Chapter 2

Analysis of Algorithms

2.1 Introduction

2.1.1 Algorithm

Algorithm

Algorithm is an effective method for solving a problem expressed as a finite sequence of instructions

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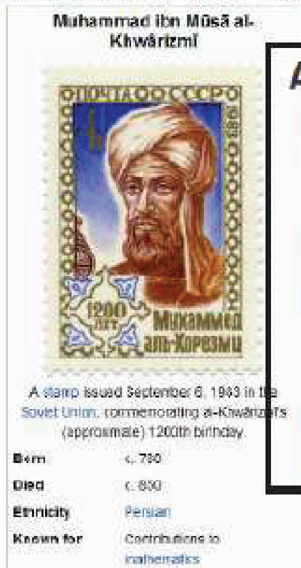


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Algorithm LargestNumber
  Input: A List L that has N numbers and N >= 1
  Output: The largest number in the list L.

  largest = L[0]
  for (i = 1 to N-1) {
    if (L[i] > largest)
      largest = item L[i]
  }
  return largest
```

1. Precise
2. Unambiguous
3. Mechanical
4. Efficient
5. Correct

1. It it correct ?
2. How much time does it take, in terms of n
3. And can we do better?

Figure 2.1: Algorithm

2.1.2 Finding a number in an unsorted array

Figure 2.2: Finding a number in an unsorted array

2.1.3 Finding a fake coin

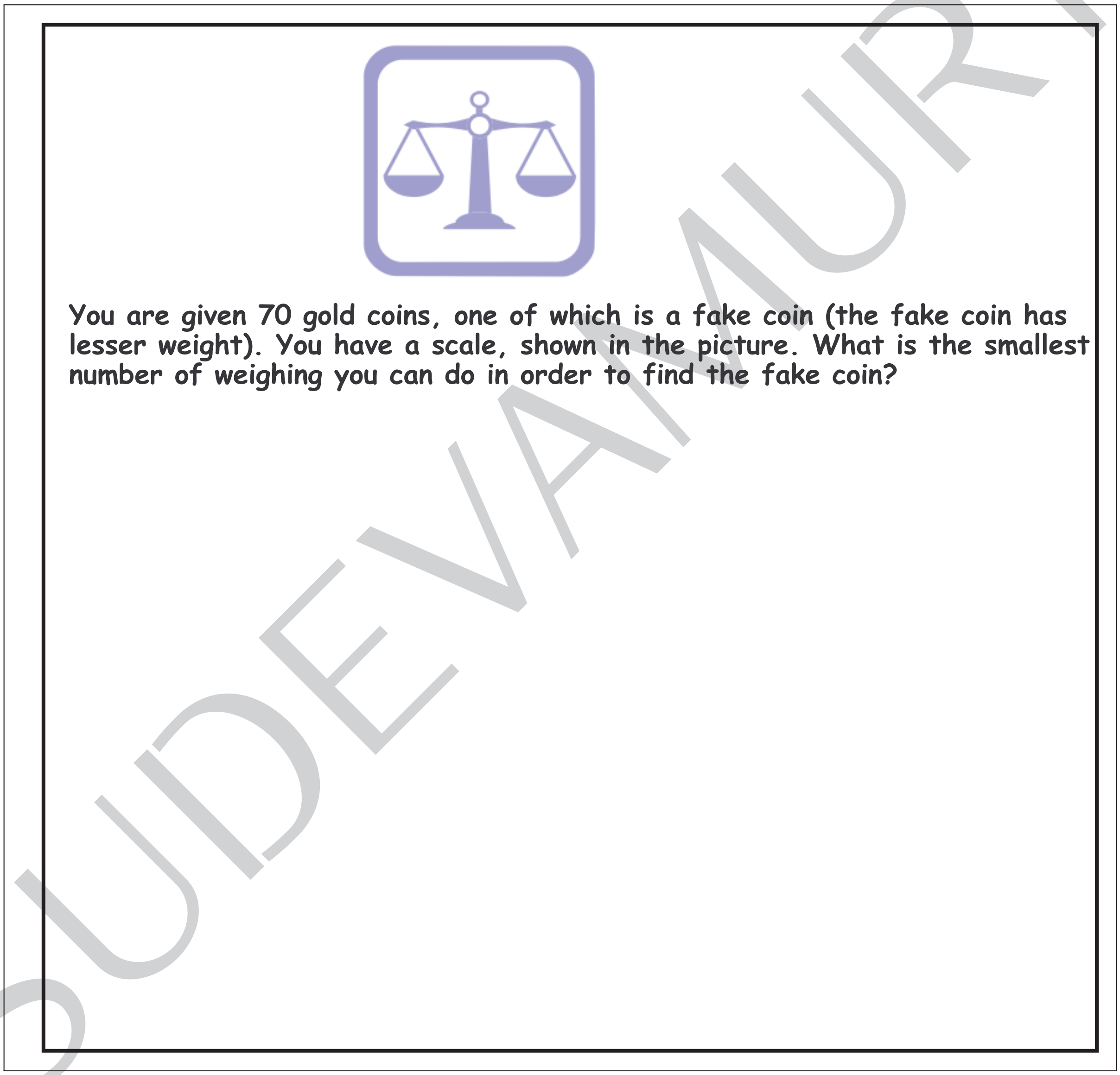

Figure 2.3: Finding fake coin

