comparison on each second row (between brackets); some files are renamed for internal consistency. All technology files are located in /simulation/data/technologies/

4.1 Comparison table (economic)

technology	cost (f, w, s, m; time)	phase	effects
gather_animals_stockbreeding.json	100, 0, 0, 0; 45 (50, 0, 0, 0; 40)	village	domestic animals −25% breed time
gather_capacity_basket.json	250, 250, 0, 0; 30 (300, 300, 0, 0; 40)	village	workers +5 resource carrying capacity
gather_capacity_carts.json	1000, 1000, 0, 0; 60 (1000, 1000, 0, 0; 40)	city	workers +10 resource carrying capacity
gather_capacity_fishing.json	200, 100, 0, 0; 30 (200, 100, 0, 0; 30)	town	fishing boats +20 food carrying capacity
gather_capacity_wheelbarrow.json	500, 500, 0, 0; 45 (500, 500, 0, 0; 40)	town	workers +5 resource carrying capacity
gather_farming_fertilizer.json	0, 600, 0, 300; 60 (0, 500, 0, 250; 40)	city	workers +25% food.grain farming rate
gather_farming_plows.json	0, 200, 0, 100; 40 (0, 200, 0, 100; 40)	village	workers +15% food.grain farming rate
gather_farming_training.json	0, 400, 0, 200; 50 (0, 300, 0, 150; 40)	town	workers +20% food.grain farming rate (+15%)
gather_fishing_net.json	0, 100, 0, 0; 30 (0, 100, 0, 0; 30)	village	fishing boats +25% food.fish fishing rate (+30%)
gather_lumbering_ironaxes.json	125, 125, 0, 50; 30 (0, 200, 0, 50; 40)	village	workers +20% wood.tree lumbering rate (+15%)
gather_lumbering_sharpaxes.json	500, 500, 0, 200; 60 (0, 1000, 150, 150; 40)	city	workers +30% wood.tree lumbering rate (+50%)
gather_lumbering_strongeraxes.json	250, 250, 0, 100; 45 (0, 250, 0, 50; 40)	town	workers +25% wood.tree lumbering rate (+15%)
gather_mining_shaftmining.json	250, 250, 0, 100; 45 (0, 250, 0, 50; 40)	town	workers +25% metal.ore mining rate (+15%)
gather_mining_silvermining.json	500, 500, 0, 200; 60 (0, 1000, 150, 150; 40)	city	workers +30% metal.ore mining rate (+50%)
gather_mining_wedgemallet.json	125, 125, 0, 50; 30 (0, 200, 0, 50; 40)	village	workers +20% metal.ore mining rate (+15%)
gather_quarrying_serfs.json (gather_mining_serfs.json)	250, 250, 0, 100; 45 (0, 250, 0, 50; 40)	town	workers +25% stone.rock quarrying rate (+15%)
gather_quarrying_servants.json (gather_mining_servants.json)	125, 125, 0, 50; 30 (0, 200, 0, 50; 40)	village	workers +20% stone.rock quarrying rate (+15%)
gather_quarrying_slaves.json (gather_mining_slaves.json)	500, 500, 0, 200; 60 (0, 1000, 150, 150; 40)	city	workers +30% stone.rock quarrying rate (+50%)
gather_wicker_baskets.json	0, 100, 0, 0; 30 (0, 100, 0, 0; 40)	village	workers +50% food.fruit foraging rate
health_females_01.json	150, 0, 0, 0; 30 (150, 0, 0, 0; 40)	village	females +60% health (+50%)
trade_commercial_treaty.json	0, 0, 0, 200; 40 (0, 0, 0, 100; 40)	town	markets +0.1 [i.e. +10%] international bonus
trade_convoy_armour.json (trade_convoys_armor.json)	0, 200, 0, 200; 40 (0, 0, 0, 200; 40)	city	traders +2 crush, hack, and pierce armour (no crush)
trade_convoy_speed.json (trade_convoys_speed.json)	200, 0, 0, 200; 40 (0, 0, 0, 200; 40)	town	traders +20% walk speed (+25%)
trade_gain_01.json	200, 200, 0, 200; 40 (0, 150, 0, 150; 40)	town	traders +10% gain
trade_gain_02.json	300, 300, 0, 300; 40 (0, 300, 0, 300; 40)	city	traders +15% gain

