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Programmiersprache: Python

dokumentation  
Marktwaage

Aufgabe 5

Vorgeschichte:

Als ich mir das Problem das erste Mal anschaute, dachte ich, man könnte sehr logisch an das Ganze herangehen. Immer das Gewicht nehmen, was am nächsten an das Gesuchte herankommt (wie ich jetzt weiß, ist das eine Art des Dijkstra Algorithmus). So einfach ist es aber nicht, da die späteren Tests sehr komische Gewichte enthalten (man muss also probieren). Darüber hinaus ist schon beim zweiten Test das Problem, dass man das nächste Gewicht finden muss, wenn man nicht auf das Gesuchte kommt. Das heißt, dass man alles durchprobieren muss, was man sich gut als Baum vorstellen kann und das hat zu diesem Zeitpunkt noch Ewigkeiten gedauert. Mir war klar, ich brauche eine bessere Methode. Genauer gesagt, eine, die alle Möglichkeiten viel schneller durchgeht und dabei nicht so viele gleichwertige Wege, wie g1 + g2 und g2 + g1, probiert.

|  |  |
| --- | --- |
| g1 | g2 |
| 2-mal | 1-mal |

erfundene Werte

Ansatz:

Die Lösung dafür sind hauptsächlich zwei Ideen, die sehr gut zusammen funktionieren.

Die erste Idee ist, dass man alle Möglichkeiten, die man mit einem Gewicht hat an seinen Baum anhängt und dann dieses Gewicht abgedeckt hat. Z.B., wenn man das Gewicht 5g 2-mal hat, gibt es für dieses die Möglichkeiten 2\*5g, 1\*5g, 0\*5g, 1\*-5g, 2\*-5g (die negativen Gewichte kommen daher, dass man die Gewichte auch auf die andere Seite der Waage stellen kann). Damit hat man alle Möglichkeiten für die 5g abgedeckt, weil das weitere Hinzufügen von einem 5g Stück z.B. bei 1\*5g nur zu 2\*5g führt. Dadurch gibt es keine Wege, die eigentlich gleichwertig sind, aber eine andere Reihenfolge haben.

Die zweite Idee sieht man schon in dem Beispiel. Denn 2\*5g war ursprünglich 5g + 5g, aber das kann man eben zu einem einzelnen Knoten des Baums kombinieren, also 2\*5g. Somit braucht das Programm nicht so viel Speicherplatz und ist auch schneller.

|  |  |
| --- | --- |
| 5g | 10g |
| 1-mal | 2-mal |

erfundene Werte

Eine weitere Optimierung ist das \*0 wegzulassen, denn es verändert sich ja nichts zu vorher. So kann man sich jeweils einen zusätzlichen Schritt sparen. Um das machen zu können, muss man den Knoten, die dazu kommen, die vorherigen Knoten hinzufügen.

[0]

[0]+[5, -5]

[0, 5, -5]+[ 20, -20, 10, -10, 25, -15, 15, -5, 15, -25, 5, -15]

So bekommt man eine Liste mit allen Möglichkeiten (also den einzelnen Knoten). Diese ist jedoch vor allem bei dem 5. Test sehr lang und es dauert zu lang über alle Elemente zu iterieren, deshalb braucht man die nächsten Tricks.

Wenn man die Liste nach dem Gesamtgewicht der Knoten sortiert hat, muss man erst den Knoten mit dem Gesamtgewicht null finden, um von diesem aus weiter zu gehen. Dies ist sehr schnell möglich, indem man genau in die Mitte der Liste schaut, denn es gibt genau so viele Knoten mit einem Gesamtgewicht größer als null, wie die mit dem Gesamtgewicht kleiner null.

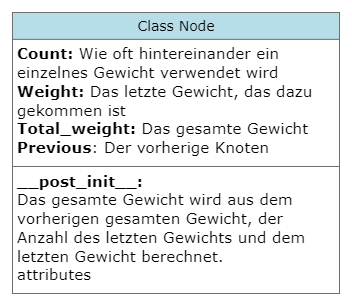
Dann schaut man die folgenden Knoten durch und überprüft, ob diese näher an dem gesuchten Gewicht sind, als die Vorherigen. Wenn das nicht mehr der Fall ist, kann man sich sicher sein, dass kein besseres mehr kommt, da die Liste der Knoten aufsteigend nach dem Gesamtgewicht der Knoten sortiert ist. Das ist dann der neue Start der Suche, da auch die gesuchten Gewichte aufsteigend sortiert sind.