2.2 Mathematics

2.2.1 Logarithm

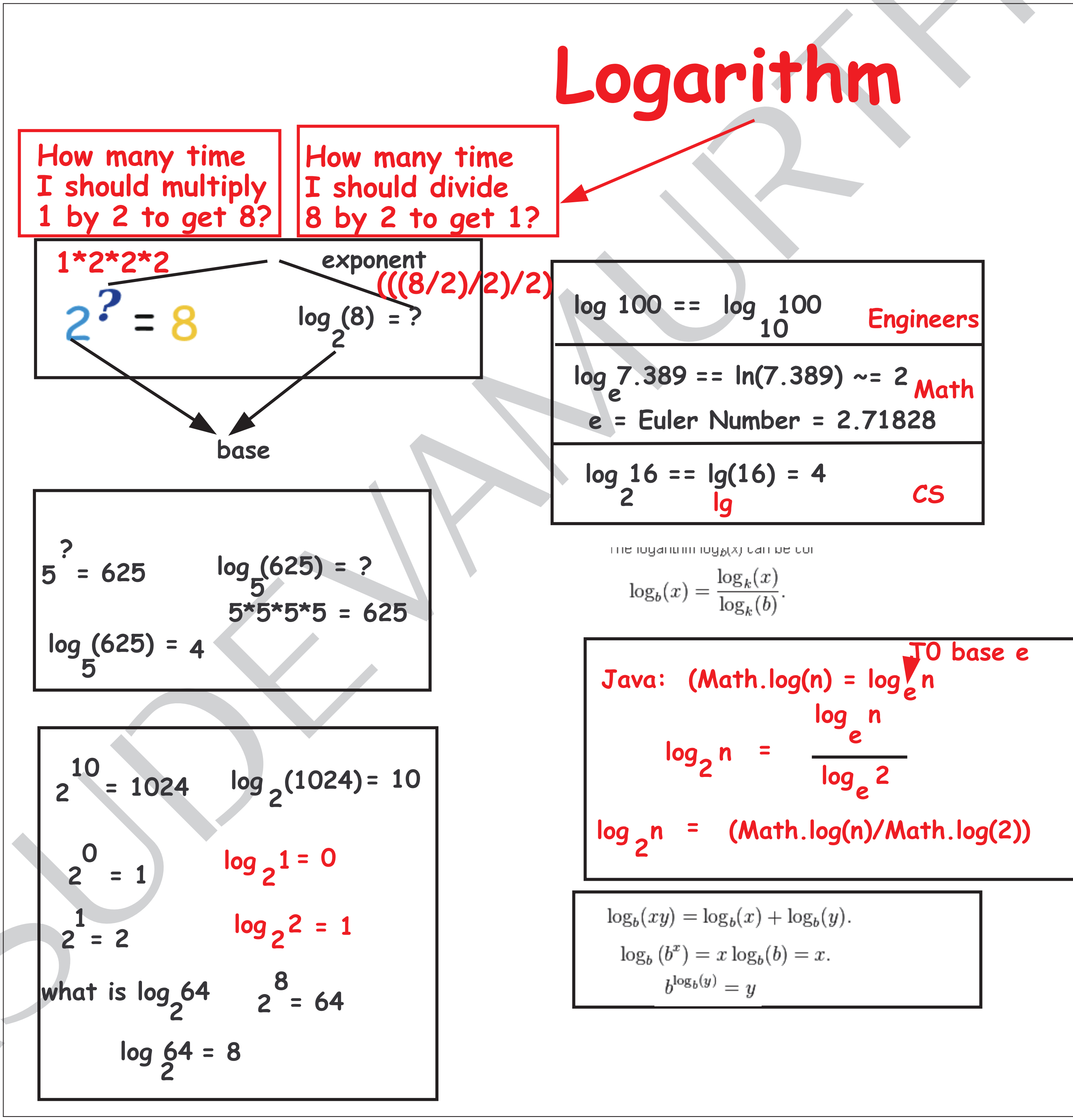

Figure 2.4: Logarithm

Logarithm Table

log 0 is NOT defined

Table of base 10, base 2 and base e (ln) logarithms:

x	$\log_{10} x$	$\log_2 x$	$\log_e x$
1	0.000000	0.000000	0.000000
2	0.301030	1.000000	0.693147
3	0.477121	1.584963	1.098612
4	0.602060	2.000000	1.386294
5	0.698970	2.321928	1.609438
6	0.778151	2.584963	1.791759
7	0.845098	2.807355	1.945910
8	0.903090	3.000000	2.079442
9	0.954243	3.169925	2.197225
