

Directions

Read this play. Then answer question 39.

Archimedes and the Siege of Syracuse

by Charles F. Baker, Calliope

INTRODUCTION

Syracuse, a peaceful and thriving city on the island of Sicily, a Greek colony off the southern coast of Italy, was the home of the famous mathematician and inventor Archimedes. Under the reign of King Hieron II, Syracuse found itself affected by a fierce conflict involving Rome and Carthage, a powerful city-state on the north coast of Africa.

- 5 The Romans and the Carthaginians were vying for control of the Mediterranean Sea. Carthage already had colonies in Spain and claimed all of the western Mediterranean and most of Sicily except for Syracuse. Rome's armies had been capturing the Greek city-states in Italy. It was reasonable to expect that Syracuse, because of its location, would be caught in a war between the rapidly growing powers.

ACT I

- 10 It is the year 220 B.C. Syracuse has an alliance with Rome, but King Hieron is wondering how long it will last. Carthage has a great fleet of ships, and the Romans are spread out all over the area and cannot be relied on for protection. King Hieron needs a plan to defend his vulnerable city and turns to his longtime friend and kinsman Archimedes for advice and help.

SCENE 1

- 15 The royal palace of King Hieron. The king and his son, Prince Gelon, have received news that the Romans are angry with the Carthaginians, because they cannot trade in Sicily. Carthage has recently gained control of the Strait of Messina, which separates Sicily and Italy. Hieron has just sent for Archimedes.

KING HIERON: My son, I fear for the safety of our city. Rome will not tolerate the aggressive actions of Carthage, and there will be a war.

- 20 **PRINCE GELON:** I agree. This is a dangerous situation. Rome will be cut off from its own ports in eastern Italy. The Romans cannot even sail around Sicily because Carthage also controls the western Mediterranean. All-out war is inevitable, and we will be caught in the middle.

KING HIERON: We must prepare to defend ourselves, even though we have an alliance with Rome. They could not possibly come to our rescue against the Carthaginians. They are already fighting in many different areas and cannot spare soldiers or ships to protect our city.

- 25 **PRINCE GELON:** I would not trust the Romans to continue to be our allies. They are an ambitious people, and I am sure they will want to add our prosperous city to their growing empire.

KING HIERON: I think you are right. That is why I want to build up our defenses. It is my hope that I will leave a strong, independent city for you and my grandson, Prince Hieronymos, to inherit. I have sent for Archimedes so that we can discuss this serious situation with him. I value his advice.

- 30 **PRINCE GELON:** I also have great respect for Archimedes, but how can he help defend our city? He is only a mathematician, not a soldier.

(Archimedes enters the royal chamber and hears Prince Gelon's statement.)

ARCHIMEDES: You are right, Your Royal Highness. Since I returned to Syracuse from Egypt many years ago, I have dedicated my life entirely to mathematical research.

35 **KING HIERON:** You know as well as I do, my friend, that you have become famous for your clever mechanical inventions.

ARCHIMEDES: They are only the diversions of geometry at play, and I attach no importance to them. I regard the business of mechanics as vulgar and despicable.

KING HIERON: Syracuse is in danger of becoming involved in the war between Rome and Carthage.

ARCHIMEDES: So I have heard.

40 **KING HIERON:** Having been at peace for so many years, we have not bothered to maintain our defenses. We forgot that our city was taken by siege years ago. I do not want that to happen again. Archimedes, I implore you to use your scientific knowledge to prepare offensive and defensive engines for me that can be used in every kind of siege warfare.

ARCHIMEDES: I do not like the idea of using science to destroy people.

45 **KING HIERON:** Why can you not use some of your scientific knowledge to defend the city that has sheltered you and given you the freedom to do your mathematical research for so many years? I should think that you would be anxious to prove that science can provide a better means for the defense of Syracuse than an army can.

50 **ARCHIMEDES:** You have won. I will begin at once to devise plans for all sorts of engines to use against any besiegers.¹

KING HIERON: We will all be grateful for your expertise.

¹ **besiegers:** attackers

Directions

Read this story. Then answer questions 40 through 42.

from *The Sand Reckoner*

by Gillian Bradshaw

The young man took his compasses out of his mouth and turned, beaming. He was thin, long-limbed, and angular, and the general effect as he twisted about was of a grasshopper preparing to jump. "It's a hundred and twenty myriads-of-myriads!" he exclaimed in triumph, brushing back a tangle of brown hair and regarding his interrupter with a pair of bright brown eyes. . . .

5 "Marcus," he said eagerly, "what's the biggest number you can imagine? The number of grains of sand in Egypt—no, in the world! No! How many grains of sand would it take to fill the universe?"

① "Can't say," replied Marcus shortly. "Sir, we're in Syracuse. In the Great Harbor. Where we disembark¹—remember? I need to pack the abacus."

10 Archimedes put his hands protectively over the tray of sand—called by the same name as the more familiar reckoning machine—and looked around with dismay. He had come up to the ship's stern deck when the vessel had sighted the point of Plemmyrion and Marcus had started packing. Syracuse then had been only a patch of red and gold against green slopes; now a whole stretch of time seemed to have vanished into the sand, and Syracuse lay all around him. Here, in its harbor, the city—richest and mightiest of all the Greek cities of Sicily—appeared as nothing but walls. To his right loomed the citadel of Ortygia, a rocky promontory² enclosed by massive battlements, and before him the seawall swept around in a long curve of gray to end in the tower-studded walls of the fort which commanded the approach from the marshes to the south. Two quinqueremes³ sat . . . ready for sea, their sides feathered white with the triple banks of their shipped oars.

20 Archimedes shot a longing glance at the clear water of the harbor entrance behind the ship. There in the bright June afternoon. "Why the Great Harbor?" he asked unhappily. He was Syracusan-born, and the city's customs were as natural to him as its dialect. Merchant ships like the one on which he and Marcus were passengers usually put into Syracuse's Small Harbor, on the other side of the promontory of Ortygia. The Great Harbor belonged to the navy.

25 "There's a war on, sir," said Marcus patiently. He squatted down beside Archimedes and put out his hands for the box of sand.

30 Archimedes looked down sadly at the twelve billion grains of gleaming sand and his own scratched calculations. Of course. Syracuse was at war, and the Small Harbor was sealed off. All the traffic was forced into the Great Harbor, where the navy could keep an eye on it. He knew about the war: it was one of the reasons he had come home. The small farm his family owned lay to the north of the city, well beyond any possible zone of defense, and it was unlikely that there would be any income from it this year. His father was ill and could not practice his usual occupation as a teacher. Archimedes was the only

¹ **disembark:** go ashore

² **promontory:** something that projects, protrudes, or juts out

³ **quinqueremes:** a type of large war ship

son of the house, and supporting the family and protecting it through what was likely to be a very bad war was now his responsibility. It was time to give up mathematical games and find some real work.

35 Walls, he thought miserably; unbreachable⁴ walls, closing in.

Slowly, he took his hands off the notched rim of the abacus. Marcus picked it up, found the lid, and closed the reckoning box away. He slid it into its canvas sack and walked off with it. Archimedes sighed and sat back, hands dangling over his knees. The compasses slipped from his limp fingers and impaled⁵ themselves in the deck. He stared at them blankly for a moment, then pulled up one side of the
40 instrument and swept it around, scratching a circle in the rough wood. Let the area of the circle be K —No. He folded the compasses and pressed the cool double bar against his forehead. No more games.

⁴ **unbreachable:** unable to be broken through

⁵ **impaled:** stuck like a spear