Zu dem besten Knoten wird dann der Weg gefunden. Es ist nicht in jedem Knoten der ganze Weg gespeichert um Speicherplatz zu sparen. Der Weg wird dann rekursiv rekonstruiert, dadurch, dass in jedem Knoten der vorherige Knoten gespeichert ist.

**Weg zu Knoten = Knoten + Weg zu vorherigem Knoten**

Dies wird Endrekursiv umgesetzt.

Beschreibung:



Gemacht auf: <https://www.smartdraw.com/>

Funktion main:

* Alle Tests werden hintereinander gemacht.
* Jeweils eine Datei wird für einen Test geöffnet .
* Die Gewichte werden nacheinander von den verschiedenen Websites gelesen (Funktion get\_weights).
* Alle möglichen Kombinationen werden probiert und als Knoten gespeichert (Funktion get\_combinations).
* Die Liste aller Knoten wird aufsteigend nach dem Gesamtgewicht der Knoten sortiert.
* Der Start der Suche wird bei null festgelegt (alle negativen werden übersprungen).
* Der Knoten mit dem Gewicht, das am nächsten zum gesuchten Gewicht ist und der Index dieses Knotens werden gegeben (Funktion get\_closesed\_weight).
* Dieser Index ist der neue Start der Such.
* Der Weg zum nächsten Knoten wird rekonstruiert (Funktion get\_path).
* Der Weg wird in die geöffnete Datei geschrieben (Funktion write\_path\_for\_weight\_to\_file).

Funktion get\_weights:

* Die Website wird von der requests library angesprochen und es wird eine Antwort gegeben.
* Der Inhalt dieser Antwort wird nach dem „utf-8“ decodiert.
* Dieser wird formatiert zurückgegeben.

Funktion get\_combinations:

* Eine Liste mit einem Knoten, der das Gesamtgewicht null hat, wird erstellt.
* In eine andere Liste werden die Knoten gespeichert, die aus den Vorherigen folgen.
* Die Listen werden zusammengefügt
* Dies wird für jedes Gewicht, für jeden vorherigen Knoten und für jede Anzahl eines Gewichts wiederholt.

Funktion get\_closesed\_weight:

* Alle Knoten werden von dem übergebenen Start aus nach dem nächsten Gewicht durchsucht.
* Wenn ein Gewicht näher an dem Gesuchten ist als die Gewichte zuvor, wird es gespeichert.
* Wenn ein Gewicht nicht das neue Nächste ist, wird die Suche abgebrochen.
* Der Knoten mit dem nächsten Gewicht und der Index von diesem werden zurückgegeben.

Funktion get\_path:

* Dem Weg wird der übergebene Knoten hinzugefügt.
* DerVorgänger, des übergebenen Knoten und der Weg bis jetzt wird get\_path übergeben bis es keinen vorherigen Knoten mehr gibt (rekursiv).
* Der ganze Weg wird zurückgegeben.

Funktion write\_path\_for\_weight\_to\_file:

* Das gesuchte und das erreichte Gewicht werden in die Datei geschrieben.
* Dann die einzelnen Schritte des Weges.
* Dabei wird die Anzahl einzelner Gewichte beachtet.

**Lösungen:**

--------------------------------------------------------------------------------------------------------------------------------------------------------------------

