Course: CS 2302

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Assignment: Lab 8

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# Introduction

Algorithms for dynamic programming are often used for problems that are often a bit open ended to solving. For this case, backtracking and randomized algorithms can be efficient for discovery and finding a goal to solve. To implement interesting algorithms to solve problems that often require a more efficient algorithm with faster times. These two problems are to discover trig identities with a randomized algorithm and to find two equal subsets of a set with backtracking.

# Proposed Solution Design and Implementation

**Discover Trigonometric Identities**

My first approach was to merely look at the algorithm design code within the class site and to see how to solve trig identities but with the listed ones for the lab. So, I acquired the original equals code from the site but had to modify it due to sec(x) not being available for the math module. To solve this required just needed to rename the math part of the string to mpmath and import it. To read in the listed files was initially set to read in a list but I got admittedly tired to type everything, so I made a word file to list all identities and made a new method to read in the file. Then, for testing purposes I made a method to generate random numbers between -pi to pi and put it back into the string. I made an overall method that helped find the equivalent trig functions and for all expressions.

Equal

Like the class site’s equal method but changes were made to accommodate sec(x) if it is used in either f1, f2, or even both. This required simple logic that is either strings contain sec(x) then it would be assigned with mpmath.sec(x) due to math not having sec(x) in its library. Other than that, the method behaves similarly and compares the strings for numerous times to see if it is true.

Gen\_rand\_trig

This method gets the list of strings read from the trig file and a random value x to replace the x within the string with the value of x. This method is mostly for testing equalities and to not keep converting the value into a string.

Discover\_trig

Is the main overall central point for the discovery of trig identities and only takes in the list of strings read in from the file. This method utilizes equal to compare each string within the list. To avoid repeating same functions (ex. Sin(x) = sin(x)), makes sure that the indexes of I and j are not equal. After both loops are done running then it returns all expressions (two trig functions), equivalent expressions, and the number of identities found.

Test\_equals

Test\_equals is the modified version of this programs equals and is for testing equalities. This method uses gen\_rand\_trig to generate new strings and mostly follows the same behavior as equals.

Read\_file

Reads in a text file within the lab folder and puts each trig function into a list of strings. This was made for a quality of life point since I was not going to type in each string and wanted to have something more easily modifiable. After each line is read from the file, it is appended to the list and returns it.

**Partition Subset sum**

To solve this problem requires knowing that the main sum of the set should be even in order to make two equal subsets. The sum should be equal because it would need to be evenly split due to the subsets being equal. To solve with a backtracking algorithm requires first checking to see if the main sum is even. If it is then we go on to using the subsetsum method to find an initial solution and then using a stack to find the second solution. Otherwise, no partition is found.

Partition

This method takes in a set and returns a solution if it is found. First, we check if the sum of the set is even. If it is not, then it returns false with a message saying a partition does not exist. If the sum is equal, two equal subsets are not guaranteed so we use subsetsum to find a subset that is equal to half the sum of the set. If no subset is found, then we return false. If an initial subset is found, then we use a stack structure to pop elements that were from the first subset in the set. This new set should be the second subset. Afterwards, both subsets are returned.

**Main I/O**

Nothing to lavish is made and no user input is made for the main method. This code mostly prints the results of each method and the runtime for each run. For the purposes of this report, lists of size n with random integers is generated for this lab for runtime and screenshot purposes and were not included in the original code but can be seen in the appendix.

# Experimental Results

For this report, I separated the two questions to for easier read and because the trig part uses cycles instead of input size. This is because my program already calculates the average for testing each expression, so it is hard to use input sizes. For partition, it uses input sizes and has a table for bad input just to show what the program cannot run.

**Discover Trigonometric Identities**

Run Time

|  |  |
| --- | --- |
| Cycle | Average Time(s) |
| 1 | 0.6471584880000592 |
| 2 | 0.5941503189999366 |
| 3 | 0.5976498370000627 |
| 4 | 0.6149200080001265 |
| 5 | 0.5863657929999135 |
| 6 | 0.8733193620000748 |

**Partition Subset sum**

Erroneous Input

|  |  |
| --- | --- |
| Input(N) | Output |
| 0 | []  Sum of S: 0  Partition Exists for []  ([], []) |
| -5 | ValueError: Sample larger than population or is negative |

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Run Time

|  |  |
| --- | --- |
| Input(N) | Time(s) |
| 10 | 2.8586999860635842e-05 |
| 20 | 9.94130000435689e-05 |
| 30 | 2.8160000056232093e-05 |
| 40 | 2.8160000056232093e-05 |
| 50 | 2.8587000088009518e-05 |
| 60 | 0.00025770600018404366 |

Screenshots

**N = 10**

DISCOVER TRIG IDENTITIES

Identities read from file:

['sin(x)', 'cos(x)', 'tan(x)', 'sec(x)', '-sin(x)', '-cos(x)', '-tan(x)', 'sin(-x)', 'cos(-x)', 'tan(-x)', 'sin(x)/cos(x)', '2\*sin(x/2)\*cos(x/2)', 'sin(x)\*sin(x)', '1-(cos(x) \* cos(x))', '(1-cos(2\*x))/(2)', '(1)/(cos(x))']

Equivalent Identities

sin(x) = 2\*sin(x/2)\*cos(x/2)

cos(x) = cos(-x)

tan(x) = sin(x)/cos(x)

-sin(x) = sin(-x)

-tan(x) = tan(-x)

sin(-x) = -sin(x)

cos(-x) = cos(x)

tan(-x) = -tan(x)

sin(x)/cos(x) = tan(x)

2\*sin(x/2)\*cos(x/2) = sin(x)

sin(x)\*sin(x) = 1-(cos(x) \* cos(x))

sin(x)\*sin(x) = (1-cos(2\*x))/(2)

1-(cos(x) \* cos(x)) = sin(x)\*sin(x)

1-(cos(x) \* cos(x)) = (1-cos(2\*x))/(2)

(1-cos(2\*x))/(2) = sin(x)\*sin(x)

(1-cos(2\*x))/(2) = 1-(cos(x) \* cos(x))

(1)/(cos(x)) = sec(x)

Time: 0.6471584880000592

Found: 17

Test Equalties:

sin(1.4462562513758064) != cos(1.4462562513758064)

sin(-1.56800308878349) != tan(-1.56800308878349)

sin(-2.1554258069558356) != mpmath.sec(-2.1554258069558356)

sin(-0.22001911092353277) != -sin(-0.22001911092353277)

sin(3.0572902560530553) != -cos(3.0572902560530553)

sin(2.6125929771472913) != -tan(2.6125929771472913)

sin(-1.1585791455579881) != sin(--1.1585791455579881)

sin(-1.416774495143519) != cos(--1.416774495143519)

sin(-0.6415115491491954) != tan(--0.6415115491491954)

sin(-0.48116389582200414) != sin(-0.48116389582200414)/cos(-0.48116389582200414)

sin(1.4791265790341344) = 2\*sin(1.4791265790341344/2)\*cos(1.4791265790341344/2)

sin(-1.981896792376315) != sin(-1.981896792376315)\*sin(-1.981896792376315)

sin(-1.3185270170830645) != 1-(cos(-1.3185270170830645) \* cos(-1.3185270170830645))

sin(0.005262187154466691) != (1-cos(2\*0.005262187154466691))/(2)

cos(2.759196283708401) != sin(2.759196283708401)

cos(2.968831499765326) != tan(2.968831499765326)

cos(0.07428728242219407) != mpmath.sec(0.07428728242219407)

cos(-2.7294034975318753) != -sin(-2.7294034975318753)

cos(-0.6821507224906966) != -cos(-0.6821507224906966)

cos(0.6635291133701529) != -tan(0.6635291133701529)

cos(-2.335921541176752) != sin(--2.335921541176752)

cos(-0.7181296552039003) = cos(--0.7181296552039003)

cos(2.322149663613673) != tan(-2.322149663613673)

cos(1.0210290230183832) != sin(1.0210290230183832)/cos(1.0210290230183832)

cos(1.3131522907993478) != 2\*sin(1.3131522907993478/2)\*cos(1.3131522907993478/2)

cos(-2.982728585554076) != sin(-2.982728585554076)\*sin(-2.982728585554076)

cos(1.8808399862580405) != 1-(cos(1.8808399862580405) \* cos(1.8808399862580405))

cos(-1.0428726272409437) != (1-cos(2\*-1.0428726272409437))/(2)

tan(1.719409871215893) != sin(1.719409871215893)

tan(-0.5352619215749108) != cos(-0.5352619215749108)

tan(1.8294053761410636) != mpmath.sec(1.8294053761410636)

tan(1.8019540454620797) != -sin(1.8019540454620797)

tan(-2.2333117015955892) != -cos(-2.2333117015955892)

tan(3.1347337585293245) != -tan(3.1347337585293245)

tan(-3.0261628539625263) != sin(--3.0261628539625263)

tan(-3.002266681362073) != cos(--3.002266681362073)

tan(-1.3938986318626154) != tan(--1.3938986318626154)

tan(-1.1433724188783851) = sin(-1.1433724188783851)/cos(-1.1433724188783851)

tan(2.7277545253933955) != 2\*sin(2.7277545253933955/2)\*cos(2.7277545253933955/2)

tan(-0.6294703313519951) != sin(-0.6294703313519951)\*sin(-0.6294703313519951)

tan(-2.2732194992810353) != 1-(cos(-2.2732194992810353) \* cos(-2.2732194992810353))

tan(2.868133831224121) != (1-cos(2\*2.868133831224121))/(2)

mpmath.sec(-2.500110658361824) != sin(-2.500110658361824)

mpmath.sec(-1.3397542435175098) != cos(-1.3397542435175098)

mpmath.sec(-1.0938505539260621) != tan(-1.0938505539260621)

mpmath.sec(1.1620922562646294) != -sin(1.1620922562646294)

mpmath.sec(2.3778320054059074) != -cos(2.3778320054059074)

mpmath.sec(-1.1309452008355376) != -tan(-1.1309452008355376)

mpmath.sec(0.08789824947570724) != sin(-0.08789824947570724)

mpmath.sec(3.102953487550055) != cos(-3.102953487550055)

mpmath.sec(-0.8364151092430347) != tan(--0.8364151092430347)

mpmath.sec(-1.5595766251241587) != sin(-1.5595766251241587)/cos(-1.5595766251241587)

mpmath.sec(2.842608324138169) != 2\*sin(2.842608324138169/2)\*cos(2.842608324138169/2)

mpmath.sec(2.0101947762806427) != sin(2.0101947762806427)\*sin(2.0101947762806427)

mpmath.sec(-1.6559680276446938) != 1-(cos(-1.6559680276446938) \* cos(-1.6559680276446938))

mpmath.sec(0.5824974865476045) != (1-cos(2\*0.5824974865476045))/(2)

-sin(-1.4003821206957974) != sin(-1.4003821206957974)

-sin(2.830042107139427) != cos(2.830042107139427)

-sin(3.1232199165982077) = tan(3.1232199165982077)

-sin(-0.5462022005410572) != mpmath.sec(-0.5462022005410572)

-sin(1.2227772732879627) != -cos(1.2227772732879627)

-sin(-2.053030320961585) != -tan(-2.053030320961585)

-sin(-2.145897281748702) = sin(--2.145897281748702)

-sin(-2.322913116978807) != cos(--2.322913116978807)

-sin(2.1621182310461364) != tan(-2.1621182310461364)

-sin(-1.0606958342895734) != sin(-1.0606958342895734)/cos(-1.0606958342895734)

-sin(-0.12505975254918722) != 2\*sin(-0.12505975254918722/2)\*cos(-0.12505975254918722/2)

-sin(-1.8678564227191359) != sin(-1.8678564227191359)\*sin(-1.8678564227191359)

-sin(-2.9397865174116773) != 1-(cos(-2.9397865174116773) \* cos(-2.9397865174116773))

-sin(-2.426458292166945) != (1-cos(2\*-2.426458292166945))/(2)

-cos(1.1030128299306643) != sin(1.1030128299306643)

-cos(2.0699055732232257) != cos(2.0699055732232257)

-cos(-2.083680185304979) != tan(-2.083680185304979)

-cos(-2.8774756352319915) != mpmath.sec(-2.8774756352319915)

-cos(0.3804457429727628) != -sin(0.3804457429727628)

-cos(0.3561338671985208) != -tan(0.3561338671985208)

-cos(-2.7185067704602432) != sin(--2.7185067704602432)

-cos(-1.2268961511567533) != cos(--1.2268961511567533)

-cos(1.5352363194846461) != tan(-1.5352363194846461)

-cos(2.530407018699747) != sin(2.530407018699747)/cos(2.530407018699747)

-cos(-0.2373225038187945) != 2\*sin(-0.2373225038187945/2)\*cos(-0.2373225038187945/2)

-cos(2.123099830262226) != sin(2.123099830262226)\*sin(2.123099830262226)

-cos(-2.483294274921759) != 1-(cos(-2.483294274921759) \* cos(-2.483294274921759))

-cos(-3.0741222551920035) != (1-cos(2\*-3.0741222551920035))/(2)

-tan(0.4586903057898759) != sin(0.4586903057898759)

-tan(-1.321851494343739) != cos(-1.321851494343739)

-tan(-1.966365150679252) != tan(-1.966365150679252)

-tan(-2.2636614691392998) != mpmath.sec(-2.2636614691392998)

-tan(0.6049286728751921) != -sin(0.6049286728751921)

-tan(1.757347302641902) != -cos(1.757347302641902)

-tan(-1.5231377028833204) != sin(--1.5231377028833204)

-tan(2.0645256850058917) != cos(-2.0645256850058917)

-tan(0.7675774894809764) = tan(-0.7675774894809764)

-tan(-1.0819119469451288) != sin(-1.0819119469451288)/cos(-1.0819119469451288)

-tan(-1.7394989598614998) != 2\*sin(-1.7394989598614998/2)\*cos(-1.7394989598614998/2)

-tan(-2.429320794278129) != sin(-2.429320794278129)\*sin(-2.429320794278129)

-tan(3.0310669798510244) != 1-(cos(3.0310669798510244) \* cos(3.0310669798510244))

