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1: #!/usr/bin/python3
2: from pylab import *
3: from math import *
4: from numpy import *
5:
6: def p3():
7:     """2.10: the Semi-Emperical Mass Formula"""
8:
9:     print("2.10 [The semi-emperical mass formula]:")
10:    def calc_b(A, Z):
11:        return (15.8 * A) - (18.3 * pow(A, 2 / 3)) - (0.714 * (
12:            pow(Z, 2) / pow(A, 1 / 3))) - (23.2 * (pow(A - 2 * Z, 2) / A)) + (
13:            (0 if A % 2 == 1 else
14:             (12.0 if Z % 2 == 0 else -12.0)) / pow(A, 1 / 2))
15:
16:    def a():
17:        print("2.10.a")
18:        a = int(input("A: "))
19:        z = int(input("Z: "))
20:        print(calc_b(a, z))
21:
22:    def b():
23:        print("2.10.b")
24:        a = int(input("A: "))
25:        z = int(input("Z: "))
26:        print(calc_b(a, z) / a)
27:
28:    def c():
29:        print("2.10.c")
30:        z = int(input("Z: "))
31:        bn = []
32:        for a in range(z, 3 * z + 1):
33:            bn.append(calc_b(a, z) / a)
34:        print(z + bn.index(max(bn)), max(bn))
35:
36:    def d():
37:        print("2.10.d")
38:        zbn = []
39:        for z in range(1, 100):
40:            bn = []
41:            for a in range(z, 3 * z + 1):
42:                bn.append(calc_b(a, z) / a)
43:            print("{}:".format(z), z + bn.index(max(bn)), max(bn))
44:            zbn.append(max(bn))
45:        print("Max at:", 1 + zbn.index(max(zbn)), max(zbn))
46:    a()
47:    b()
48:    c()
49:    d()
50:
51: if __name__ == "__main__":
52:     p3()
```