Test 0

weight 10 -> reached weight 10

10

weight 20 -> reached weight 20

10 10

weight 30 -> reached weight 30

10 10 10

weight 40 -> reached weight 40

-10

50

weight 50 -> reached weight 50

50

weight 60 -> reached weight 60

10

50

weight 70 -> reached weight 70

10 10

50

weight 80 -> reached weight 80

-10 -10

50 50

weight 90 -> reached weight 90

-10

50 50

weight 100 -> reached weight 100

50 50

weight 110 -> reached weight 110

10

50 50

weight 120 -> reached weight 120

10 10

50 50

weight 130 -> reached weight 130

10 10 10

50 50

weight 140 -> reached weight 140

-10

50

100

weight 150 -> reached weight 150

50

100

weight 160 -> reached weight 160

10

50

100

weight 170 -> reached weight 170

10 10

50

100

weight 180 -> reached weight 180

-10 -10

50 50

100

weight 190 -> reached weight 190

-10

50 50

100

weight 200 -> reached weight 200

100 100

weight 210 -> reached weight 210

10

50 50

100

weight 220 -> reached weight 220

10 10

50 50

100

weight 230 -> reached weight 230

-10 -10

50

100 100

weight 240 -> reached weight 240

-10

50

100 100

weight 250 -> reached weight 250

50

100 100

weight 260 -> reached weight 260

10

50

100 100

weight 270 -> reached weight 270

10 10

50

100 100

weight 280 -> reached weight 280

-10 -10

50 50

100 100

weight 290 -> reached weight 290

-10

50 50

100 100

weight 300 -> reached weight 300

100 100 100

weight 310 -> reached weight 310

10

50 50

100 100

weight 320 -> reached weight 320

10 10

50 50

100 100

weight 330 -> reached weight 330

-10 -10

50

100 100 100

weight 340 -> reached weight 340

-10

50

100 100 100

weight 350 -> reached weight 350

50

100 100 100

weight 360 -> reached weight 360

10

50

100 100 100

weight 370 -> reached weight 370

10 10

50

100 100 100

weight 380 -> reached weight 380

-10 -10

50 50

100 100 100

weight 390 -> reached weight 390

-10

50 50

100 100 100

weight 400 -> reached weight 400

50 50

100 100 100

weight 410 -> reached weight 410

10

50 50

100 100 100

weight 420 -> reached weight 420

10 10

50 50

100 100 100

weight 430 -> reached weight 430

10 10 10

50 50

100 100 100

weight 440 -> reached weight 440

-10

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-100

500

weight 450 -> reached weight 450

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-100

500

weight 460 -> reached weight 460

10

50

-100

500

weight 470 -> reached weight 470

10 10

50

-100

500

weight 480 -> reached weight 480

-10 -10

50 50

-100

500

weight 490 -> reached weight 490

-10

50 50

-100

500

weight 500 -> reached weight 500

500

weight 9500 -> reached weight 9500

500 500 500

1000 1000 1000

5000

weight 9510 -> reached weight 9510

10

50 50

-100

500 500 500

1000 1000 1000

5000

weight 9520 -> reached weight 9520

10 10

50 50

-100

500 500 500

1000 1000 1000

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weight 9530 -> reached weight 9530

-10 -10

-50

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500 500 500

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weight 9540 -> reached weight 9540

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weight 9550 -> reached weight 9550

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weight 9560 -> reached weight 9560

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500 500 500

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weight 9570 -> reached weight 9570

10 10

-50

100

500 500 500

1000 1000 1000

5000

weight 9580 -> reached weight 9580

-10 -10

-50 -50

100 100

500 500 500

1000 1000 1000

5000

weight 9590 -> reached weight 9590

-10

-50 -50

100 100

500 500 500

1000 1000 1000

5000

weight 9600 -> reached weight 9600

100

500 500 500

1000 1000 1000

5000

weight 9610 -> reached weight 9610

10

-50 -50

100 100

500 500 500

1000 1000 1000

5000

weight 9620 -> reached weight 9620

10 10

-50 -50

100 100

500 500 500

1000 1000 1000

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weight 9630 -> reached weight 9630

-10 -10

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weight 9640 -> reached weight 9640

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weight 9670 -> reached weight 9670

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weight 9680 -> reached weight 9680

-10 -10

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weight 9690 -> reached weight 9690

-10

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500 500 500

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weight 9700 -> reached weight 9700

100 100

500 500 500

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5000

weight 9710 -> reached weight 9710

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50 50

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500 500 500

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weight 9720 -> reached weight 9720

10 10

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500 500 500

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weight 9730 -> reached weight 9730

-10 -10

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100 100

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weight 9740 -> reached weight 9740

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500 500 500

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weight 9750 -> reached weight 9750

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100 100

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weight 9760 -> reached weight 9760

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100 100

500 500 500

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weight 9770 -> reached weight 9770

10 10

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100 100

500 500 500

1000 1000 1000

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weight 9780 -> reached weight 9780

-10 -10

50 50

100 100

500 500 500

1000 1000 1000

5000

weight 9790 -> reached weight 9790

-10

50 50

100 100

500 500 500

1000 1000 1000

5000

weight 9800 -> reached weight 9800

100 100 100

500 500 500

1000 1000 1000

5000

weight 9810 -> reached weight 9810

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50 50

100 100

500 500 500

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weight 9820 -> reached weight 9820