-tan(-1.0195006886397202) != (1-cos(2\*-1.0195006886397202))/(2)

sin(--0.3168903731664696) != sin(-0.3168903731664696)

sin(-1.6822382911654277) != cos(1.6822382911654277)

sin(-0.13655962471039063) != tan(0.13655962471039063)

sin(--2.601462268221507) != mpmath.sec(-2.601462268221507)

sin(--1.4148519437221219) = -sin(-1.4148519437221219)

sin(--0.3191021946928485) != -cos(-0.3191021946928485)

sin(-1.215557268532363) != -tan(1.215557268532363)

sin(-1.2970914698867793) != cos(-1.2970914698867793)

sin(-3.077622670742402) != tan(-3.077622670742402)

sin(-2.090298972656715) != sin(2.090298972656715)/cos(2.090298972656715)

sin(-0.18985787568674528) != 2\*sin(0.18985787568674528/2)\*cos(0.18985787568674528/2)

sin(--1.1903475793112515) != sin(-1.1903475793112515)\*sin(-1.1903475793112515)

sin(-0.607203724486324) != 1-(cos(0.607203724486324) \* cos(0.607203724486324))

sin(--0.1268880002903936) != (1-cos(2\*-0.1268880002903936))/(2)

cos(--1.7734285251227913) != sin(-1.7734285251227913)

cos(--2.875429459834129) = cos(-2.875429459834129)

cos(--2.135096984882588) != tan(-2.135096984882588)

cos(--1.8439011614743803) != mpmath.sec(-1.8439011614743803)

cos(-1.1168014950004537) != -sin(1.1168014950004537)

cos(--2.268455158820943) != -cos(-2.268455158820943)

cos(--2.681048978159853) != -tan(-2.681048978159853)

cos(-0.9046292078049456) != sin(-0.9046292078049456)

cos(--0.4337284698610766) != tan(--0.4337284698610766)

cos(--0.493599732450551) != sin(-0.493599732450551)/cos(-0.493599732450551)

cos(-0.6365985783346488) != 2\*sin(0.6365985783346488/2)\*cos(0.6365985783346488/2)

cos(-2.2653735361571856) != sin(2.2653735361571856)\*sin(2.2653735361571856)

cos(-0.6326757845863069) != 1-(cos(0.6326757845863069) \* cos(0.6326757845863069))

cos(-2.5667142926250888) != (1-cos(2\*2.5667142926250888))/(2)

tan(--2.5223852297103666) != sin(-2.5223852297103666)

tan(--3.026952508247809) != cos(-3.026952508247809)

tan(--0.46076167460328143) != tan(-0.46076167460328143)

tan(--2.253013632788669) != mpmath.sec(-2.253013632788669)

tan(-1.9259894063348906) != -sin(1.9259894063348906)

tan(--0.169042140669871) != -cos(-0.169042140669871)

tan(--0.32976550302171104) = -tan(-0.32976550302171104)

tan(--2.3074675186532203) != sin(--2.3074675186532203)

tan(-1.9961179412645649) != cos(-1.9961179412645649)

tan(-1.1481963569652809) != sin(1.1481963569652809)/cos(1.1481963569652809)

tan(--2.6731957927498007) != 2\*sin(-2.6731957927498007/2)\*cos(-2.6731957927498007/2)

tan(-1.5518790071451214) != sin(1.5518790071451214)\*sin(1.5518790071451214)

tan(-0.7752004433658981) != 1-(cos(0.7752004433658981) \* cos(0.7752004433658981))

tan(--0.9276431168077433) != (1-cos(2\*-0.9276431168077433))/(2)

sin(-0.1239276309673416)/cos(-0.1239276309673416) != sin(-0.1239276309673416)

sin(0.3644612526933595)/cos(0.3644612526933595) != cos(0.3644612526933595)

sin(0.056136552528780914)/cos(0.056136552528780914) = tan(0.056136552528780914)

sin(3.011099435623562)/cos(3.011099435623562) != mpmath.sec(3.011099435623562)

sin(-2.3267887606750115)/cos(-2.3267887606750115) != -sin(-2.3267887606750115)

sin(-1.7940747890023008)/cos(-1.7940747890023008) != -cos(-1.7940747890023008)

sin(-1.0486679153380778)/cos(-1.0486679153380778) != -tan(-1.0486679153380778)

sin(0.9849520886572689)/cos(0.9849520886572689) != sin(-0.9849520886572689)

sin(1.274427882389018)/cos(1.274427882389018) != cos(-1.274427882389018)

sin(1.6947305706076063)/cos(1.6947305706076063) != tan(-1.6947305706076063)

sin(-1.7291507119265406)/cos(-1.7291507119265406) != 2\*sin(-1.7291507119265406/2)\*cos(-1.7291507119265406/2)

sin(1.0797625136340843)/cos(1.0797625136340843) != sin(1.0797625136340843)\*sin(1.0797625136340843)

sin(1.2855173920155094)/cos(1.2855173920155094) != 1-(cos(1.2855173920155094) \* cos(1.2855173920155094))

sin(2.594152063614912)/cos(2.594152063614912) != (1-cos(2\*2.594152063614912))/(2)

2\*sin(2.846072421107218/2)\*cos(2.846072421107218/2) = sin(2.846072421107218)

2\*sin(2.4811624396176306/2)\*cos(2.4811624396176306/2) != cos(2.4811624396176306)

2\*sin(-0.6886503456125288/2)\*cos(-0.6886503456125288/2) != tan(-0.6886503456125288)

2\*sin(-1.8861360295371252/2)\*cos(-1.8861360295371252/2) != mpmath.sec(-1.8861360295371252)

2\*sin(1.90061588079804/2)\*cos(1.90061588079804/2) != -sin(1.90061588079804)

2\*sin(-0.6537446934949407/2)\*cos(-0.6537446934949407/2) != -cos(-0.6537446934949407)

2\*sin(-0.1610963369659304/2)\*cos(-0.1610963369659304/2) != -tan(-0.1610963369659304)

2\*sin(2.5943364541418488/2)\*cos(2.5943364541418488/2) != sin(-2.5943364541418488)

2\*sin(0.2113283118870326/2)\*cos(0.2113283118870326/2) != cos(-0.2113283118870326)

2\*sin(-1.8325975794913516/2)\*cos(-1.8325975794913516/2) != tan(--1.8325975794913516)

2\*sin(0.45328943446419157/2)\*cos(0.45328943446419157/2) != sin(0.45328943446419157)/cos(0.45328943446419157)

2\*sin(2.173974014117775/2)\*cos(2.173974014117775/2) != sin(2.173974014117775)\*sin(2.173974014117775)

2\*sin(0.7124562882553129/2)\*cos(0.7124562882553129/2) != 1-(cos(0.7124562882553129) \* cos(0.7124562882553129))

2\*sin(-0.9310305221096429/2)\*cos(-0.9310305221096429/2) != (1-cos(2\*-0.9310305221096429))/(2)

sin(-2.1231625751373775)\*sin(-2.1231625751373775) != sin(-2.1231625751373775)

sin(2.758838693722378)\*sin(2.758838693722378) != cos(2.758838693722378)

sin(-1.627617937697556)\*sin(-1.627617937697556) != tan(-1.627617937697556)

sin(-1.9929576648670155)\*sin(-1.9929576648670155) != mpmath.sec(-1.9929576648670155)

sin(1.1111841587485438)\*sin(1.1111841587485438) != -sin(1.1111841587485438)

sin(0.18308754035090447)\*sin(0.18308754035090447) != -cos(0.18308754035090447)

sin(-0.5372372923568416)\*sin(-0.5372372923568416) != -tan(-0.5372372923568416)

sin(0.24748140631982052)\*sin(0.24748140631982052) != sin(-0.24748140631982052)

sin(2.8067274363304575)\*sin(2.8067274363304575) != cos(-2.8067274363304575)

sin(-0.4230694331802649)\*sin(-0.4230694331802649) != tan(--0.4230694331802649)

sin(-2.8861181595407497)\*sin(-2.8861181595407497) != sin(-2.8861181595407497)/cos(-2.8861181595407497)

sin(2.126302620470116)\*sin(2.126302620470116) != 2\*sin(2.126302620470116/2)\*cos(2.126302620470116/2)

sin(-1.8476179053428863)\*sin(-1.8476179053428863) = 1-(cos(-1.8476179053428863) \* cos(-1.8476179053428863))

sin(-0.6176507754626708)\*sin(-0.6176507754626708) = (1-cos(2\*-0.6176507754626708))/(2)

1-(cos(1.5367843437483257) \* cos(1.5367843437483257)) != sin(1.5367843437483257)

1-(cos(0.6130755250984694) \* cos(0.6130755250984694)) != cos(0.6130755250984694)

1-(cos(2.6957283896219675) \* cos(2.6957283896219675)) != tan(2.6957283896219675)

1-(cos(-0.02253777319734729) \* cos(-0.02253777319734729)) != mpmath.sec(-0.02253777319734729)

1-(cos(-2.3722235614612837) \* cos(-2.3722235614612837)) != -sin(-2.3722235614612837)

1-(cos(-0.4580719694794735) \* cos(-0.4580719694794735)) != -cos(-0.4580719694794735)

1-(cos(1.5117609544890618) \* cos(1.5117609544890618)) != -tan(1.5117609544890618)

1-(cos(2.6514837706107475) \* cos(2.6514837706107475)) != sin(-2.6514837706107475)

1-(cos(2.9873819572156046) \* cos(2.9873819572156046)) != cos(-2.9873819572156046)

1-(cos(-1.2304386024174156) \* cos(-1.2304386024174156)) != tan(--1.2304386024174156)

1-(cos(2.5527617521810795) \* cos(2.5527617521810795)) != sin(2.5527617521810795)/cos(2.5527617521810795)

1-(cos(-2.7157893810430758) \* cos(-2.7157893810430758)) != 2\*sin(-2.7157893810430758/2)\*cos(-2.7157893810430758/2)

1-(cos(0.1572974665739557) \* cos(0.1572974665739557)) = sin(0.1572974665739557)\*sin(0.1572974665739557)

1-(cos(-1.4442765975325826) \* cos(-1.4442765975325826)) = (1-cos(2\*-1.4442765975325826))/(2)

(1-cos(2\*1.0982092578951805))/(2) != sin(1.0982092578951805)

(1-cos(2\*0.8608894608264759))/(2) != cos(0.8608894608264759)

(1-cos(2\*-1.05896264377037))/(2) != tan(-1.05896264377037)

(1-cos(2\*1.0298232825225302))/(2) != mpmath.sec(1.0298232825225302)

(1-cos(2\*2.815847467524688))/(2) != -sin(2.815847467524688)

(1-cos(2\*-0.5814786831540388))/(2) != -cos(-0.5814786831540388)

(1-cos(2\*-0.9358318823272902))/(2) != -tan(-0.9358318823272902)

(1-cos(2\*0.3389386285949074))/(2) != sin(-0.3389386285949074)

(1-cos(2\*1.9935466450342822))/(2) != cos(-1.9935466450342822)

(1-cos(2\*0.601426171607931))/(2) != tan(-0.601426171607931)

(1-cos(2\*-2.641157578217621))/(2) != sin(-2.641157578217621)/cos(-2.641157578217621)

(1-cos(2\*-0.270676377042526))/(2) != 2\*sin(-0.270676377042526/2)\*cos(-0.270676377042526/2)

(1-cos(2\*0.999324852235481))/(2) = sin(0.999324852235481)\*sin(0.999324852235481)

(1-cos(2\*1.7351301190141255))/(2) = 1-(cos(1.7351301190141255) \* cos(1.7351301190141255))

(1)/(cos(1.5029430448792596)) != sin(1.5029430448792596)

(1)/(cos(-2.896945192734228)) != cos(-2.896945192734228)

(1)/(cos(1.8019893733518586)) != tan(1.8019893733518586)

(1)/(cos(-1.1711640818430027)) = mpmath.sec(-1.1711640818430027)

(1)/(cos(-1.1236108501748188)) != -sin(-1.1236108501748188)

(1)/(cos(1.2172403651327048)) != -cos(1.2172403651327048)

(1)/(cos(-0.841617406202865)) != -tan(-0.841617406202865)

(1)/(cos(-0.15936280483097187)) != sin(--0.15936280483097187)

(1)/(cos(0.06793344041114446)) != cos(-0.06793344041114446)

(1)/(cos(-0.7550779853942586)) != tan(--0.7550779853942586)

(1)/(cos(2.4777394320044737)) != sin(2.4777394320044737)/cos(2.4777394320044737)

(1)/(cos(2.1378401172104358)) != 2\*sin(2.1378401172104358/2)\*cos(2.1378401172104358/2)

(1)/(cos(-1.8562393647165576)) != sin(-1.8562393647165576)\*sin(-1.8562393647165576)

(1)/(cos(-1.547475866197761)) != 1-(cos(-1.547475866197761) \* cos(-1.547475866197761))

(1)/(cos(-2.7806394377518044)) != (1-cos(2\*-2.7806394377518044))/(2)

PARTITION SUBSETSUM

[10, 56, 64, 48, 73, 83, 13, 23, 49, 92]

Sum of S: 511

Partition does not exist

False

Time: 2.8586999860635842e-05

**N = 20**

DISCOVER TRIG IDENTITIES

Identities read from file:

['sin(x)', 'cos(x)', 'tan(x)', 'sec(x)', '-sin(x)', '-cos(x)', '-tan(x)', 'sin(-x)', 'cos(-x)', 'tan(-x)', 'sin(x)/cos(x)', '2\*sin(x/2)\*cos(x/2)', 'sin(x)\*sin(x)', '1-(cos(x) \* cos(x))', '(1-cos(2\*x))/(2)', '(1)/(cos(x))']

Equivalent Identities

sin(x) = 2\*sin(x/2)\*cos(x/2)

cos(x) = cos(-x)

tan(x) = sin(x)/cos(x)

-sin(x) = sin(-x)

-tan(x) = tan(-x)

sin(-x) = -sin(x)

cos(-x) = cos(x)

tan(-x) = -tan(x)

sin(x)/cos(x) = tan(x)

2\*sin(x/2)\*cos(x/2) = sin(x)

sin(x)\*sin(x) = 1-(cos(x) \* cos(x))

sin(x)\*sin(x) = (1-cos(2\*x))/(2)

1-(cos(x) \* cos(x)) = sin(x)\*sin(x)

1-(cos(x) \* cos(x)) = (1-cos(2\*x))/(2)

(1-cos(2\*x))/(2) = sin(x)\*sin(x)

(1-cos(2\*x))/(2) = 1-(cos(x) \* cos(x))

(1)/(cos(x)) = sec(x)