4.2 Comparison table (armoury)

technology	cost (f, w, s, m; time)	phase	effects
armour_cavalry_01.json (armor_cavalry_01.json)	0, 1000, 0, 400; 40 (0, 1000, 0, 350; 40)	village (town)	cavalry +1 crush, hack, and pierce armour (no crush, +1 hack, +1 pierce)
armour_cavalry_02.json (armor_cavalry_02.json)	0, 1000, 0, 500; 50 (0, 1000, 0, 450; 40)	town (city)	cavalry +1 crush, hack, and pierce armour (no crush, +1 hack, +1 pierce)
armour_cavalry_03.json [new]	0, 1000, 0, 600; 60 [new]	city [new]	cavalry +1 crush, hack, and pierce armour [new]
armour_hero_01.json (armor_hero_01.json)	0, 250, 0, 500; 60 (0, 0, 0, 600; 40)	city	heroes +3 crush, hack, and pierce armour (no crush, +2 hack, +2 pierce; +50 metal cos
armour_infantry_01.json (armor_infantry_01.json)	0, 1000, 0, 400; 40 (0, 1000, 0, 350; 40)	village (town)	infantry +1 crush, hack, and pierce armour (no crush, +1 hack, +1 pierce)
armour_infantry_02.json (armor_infantry_02.json)	0, 1000, 0, 500; 50 (0, 1000, 0, 450; 40)	town (city)	infantry +1 crush, hack, and pierce armour (no crush, +1 hack, +1 pierces)
armour_infantry_03.json [new]	0, 1000, 0, 600; 60 [new]	city [new]	infantry +1 crush, hack, and pierce armour [new]
armour_ship_01.json (armor_ship_reinforcedhull.json)	0, 200, 0, 0; 40 (0, 250, 0, 0; 40)	village	ships +2 crush, hack, and pierce armour
armour_ship_02.json (armor_ship_hypozomata.json)	0, 200, 0, 200; 40 (0, 150, 0, 150; 40)	town	ships +2 crush, hack, and pierce armour
armour_ship_03.json (armor_ship_hullsheating.json)	0, 0, 0, 400; 60 (0, 0, 0, 350; 40)	city	ships +2 crush, hack, and pierce armour
attack_cavalry_melee_01	400, 400, 0, 400; 40 (500, 750, 0, 350; 40)	village (town)	melee cavalry +15% attack (+20%)
attack_cavalry_melee_02	500, 500, 0, 500; 50 (500, 500, 0, 500; 40)	town (city)	melee cavalry +15% attack (+20%)
attack_cavalry_melee_03 [new]	600, 600, 0, 600; 40 [new]	city [new]	melee cavalry +15% attack [new]
attack_cavalry_ranged_01	400, 400, 0, 400; 40 (500, 750, 0, 350; 40)	village (town)	ranged cavalry +15% attack (+20%)
attack_cavalry_ranged_02	500, 500, 0, 500; 50 (500, 500, 0, 500; 40)	town (city)	ranged cavalry +15% attack (+20%)
attack_cavalry_ranged_03 [new]	600, 600, 0, 600; 60 [new]	city [new]	ranged cavalry +15% attack [new]
attack_champions_elite.json	0, 0, 0, 300; 40 (0, 0, 0, 300; 40)	city	melee champions +2 hack melee attack, ranged champions +2 pierce ranged attack
attack_infantry_melee_01	400, 400, 0, 400; 40 (500, 500, 250, 250; 40)	village (town)	melee infantry +15% attack (+20%)
attack_infantry_melee_02	500, 500, 0, 500; 50 (500, 500, 250, 450; 40)	town (city)	melee infantry +15% attack (+20%)
attack_infantry_melee_03 [new]	600, 600, 0, 600; 60 [new]	city [new]	melee infantry +15% attack [new]
attack_infantry_ranged_01	400, 400, 0, 400; 40 (500, 500, 250, 250; 40)	village (town)	ranged infantry +15% attack (+20%)
attack_infantry_ranged_02	500, 500, 0, 500; 50 (500, 500, 250, 350; 40)	town (city)	ranged infantry +15% attack (+20%)
attack_infantry_ranged_03 [new]	600, 600, 0, 600; 60 [new]	city [new]	ranged infantry +15% attack [new]
attack_soldiers_will.json	1500, 1500, 1500, 1500; 60 (1500, 1500, 1500, 1500; 40)	city	soldiers +25% attack
attack_steel_working.json [iber, maur]	0, 200, 0, 200; 60 (0, 200, 0, 200; 60)	city	sword units +20% hack melee attack
speed_cavalry_01	400, 0, 0, 80; 40 (500, 500, 0, 150; 40)	village (town)	cavalry +5% walk speed (+10%)
speed_cavalry_02	500, 0, 0, 100; 50 (500, 500, 0, 150; 40)	town (city)	cavalry +5% walk speed (+10%)
speed_cavalry_03 [new]	600, 0, 0, 120; 60 [new]	city [new]	cavalry +5% walk speed [new]