10 10

50 50

100 100

500 500 500

1000 1000 1000

5000

weight 9830 -> reached weight 9830

-10 -10

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100 100 100

500 500 500

1000 1000 1000

5000

weight 9840 -> reached weight 9840

-10

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100 100 100

500 500 500

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weight 9850 -> reached weight 9850

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100 100 100

500 500 500

1000 1000 1000

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weight 9860 -> reached weight 9860

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100 100 100

500 500 500

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weight 9870 -> reached weight 9870

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100 100 100

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weight 9880 -> reached weight 9880

-10 -10

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100 100 100

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weight 9890 -> reached weight 9890

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weight 9900 -> reached weight 9900

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weight 9910 -> reached weight 9910

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weight 9920 -> reached weight 9920

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weight 9930 -> reached weight 9930

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weight 9940 -> reached weight 9930

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weight 9950 -> reached weight 9930

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weight 9960 -> reached weight 9930

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100 100 100

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weight 9970 -> reached weight 9930

10 10 10

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100 100 100

500 500 500

1000 1000 1000

5000

weight 9980 -> reached weight 9930

10 10 10

50 50

100 100 100

500 500 500

1000 1000 1000

5000

weight 9990 -> reached weight 9930

10 10 10

50 50

100 100 100

500 500 500

1000 1000 1000

5000

weight 10000 -> reached weight 9930

10 10 10

50 50

100 100 100

500 500 500

1000 1000 1000

5000

--------------------------------------------------------------------------------------------------------------------------------------------------------------------

