



Archimedes' Modern Works

Table of contents

I. Introduction	9
1. Comparison methods	9
2. Weighing Methods	11
3. Organization of the book	11
Historical Facts	13
First Part : Archimedes Maps	17
Chapter I: The surface of a sphere and of a great circle	19
I. Introduction	19
II. A direct extension of Archimedes' construction	43
III. Comments	44
Chapter II: The Maps	49
I. Introduction	49
II. The Archimedes-Lambert projection	49
III. Archimedes Transformations and Archimedes Maps	54
IV. Using A-maps	55
A. Optimal location of resources	55
B. Optimal location of monitoring points	56
1. These zones should be in one piece	57
2. No zone should be too long or too large.	57
V. Simple construction of A-maps in two dimensions	57
A. General territories	57
1. Homothety	57
2. Rotation	57
B. The case of a square (or cube)	59
VI. Constructing Archimedes Transforms	60
A. General use	60
B. Simple structures in two dimensions	61
C. Analytic structures in higher dimensions	65
D. Constructing an Archimedes Transform	68
E. An explicit 3 dimensional example	70
F. A general attempt for Archimedes Transform	71
1. Archimedes Floating Bodies	72
2. Building Archimedes Transforms	74
G. An application : uniformly distributed points in a set	75

Second Part: Archimedes "Method"	79
Introduction	81
Chapter I: The Method	85
I. Statement of the results	85
II. Archimedes ideas and their evolution	89
Chapter II: Understanding the Method	91
I. Introduction	91
II. A direct application	91
III. A first statement in modern terms	93
IV. Enlarging the scope	94
A. Changing the scale on the axis	95
B. Modification of one of the solids	95
V. A direct application to the cone	96
VI. Cone and cylinder	99
VII. The Method: Extended statement	102
VIII. Four Dimensional Extension	103
Chapter III: Modern Times and Beyond	107
I. More computing power !	107
II. Weighing methods	107
Chapter IV: Weights and Robustness	111
I. Introduction	111
II. The robustness, extended statement	112
III. The weight of a solid	113
A. Determination of the weight	113
B. Finding the position of the center of gravity	115
IV. Finding the composition of a solid	116
A. Hiero's crown	116
B. What if the solid is not homogeneous ?	119
C. Using rotations	120
D. Comparison methods for the moment of inertia	122
1. Replacing any solid by an homogeneous one	122
2. An invariant	123
Chapter V: Weights and Probabilities	127
I. Introduction	127
II. Basic results	128
III. An estimate for the volume of a solid	132

Chapter VI: Weights and Polynomials	139
I. Introduction	139
II. A pedagogical example	140
A. Description of the example	140
B. The theory behind the example	142
C. Practical implementation	142
III. General theory	144
A. Polynomials in one variable	144
B. Case of a system of polynomial equations	145
IV. Robustness of the method	146
 Chapter VII: Optics	 147
I. Introduction	147
II. General approach	148
III. The "Easy to Reach" Hyperbola	151
A. The construction	151
B. Using the ETRH for approximate computations	154
C. Other similar hyperbolas:	155
D. Another approach	157
IV. Generating artificial information	159
V. Weights of solids	165
A. Basic construction	166
B. Various uncertainties	169
1. Uncertainty upon the refraction index	169
2. Uncertainty upon the the target point	170
3. Imprecise equality of moments	170
 Chapter VIII: Nondestructive testing	 175
I. Introduction	175
II. Eddy Currents and Non Destructive Testing	175
III. Archimedes comes in again	178
 Third Part: What is known about Archimedes ?	 181
 Introduction	 183
Plutarch	187
Polybius	192
Titus Livius	196
Marcus Vitruvius Pollio	198
Marcus Tullius Cicero	200
Marcus Tullius Cicero	201
The Tomb of Archimedes, modern times	205
The modern siege of Syracuse	208
Archimedes abilities	211
1. Visualisation in 2d and 3d	211
2. Conceptualisation	211
3. Intuition	213
4. Technical abilities	213
5. Conceptual abilities	214
6. Modern views about Archimedes	214
 References	 217