Time: 0.5941503189999366

Found: 17

Test Equalties:

sin(-2.6928446783688775) != cos(-2.6928446783688775)

sin(2.2623350172533376) != tan(2.2623350172533376)

sin(1.6258584121485171) != mpmath.sec(1.6258584121485171)

sin(-0.49292940609797276) != -sin(-0.49292940609797276)

sin(-2.878518824906744) != -cos(-2.878518824906744)

sin(-2.901871265388966) != -tan(-2.901871265388966)

sin(0.45951700750762337) != sin(-0.45951700750762337)

sin(0.5465593063020826) != cos(-0.5465593063020826)

sin(2.0569704647324514) != tan(-2.0569704647324514)

sin(-1.0657140220858081) != sin(-1.0657140220858081)/cos(-1.0657140220858081)

sin(-1.4660764843829035) = 2\*sin(-1.4660764843829035/2)\*cos(-1.4660764843829035/2)

sin(0.7537575063595723) != sin(0.7537575063595723)\*sin(0.7537575063595723)

sin(-0.2735766818087835) != 1-(cos(-0.2735766818087835) \* cos(-0.2735766818087835))

sin(-1.3789617143723254) != (1-cos(2\*-1.3789617143723254))/(2)

cos(3.0570890064556986) != sin(3.0570890064556986)

cos(-2.3030284308643783) != tan(-2.3030284308643783)

cos(-0.1274018663257097) != mpmath.sec(-0.1274018663257097)

cos(-2.3180162364890307) != -sin(-2.3180162364890307)

cos(2.2896991619641494) != -cos(2.2896991619641494)

cos(-0.5915171935743211) != -tan(-0.5915171935743211)

cos(-2.6181825528219984) != sin(--2.6181825528219984)

cos(-1.7841432368828603) = cos(--1.7841432368828603)

cos(-0.35736112939974607) != tan(--0.35736112939974607)

cos(0.8651036912171053) != sin(0.8651036912171053)/cos(0.8651036912171053)

cos(1.9828436726547434) != 2\*sin(1.9828436726547434/2)\*cos(1.9828436726547434/2)

cos(-0.5245109933335406) != sin(-0.5245109933335406)\*sin(-0.5245109933335406)

cos(1.8087517606292298) != 1-(cos(1.8087517606292298) \* cos(1.8087517606292298))

cos(-0.4371925590945511) != (1-cos(2\*-0.4371925590945511))/(2)

tan(0.8991079462589733) != sin(0.8991079462589733)

tan(0.7430604836016088) != cos(0.7430604836016088)

tan(0.7186613590726103) != mpmath.sec(0.7186613590726103)

tan(0.7505628819896706) != -sin(0.7505628819896706)

tan(-0.5969716626588903) != -cos(-0.5969716626588903)

tan(0.5004111663230764) != -tan(0.5004111663230764)

tan(1.765246474293665) != sin(-1.765246474293665)

tan(0.4971132768952584) != cos(-0.4971132768952584)

tan(1.5788824262276684) != tan(-1.5788824262276684)

tan(-0.6473683543567215) = sin(-0.6473683543567215)/cos(-0.6473683543567215)

tan(-0.08252297728461144) != 2\*sin(-0.08252297728461144/2)\*cos(-0.08252297728461144/2)

tan(0.18467844179979043) != sin(0.18467844179979043)\*sin(0.18467844179979043)

tan(0.13403557921291887) != 1-(cos(0.13403557921291887) \* cos(0.13403557921291887))

tan(3.112305916462355) != (1-cos(2\*3.112305916462355))/(2)

mpmath.sec(-0.18214245737055368) != sin(-0.18214245737055368)

mpmath.sec(2.440673814534204) != cos(2.440673814534204)

mpmath.sec(1.5666160199107715) != tan(1.5666160199107715)

mpmath.sec(-0.14053752907170258) != -sin(-0.14053752907170258)

mpmath.sec(2.2398258043381487) != -cos(2.2398258043381487)

mpmath.sec(-0.6807931573240484) != -tan(-0.6807931573240484)

mpmath.sec(2.250704418966917) != sin(-2.250704418966917)

mpmath.sec(-2.737735293515775) != cos(--2.737735293515775)

mpmath.sec(-2.949858683581594) != tan(--2.949858683581594)

mpmath.sec(2.634189654842655) != sin(2.634189654842655)/cos(2.634189654842655)

mpmath.sec(0.7662454690801295) != 2\*sin(0.7662454690801295/2)\*cos(0.7662454690801295/2)

mpmath.sec(-0.7276690837165427) != sin(-0.7276690837165427)\*sin(-0.7276690837165427)

mpmath.sec(1.399014272672777) != 1-(cos(1.399014272672777) \* cos(1.399014272672777))

mpmath.sec(-2.3104568831154384) != (1-cos(2\*-2.3104568831154384))/(2)

-sin(1.9749994350950626) != sin(1.9749994350950626)

-sin(-1.4927724875668662) != cos(-1.4927724875668662)

-sin(-0.910817181568917) != tan(-0.910817181568917)

-sin(0.6981292007042201) != mpmath.sec(0.6981292007042201)

-sin(-2.7245981321941493) != -cos(-2.7245981321941493)

-sin(-2.548760002614188) != -tan(-2.548760002614188)

-sin(-2.6509640263219563) = sin(--2.6509640263219563)

-sin(2.412833930794771) != cos(-2.412833930794771)

-sin(2.5505728497813402) != tan(-2.5505728497813402)

-sin(0.6386825597946775) != sin(0.6386825597946775)/cos(0.6386825597946775)

-sin(2.5329516778283008) != 2\*sin(2.5329516778283008/2)\*cos(2.5329516778283008/2)

-sin(2.3517841915953754) != sin(2.3517841915953754)\*sin(2.3517841915953754)

-sin(0.9615014751198601) != 1-(cos(0.9615014751198601) \* cos(0.9615014751198601))

-sin(-1.8015190114893784) != (1-cos(2\*-1.8015190114893784))/(2)

-cos(1.1198020630875778) != sin(1.1198020630875778)

-cos(0.054361914036384906) != cos(0.054361914036384906)

-cos(1.6042882463171972) != tan(1.6042882463171972)

-cos(1.2825190287333292) != mpmath.sec(1.2825190287333292)

-cos(-1.4437347020979787) != -sin(-1.4437347020979787)

-cos(-0.8343965861912945) != -tan(-0.8343965861912945)

-cos(1.5794508767035182) != sin(-1.5794508767035182)

-cos(-1.8515302274506584) != cos(--1.8515302274506584)

-cos(-2.6622929493973673) != tan(--2.6622929493973673)

-cos(-2.876108757556547) != sin(-2.876108757556547)/cos(-2.876108757556547)

-cos(2.838727831765679) != 2\*sin(2.838727831765679/2)\*cos(2.838727831765679/2)

-cos(1.8540971161547501) != sin(1.8540971161547501)\*sin(1.8540971161547501)

-cos(1.8347693968742593) != 1-(cos(1.8347693968742593) \* cos(1.8347693968742593))

-cos(2.461570014499526) != (1-cos(2\*2.461570014499526))/(2)

-tan(1.3365407610582034) != sin(1.3365407610582034)

-tan(-2.894515543385567) != cos(-2.894515543385567)

-tan(-0.8348784300299696) != tan(-0.8348784300299696)

-tan(-2.4578644456888044) != mpmath.sec(-2.4578644456888044)

-tan(-2.654177357241803) != -sin(-2.654177357241803)

-tan(0.9063896713091353) != -cos(0.9063896713091353)

-tan(-0.21515337934997536) != sin(--0.21515337934997536)

-tan(-0.22343404302662817) != cos(--0.22343404302662817)

-tan(-1.6361590479879018) = tan(--1.6361590479879018)

-tan(2.5895299704476544) != sin(2.5895299704476544)/cos(2.5895299704476544)

-tan(-2.2942924244640173) != 2\*sin(-2.2942924244640173/2)\*cos(-2.2942924244640173/2)

-tan(-0.47213591126890897) != sin(-0.47213591126890897)\*sin(-0.47213591126890897)

-tan(2.7236300925656343) != 1-(cos(2.7236300925656343) \* cos(2.7236300925656343))

-tan(-1.9152691199919907) != (1-cos(2\*-1.9152691199919907))/(2)

sin(--2.465138393639924) != sin(-2.465138393639924)

sin(--2.366044542724443) != cos(-2.366044542724443)

sin(-0.21245626481141322) != tan(0.21245626481141322)

sin(-1.5919893425810656) != mpmath.sec(1.5919893425810656)

sin(-2.1632454655815136) = -sin(2.1632454655815136)

sin(--1.2266694392071724) != -cos(-1.2266694392071724)

sin(--0.5943975862021684) != -tan(-0.5943975862021684)

sin(-0.234806929927029) != cos(-0.234806929927029)

sin(--1.0475143841745131) != tan(--1.0475143841745131)

sin(-0.5360968069304084) != sin(0.5360968069304084)/cos(0.5360968069304084)

sin(-2.5077830109477146) != 2\*sin(2.5077830109477146/2)\*cos(2.5077830109477146/2)

sin(--0.43097930686804364) != sin(-0.43097930686804364)\*sin(-0.43097930686804364)

sin(-0.5597751009805672) != 1-(cos(0.5597751009805672) \* cos(0.5597751009805672))

sin(-0.1552774442931848) != (1-cos(2\*0.1552774442931848))/(2)

cos(--2.5753833852376844) != sin(-2.5753833852376844)

cos(-0.9528294569919868) = cos(0.9528294569919868)

cos(-2.5582080960111293) != tan(2.5582080960111293)

cos(-0.6583176958693886) != mpmath.sec(0.6583176958693886)

cos(-0.265960775513598) != -sin(0.265960775513598)

cos(--2.647695342662786) != -cos(-2.647695342662786)

cos(--2.240527465062997) != -tan(-2.240527465062997)

cos(--0.16874111842589867) != sin(--0.16874111842589867)

cos(--3.1176297240195665) != tan(--3.1176297240195665)

cos(--0.14324988131695626) != sin(-0.14324988131695626)/cos(-0.14324988131695626)

cos(-1.538950710680993) != 2\*sin(1.538950710680993/2)\*cos(1.538950710680993/2)

cos(-1.8529827111416433) != sin(1.8529827111416433)\*sin(1.8529827111416433)

cos(-1.5303498324247853) != 1-(cos(1.5303498324247853) \* cos(1.5303498324247853))

cos(--0.608720420285346) != (1-cos(2\*-0.608720420285346))/(2)

tan(-1.6033363020997227) != sin(1.6033363020997227)

tan(-2.986271655067946) != cos(2.986271655067946)

tan(--1.4374333603910203) != tan(-1.4374333603910203)

tan(-1.2976899700105538) != mpmath.sec(1.2976899700105538)

tan(--2.9069525379099606) != -sin(-2.9069525379099606)

tan(-1.2351581412881902) != -cos(1.2351581412881902)

tan(-1.0131292386252433) = -tan(1.0131292386252433)

tan(-2.1878976367355243) != sin(-2.1878976367355243)

tan(-1.4856743899276479) != cos(-1.4856743899276479)

tan(-1.1993818603139923) != sin(1.1993818603139923)/cos(1.1993818603139923)

tan(-1.132018823598174) != 2\*sin(1.132018823598174/2)\*cos(1.132018823598174/2)

tan(-0.5251879319031385) != sin(0.5251879319031385)\*sin(0.5251879319031385)

tan(--2.4047208365115402) != 1-(cos(-2.4047208365115402) \* cos(-2.4047208365115402))

tan(--1.809000740187675) != (1-cos(2\*-1.809000740187675))/(2)

sin(-2.7207007620838093)/cos(-2.7207007620838093) != sin(-2.7207007620838093)

sin(2.298297678771668)/cos(2.298297678771668) != cos(2.298297678771668)

sin(-2.888184050977047)/cos(-2.888184050977047) = tan(-2.888184050977047)

sin(1.3682056748424873)/cos(1.3682056748424873) != mpmath.sec(1.3682056748424873)

sin(-0.5953478303826389)/cos(-0.5953478303826389) != -sin(-0.5953478303826389)

sin(-0.6332156588566775)/cos(-0.6332156588566775) != -cos(-0.6332156588566775)

sin(-0.8633718931245609)/cos(-0.8633718931245609) != -tan(-0.8633718931245609)

sin(-2.9493277854948667)/cos(-2.9493277854948667) != sin(--2.9493277854948667)

sin(-3.131352389840746)/cos(-3.131352389840746) != cos(--3.131352389840746)

sin(-0.367605579777293)/cos(-0.367605579777293) != tan(--0.367605579777293)

sin(3.0313177676251284)/cos(3.0313177676251284) != 2\*sin(3.0313177676251284/2)\*cos(3.0313177676251284/2)

sin(-1.322312699965672)/cos(-1.322312699965672) != sin(-1.322312699965672)\*sin(-1.322312699965672)

sin(-2.951262762405545)/cos(-2.951262762405545) != 1-(cos(-2.951262762405545) \* cos(-2.951262762405545))

sin(-1.72576527613692)/cos(-1.72576527613692) != (1-cos(2\*-1.72576527613692))/(2)

2\*sin(0.7824993804342681/2)\*cos(0.7824993804342681/2) = sin(0.7824993804342681)

2\*sin(-2.894644349009767/2)\*cos(-2.894644349009767/2) != cos(-2.894644349009767)

2\*sin(-2.860467496924538/2)\*cos(-2.860467496924538/2) != tan(-2.860467496924538)

2\*sin(-2.672244433219397/2)\*cos(-2.672244433219397/2) != mpmath.sec(-2.672244433219397)

2\*sin(2.4450948193876076/2)\*cos(2.4450948193876076/2) != -sin(2.4450948193876076)

2\*sin(0.26188117133817057/2)\*cos(0.26188117133817057/2) != -cos(0.26188117133817057)

2\*sin(-0.04143757037479112/2)\*cos(-0.04143757037479112/2) != -tan(-0.04143757037479112)

2\*sin(-1.6590528197034327/2)\*cos(-1.6590528197034327/2) != sin(--1.6590528197034327)

2\*sin(1.5038392340717266/2)\*cos(1.5038392340717266/2) != cos(-1.5038392340717266)

2\*sin(-1.7536504400726158/2)\*cos(-1.7536504400726158/2) != tan(--1.7536504400726158)

2\*sin(-0.11980461227945716/2)\*cos(-0.11980461227945716/2) != sin(-0.11980461227945716)/cos(-0.11980461227945716)

2\*sin(-1.04930100920321/2)\*cos(-1.04930100920321/2) != sin(-1.04930100920321)\*sin(-1.04930100920321)

2\*sin(0.22244404283909525/2)\*cos(0.22244404283909525/2) != 1-(cos(0.22244404283909525) \* cos(0.22244404283909525))