Test 1

weight 10 -> reached weight 10

127 127 127

-371

weight 20 -> reached weight 18

-127

-371 -371 -371 -371 -371

2000

weight 30 -> reached weight 29

-42 -42 -42

127 127 127

-371 -371 -371 -371 -371 -371

2000

weight 40 -> reached weight 42

42

weight 50 -> reached weight 51

-42 -42

-127 -127 -127

-371 -371 -371 -371

2000

weight 60 -> reached weight 60

42

-127

-371 -371 -371 -371 -371

2000

weight 70 -> reached weight 70

42

127 127

-371 -371 -371 -371 -371 -371

2000

weight 80 -> reached weight 84

42 42

weight 90 -> reached weight 93

-42

-127 -127 -127

-371 -371 -371 -371

2000

weight 100 -> reached weight 99

-127

371 371 371 371 371 371

-2000

weight 110 -> reached weight 110

-42 -42 -42

127 127 127

371 371 371 371 371

-2000

weight 120 -> reached weight 118

-42 -42 -42

-127

371

weight 130 -> reached weight 128

-42 -42 -42

127 127

weight 140 -> reached weight 141

42

-127

371 371 371 371 371 371

-2000

weight 150 -> reached weight 151

42

127 127

371 371 371 371 371

-2000

weight 160 -> reached weight 160

-42 -42

-127

371

weight 170 -> reached weight 170

-42 -42

127 127

weight 180 -> reached weight 178

-42 -42

-127 -127

-371 -371 -371 -371

2000

weight 190 -> reached weight 188

-42 -42

127

-371 -371 -371 -371 -371

2000

weight 200 -> reached weight 201

42 42

-127 -127

371

weight 210 -> reached weight 211

42 42

127

weight 220 -> reached weight 220

-42

-127 -127

-371 -371 -371 -371

2000

weight 230 -> reached weight 230

-42

127

-371 -371 -371 -371 -371

2000

weight 240 -> reached weight 239

42 42

127 127 127

-371 -371 -371 -371 -371 -371

2000

weight 250 -> reached weight 253

42 42 42

127

weight 260 -> reached weight 261

42 42 42

-127 -127 -127

-371 -371 -371 -371

2000

weight 270 -> reached weight 269

-42 -42

127

371 371 371 371 371 371

-2000

weight 280 -> reached weight 281

42 42 42

127 127 127

-371 -371 -371 -371 -371 -371

2000

weight 290 -> reached weight 286

42

-127

371

weight 300 -> reached weight 297

-42 -42

127 127 127

weight 310 -> reached weight 311

-42

127

371 371 371 371 371 371

-2000

weight 320 -> reached weight 320

42 42

127 127 127

371 371 371 371 371

-2000

weight 330 -> reached weight 328

42 42

-127

371

weight 340 -> reached weight 339

-42

127 127 127

weight 350 -> reached weight 353

127

371 371 371 371 371 371

-2000

weight 360 -> reached weight 361

-127 -127 -127

371 371

weight 370 -> reached weight 370

42 42 42

-127

371

weight 380 -> reached weight 380

42 42 42

127 127

weight 390 -> reached weight 389

-127

-371 -371 -371 -371

2000

weight 400 -> reached weight 400

-42 -42 -42

127 127 127

-371 -371 -371 -371 -371

2000

weight 410 -> reached weight 414

-42 -42

127

371

weight 420 -> reached weight 422

-42 -42

-127 -127 -127

-371 -371 -371

2000

weight 430 -> reached weight 431

42

-127

-371 -371 -371 -371

2000

weight 440 -> reached weight 441

42

127 127

-371 -371 -371 -371 -371

2000

weight 450 -> reached weight 446

-42

-127 -127

371 371

weight 460 -> reached weight 456

-42

127

371

weight 470 -> reached weight 473

42 42

-127

-371 -371 -371 -371

2000

weight 480 -> reached weight 480

127 127

371 371 371 371 371 371

-2000

weight 490 -> reached weight 489

-42 -42 -42

-127

371 371

weight 500 -> reached weight 499

-42 -42 -42

127 127

371

weight 9500 -> reached weight 9501

42 42 42

-127 -127

-371

2000 2000 2000 2000 2000

weight 9510 -> reached weight 9511

42 42 42

127

-371 -371

2000 2000 2000 2000 2000

weight 9520 -> reached weight 9517

-42 -42

-127 -127

371 371 371 371 371

2000 2000 2000 2000

weight 9530 -> reached weight 9527

-42 -42

127

371 371 371 371

2000 2000 2000 2000

weight 9540 -> reached weight 9544

42

-127

-371

2000 2000 2000 2000 2000

weight 9550 -> reached weight 9554

42

127 127

-371 -371

2000 2000 2000 2000 2000

weight 9560 -> reached weight 9559

-42

-127 -127

371 371 371 371 371

2000 2000 2000 2000

weight 9570 -> reached weight 9569

-42

127

371 371 371 371

2000 2000 2000 2000

weight 9580 -> reached weight 9578

42 42

127 127 127

371 371 371

2000 2000 2000 2000

weight 9590 -> reached weight 9586

42 42

-127

-371

2000 2000 2000 2000 2000

weight 9600 -> reached weight 9600

42 42 42

-127 -127 -127

371 371 371 371 371

2000 2000 2000 2000

weight 9610 -> reached weight 9611

127

371 371 371 371

2000 2000 2000 2000

weight 9620 -> reached weight 9620

42 42 42

127 127 127

371 371 371

2000 2000 2000 2000

weight 9630 -> reached weight 9630

-42 -42 -42

127

-371

2000 2000 2000 2000 2000

weight 9640 -> reached weight 9639

127 127 127

-371 -371

2000 2000 2000 2000 2000

weight 9650 -> reached weight 9653

42

127

371 371 371 371

2000 2000 2000 2000

weight 9660 -> reached weight 9654

-42 -42

127 127

371 371 371 371

2000 2000 2000 2000

weight 9670 -> reached weight 9672

-42 -42

127

-371

2000 2000 2000 2000 2000

weight 9680 -> reached weight 9681