10	1.000000	3.321928	2.302585
20	1.301030	4.321928	2.995732
30	1.477121	4.906891	3.401197
40	1.602060	5.321928	3.688879
50	1.698970	5.643856	3.912023
60	1.778151	5.906991	4.094345
70	1.845098	6.129283	4.248495
80	1.903090	6.321928	4.382027
90	1.954243	6.491853	4.499810
100	2.000000	6.643856	4.605170
200	2.301030	7.643856	5.298317
300	2.477121	8.228819	5.703782
400	2.602060	8.643856	5.991465
500	2.698970	8.965784	6.214608
600	2.778151	9.228819	6.396930
700	2.845098	9.451211	6.551080
800	2.903090	9.643856	6.684612
900	2.954243	9.813781	6.802395
1000	3.000000	9.965784	6.907755
10000	4.000000	13.287712	9.210340

Figure 2.5: Logarithm table

2.2.2 Arithmetic series

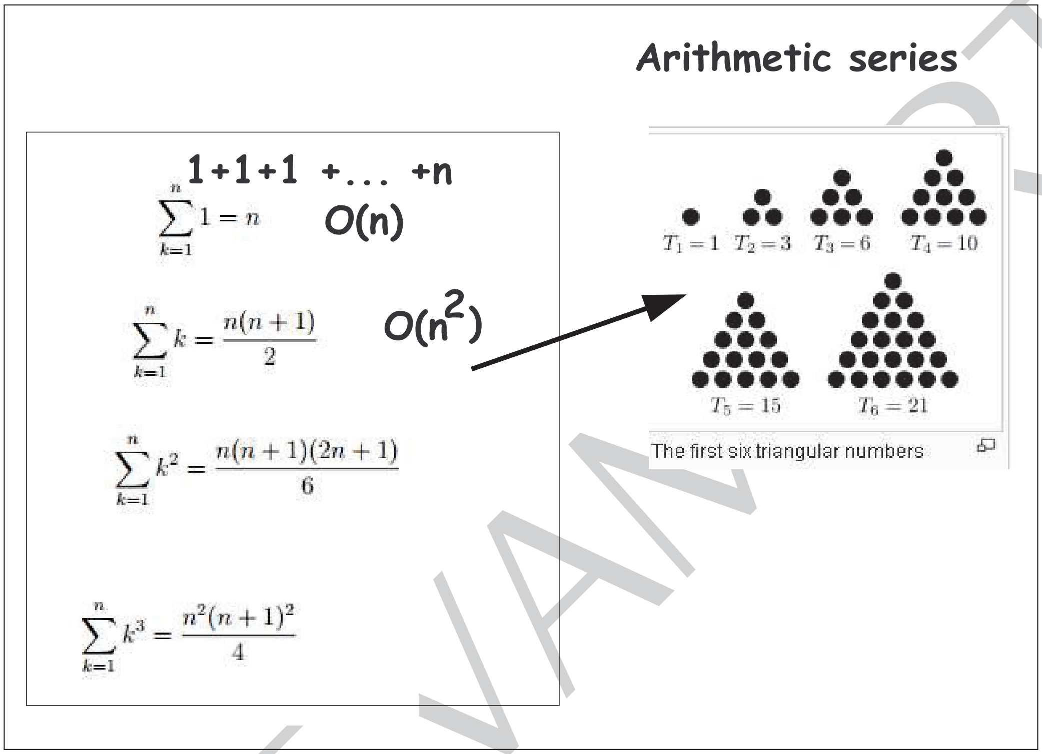

Figure 2.6: Arithmetic series

2.2.3 Harmonic series

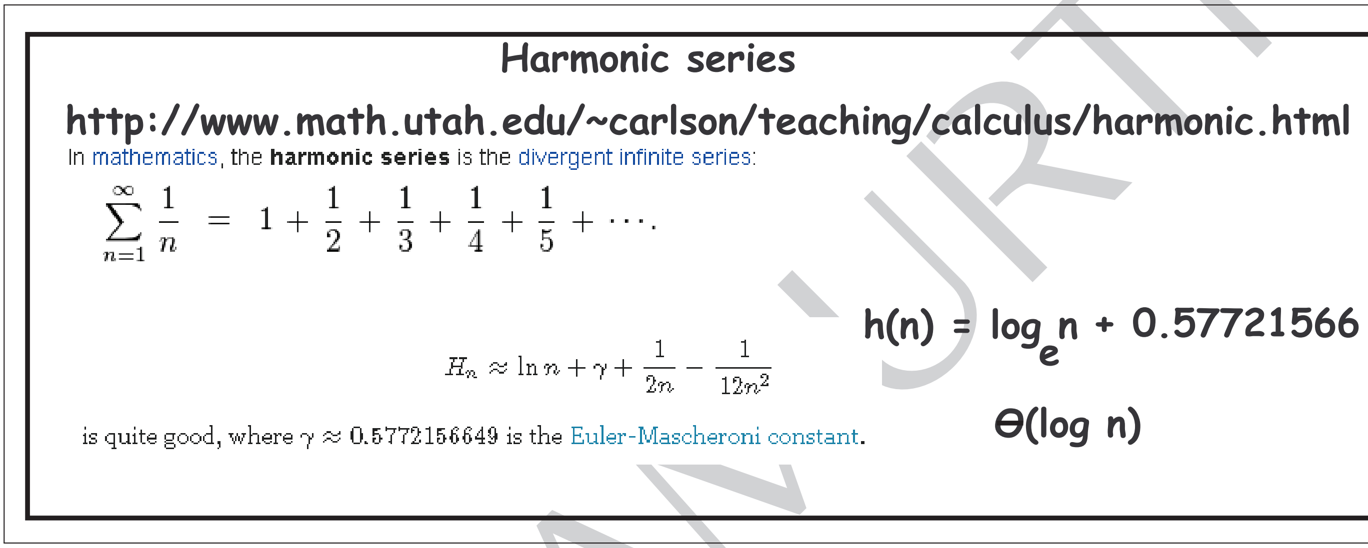

Figure 2.7: Harmonic series

2.2.4 Geometric series

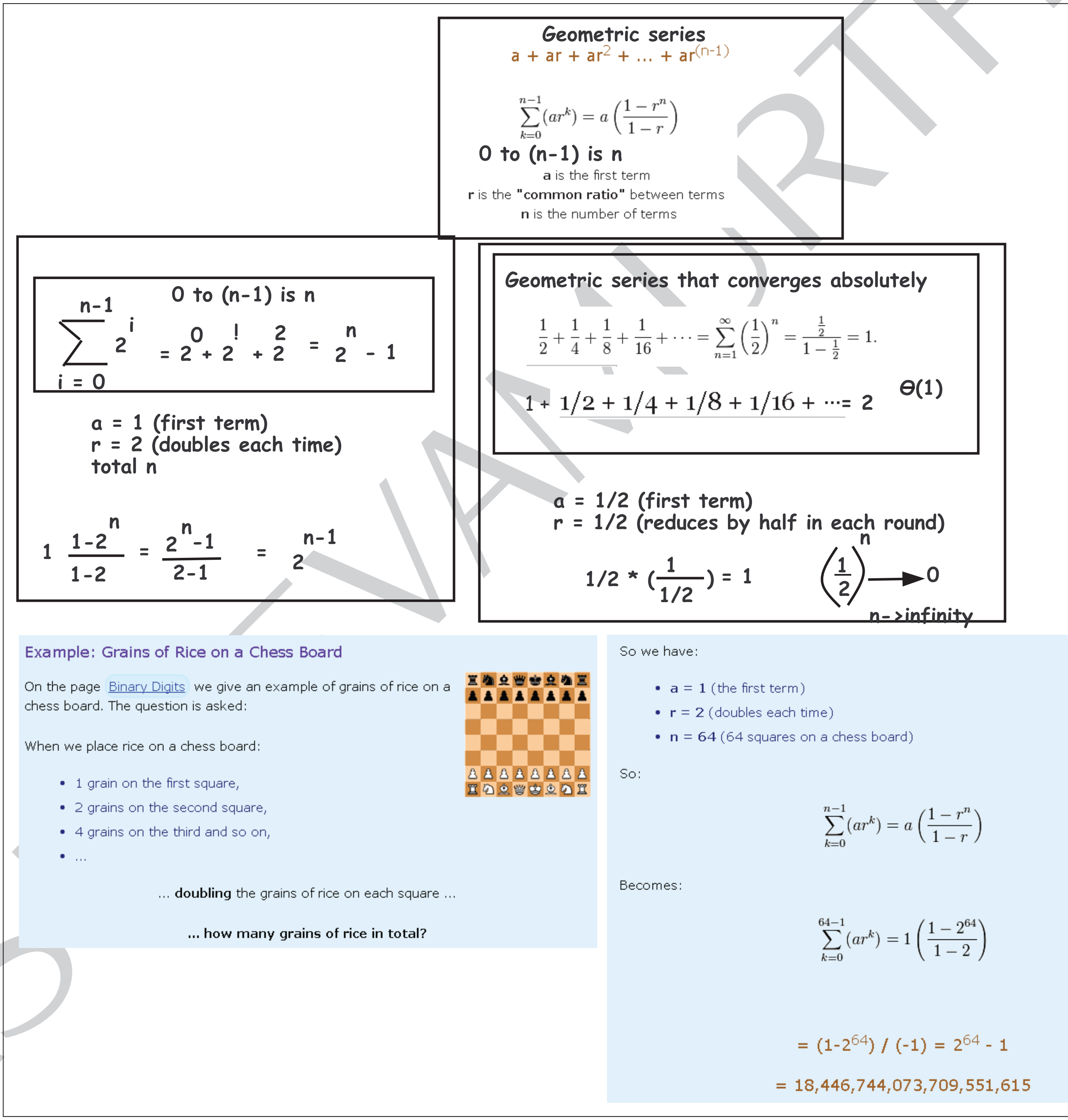

Figure 2.8: Geometric series