2\*sin(0.030729173059835357/2)\*cos(0.030729173059835357/2) != (1-cos(2\*0.030729173059835357))/(2)

sin(-2.3584245356286093)\*sin(-2.3584245356286093) != sin(-2.3584245356286093)

sin(0.4043611120298789)\*sin(0.4043611120298789) != cos(0.4043611120298789)

sin(-1.9647756623863866)\*sin(-1.9647756623863866) != tan(-1.9647756623863866)

sin(2.74647043568826)\*sin(2.74647043568826) != mpmath.sec(2.74647043568826)

sin(-1.519642652672305)\*sin(-1.519642652672305) != -sin(-1.519642652672305)

sin(2.7024368911751777)\*sin(2.7024368911751777) != -cos(2.7024368911751777)

sin(-1.997226079225901)\*sin(-1.997226079225901) != -tan(-1.997226079225901)

sin(0.6601316335743412)\*sin(0.6601316335743412) != sin(-0.6601316335743412)

sin(2.0370784440485865)\*sin(2.0370784440485865) != cos(-2.0370784440485865)

sin(-1.3460236486606303)\*sin(-1.3460236486606303) != tan(--1.3460236486606303)

sin(1.9420726111942876)\*sin(1.9420726111942876) != sin(1.9420726111942876)/cos(1.9420726111942876)

sin(-2.1841634648842176)\*sin(-2.1841634648842176) != 2\*sin(-2.1841634648842176/2)\*cos(-2.1841634648842176/2)

sin(-1.358229878726389)\*sin(-1.358229878726389) = 1-(cos(-1.358229878726389) \* cos(-1.358229878726389))

sin(2.755485683482986)\*sin(2.755485683482986) = (1-cos(2\*2.755485683482986))/(2)

1-(cos(0.31613592495893084) \* cos(0.31613592495893084)) != sin(0.31613592495893084)

1-(cos(1.091817086800785) \* cos(1.091817086800785)) != cos(1.091817086800785)

1-(cos(-1.3247371241252353) \* cos(-1.3247371241252353)) != tan(-1.3247371241252353)

1-(cos(1.5652165799443454) \* cos(1.5652165799443454)) != mpmath.sec(1.5652165799443454)

1-(cos(-1.1814546279387923) \* cos(-1.1814546279387923)) != -sin(-1.1814546279387923)

1-(cos(-2.188779833911349) \* cos(-2.188779833911349)) != -cos(-2.188779833911349)

1-(cos(0.4669493012932615) \* cos(0.4669493012932615)) != -tan(0.4669493012932615)

1-(cos(0.665451969758732) \* cos(0.665451969758732)) != sin(-0.665451969758732)

1-(cos(1.209219086337379) \* cos(1.209219086337379)) != cos(-1.209219086337379)

1-(cos(-2.988338667278181) \* cos(-2.988338667278181)) != tan(--2.988338667278181)

1-(cos(1.6391296611124275) \* cos(1.6391296611124275)) != sin(1.6391296611124275)/cos(1.6391296611124275)

1-(cos(1.6647980453998024) \* cos(1.6647980453998024)) != 2\*sin(1.6647980453998024/2)\*cos(1.6647980453998024/2)

1-(cos(2.7373565372316735) \* cos(2.7373565372316735)) = sin(2.7373565372316735)\*sin(2.7373565372316735)

1-(cos(-2.8084822719434) \* cos(-2.8084822719434)) = (1-cos(2\*-2.8084822719434))/(2)

(1-cos(2\*1.408806466573397))/(2) != sin(1.408806466573397)

(1-cos(2\*-0.1396401151197435))/(2) != cos(-0.1396401151197435)

(1-cos(2\*0.08419432141663874))/(2) != tan(0.08419432141663874)

(1-cos(2\*1.6873474220225768))/(2) != mpmath.sec(1.6873474220225768)

(1-cos(2\*2.4388407454699017))/(2) != -sin(2.4388407454699017)

(1-cos(2\*2.742045565147073))/(2) != -cos(2.742045565147073)

(1-cos(2\*0.6824712656783092))/(2) != -tan(0.6824712656783092)

(1-cos(2\*-0.32630228409701667))/(2) != sin(--0.32630228409701667)

(1-cos(2\*0.8793253880117682))/(2) != cos(-0.8793253880117682)

(1-cos(2\*-0.9219043772179263))/(2) != tan(--0.9219043772179263)

(1-cos(2\*-1.9791087986861065))/(2) != sin(-1.9791087986861065)/cos(-1.9791087986861065)

(1-cos(2\*-1.108613151009715))/(2) != 2\*sin(-1.108613151009715/2)\*cos(-1.108613151009715/2)

(1-cos(2\*-1.941018390113741))/(2) = sin(-1.941018390113741)\*sin(-1.941018390113741)

(1-cos(2\*-0.8602358134335035))/(2) = 1-(cos(-0.8602358134335035) \* cos(-0.8602358134335035))

(1)/(cos(-2.5462309214525556)) != sin(-2.5462309214525556)

(1)/(cos(0.2638831775812269)) != cos(0.2638831775812269)

(1)/(cos(-2.3521573269331144)) != tan(-2.3521573269331144)

(1)/(cos(-0.2552794615992169)) = mpmath.sec(-0.2552794615992169)

(1)/(cos(1.073202737711707)) != -sin(1.073202737711707)

(1)/(cos(-1.8861131431278)) != -cos(-1.8861131431278)

(1)/(cos(-2.6464951139635833)) != -tan(-2.6464951139635833)

(1)/(cos(2.354106619727033)) != sin(-2.354106619727033)

(1)/(cos(1.957536562687416)) != cos(-1.957536562687416)

(1)/(cos(1.6766252680229714)) != tan(-1.6766252680229714)

(1)/(cos(2.920619305861349)) != sin(2.920619305861349)/cos(2.920619305861349)

(1)/(cos(0.09545314296639651)) != 2\*sin(0.09545314296639651/2)\*cos(0.09545314296639651/2)

(1)/(cos(1.0132355946438256)) != sin(1.0132355946438256)\*sin(1.0132355946438256)

(1)/(cos(2.1741047358796015)) != 1-(cos(2.1741047358796015) \* cos(2.1741047358796015))

(1)/(cos(1.4424476194691351)) != (1-cos(2\*1.4424476194691351))/(2)

PARTITION SUBSETSUM

[4, 16, 62, 56, 43, 81, 1, 38, 69, 89, 34, 64, 39, 45, 12, 2, 93, 15, 59, 76]

Sum of S: 898

Partition Exists for [4, 16, 62, 56, 43, 81, 1, 38, 69, 89, 34, 64, 39, 45, 12, 2, 93, 15, 59, 76]

([43, 1, 64, 39, 45, 12, 2, 93, 15, 59, 76], [4, 16, 62, 56, 81, 38, 69, 89, 34])

Time: 9.94130000435689e-05

**N = 30**

DISCOVER TRIG IDENTITIES

Identities read from file:

['sin(x)', 'cos(x)', 'tan(x)', 'sec(x)', '-sin(x)', '-cos(x)', '-tan(x)', 'sin(-x)', 'cos(-x)', 'tan(-x)', 'sin(x)/cos(x)', '2\*sin(x/2)\*cos(x/2)', 'sin(x)\*sin(x)', '1-(cos(x) \* cos(x))', '(1-cos(2\*x))/(2)', '(1)/(cos(x))']

Equivalent Identities

sin(x) = 2\*sin(x/2)\*cos(x/2)

cos(x) = cos(-x)

tan(x) = sin(x)/cos(x)

-sin(x) = sin(-x)

-tan(x) = tan(-x)

sin(-x) = -sin(x)

cos(-x) = cos(x)

tan(-x) = -tan(x)

sin(x)/cos(x) = tan(x)

2\*sin(x/2)\*cos(x/2) = sin(x)

sin(x)\*sin(x) = 1-(cos(x) \* cos(x))

sin(x)\*sin(x) = (1-cos(2\*x))/(2)

1-(cos(x) \* cos(x)) = sin(x)\*sin(x)

1-(cos(x) \* cos(x)) = (1-cos(2\*x))/(2)

(1-cos(2\*x))/(2) = sin(x)\*sin(x)

(1-cos(2\*x))/(2) = 1-(cos(x) \* cos(x))

(1)/(cos(x)) = sec(x)

Time: 0.5976498370000627

Found: 17

Test Equalties:

sin(1.1741469712879962) != cos(1.1741469712879962)

sin(2.083207015935277) != tan(2.083207015935277)

sin(-1.8889559635729802) != mpmath.sec(-1.8889559635729802)

sin(0.6489808908649155) != -sin(0.6489808908649155)

sin(-0.37510067797834257) != -cos(-0.37510067797834257)

sin(-1.2179718753701092) != -tan(-1.2179718753701092)

sin(0.5602455170426346) != sin(-0.5602455170426346)

sin(1.2831357762101367) != cos(-1.2831357762101367)

sin(-0.19651807866751314) != tan(--0.19651807866751314)

sin(2.3173920408108613) != sin(2.3173920408108613)/cos(2.3173920408108613)

sin(3.114301301142329) = 2\*sin(3.114301301142329/2)\*cos(3.114301301142329/2)

sin(-1.0753002134536063) != sin(-1.0753002134536063)\*sin(-1.0753002134536063)

sin(-0.7147768206658305) != 1-(cos(-0.7147768206658305) \* cos(-0.7147768206658305))

sin(0.8611757079616247) != (1-cos(2\*0.8611757079616247))/(2)

cos(2.660227137347012) != sin(2.660227137347012)

cos(0.47969049650291096) != tan(0.47969049650291096)

cos(1.8651495180405053) != mpmath.sec(1.8651495180405053)

cos(1.87118897089971) != -sin(1.87118897089971)

cos(0.29829864429478725) != -cos(0.29829864429478725)

cos(0.79120093931403) != -tan(0.79120093931403)

cos(-2.9606588946063774) != sin(--2.9606588946063774)

cos(2.596191408377238) = cos(-2.596191408377238)

cos(-1.3947869533437285) != tan(--1.3947869533437285)

cos(-2.728974816542799) != sin(-2.728974816542799)/cos(-2.728974816542799)

cos(-1.3067993696662143) != 2\*sin(-1.3067993696662143/2)\*cos(-1.3067993696662143/2)

cos(-2.7314564418414182) != sin(-2.7314564418414182)\*sin(-2.7314564418414182)

cos(1.4091706845262317) != 1-(cos(1.4091706845262317) \* cos(1.4091706845262317))

cos(0.09414597892173227) != (1-cos(2\*0.09414597892173227))/(2)

tan(-3.066231212090403) != sin(-3.066231212090403)

tan(-0.02235477359060134) != cos(-0.02235477359060134)

tan(2.0031576200140986) != mpmath.sec(2.0031576200140986)

tan(2.520535238630596) != -sin(2.520535238630596)

tan(0.6624941955562225) != -cos(0.6624941955562225)

tan(-2.5624735465731567) != -tan(-2.5624735465731567)

tan(2.2067771310719015) != sin(-2.2067771310719015)

tan(2.726500934045154) != cos(-2.726500934045154)

tan(-2.6534387657523157) != tan(--2.6534387657523157)

tan(2.9284525732121462) = sin(2.9284525732121462)/cos(2.9284525732121462)

tan(2.9160722274612967) != 2\*sin(2.9160722274612967/2)\*cos(2.9160722274612967/2)

tan(0.5370092623759963) != sin(0.5370092623759963)\*sin(0.5370092623759963)

tan(0.21530696985889008) != 1-(cos(0.21530696985889008) \* cos(0.21530696985889008))

tan(-0.28214353771725253) != (1-cos(2\*-0.28214353771725253))/(2)

mpmath.sec(0.16115738141874925) != sin(0.16115738141874925)

mpmath.sec(-2.1088278103363223) != cos(-2.1088278103363223)

mpmath.sec(1.5703486289852142) != tan(1.5703486289852142)

mpmath.sec(-1.0673427659252397) != -sin(-1.0673427659252397)

mpmath.sec(2.2038470840653455) != -cos(2.2038470840653455)

mpmath.sec(-1.0522588381643359) != -tan(-1.0522588381643359)

mpmath.sec(-1.906120614782134) != sin(--1.906120614782134)

mpmath.sec(-0.7445187901084771) != cos(--0.7445187901084771)

mpmath.sec(-0.234529446811798) != tan(--0.234529446811798)

mpmath.sec(-1.4831820927577133) != sin(-1.4831820927577133)/cos(-1.4831820927577133)

mpmath.sec(-0.11011030126417154) != 2\*sin(-0.11011030126417154/2)\*cos(-0.11011030126417154/2)

mpmath.sec(-1.4155126765376496) != sin(-1.4155126765376496)\*sin(-1.4155126765376496)

mpmath.sec(-0.6370437251561429) != 1-(cos(-0.6370437251561429) \* cos(-0.6370437251561429))

mpmath.sec(-2.295152719569181) != (1-cos(2\*-2.295152719569181))/(2)

-sin(0.9946080968709756) != sin(0.9946080968709756)

-sin(0.613330682992594) != cos(0.613330682992594)

-sin(-2.8327061670008917) != tan(-2.8327061670008917)

-sin(-0.6298886194382001) != mpmath.sec(-0.6298886194382001)

-sin(-0.0893681119569738) != -cos(-0.0893681119569738)

-sin(2.15406263065198) != -tan(2.15406263065198)

-sin(-0.4649178923209911) = sin(--0.4649178923209911)

-sin(-2.909234812979353) != cos(--2.909234812979353)

-sin(2.1738261625478916) != tan(-2.1738261625478916)

-sin(0.7370706226268569) != sin(0.7370706226268569)/cos(0.7370706226268569)

-sin(-1.541435256300268) != 2\*sin(-1.541435256300268/2)\*cos(-1.541435256300268/2)

-sin(0.1322940177774088) != sin(0.1322940177774088)\*sin(0.1322940177774088)

-sin(1.5547503001375942) != 1-(cos(1.5547503001375942) \* cos(1.5547503001375942))

-sin(-0.3344191406623209) != (1-cos(2\*-0.3344191406623209))/(2)

-cos(2.724567741742078) != sin(2.724567741742078)

-cos(-2.6954906301688863) != cos(-2.6954906301688863)

-cos(1.6005541193664365) != tan(1.6005541193664365)

-cos(1.6120320147763598) != mpmath.sec(1.6120320147763598)

-cos(-0.5400938126019481) != -sin(-0.5400938126019481)

-cos(-1.5576747800122808) != -tan(-1.5576747800122808)

-cos(2.613761316607171) != sin(-2.613761316607171)

-cos(0.4062985352151798) != cos(-0.4062985352151798)

-cos(0.8759300095184948) != tan(-0.8759300095184948)

-cos(-1.6478682326234046) != sin(-1.6478682326234046)/cos(-1.6478682326234046)

-cos(3.0293725821025905) != 2\*sin(3.0293725821025905/2)\*cos(3.0293725821025905/2)

-cos(-2.148146237443505) != sin(-2.148146237443505)\*sin(-2.148146237443505)

-cos(-1.148623624861355) != 1-(cos(-1.148623624861355) \* cos(-1.148623624861355))

-cos(2.442256270080394) != (1-cos(2\*2.442256270080394))/(2)

-tan(-1.8303183046092273) != sin(-1.8303183046092273)

-tan(-2.7740993560392293) != cos(-2.7740993560392293)

-tan(-0.15698457490141893) != tan(-0.15698457490141893)