42

127 127 127

-371 -371

2000 2000 2000 2000 2000

weight 9690 -> reached weight 9686

-42

-127

371 371 371 371 371

2000 2000 2000 2000

weight 9700 -> reached weight 9696

-42

127 127

371 371 371 371

2000 2000 2000 2000

weight 9710 -> reached weight 9714

-42

127

-371

2000 2000 2000 2000 2000

weight 9720 -> reached weight 9719

-42 -42 -42

-127 -127 -127

371 371 371 371 371 371

2000 2000 2000 2000

weight 9730 -> reached weight 9728

-127

371 371 371 371 371

2000 2000 2000 2000

weight 9740 -> reached weight 9739

-42 -42 -42

127 127 127

371 371 371 371

2000 2000 2000 2000

weight 9750 -> reached weight 9756

127

-371

2000 2000 2000 2000 2000

weight 9760 -> reached weight 9761

-42 -42

-127 -127 -127

371 371 371 371 371 371

2000 2000 2000 2000

weight 9770 -> reached weight 9770

42

-127

371 371 371 371 371

2000 2000 2000 2000

weight 9780 -> reached weight 9780

42

127 127

371 371 371 371

2000 2000 2000 2000

weight 9790 -> reached weight 9798

42

127

-371

2000 2000 2000 2000 2000

weight 9800 -> reached weight 9799

-42 -42

127 127

-371

2000 2000 2000 2000 2000

weight 9810 -> reached weight 9812

42 42

-127

371 371 371 371 371

2000 2000 2000 2000

weight 9820 -> reached weight 9822

42 42

127 127

371 371 371 371

2000 2000 2000 2000

weight 9830 -> reached weight 9823

-42

127 127 127

371 371 371 371

2000 2000 2000 2000

weight 9840 -> reached weight 9840

42 42

127

-371

2000 2000 2000 2000 2000

weight 9850 -> reached weight 9854

42 42 42

-127

371 371 371 371 371

2000 2000 2000 2000

weight 9860 -> reached weight 9864

42 42 42

127 127

371 371 371 371

2000 2000 2000 2000

weight 9870 -> reached weight 9865

127 127 127

371 371 371 371

2000 2000 2000 2000

weight 9880 -> reached weight 9882

42 42 42

127

-371

2000 2000 2000 2000 2000

weight 9890 -> reached weight 9888

-42 -42

-127 -127

371 371 371 371 371 371

2000 2000 2000 2000

weight 9900 -> reached weight 9898

-42 -42

127

371 371 371 371 371

2000 2000 2000 2000

weight 9910 -> reached weight 9907

42

127 127 127

371 371 371 371

2000 2000 2000 2000

weight 9920 -> reached weight 9925

42

127 127

-371

2000 2000 2000 2000 2000

weight 9930 -> reached weight 9930

-42

-127 -127

371 371 371 371 371 371

2000 2000 2000 2000

weight 9940 -> reached weight 9940

-42

127

371 371 371 371 371

2000 2000 2000 2000

weight 9950 -> reached weight 9949

42 42

127 127 127

371 371 371 371

2000 2000 2000 2000

weight 9960 -> reached weight 9967

42 42

127 127

-371

2000 2000 2000 2000 2000

weight 9970 -> reached weight 9971

42 42 42

-127 -127 -127

371 371 371 371 371 371

2000 2000 2000 2000

weight 9980 -> reached weight 9982

127

371 371 371 371 371

2000 2000 2000 2000

weight 9990 -> reached weight 9990

-127 -127 -127

371

2000 2000 2000 2000 2000

weight 10000 -> reached weight 10000

2000 2000 2000 2000 2000

--------------------------------------------------------------------------------------------------------------------------------------------------------------------

Test 2

weight 10 -> reached weight 10

10

weight 20 -> reached weight 20

20

weight 30 -> reached weight 30

10

20

weight 40 -> reached weight 40

40

weight 50 -> reached weight 50

-10

20

40

weight 60 -> reached weight 60

20

40

weight 70 -> reached weight 70

10

20

40

weight 80 -> reached weight 80

80

weight 90 -> reached weight 90

-10

-20

40

80

weight 100 -> reached weight 100

-20

40

80

weight 110 -> reached weight 110

10

-20

40

80

weight 120 -> reached weight 120

40

80

weight 130 -> reached weight 130

-10

20

40

80

weight 140 -> reached weight 140

20

40

80

weight 150 -> reached weight 150

10

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80

weight 160 -> reached weight 160

160

weight 170 -> reached weight 170

-10

-20

-40

80

160

weight 180 -> reached weight 180

-20

-40

80

160

weight 190 -> reached weight 190

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-20

-40

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160

weight 200 -> reached weight 200

-40

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160

weight 210 -> reached weight 210

-10

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weight 220 -> reached weight 220

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weight 230 -> reached weight 230

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-40

80

160

weight 240 -> reached weight 240

80

160

weight 250 -> reached weight 250

-10

-20

40

80

160

weight 260 -> reached weight 260

-20

40

80

160

weight 270 -> reached weight 270

10

-20

40

80

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weight 290 -> reached weight 290

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weight 310 -> reached weight 310

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weight 320 -> reached weight 320

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weight 330 -> reached weight 330