4.3 Comparison table (healing)

technology	cost (f, w, s, m; time)	phase	effects
heal_barracks.json	500, 0, 0, 250; 40 (500, 0, 0, 250; 40)	town	barracks +1 buff heal garrison
heal_range.json	200, 0, 0, 100; 30 (400, 0, 0, 200; 40)	town	healers +3 heal range (+5 heal and vision range)
heal_range_2.json	300, 0, 0, 150; 30 (800, 0, 0, 400; 40)	city	healers +3 heal range (+5 heal and vision range)
heal_rate.json	500, 0, 0, 250; 40 (500, 0, 0, 250; 40)	town	healers +25% heal rate
heal_rate_2.json	1000, 0, 0, 500; 40 (1000, 0, 0, 500; 40)	city	healers +25% heal rate
heal_temple.json	500, 0, 0, 250; 40 (500, 0, 0, 250; 40)	city	temples +50% buff heal garrison
health_regen_units.json	1000, 0, 0, 250; 40 (1000, 0, 0, 250; 40)	city	idle units +0.5 health regeneration rate

4.4 Comparison table (healing)

technology	cost (f, w, s, m; time)	phase	effects
heal_barracks.json	500, 0, 0, 250; 40 (500, 0, 0, 250; 40)	town	barracks +1 buff heal garrison
heal_range.json	200, 0, 0, 100; 30 (400, 0, 0, 200; 40)	town	healers +3 heal range (+5 heal and vision range)
heal_range_2.json	300, 0, 0, 150; 30 (800, 0, 0, 400; 40)	city	healers +3 heal range (+5 heal and vision range)
heal_rate.json	500, 0, 0, 250; 40 (500, 0, 0, 250; 40)	town	healers +25% heal rate
heal_rate_2.json	1000, 0, 0, 500; 40 (1000, 0, 0, 500; 40)	city	healers +25% heal rate
heal_temple.json	500, 0, 0, 250; 40 (500, 0, 0, 250; 40)	city	temples +50% buff heal garrison
health_regen_units.json	1000, 0, 0, 250; 40 (1000, 0, 0, 250; 40)	city	idle units +0.5 health regeneration rate

4.5 Comparison table (siege)

technology	cost (f, w, s, m; time)	phase	effects
siege_armour.json (siege_armor.json)	0, 500, 0, 250; 40 (0, 500, 0, 250; 40)	city	siege weapons +2 hack armour
siege_attack.json	0, 1000, 0, 500; 40 (0, 1000, 0, 500; 40)	city	siege weapons +25% crush attack damage
siege_bolt_accuracy.json	0, 250, 0, 250; 40 (0, 250, 0, 250; 40)	city	bolt shooters −20% spread
siege_cost_metal.json	500, 500, 250, 0; 40 (500, 500, 250, 0; 40)	city	siege weapons −20% metal cost
siege_cost_wood.json	500, 0, 250, 500; 40 (500, 0, 250, 500; 40)	city	siege weapons −20% wood cost

4.6 Unique technologies

- Archery Tradition increases archer maximum range by +20% (from +10.0) and training time by +20% (from −20%); +10 vision range bonus and −20% health penalty are removed; also available to Seleucids (in addition to Persians and Mauryans).
- Hellenistic Metropolis now cost 500 food and wood (in addition to 500 metal, 500 stone, and 60 time).
- Mercenary rank upgrade now grants +10% health (instead of an additional rank), but also +10% training time (from +20%).