-tan(-2.195647055912072) != mpmath.sec(-2.195647055912072)

-tan(-1.044128031715323) != -sin(-1.044128031715323)

-tan(-0.04269074659001104) != -cos(-0.04269074659001104)

-tan(-2.8026734351637193) != sin(--2.8026734351637193)

-tan(0.4264027062463893) != cos(-0.4264027062463893)

-tan(-2.402383191055376) = tan(--2.402383191055376)

-tan(-0.12431559705344286) != sin(-0.12431559705344286)/cos(-0.12431559705344286)

-tan(1.0791703826986936) != 2\*sin(1.0791703826986936/2)\*cos(1.0791703826986936/2)

-tan(0.6065659725397414) != sin(0.6065659725397414)\*sin(0.6065659725397414)

-tan(-0.10605598508761727) != 1-(cos(-0.10605598508761727) \* cos(-0.10605598508761727))

-tan(0.9062774398006308) != (1-cos(2\*0.9062774398006308))/(2)

sin(-0.9651726547306758) != sin(0.9651726547306758)

sin(-1.4469060686186808) != cos(1.4469060686186808)

sin(--0.9328838305923104) != tan(-0.9328838305923104)

sin(--1.7678361167577135) != mpmath.sec(-1.7678361167577135)

sin(-1.3619721298300993) = -sin(1.3619721298300993)

sin(--0.3770456731521321) != -cos(-0.3770456731521321)

sin(--0.7713927812620369) != -tan(-0.7713927812620369)

sin(--0.6086306784835589) != cos(--0.6086306784835589)

sin(--2.4759765718467714) != tan(--2.4759765718467714)

sin(-1.2776827044233698) != sin(1.2776827044233698)/cos(1.2776827044233698)

sin(--2.9612344736354093) != 2\*sin(-2.9612344736354093/2)\*cos(-2.9612344736354093/2)

sin(-1.8320475181159237) != sin(1.8320475181159237)\*sin(1.8320475181159237)

sin(--1.0195948193959956) != 1-(cos(-1.0195948193959956) \* cos(-1.0195948193959956))

sin(--0.6712316569885295) != (1-cos(2\*-0.6712316569885295))/(2)

cos(-2.106388187030288) != sin(2.106388187030288)

cos(--0.9995551397870113) = cos(-0.9995551397870113)

cos(-1.57336868276718) != tan(1.57336868276718)

cos(--2.0488936507930324) != mpmath.sec(-2.0488936507930324)

cos(-0.6687607910418563) != -sin(0.6687607910418563)

cos(--2.4722812234844493) != -cos(-2.4722812234844493)

cos(-2.374890982650827) != -tan(2.374890982650827)

cos(-0.5026893212243131) != sin(-0.5026893212243131)

cos(--0.48421730108539895) != tan(--0.48421730108539895)

cos(-0.6240169604924346) != sin(0.6240169604924346)/cos(0.6240169604924346)

cos(-0.4876510765013644) != 2\*sin(0.4876510765013644/2)\*cos(0.4876510765013644/2)

cos(--2.728386653697193) != sin(-2.728386653697193)\*sin(-2.728386653697193)

cos(-1.6556962646008815) != 1-(cos(1.6556962646008815) \* cos(1.6556962646008815))

cos(-2.633336815812834) != (1-cos(2\*2.633336815812834))/(2)

tan(--1.4494589922193084) != sin(-1.4494589922193084)

tan(-2.035579536821354) != cos(2.035579536821354)

tan(-2.7438784276455817) != tan(2.7438784276455817)

tan(--1.2319292176381973) != mpmath.sec(-1.2319292176381973)

tan(-1.3209376155780257) != -sin(1.3209376155780257)

tan(--2.00205277770313) != -cos(-2.00205277770313)

tan(-1.9361719602623646) = -tan(1.9361719602623646)

tan(-1.4682666835168687) != sin(-1.4682666835168687)

tan(--2.4846242855620346) != cos(--2.4846242855620346)

tan(-0.8878456364225036) != sin(0.8878456364225036)/cos(0.8878456364225036)

tan(--1.8593135695155858) != 2\*sin(-1.8593135695155858/2)\*cos(-1.8593135695155858/2)

tan(-1.3185944149090316) != sin(1.3185944149090316)\*sin(1.3185944149090316)

tan(--1.7698876313643634) != 1-(cos(-1.7698876313643634) \* cos(-1.7698876313643634))

tan(--0.2633830464932765) != (1-cos(2\*-0.2633830464932765))/(2)

sin(0.2474601666714089)/cos(0.2474601666714089) != sin(0.2474601666714089)

sin(-1.3878328495985621)/cos(-1.3878328495985621) != cos(-1.3878328495985621)

sin(-1.0266646939051087)/cos(-1.0266646939051087) = tan(-1.0266646939051087)

sin(-0.29489257269617486)/cos(-0.29489257269617486) != mpmath.sec(-0.29489257269617486)

sin(2.2975433494210273)/cos(2.2975433494210273) != -sin(2.2975433494210273)

sin(-0.3145535969566353)/cos(-0.3145535969566353) != -cos(-0.3145535969566353)

sin(-2.479397098799436)/cos(-2.479397098799436) != -tan(-2.479397098799436)

sin(1.3050871126923083)/cos(1.3050871126923083) != sin(-1.3050871126923083)

sin(-3.1272381946628975)/cos(-3.1272381946628975) != cos(--3.1272381946628975)

sin(0.6491370127185805)/cos(0.6491370127185805) != tan(-0.6491370127185805)

sin(1.3930132397472432)/cos(1.3930132397472432) != 2\*sin(1.3930132397472432/2)\*cos(1.3930132397472432/2)

sin(0.3657873517984789)/cos(0.3657873517984789) != sin(0.3657873517984789)\*sin(0.3657873517984789)

sin(-2.6765997885277537)/cos(-2.6765997885277537) != 1-(cos(-2.6765997885277537) \* cos(-2.6765997885277537))

sin(-0.4582644365251243)/cos(-0.4582644365251243) != (1-cos(2\*-0.4582644365251243))/(2)

2\*sin(2.7763331965735194/2)\*cos(2.7763331965735194/2) = sin(2.7763331965735194)

2\*sin(0.3812265337706311/2)\*cos(0.3812265337706311/2) != cos(0.3812265337706311)

2\*sin(3.103599999061519/2)\*cos(3.103599999061519/2) != tan(3.103599999061519)

2\*sin(-0.8846705808150244/2)\*cos(-0.8846705808150244/2) != mpmath.sec(-0.8846705808150244)

2\*sin(1.1405662354127504/2)\*cos(1.1405662354127504/2) != -sin(1.1405662354127504)

2\*sin(-2.549837294933619/2)\*cos(-2.549837294933619/2) != -cos(-2.549837294933619)

2\*sin(2.8083928180367543/2)\*cos(2.8083928180367543/2) != -tan(2.8083928180367543)

2\*sin(-2.0559354151783458/2)\*cos(-2.0559354151783458/2) != sin(--2.0559354151783458)

2\*sin(2.740342040120848/2)\*cos(2.740342040120848/2) != cos(-2.740342040120848)

2\*sin(1.7491577413094523/2)\*cos(1.7491577413094523/2) != tan(-1.7491577413094523)

2\*sin(-1.8853082384171553/2)\*cos(-1.8853082384171553/2) != sin(-1.8853082384171553)/cos(-1.8853082384171553)

2\*sin(-0.8508546043306602/2)\*cos(-0.8508546043306602/2) != sin(-0.8508546043306602)\*sin(-0.8508546043306602)

2\*sin(-2.498498851305115/2)\*cos(-2.498498851305115/2) != 1-(cos(-2.498498851305115) \* cos(-2.498498851305115))

2\*sin(0.7282866085897006/2)\*cos(0.7282866085897006/2) != (1-cos(2\*0.7282866085897006))/(2)

sin(0.011847225326236721)\*sin(0.011847225326236721) != sin(0.011847225326236721)

sin(-1.13035342037483)\*sin(-1.13035342037483) != cos(-1.13035342037483)

sin(-0.5078313064891375)\*sin(-0.5078313064891375) != tan(-0.5078313064891375)

sin(1.76673654820922)\*sin(1.76673654820922) != mpmath.sec(1.76673654820922)

sin(2.023048333077308)\*sin(2.023048333077308) != -sin(2.023048333077308)

sin(-2.573000729489724)\*sin(-2.573000729489724) != -cos(-2.573000729489724)

sin(-2.696880544202699)\*sin(-2.696880544202699) != -tan(-2.696880544202699)

sin(3.1385858078438424)\*sin(3.1385858078438424) != sin(-3.1385858078438424)

sin(-1.9932863474758953)\*sin(-1.9932863474758953) != cos(--1.9932863474758953)

sin(0.7148531600324621)\*sin(0.7148531600324621) != tan(-0.7148531600324621)

sin(2.5520544942024586)\*sin(2.5520544942024586) != sin(2.5520544942024586)/cos(2.5520544942024586)

sin(-0.6928984904658266)\*sin(-0.6928984904658266) != 2\*sin(-0.6928984904658266/2)\*cos(-0.6928984904658266/2)

sin(-1.361218794316627)\*sin(-1.361218794316627) = 1-(cos(-1.361218794316627) \* cos(-1.361218794316627))

sin(2.6927660788928423)\*sin(2.6927660788928423) = (1-cos(2\*2.6927660788928423))/(2)

1-(cos(0.4454535870618601) \* cos(0.4454535870618601)) != sin(0.4454535870618601)

1-(cos(2.903376721049523) \* cos(2.903376721049523)) != cos(2.903376721049523)

1-(cos(-1.1454650368081998) \* cos(-1.1454650368081998)) != tan(-1.1454650368081998)

1-(cos(-2.5236378833193416) \* cos(-2.5236378833193416)) != mpmath.sec(-2.5236378833193416)

1-(cos(3.0301587567971637) \* cos(3.0301587567971637)) != -sin(3.0301587567971637)

1-(cos(-0.17276247053799576) \* cos(-0.17276247053799576)) != -cos(-0.17276247053799576)

1-(cos(-2.4513159866774203) \* cos(-2.4513159866774203)) != -tan(-2.4513159866774203)

1-(cos(-1.6925909639155765) \* cos(-1.6925909639155765)) != sin(--1.6925909639155765)

1-(cos(0.9530009824160395) \* cos(0.9530009824160395)) != cos(-0.9530009824160395)

1-(cos(2.001232252795365) \* cos(2.001232252795365)) != tan(-2.001232252795365)

1-(cos(1.200470000016832) \* cos(1.200470000016832)) != sin(1.200470000016832)/cos(1.200470000016832)

1-(cos(2.6809178708501076) \* cos(2.6809178708501076)) != 2\*sin(2.6809178708501076/2)\*cos(2.6809178708501076/2)

1-(cos(-1.7240438816165284) \* cos(-1.7240438816165284)) = sin(-1.7240438816165284)\*sin(-1.7240438816165284)

1-(cos(-1.0721514349385206) \* cos(-1.0721514349385206)) = (1-cos(2\*-1.0721514349385206))/(2)

(1-cos(2\*1.9964447772014795))/(2) != sin(1.9964447772014795)

(1-cos(2\*2.382611369588899))/(2) != cos(2.382611369588899)

(1-cos(2\*3.0497896461578176))/(2) != tan(3.0497896461578176)

(1-cos(2\*1.0749792597472672))/(2) != mpmath.sec(1.0749792597472672)

(1-cos(2\*-1.006201062257225))/(2) != -sin(-1.006201062257225)

(1-cos(2\*-1.5314894035139643))/(2) != -cos(-1.5314894035139643)

(1-cos(2\*2.0648215751893577))/(2) != -tan(2.0648215751893577)

(1-cos(2\*0.2601047610904059))/(2) != sin(-0.2601047610904059)

(1-cos(2\*-0.6495001758971335))/(2) != cos(--0.6495001758971335)

(1-cos(2\*0.21818058573575083))/(2) != tan(-0.21818058573575083)

(1-cos(2\*-2.1488870500971515))/(2) != sin(-2.1488870500971515)/cos(-2.1488870500971515)

(1-cos(2\*1.8651996075135475))/(2) != 2\*sin(1.8651996075135475/2)\*cos(1.8651996075135475/2)

(1-cos(2\*1.053574271090886))/(2) = sin(1.053574271090886)\*sin(1.053574271090886)

(1-cos(2\*-1.3433648086810217))/(2) = 1-(cos(-1.3433648086810217) \* cos(-1.3433648086810217))

(1)/(cos(1.9388819208699832)) != sin(1.9388819208699832)

(1)/(cos(-0.49349535402564415)) != cos(-0.49349535402564415)

(1)/(cos(2.0278444503539124)) != tan(2.0278444503539124)

(1)/(cos(0.32042347309907493)) = mpmath.sec(0.32042347309907493)

(1)/(cos(0.5125698712776381)) != -sin(0.5125698712776381)

(1)/(cos(2.407626420982777)) != -cos(2.407626420982777)

(1)/(cos(1.806349584081686)) != -tan(1.806349584081686)

(1)/(cos(-3.045503604786731)) != sin(--3.045503604786731)

(1)/(cos(-1.1126371429633237)) != cos(--1.1126371429633237)

(1)/(cos(1.336993663804991)) != tan(-1.336993663804991)

(1)/(cos(1.4784902061617888)) != sin(1.4784902061617888)/cos(1.4784902061617888)

(1)/(cos(0.3650415880240021)) != 2\*sin(0.3650415880240021/2)\*cos(0.3650415880240021/2)

(1)/(cos(-3.002527513648525)) != sin(-3.002527513648525)\*sin(-3.002527513648525)

(1)/(cos(-0.8738715968752286)) != 1-(cos(-0.8738715968752286) \* cos(-0.8738715968752286))

(1)/(cos(0.39853371376097213)) != (1-cos(2\*0.39853371376097213))/(2)

PARTITION SUBSETSUM

[96, 28, 19, 43, 54, 73, 17, 59, 24, 71, 26, 12, 47, 67, 97, 44, 62, 57, 99, 50, 32, 77, 40, 2, 20, 91, 78, 30, 4, 70]

Sum of S: 1489

Partition does not exist

False

Time: 2.8160000056232093e-05

**N = 40**

DISCOVER TRIG IDENTITIES

Identities read from file:

['sin(x)', 'cos(x)', 'tan(x)', 'sec(x)', '-sin(x)', '-cos(x)', '-tan(x)', 'sin(-x)', 'cos(-x)', 'tan(-x)', 'sin(x)/cos(x)', '2\*sin(x/2)\*cos(x/2)', 'sin(x)\*sin(x)', '1-(cos(x) \* cos(x))', '(1-cos(2\*x))/(2)', '(1)/(cos(x))']