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weight 340 -> reached weight 340

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weight 350 -> reached weight 350

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weight 360 -> reached weight 360

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320

640

1280

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5120

weight 10000 -> reached weight 10000

-80

160

320

640

1280

2560

5120

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weight 10 -> reached weight 10

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weight 20 -> reached weight 20

-10

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weight 30 -> reached weight 30

30

weight 40 -> reached weight 40

10

30

weight 50 -> reached weight 50

-10

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weight 60 -> reached weight 60

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weight 70 -> reached weight 70

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weight 80 -> reached weight 90

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weight 90 -> reached weight 90

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weight 100 -> reached weight 90

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weight 110 -> reached weight 110

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weight 120 -> reached weight 120

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weight 130 -> reached weight 130

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weight 140 -> reached weight 140

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weight 150 -> reached weight 150

-30

-90

270

weight 160 -> reached weight 160

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-90

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weight 170 -> reached weight 180

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270

weight 180 -> reached weight 180

-90

270

weight 190 -> reached weight 180

-90

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weight 200 -> reached weight 200

-10

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-90

270

weight 210 -> reached weight 210

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weight 220 -> reached weight 220

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weight 230 -> reached weight 220

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weight 240 -> reached weight 220

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weight 250 -> reached weight 270

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weight 260 -> reached weight 270

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weight 270 -> reached weight 270

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weight 280 -> reached weight 270

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weight 290 -> reached weight 270

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weight 300 -> reached weight 320

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weight 320 -> reached weight 320

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weight 330 -> reached weight 330

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weight 340 -> reached weight 340

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weight 350 -> reached weight 360

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weight 360 -> reached weight 360

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weight 370 -> reached weight 360

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weight 380 -> reached weight 380

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weight 390 -> reached weight 390

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weight 400 -> reached weight 400

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weight 410 -> reached weight 410

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weight 460 -> reached weight 450

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weight 480 -> reached weight 480

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weight 10000 -> reached weight 10130

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7290

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weight 20 -> reached weight 20

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-29

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weight 30 -> reached weight 30

29 29

259

-287

weight 40 -> reached weight 40

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weight 50 -> reached weight 50

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weight 60 -> reached weight 60

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29 29

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weight 70 -> reached weight 70

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weight 80 -> reached weight 80

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29 29 29

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weight 90 -> reached weight 89

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29 29 29

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weight 100 -> reached weight 100

21 21

29 29

weight 110 -> reached weight 110

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weight 120 -> reached weight 120

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weight 130 -> reached weight 130

-21 -21

-29 -29 -29

259

weight 140 -> reached weight 141

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21

29 29 29

-259

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weight 150 -> reached weight 150

21 21 21

29 29 29

weight 160 -> reached weight 160

21 21

-29

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-399

weight 170 -> reached weight 171

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29 29 29

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-399

weight 180 -> reached weight 180

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-29 -29

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weight 190 -> reached weight 189

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weight 200 -> reached weight 201

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weight 210 -> reached weight 209

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weight 220 -> reached weight 220

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weight 230 -> reached weight 230

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weight 240 -> reached weight 240

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21 21 21

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weight 250 -> reached weight 250

-21 -21 -21

-29 -29

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-287

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weight 260 -> reached weight 260

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29 29 29

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weight 270 -> reached weight 270

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29 29

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weight 280 -> reached weight 280

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weight 290 -> reached weight 291

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weight 300 -> reached weight 300

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weight 310 -> reached weight 310

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weight 350 -> reached weight 350

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weight 360 -> reached weight 360

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21 21

-29 -29

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-287

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weight 370 -> reached weight 371

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weight 380 -> reached weight 380

21 21 21

29 29

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weight 390 -> reached weight 390

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-29 -29

-259

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weight 400 -> reached weight 400

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-287

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weight 410 -> reached weight 410

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weight 420 -> reached weight 420

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weight 430 -> reached weight 430

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weight 480 -> reached weight 480

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weight 490 -> reached weight 491

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weight 9600 -> reached weight 9561

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weight 9610 -> reached weight 9561

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weight 9620 -> reached weight 9665

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weight 9740 -> reached weight 9769

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weight 9770 -> reached weight 9769

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weight 9810 -> reached weight 9811

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weight 9820 -> reached weight 9821

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weight 9830 -> reached weight 9829