4.7 Civilization bonuses

- Celtic (Briton and Gaulish) healers have +20% walk speed and +4 hack, pierce, and crush armour levels. *[new]*
- Celtic (Briton and Gaulish) structures have −20% health, capture points, and build time. *[unchanged]*
- Celts (Britons and Gauls) have a 20% resource cost and time discount on Armoury technologies. *[new]*
- Greek (Athenians, Macedonians, Spartans) civic structures have +20% health and capture points (instead of all structures +10% health, capture points, and build time). *[changed]*
- Athenians have a 10% resource cost and time discount on Storehouse technologies. *[new]*
- Athenians no longer gain +10% metal.ore mining gather rate per phase advance (see **0abc/structures** above). *[removed]*
- Athenian warships have +10% walk speed. *[new]*
- Briton infantry swordsmen have +1.0 walk speed. *[new]*
- Carthaginian markets (including docks) have −50% resource costs and construction time and Market (and consequently naval) technologies have a 30% resource cost and time discount. *[new]*
- Carthaginian ships have +20% vision range (instead of ships and traders +25% vision range; formerly “Exploration” unique technology, town phase, costing 200 food, 0 wood, 0 stone, 200 metal, and 60 time). *[changed]*
- Carthaginian stone walls have +25% health (instead of +100% stone cost, +100% construction time, and +200% health). *[changed]*
- Carthaginian traders have +5% gain. *[new]*
- Gaulish infantry spearmen have +10% melee attack damage. *[new]*
- Iberian infantry javelinists have +10% ranged attack damage. *[new]*
- Macedonian cavalry lancers have +10% melee attack damage. *[new]*
- Macedonian pikemen have +1.0 walk speed. *[new]*
- Mauryans have +10% maximum population. *[unchanged]*
- Mauryan stone walls have −20% health and building time. *[unchanged]*
- Mauryan temples have −50% resource costs and construction time (former team bonus). *[new]*
- Persians have +10% maximum population. *[unchanged]*
- Persian storehouses have +100% health and territory influence radius. *[new]*
- Ptolemaic healers have +6 healing range. *[new]*
- Ptolemies have a 40% resource cost and time discount on Temple technologies. *[new]*
- Roman cavalry swordsmen have a −10% melee attack damage penalty. *[new]*
- Roman infantry swordsmen have +10% melee attack damage. *[new]*
- Seleucid civic centres have −20% resource costs (former team bonus). *[new]*
- Spartans *no longer* have −10% maximum population. *[removed]*
- Spartan cavalry have a −10% attack damage penalty. *[new]*
- Spartan hoplites have +1.0 walk speed. *[new]*

4.8 Team bonuses

- Athenian allies: warships -20% (from -25%) construction time [*changed*]
- Briton allies: $+1.0$ metal trickle rate [*new*]
formerly: healers -20% resource costs
- Carthaginian allies: land traders -20% training time and $+5\%$ walk speed [*new*]
formerly: markets $+0.1$ (i.e. 10%) international bonus
- Gaulish allies: infantry spearmen -20% training time [*new*]
formerly: all technologies -20% research time
- Iberian allies: infantry javelinists -20% training time [*new*]
formerly: citizen javelinists (infantry and cavalry) -20% resource costs
- Macedonian allies: infantry pikemen -20% training time [*new*]
formerly: markets $+20\%$ sell prices
- Mauryan allies: healers -25% training time [*new*]
formerly: temple technologies and temples cost -50% resources and time
- Persian allies: land traders $+10\%$ (from $+15\%$) gain [*changed*]
- Ptolemaic allies: $+1.0$ food trickle rate [*unchanged*]
- Roman allies: infantry swordsmen -20% training time [*new*]
formerly: all infantry -20% training time
- Seleucid allies: civic centres -20% construction time [*new*]
formerly: civic centres -20% resource costs
- Spartan allies: infantry hoplites -20% training time [*new*]
formerly: citizen infantry spearmen $+10\%$ health