Equivalent Identities

sin(x) = 2\*sin(x/2)\*cos(x/2)

cos(x) = cos(-x)

tan(x) = sin(x)/cos(x)

-sin(x) = sin(-x)

-tan(x) = tan(-x)

sin(-x) = -sin(x)

cos(-x) = cos(x)

tan(-x) = -tan(x)

sin(x)/cos(x) = tan(x)

2\*sin(x/2)\*cos(x/2) = sin(x)

sin(x)\*sin(x) = 1-(cos(x) \* cos(x))

sin(x)\*sin(x) = (1-cos(2\*x))/(2)

1-(cos(x) \* cos(x)) = sin(x)\*sin(x)

1-(cos(x) \* cos(x)) = (1-cos(2\*x))/(2)

(1-cos(2\*x))/(2) = sin(x)\*sin(x)

(1-cos(2\*x))/(2) = 1-(cos(x) \* cos(x))

(1)/(cos(x)) = sec(x)

Time: 0.6149200080001265

Found: 17

Test Equalties:

sin(1.8917419580531476) != cos(1.8917419580531476)

sin(1.330505835284641) != tan(1.330505835284641)

sin(-0.24563306965740095) != mpmath.sec(-0.24563306965740095)

sin(1.7353139373450759) != -sin(1.7353139373450759)

sin(2.410094164257271) != -cos(2.410094164257271)

sin(-3.009194745318172) != -tan(-3.009194745318172)

sin(-0.37940475702995746) != sin(--0.37940475702995746)

sin(-3.0553819838914285) != cos(--3.0553819838914285)

sin(0.1233833091204608) != tan(-0.1233833091204608)

sin(-2.125654695107692) != sin(-2.125654695107692)/cos(-2.125654695107692)

sin(-1.458999027554493) = 2\*sin(-1.458999027554493/2)\*cos(-1.458999027554493/2)

sin(-2.728052228913305) != sin(-2.728052228913305)\*sin(-2.728052228913305)

sin(-1.11006204096419) != 1-(cos(-1.11006204096419) \* cos(-1.11006204096419))

sin(-2.958272794142581) != (1-cos(2\*-2.958272794142581))/(2)

cos(2.193958372210795) != sin(2.193958372210795)

cos(2.069877937761328) != tan(2.069877937761328)

cos(-0.1065832233824553) != mpmath.sec(-0.1065832233824553)

cos(0.585314414273749) != -sin(0.585314414273749)

cos(-2.9301981402794186) != -cos(-2.9301981402794186)

cos(3.1402852121465514) != -tan(3.1402852121465514)

cos(-2.475302951711297) != sin(--2.475302951711297)

cos(1.6860106349679036) = cos(-1.6860106349679036)

cos(2.8341215143327014) != tan(-2.8341215143327014)

cos(-0.3297344823061601) != sin(-0.3297344823061601)/cos(-0.3297344823061601)

cos(0.3694887138195191) != 2\*sin(0.3694887138195191/2)\*cos(0.3694887138195191/2)

cos(-2.690254638279053) != sin(-2.690254638279053)\*sin(-2.690254638279053)

cos(1.3182291726664266) != 1-(cos(1.3182291726664266) \* cos(1.3182291726664266))

cos(0.18985732089388563) != (1-cos(2\*0.18985732089388563))/(2)

tan(-2.6607466396463924) != sin(-2.6607466396463924)

tan(-1.8609254857945143) != cos(-1.8609254857945143)

tan(1.4077277088793432) != mpmath.sec(1.4077277088793432)

tan(-3.008159013147938) != -sin(-3.008159013147938)

tan(-1.7523916396025518) != -cos(-1.7523916396025518)

tan(3.0740889411428594) != -tan(3.0740889411428594)

tan(-1.1506964974550136) != sin(--1.1506964974550136)

tan(2.649222907192777) != cos(-2.649222907192777)

tan(-0.2557278068829283) != tan(--0.2557278068829283)

tan(1.3166893575721517) = sin(1.3166893575721517)/cos(1.3166893575721517)

tan(0.5560244070077061) != 2\*sin(0.5560244070077061/2)\*cos(0.5560244070077061/2)

tan(-3.1256231163431822) != sin(-3.1256231163431822)\*sin(-3.1256231163431822)

tan(0.35186292766946936) != 1-(cos(0.35186292766946936) \* cos(0.35186292766946936))

tan(0.9605756186065095) != (1-cos(2\*0.9605756186065095))/(2)

mpmath.sec(-2.3921665866100192) != sin(-2.3921665866100192)

mpmath.sec(2.6772318693949844) != cos(2.6772318693949844)

mpmath.sec(2.726400151513727) != tan(2.726400151513727)

mpmath.sec(3.13983747644897) != -sin(3.13983747644897)

mpmath.sec(-1.256026342186732) != -cos(-1.256026342186732)

mpmath.sec(-2.939881434870279) != -tan(-2.939881434870279)

mpmath.sec(-2.0008716499223564) != sin(--2.0008716499223564)

mpmath.sec(-0.9001647040473739) != cos(--0.9001647040473739)

mpmath.sec(-1.9817637177339322) != tan(--1.9817637177339322)

mpmath.sec(2.057051240677609) != sin(2.057051240677609)/cos(2.057051240677609)

mpmath.sec(-1.675686150209187) != 2\*sin(-1.675686150209187/2)\*cos(-1.675686150209187/2)

mpmath.sec(0.10199858609702206) != sin(0.10199858609702206)\*sin(0.10199858609702206)

mpmath.sec(-1.3666434641253107) != 1-(cos(-1.3666434641253107) \* cos(-1.3666434641253107))

mpmath.sec(1.8247700164899925) != (1-cos(2\*1.8247700164899925))/(2)

-sin(-1.0415941036588472) != sin(-1.0415941036588472)

-sin(1.798489421325142) != cos(1.798489421325142)

-sin(0.26135436533985335) != tan(0.26135436533985335)

-sin(2.259635700930982) != mpmath.sec(2.259635700930982)

-sin(1.8832348775694872) != -cos(1.8832348775694872)

-sin(0.48479541188474373) != -tan(0.48479541188474373)

-sin(-2.5889911406978308) = sin(--2.5889911406978308)

-sin(-2.373274544992) != cos(--2.373274544992)

-sin(-0.21279190665796666) != tan(--0.21279190665796666)

-sin(2.0435480961694106) != sin(2.0435480961694106)/cos(2.0435480961694106)

-sin(-1.8129218002109886) != 2\*sin(-1.8129218002109886/2)\*cos(-1.8129218002109886/2)

-sin(0.5647784034526921) != sin(0.5647784034526921)\*sin(0.5647784034526921)

-sin(0.1962961287246987) != 1-(cos(0.1962961287246987) \* cos(0.1962961287246987))

-sin(2.446014552956836) != (1-cos(2\*2.446014552956836))/(2)

-cos(-2.4051589800348485) != sin(-2.4051589800348485)

-cos(0.9037771175357356) != cos(0.9037771175357356)

-cos(0.842880781394252) != tan(0.842880781394252)

-cos(1.9522334964113126) != mpmath.sec(1.9522334964113126)

-cos(-2.054468543731808) != -sin(-2.054468543731808)

-cos(-1.591808364541843) != -tan(-1.591808364541843)

-cos(-0.33500383733072026) != sin(--0.33500383733072026)

-cos(-0.9928838502955961) != cos(--0.9928838502955961)

-cos(0.38826239091399506) != tan(-0.38826239091399506)

-cos(0.40766091390815484) != sin(0.40766091390815484)/cos(0.40766091390815484)

-cos(-2.191048040846826) != 2\*sin(-2.191048040846826/2)\*cos(-2.191048040846826/2)

-cos(1.4465887463678806) != sin(1.4465887463678806)\*sin(1.4465887463678806)

-cos(0.23782770446826573) != 1-(cos(0.23782770446826573) \* cos(0.23782770446826573))

-cos(-1.4990742704988518) != (1-cos(2\*-1.4990742704988518))/(2)

-tan(-3.0664556685314883) != sin(-3.0664556685314883)

-tan(2.398366379126789) != cos(2.398366379126789)

-tan(2.211078610994109) != tan(2.211078610994109)

-tan(0.6225810426129987) != mpmath.sec(0.6225810426129987)

-tan(0.9091262743896857) != -sin(0.9091262743896857)

-tan(-2.7703598430625913) != -cos(-2.7703598430625913)

-tan(2.0811473939435103) != sin(-2.0811473939435103)

-tan(0.3084372571782956) != cos(-0.3084372571782956)

-tan(-1.1015000265915695) = tan(--1.1015000265915695)

-tan(0.940132414639292) != sin(0.940132414639292)/cos(0.940132414639292)

-tan(-1.8220396710472804) != 2\*sin(-1.8220396710472804/2)\*cos(-1.8220396710472804/2)

-tan(-2.69529134192703) != sin(-2.69529134192703)\*sin(-2.69529134192703)

-tan(-0.1516147877659768) != 1-(cos(-0.1516147877659768) \* cos(-0.1516147877659768))

-tan(1.5950204307513571) != (1-cos(2\*1.5950204307513571))/(2)

sin(-1.5779886651667425) != sin(1.5779886651667425)

sin(--0.6160617120500129) != cos(-0.6160617120500129)

sin(--0.6655301915613765) != tan(-0.6655301915613765)

sin(-1.831462297322302) != mpmath.sec(1.831462297322302)

sin(-2.4765404665770276) = -sin(2.4765404665770276)

sin(--0.21856949713635565) != -cos(-0.21856949713635565)

sin(--2.8758135348679854) != -tan(-2.8758135348679854)

sin(--1.8803011143847532) != cos(--1.8803011143847532)

sin(-2.432567749867019) != tan(-2.432567749867019)

sin(--2.268293320217573) != sin(-2.268293320217573)/cos(-2.268293320217573)

sin(-2.5464897407198794) != 2\*sin(2.5464897407198794/2)\*cos(2.5464897407198794/2)

sin(-1.477038466215065) != sin(1.477038466215065)\*sin(1.477038466215065)

sin(-2.2665826644905716) != 1-(cos(2.2665826644905716) \* cos(2.2665826644905716))

sin(--1.8048378998671466) != (1-cos(2\*-1.8048378998671466))/(2)

cos(-0.5561929805949144) != sin(0.5561929805949144)

cos(-2.7464932892821228) = cos(2.7464932892821228)

cos(--0.092614222056429) != tan(-0.092614222056429)

cos(-0.7299195751545837) != mpmath.sec(0.7299195751545837)

cos(-1.317812516629739) != -sin(1.317812516629739)

cos(--0.2921963474185283) != -cos(-0.2921963474185283)

cos(-1.4225483278681441) != -tan(1.4225483278681441)

cos(--1.4659907631147748) != sin(--1.4659907631147748)

cos(-2.2101078906460696) != tan(-2.2101078906460696)

cos(--1.5016082823109016) != sin(-1.5016082823109016)/cos(-1.5016082823109016)

cos(--0.8388823759820037) != 2\*sin(-0.8388823759820037/2)\*cos(-0.8388823759820037/2)

cos(-0.9584638159355254) != sin(0.9584638159355254)\*sin(0.9584638159355254)

cos(--2.7724226346601957) != 1-(cos(-2.7724226346601957) \* cos(-2.7724226346601957))

cos(--0.6889992783629277) != (1-cos(2\*-0.6889992783629277))/(2)

tan(-2.0329555265478874) != sin(2.0329555265478874)

tan(--1.8203874634788826) != cos(-1.8203874634788826)

tan(-1.2129995494775967) != tan(1.2129995494775967)

tan(--0.6749440307594288) != mpmath.sec(-0.6749440307594288)

tan(--1.6767484769046002) != -sin(-1.6767484769046002)

tan(--1.2745408134293892) != -cos(-1.2745408134293892)

tan(-0.39261539591014083) = -tan(0.39261539591014083)

tan(-1.7378583393076745) != sin(-1.7378583393076745)

tan(-3.0069407631713725) != cos(-3.0069407631713725)

tan(--0.8156670302978783) != sin(-0.8156670302978783)/cos(-0.8156670302978783)

tan(-2.517967094311354) != 2\*sin(2.517967094311354/2)\*cos(2.517967094311354/2)

tan(-0.35557540974941526) != sin(0.35557540974941526)\*sin(0.35557540974941526)

tan(--0.7922358922911319) != 1-(cos(-0.7922358922911319) \* cos(-0.7922358922911319))

tan(-2.2763045468185146) != (1-cos(2\*2.2763045468185146))/(2)

sin(2.286533789643606)/cos(2.286533789643606) != sin(2.286533789643606)

sin(-1.703802141296719)/cos(-1.703802141296719) != cos(-1.703802141296719)

sin(-1.18552605212909)/cos(-1.18552605212909) = tan(-1.18552605212909)

sin(2.2101568410595904)/cos(2.2101568410595904) != mpmath.sec(2.2101568410595904)

sin(-2.740886822324631)/cos(-2.740886822324631) != -sin(-2.740886822324631)

sin(-0.9347829546235027)/cos(-0.9347829546235027) != -cos(-0.9347829546235027)

sin(-2.3482244423791627)/cos(-2.3482244423791627) != -tan(-2.3482244423791627)

sin(-2.482856080881147)/cos(-2.482856080881147) != sin(--2.482856080881147)

sin(-2.51238515553174)/cos(-2.51238515553174) != cos(--2.51238515553174)

sin(-2.6359263799658157)/cos(-2.6359263799658157) != tan(--2.6359263799658157)

sin(-1.9390706900648265)/cos(-1.9390706900648265) != 2\*sin(-1.9390706900648265/2)\*cos(-1.9390706900648265/2)

sin(-2.718976795271415)/cos(-2.718976795271415) != sin(-2.718976795271415)\*sin(-2.718976795271415)

sin(-0.2069339396967429)/cos(-0.2069339396967429) != 1-(cos(-0.2069339396967429) \* cos(-0.2069339396967429))

sin(-2.9456136196465748)/cos(-2.9456136196465748) != (1-cos(2\*-2.9456136196465748))/(2)

2\*sin(1.9001789682798407/2)\*cos(1.9001789682798407/2) = sin(1.9001789682798407)

2\*sin(3.119693684954785/2)\*cos(3.119693684954785/2) != cos(3.119693684954785)

2\*sin(2.571417589546442/2)\*cos(2.571417589546442/2) != tan(2.571417589546442)

2\*sin(1.5115795063100101/2)\*cos(1.5115795063100101/2) != mpmath.sec(1.5115795063100101)

2\*sin(-0.4453000337895223/2)\*cos(-0.4453000337895223/2) != -sin(-0.4453000337895223)

2\*sin(1.330974173239352/2)\*cos(1.330974173239352/2) != -cos(1.330974173239352)