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259

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21 21 21

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weight 9950 -> reached weight 9948

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29 29 29

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weight 9960 -> reached weight 9961

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weight 9970 -> reached weight 9969

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weight 9990 -> reached weight 9990

-21

29 29 29

259

287

399

2993 2993 2993

weight 10000 -> reached weight 10000

5

21 21

29

259

287

399

2993 2993 2993

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Test 5

weight 10 -> reached weight 11

11

weight 20 -> reached weight 20

-11

-99480

99511

weight 30 -> reached weight 31

-99480

99511

weight 40 -> reached weight 42

11

-99480

99511

weight 50 -> reached weight 47

-11

99480

-99511

-299836 -299836

599761

weight 60 -> reached weight 58

99480

-99511

-299836 -299836

599761

weight 70 -> reached weight 69

11

99480

-99511

-299836 -299836

599761

weight 80 -> reached weight 89

-299836 -299836

599761

weight 90 -> reached weight 89

-299836 -299836

599761

weight 100 -> reached weight 109

-11

-99480

99511

-299836 -299836

599761

weight 110 -> reached weight 109

-11

-99480

99511

-299836 -299836

599761

weight 120 -> reached weight 120

-99480

99511

-299836 -299836

599761

weight 130 -> reached weight 131

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weight 140 -> reached weight 131

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weight 150 -> reached weight 131

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weight 160 -> reached weight 131

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weight 170 -> reached weight 131

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weight 180 -> reached weight 131

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weight 190 -> reached weight 131

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weight 200 -> reached weight 131

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weight 210 -> reached weight 131

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weight 220 -> reached weight 131

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weight 230 -> reached weight 131

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weight 240 -> reached weight 131

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weight 250 -> reached weight 131

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weight 260 -> reached weight 131

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weight 270 -> reached weight 131

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weight 280 -> reached weight 131

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weight 290 -> reached weight 131

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weight 300 -> reached weight 131

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weight 310 -> reached weight 131

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weight 320 -> reached weight 131

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weight 330 -> reached weight 131

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weight 340 -> reached weight 131

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weight 350 -> reached weight 131

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weight 360 -> reached weight 131

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weight 370 -> reached weight 131

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weight 380 -> reached weight 131

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weight 390 -> reached weight 131

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-299836 -299836

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weight 400 -> reached weight 131

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weight 410 -> reached weight 131

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-299836 -299836

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weight 420 -> reached weight 131

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-99480

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-299836 -299836

599761

weight 430 -> reached weight 131

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-99480

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weight 440 -> reached weight 745

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weight 450 -> reached weight 745

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weight 460 -> reached weight 745

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-1984505261

weight 470 -> reached weight 745

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weight 480 -> reached weight 745

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-1984505261

weight 490 -> reached weight 745

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weight 500 -> reached weight 745

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weight 9500 -> reached weight 9508

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weight 9510 -> reached weight 9508

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weight 9520 -> reached weight 9519

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weight 9530 -> reached weight 9530

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283501867

weight 9540 -> reached weight 9550

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weight 9550 -> reached weight 9550

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-1499171

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-41999427

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283501867

weight 9560 -> reached weight 9550

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-1499171

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-41999427

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283501867

weight 9570 -> reached weight 9570

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283501867

weight 9580 -> reached weight 9581

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283501867

weight 9590 -> reached weight 9592

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weight 9600 -> reached weight 9592

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weight 9610 -> reached weight 9592

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weight 9620 -> reached weight 9592

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weight 9630 -> reached weight 9592

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weight 9640 -> reached weight 9592

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weight 9650 -> reached weight 9592

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weight 9660 -> reached weight 9720

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weight 9670 -> reached weight 9720

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weight 9680 -> reached weight 9720

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weight 9690 -> reached weight 9720

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weight 9700 -> reached weight 9720

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weight 9710 -> reached weight 9720

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weight 9720 -> reached weight 9720

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weight 9730 -> reached weight 9720

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weight 9740 -> reached weight 9720

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weight 9770 -> reached weight 9720

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weight 9780 -> reached weight 9720

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weight 9790 -> reached weight 9720

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weight 9880 -> reached weight 9720

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weight 9960 -> reached weight 9720

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weight 9970 -> reached weight 9720

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weight 9980 -> reached weight 9720

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weight 9990 -> reached weight 9720

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weight 10000 -> reached weight 9720

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