2\*sin(-2.2866719688512402/2)\*cos(-2.2866719688512402/2) != -tan(-2.2866719688512402)

2\*sin(0.44417655056131977/2)\*cos(0.44417655056131977/2) != sin(-0.44417655056131977)

2\*sin(-0.7128751020543214/2)\*cos(-0.7128751020543214/2) != cos(--0.7128751020543214)

2\*sin(2.1114055132658756/2)\*cos(2.1114055132658756/2) != tan(-2.1114055132658756)

2\*sin(-2.04958092875714/2)\*cos(-2.04958092875714/2) != sin(-2.04958092875714)/cos(-2.04958092875714)

2\*sin(1.089961772042514/2)\*cos(1.089961772042514/2) != sin(1.089961772042514)\*sin(1.089961772042514)

2\*sin(2.748487536470372/2)\*cos(2.748487536470372/2) != 1-(cos(2.748487536470372) \* cos(2.748487536470372))

2\*sin(-1.0044391047380934/2)\*cos(-1.0044391047380934/2) != (1-cos(2\*-1.0044391047380934))/(2)

sin(-2.7770523767815534)\*sin(-2.7770523767815534) != sin(-2.7770523767815534)

sin(1.727726002289562)\*sin(1.727726002289562) != cos(1.727726002289562)

sin(-0.22980046377516583)\*sin(-0.22980046377516583) != tan(-0.22980046377516583)

sin(0.36814997442738084)\*sin(0.36814997442738084) != mpmath.sec(0.36814997442738084)

sin(1.7327206094497472)\*sin(1.7327206094497472) != -sin(1.7327206094497472)

sin(-2.7634486098798545)\*sin(-2.7634486098798545) != -cos(-2.7634486098798545)

sin(1.9520034370223476)\*sin(1.9520034370223476) != -tan(1.9520034370223476)

sin(2.9302561417053523)\*sin(2.9302561417053523) != sin(-2.9302561417053523)

sin(-2.9987542629266946)\*sin(-2.9987542629266946) != cos(--2.9987542629266946)

sin(-3.089243668538872)\*sin(-3.089243668538872) != tan(--3.089243668538872)

sin(-0.7423209359120788)\*sin(-0.7423209359120788) != sin(-0.7423209359120788)/cos(-0.7423209359120788)

sin(2.602988713419019)\*sin(2.602988713419019) != 2\*sin(2.602988713419019/2)\*cos(2.602988713419019/2)

sin(-0.3237787770642182)\*sin(-0.3237787770642182) = 1-(cos(-0.3237787770642182) \* cos(-0.3237787770642182))

sin(0.23266817229939551)\*sin(0.23266817229939551) = (1-cos(2\*0.23266817229939551))/(2)

1-(cos(2.7463115513241716) \* cos(2.7463115513241716)) != sin(2.7463115513241716)

1-(cos(-0.7322284926194307) \* cos(-0.7322284926194307)) != cos(-0.7322284926194307)

1-(cos(-2.84024747423754) \* cos(-2.84024747423754)) != tan(-2.84024747423754)

1-(cos(-3.1345049193845305) \* cos(-3.1345049193845305)) != mpmath.sec(-3.1345049193845305)

1-(cos(-0.4513370986637999) \* cos(-0.4513370986637999)) != -sin(-0.4513370986637999)

1-(cos(0.8190020212525613) \* cos(0.8190020212525613)) != -cos(0.8190020212525613)

1-(cos(-3.0810931312905216) \* cos(-3.0810931312905216)) != -tan(-3.0810931312905216)

1-(cos(2.2441156475037296) \* cos(2.2441156475037296)) != sin(-2.2441156475037296)

1-(cos(1.3828929374158658) \* cos(1.3828929374158658)) != cos(-1.3828929374158658)

1-(cos(-1.1761397152318698) \* cos(-1.1761397152318698)) != tan(--1.1761397152318698)

1-(cos(1.8933878534908155) \* cos(1.8933878534908155)) != sin(1.8933878534908155)/cos(1.8933878534908155)

1-(cos(0.249725904958086) \* cos(0.249725904958086)) != 2\*sin(0.249725904958086/2)\*cos(0.249725904958086/2)

1-(cos(1.6910347719510384) \* cos(1.6910347719510384)) = sin(1.6910347719510384)\*sin(1.6910347719510384)

1-(cos(0.2955815452512929) \* cos(0.2955815452512929)) = (1-cos(2\*0.2955815452512929))/(2)

(1-cos(2\*-0.1776268550014639))/(2) != sin(-0.1776268550014639)

(1-cos(2\*-0.5790634833614052))/(2) != cos(-0.5790634833614052)

(1-cos(2\*-1.6016917406589473))/(2) != tan(-1.6016917406589473)

(1-cos(2\*2.9936859616152214))/(2) != mpmath.sec(2.9936859616152214)

(1-cos(2\*-1.4275608980123125))/(2) != -sin(-1.4275608980123125)

(1-cos(2\*1.2704430194375922))/(2) != -cos(1.2704430194375922)

(1-cos(2\*-1.3498946367972304))/(2) != -tan(-1.3498946367972304)

(1-cos(2\*-0.6807290483459143))/(2) != sin(--0.6807290483459143)

(1-cos(2\*2.1615414736491534))/(2) != cos(-2.1615414736491534)

(1-cos(2\*2.60507565273371))/(2) != tan(-2.60507565273371)

(1-cos(2\*-1.2101927053445807))/(2) != sin(-1.2101927053445807)/cos(-1.2101927053445807)

(1-cos(2\*-2.6840208432851993))/(2) != 2\*sin(-2.6840208432851993/2)\*cos(-2.6840208432851993/2)

(1-cos(2\*-0.11673818077098419))/(2) = sin(-0.11673818077098419)\*sin(-0.11673818077098419)

(1-cos(2\*3.133571213468792))/(2) = 1-(cos(3.133571213468792) \* cos(3.133571213468792))

(1)/(cos(1.6308478542506641)) != sin(1.6308478542506641)

(1)/(cos(1.2916799185030712)) != cos(1.2916799185030712)

(1)/(cos(2.3171931328177457)) != tan(2.3171931328177457)

(1)/(cos(-0.2499606994432102)) = mpmath.sec(-0.2499606994432102)

(1)/(cos(1.7188194220925643)) != -sin(1.7188194220925643)

(1)/(cos(2.139790045527646)) != -cos(2.139790045527646)

(1)/(cos(2.1293185212809567)) != -tan(2.1293185212809567)

(1)/(cos(-2.9989302135576126)) != sin(--2.9989302135576126)

(1)/(cos(2.242433547171369)) != cos(-2.242433547171369)

(1)/(cos(-2.311993024067352)) != tan(--2.311993024067352)

(1)/(cos(-1.443973308705566)) != sin(-1.443973308705566)/cos(-1.443973308705566)

(1)/(cos(2.703457196770697)) != 2\*sin(2.703457196770697/2)\*cos(2.703457196770697/2)

(1)/(cos(-1.4096516255545306)) != sin(-1.4096516255545306)\*sin(-1.4096516255545306)

(1)/(cos(0.408437582028923)) != 1-(cos(0.408437582028923) \* cos(0.408437582028923))

(1)/(cos(-2.5437473274209923)) != (1-cos(2\*-2.5437473274209923))/(2)

PARTITION SUBSETSUM

[54, 21, 36, 26, 98, 20, 83, 49, 5, 69, 43, 51, 47, 67, 17, 40, 48, 99, 65, 61, 38, 44, 45, 25, 55, 23, 62, 76, 56, 93, 46, 28, 39, 42, 30, 29, 74, 18, 96, 3]

Sum of S: 1921

Partition does not exist

False

Time: 2.8160000056232093e-05

**N = 50**

DISCOVER TRIG IDENTITIES

Identities read from file:

['sin(x)', 'cos(x)', 'tan(x)', 'sec(x)', '-sin(x)', '-cos(x)', '-tan(x)', 'sin(-x)', 'cos(-x)', 'tan(-x)', 'sin(x)/cos(x)', '2\*sin(x/2)\*cos(x/2)', 'sin(x)\*sin(x)', '1-(cos(x) \* cos(x))', '(1-cos(2\*x))/(2)', '(1)/(cos(x))']

Equivalent Identities

sin(x) = 2\*sin(x/2)\*cos(x/2)

cos(x) = cos(-x)

tan(x) = sin(x)/cos(x)

-sin(x) = sin(-x)

-tan(x) = tan(-x)

sin(-x) = -sin(x)

cos(-x) = cos(x)

tan(-x) = -tan(x)

sin(x)/cos(x) = tan(x)

2\*sin(x/2)\*cos(x/2) = sin(x)

sin(x)\*sin(x) = 1-(cos(x) \* cos(x))

sin(x)\*sin(x) = (1-cos(2\*x))/(2)

1-(cos(x) \* cos(x)) = sin(x)\*sin(x)

1-(cos(x) \* cos(x)) = (1-cos(2\*x))/(2)

(1-cos(2\*x))/(2) = sin(x)\*sin(x)

(1-cos(2\*x))/(2) = 1-(cos(x) \* cos(x))

(1)/(cos(x)) = sec(x)

Time: 0.5863657929999135

Found: 17

Test Equalties:

sin(-1.7254465970081965) != cos(-1.7254465970081965)

sin(0.8734075732852533) != tan(0.8734075732852533)

sin(-0.7069070916039566) != mpmath.sec(-0.7069070916039566)

sin(-2.773860785663193) != -sin(-2.773860785663193)

sin(2.631911783215603) != -cos(2.631911783215603)

sin(3.1179257692309443) = -tan(3.1179257692309443)

sin(2.6198242655474147) != sin(-2.6198242655474147)

sin(0.8910159863828531) != cos(-0.8910159863828531)

sin(-1.9791741585655755) != tan(--1.9791741585655755)

sin(0.8937489358046884) != sin(0.8937489358046884)/cos(0.8937489358046884)

sin(-2.6559492505047526) = 2\*sin(-2.6559492505047526/2)\*cos(-2.6559492505047526/2)

sin(2.4353397378408594) != sin(2.4353397378408594)\*sin(2.4353397378408594)

sin(0.3444736672840363) != 1-(cos(0.3444736672840363) \* cos(0.3444736672840363))

sin(1.598720035124554) != (1-cos(2\*1.598720035124554))/(2)

cos(0.9385978465455258) != sin(0.9385978465455258)

cos(-2.6191603444263243) != tan(-2.6191603444263243)

cos(-1.405524828312596) != mpmath.sec(-1.405524828312596)

cos(-0.42676585622049146) != -sin(-0.42676585622049146)

cos(1.8545403454698235) != -cos(1.8545403454698235)

cos(-0.7919374877005425) != -tan(-0.7919374877005425)

cos(-2.739005352509099) != sin(--2.739005352509099)

cos(2.8234196444661466) = cos(-2.8234196444661466)

cos(-0.32752561947836645) != tan(--0.32752561947836645)

cos(0.07115269272184044) != sin(0.07115269272184044)/cos(0.07115269272184044)

cos(-2.564566054244293) != 2\*sin(-2.564566054244293/2)\*cos(-2.564566054244293/2)

cos(-0.6157191850824786) != sin(-0.6157191850824786)\*sin(-0.6157191850824786)

cos(2.688020923904559) != 1-(cos(2.688020923904559) \* cos(2.688020923904559))

cos(0.33364755478658603) != (1-cos(2\*0.33364755478658603))/(2)

tan(-2.21590603730892) != sin(-2.21590603730892)

tan(1.1303037084984426) != cos(1.1303037084984426)

tan(-1.061226090023363) != mpmath.sec(-1.061226090023363)

tan(2.701777681855032) != -sin(2.701777681855032)

tan(2.5772940383156184) != -cos(2.5772940383156184)

tan(0.9347415481530339) != -tan(0.9347415481530339)

tan(-0.15227583832133007) != sin(--0.15227583832133007)

tan(1.0272445895572542) != cos(-1.0272445895572542)

tan(-2.5349025391954916) != tan(--2.5349025391954916)

tan(0.35632962995923023) = sin(0.35632962995923023)/cos(0.35632962995923023)

tan(-1.1334248036606276) != 2\*sin(-1.1334248036606276/2)\*cos(-1.1334248036606276/2)

tan(0.7474929777194768) != sin(0.7474929777194768)\*sin(0.7474929777194768)

tan(-0.2807367440120849) != 1-(cos(-0.2807367440120849) \* cos(-0.2807367440120849))

tan(0.6001167853087064) != (1-cos(2\*0.6001167853087064))/(2)

mpmath.sec(2.480132370753844) != sin(2.480132370753844)

mpmath.sec(-1.719702965492976) != cos(-1.719702965492976)

mpmath.sec(0.4201597971670723) != tan(0.4201597971670723)

mpmath.sec(-1.2042886254815761) != -sin(-1.2042886254815761)

mpmath.sec(0.295706998627181) != -cos(0.295706998627181)

mpmath.sec(1.1619285805610469) != -tan(1.1619285805610469)

mpmath.sec(2.830107095346241) != sin(-2.830107095346241)

mpmath.sec(2.1299977091795483) != cos(-2.1299977091795483)

mpmath.sec(2.221143462024111) != tan(-2.221143462024111)

mpmath.sec(0.7525954926963352) != sin(0.7525954926963352)/cos(0.7525954926963352)

mpmath.sec(-0.5255585779132916) != 2\*sin(-0.5255585779132916/2)\*cos(-0.5255585779132916/2)

mpmath.sec(-2.8963443771596435) != sin(-2.8963443771596435)\*sin(-2.8963443771596435)

mpmath.sec(2.385384513527674) != 1-(cos(2.385384513527674) \* cos(2.385384513527674))

mpmath.sec(-1.6736445695590356) != (1-cos(2\*-1.6736445695590356))/(2)

-sin(-0.08551043690264937) != sin(-0.08551043690264937)

-sin(0.2273333982876582) != cos(0.2273333982876582)

-sin(-0.31824386694906037) != tan(-0.31824386694906037)

-sin(2.320451052148319) != mpmath.sec(2.320451052148319)

-sin(1.8258369744490146) != -cos(1.8258369744490146)

-sin(0.4997634374765072) != -tan(0.4997634374765072)

-sin(1.43877824161477) = sin(-1.43877824161477)

-sin(-0.32484028002060095) != cos(--0.32484028002060095)

-sin(-3.001451678924069) != tan(--3.001451678924069)

-sin(-2.1532749420927226) != sin(-2.1532749420927226)/cos(-2.1532749420927226)

-sin(-1.4121052331273982) != 2\*sin(-1.4121052331273982/2)\*cos(-1.4121052331273982/2)

-sin(1.0939872222264562) != sin(1.0939872222264562)\*sin(1.0939872222264562)

-sin(1.6471157039324833) != 1-(cos(1.6471157039324833) \* cos(1.6471157039324833))

-sin(-1.9578201050416302) != (1-cos(2\*-1.9578201050416302))/(2)

-cos(-0.73113976767474) != sin(-0.73113976767474)

-cos(-2.3927964426551673) != cos(-2.3927964426551673)

-cos(0.2825124363679943) != tan(0.2825124363679943)

-cos(-0.9254540972768401) != mpmath.sec(-0.9254540972768401)

-cos(-1.5585047322351868) != -sin(-1.5585047322351868)

-cos(-1.1337537718336423) != -tan(-1.1337537718336423)

-cos(-0.9036941100187517) != sin(--0.9036941100187517)

-cos(2.184051776352532) != cos(-2.184051776352532)

-cos(-2.643089253281295) != tan(--2.643089253281295)

-cos(0.4562377261834949) != sin(0.4562377261834949)/cos(0.4562377261834949)

-cos(-2.5408550843648734) != 2\*sin(-2.5408550843648734/2)\*cos(-2.5408550843648734/2)

-cos(-0.8467936405906058) != sin(-0.8467936405906058)\*sin(-0.8467936405906058)

-cos(-1.4077607770182263) != 1-(cos(-1.4077607770182263) \* cos(-1.4077607770182263))

-cos(0.15545554478205315) != (1-cos(2\*0.15545554478205315))/(2)

-tan(-1.0739038525139701) != sin(-1.0739038525139701)

-tan(-1.3005026696349309) != cos(-1.3005026696349309)

-tan(-2.6287502467872614) != tan(-2.6287502467872614)

-tan(-0.2412793432741518) != mpmath.sec(-0.2412793432741518)

-tan(2.4790120721050233) != -sin(2.4790120721050233)

-tan(-2.601304630853952) != -cos(-2.601304630853952)

-tan(1.5836053671066894) != sin(-1.5836053671066894)

-tan(0.09493590980527289) != cos(-0.09493590980527289)

-tan(2.253404926583479) = tan(-2.253404926583479)

-tan(-2.017377459327868) != sin(-2.017377459327868)/cos(-2.017377459327868)

-tan(-2.729143505114469) != 2\*sin(-2.729143505114469/2)\*cos(-2.729143505114469/2)

-tan(0.39104633608832584) != sin(0.39104633608832584)\*sin(0.39104633608832584)

-tan(0.3060607850960131) != 1-(cos(0.3060607850960131) \* cos(0.3060607850960131))

-tan(2.4861678718672033) != (1-cos(2\*2.4861678718672033))/(2)

sin(--2.684804479632076) != sin(-2.684804479632076)

sin(-1.5518347151709388) != cos(1.5518347151709388)

sin(-2.797260368292629) != tan(2.797260368292629)

sin(--0.8437328574018785) != mpmath.sec(-0.8437328574018785)

sin(--0.6155365349055346) = -sin(-0.6155365349055346)

sin(--0.8543249596796252) != -cos(-0.8543249596796252)

sin(--1.7179235627488936) != -tan(-1.7179235627488936)

sin(-0.6987892213805775) != cos(-0.6987892213805775)

sin(--2.5610847213414467) != tan(--2.5610847213414467)

sin(-0.8011157714314621) != sin(0.8011157714314621)/cos(0.8011157714314621)

sin(--0.7813820253855259) != 2\*sin(-0.7813820253855259/2)\*cos(-0.7813820253855259/2)

sin(--0.7894588328581298) != sin(-0.7894588328581298)\*sin(-0.7894588328581298)

sin(--2.728185712596573) != 1-(cos(-2.728185712596573) \* cos(-2.728185712596573))

sin(--1.261217686877076) != (1-cos(2\*-1.261217686877076))/(2)

cos(-1.4368289007805641) != sin(1.4368289007805641)

cos(-3.059615319163033) = cos(3.059615319163033)

cos(--1.9706817261331522) != tan(-1.9706817261331522)

cos(--0.39056239172226626) != mpmath.sec(-0.39056239172226626)

cos(-1.1497719078086446) != -sin(1.1497719078086446)

cos(--0.9350693691487066) != -cos(-0.9350693691487066)

cos(--0.5399714439721257) != -tan(-0.5399714439721257)

cos(--0.014869894034926112) != sin(--0.014869894034926112)

cos(-0.09598362561391927) != tan(-0.09598362561391927)

cos(--1.5657157214618065) != sin(-1.5657157214618065)/cos(-1.5657157214618065)

cos(-0.07938602164485697) != 2\*sin(0.07938602164485697/2)\*cos(0.07938602164485697/2)

cos(-0.6441296947525541) != sin(0.6441296947525541)\*sin(0.6441296947525541)

cos(--0.930065784985171) != 1-(cos(-0.930065784985171) \* cos(-0.930065784985171))

cos(--0.6366889536228819) != (1-cos(2\*-0.6366889536228819))/(2)

tan(--2.163873524909998) != sin(-2.163873524909998)

tan(-2.972807756023135) != cos(2.972807756023135)

tan(--1.5229391483173358) != tan(-1.5229391483173358)

tan(--1.5891768610787085) != mpmath.sec(-1.5891768610787085)

tan(-1.6167091825143798) != -sin(1.6167091825143798)

tan(-2.7929864437259404) != -cos(2.7929864437259404)

tan(-2.3821542197173784) = -tan(2.3821542197173784)

tan(-0.4793819274211928) != sin(-0.4793819274211928)

tan(-1.3984731776066788) != cos(-1.3984731776066788)

tan(-1.510764348638335) != sin(1.510764348638335)/cos(1.510764348638335)

tan(--2.924823485908041) != 2\*sin(-2.924823485908041/2)\*cos(-2.924823485908041/2)

tan(-3.0429016430515112) != sin(3.0429016430515112)\*sin(3.0429016430515112)

tan(--2.0924896098932084) != 1-(cos(-2.0924896098932084) \* cos(-2.0924896098932084))

tan(-2.829962576772963) != (1-cos(2\*2.829962576772963))/(2)

sin(0.0471397201928454)/cos(0.0471397201928454) = sin(0.0471397201928454)

sin(-2.1541211219043195)/cos(-2.1541211219043195) != cos(-2.1541211219043195)

sin(1.4142390109629037)/cos(1.4142390109629037) = tan(1.4142390109629037)

sin(2.9651222400937964)/cos(2.9651222400937964) != mpmath.sec(2.9651222400937964)

sin(-1.505379043028694)/cos(-1.505379043028694) != -sin(-1.505379043028694)

sin(-0.22403304405687585)/cos(-0.22403304405687585) != -cos(-0.22403304405687585)

sin(-1.411245024296657)/cos(-1.411245024296657) != -tan(-1.411245024296657)

sin(-1.0550557350848542)/cos(-1.0550557350848542) != sin(--1.0550557350848542)

sin(2.331668279408899)/cos(2.331668279408899) != cos(-2.331668279408899)

sin(2.232605622185294)/cos(2.232605622185294) != tan(-2.232605622185294)

sin(-2.489959538453305)/cos(-2.489959538453305) != 2\*sin(-2.489959538453305/2)\*cos(-2.489959538453305/2)

sin(-0.027340625184543388)/cos(-0.027340625184543388) != sin(-0.027340625184543388)\*sin(-0.027340625184543388)

sin(2.632459708531397)/cos(2.632459708531397) != 1-(cos(2.632459708531397) \* cos(2.632459708531397))

sin(-1.2835917312534388)/cos(-1.2835917312534388) != (1-cos(2\*-1.2835917312534388))/(2)

2\*sin(2.4005845933078884/2)\*cos(2.4005845933078884/2) = sin(2.4005845933078884)

2\*sin(-2.3647267894070287/2)\*cos(-2.3647267894070287/2) != cos(-2.3647267894070287)

2\*sin(-0.2774019948693329/2)\*cos(-0.2774019948693329/2) != tan(-0.2774019948693329)

2\*sin(3.088179060647117/2)\*cos(3.088179060647117/2) != mpmath.sec(3.088179060647117)

2\*sin(1.9448149250923947/2)\*cos(1.9448149250923947/2) != -sin(1.9448149250923947)

2\*sin(0.20829272657101283/2)\*cos(0.20829272657101283/2) != -cos(0.20829272657101283)

2\*sin(2.6822083859480745/2)\*cos(2.6822083859480745/2) != -tan(2.6822083859480745)

2\*sin(1.983140857094865/2)\*cos(1.983140857094865/2) != sin(-1.983140857094865)

2\*sin(-2.0093700112203066/2)\*cos(-2.0093700112203066/2) != cos(--2.0093700112203066)

2\*sin(2.241017517115128/2)\*cos(2.241017517115128/2) != tan(-2.241017517115128)

2\*sin(-2.932303989379958/2)\*cos(-2.932303989379958/2) != sin(-2.932303989379958)/cos(-2.932303989379958)

2\*sin(1.9741171185103292/2)\*cos(1.9741171185103292/2) != sin(1.9741171185103292)\*sin(1.9741171185103292)

2\*sin(-2.323057468135999/2)\*cos(-2.323057468135999/2) != 1-(cos(-2.323057468135999) \* cos(-2.323057468135999))

2\*sin(1.3407864729774381/2)\*cos(1.3407864729774381/2) != (1-cos(2\*1.3407864729774381))/(2)

sin(-0.942349218208355)\*sin(-0.942349218208355) != sin(-0.942349218208355)

sin(2.927034515660613)\*sin(2.927034515660613) != cos(2.927034515660613)

sin(2.7179989761108683)\*sin(2.7179989761108683) != tan(2.7179989761108683)

sin(-1.9882783812704807)\*sin(-1.9882783812704807) != mpmath.sec(-1.9882783812704807)

sin(-1.686264620461653)\*sin(-1.686264620461653) != -sin(-1.686264620461653)

sin(1.2543785288454616)\*sin(1.2543785288454616) != -cos(1.2543785288454616)

sin(-2.547673531063151)\*sin(-2.547673531063151) != -tan(-2.547673531063151)

sin(2.152919905752544)\*sin(2.152919905752544) != sin(-2.152919905752544)

sin(-2.680912350255872)\*sin(-2.680912350255872) != cos(--2.680912350255872)

sin(2.207651668295986)\*sin(2.207651668295986) != tan(-2.207651668295986)

sin(2.4991259266665296)\*sin(2.4991259266665296) != sin(2.4991259266665296)/cos(2.4991259266665296)

sin(2.3969494635431134)\*sin(2.3969494635431134) != 2\*sin(2.3969494635431134/2)\*cos(2.3969494635431134/2)

sin(1.214993745053345)\*sin(1.214993745053345) = 1-(cos(1.214993745053345) \* cos(1.214993745053345))

sin(-0.5374370722436086)\*sin(-0.5374370722436086) = (1-cos(2\*-0.5374370722436086))/(2)

1-(cos(3.060626429160769) \* cos(3.060626429160769)) != sin(3.060626429160769)

1-(cos(-1.8544509713194501) \* cos(-1.8544509713194501)) != cos(-1.8544509713194501)

1-(cos(-1.0477853520301403) \* cos(-1.0477853520301403)) != tan(-1.0477853520301403)

1-(cos(-0.13316594064467946) \* cos(-0.13316594064467946)) != mpmath.sec(-0.13316594064467946)

1-(cos(2.0563029050722568) \* cos(2.0563029050722568)) != -sin(2.0563029050722568)

1-(cos(-2.004262902483161) \* cos(-2.004262902483161)) != -cos(-2.004262902483161)

1-(cos(0.31140677404291806) \* cos(0.31140677404291806)) != -tan(0.31140677404291806)

1-(cos(2.5091538427121485) \* cos(2.5091538427121485)) != sin(-2.5091538427121485)

1-(cos(1.0989328206270592) \* cos(1.0989328206270592)) != cos(-1.0989328206270592)

1-(cos(1.0232592661715296) \* cos(1.0232592661715296)) != tan(-1.0232592661715296)

1-(cos(1.7996664875448607) \* cos(1.7996664875448607)) != sin(1.7996664875448607)/cos(1.7996664875448607)

1-(cos(-3.061755902932017) \* cos(-3.061755902932017)) != 2\*sin(-3.061755902932017/2)\*cos(-3.061755902932017/2)

1-(cos(1.8029995787743003) \* cos(1.8029995787743003)) = sin(1.8029995787743003)\*sin(1.8029995787743003)

1-(cos(2.33925815638513) \* cos(2.33925815638513)) = (1-cos(2\*2.33925815638513))/(2)

(1-cos(2\*-1.910248845097979))/(2) != sin(-1.910248845097979)

(1-cos(2\*-2.785728155252536))/(2) != cos(-2.785728155252536)

(1-cos(2\*0.19675642427293738))/(2) != tan(0.19675642427293738)

(1-cos(2\*-0.1358040717510498))/(2) != mpmath.sec(-0.1358040717510498)

(1-cos(2\*-0.10252035825579764))/(2) != -sin(-0.10252035825579764)

(1-cos(2\*1.6783966329347138))/(2) != -cos(1.6783966329347138)

(1-cos(2\*-2.075021110028716))/(2) != -tan(-2.075021110028716)

(1-cos(2\*1.3710234737847529))/(2) != sin(-1.3710234737847529)

(1-cos(2\*-2.995241346794834))/(2) != cos(--2.995241346794834)

(1-cos(2\*-2.1717934445965885))/(2) != tan(--2.1717934445965885)

(1-cos(2\*2.523663940412894))/(2) != sin(2.523663940412894)/cos(2.523663940412894)

(1-cos(2\*0.0926139215974704))/(2) != 2\*sin(0.0926139215974704/2)\*cos(0.0926139215974704/2)

(1-cos(2\*2.369882367513722))/(2) = sin(2.369882367513722)\*sin(2.369882367513722)

(1-cos(2\*3.006941310051258))/(2) = 1-(cos(3.006941310051258) \* cos(3.006941310051258))

(1)/(cos(-2.6664769032638294)) != sin(-2.6664769032638294)

(1)/(cos(2.9736694602618785)) != cos(2.9736694602618785)

(1)/(cos(2.5867014635399377)) != tan(2.5867014635399377)

(1)/(cos(-2.16297263643114)) = mpmath.sec(-2.16297263643114)

(1)/(cos(0.8212527121282132)) != -sin(0.8212527121282132)

(1)/(cos(1.2369880664523096)) != -cos(1.2369880664523096)

(1)/(cos(-1.1069353466036014)) != -tan(-1.1069353466036014)

(1)/(cos(0.585435361476105)) != sin(-0.585435361476105)

(1)/(cos(2.236431894039442)) != cos(-2.236431894039442)

(1)/(cos(-0.396760925363457)) != tan(--0.396760925363457)

(1)/(cos(0.6222695351443348)) != sin(0.6222695351443348)/cos(0.6222695351443348)

(1)/(cos(-1.3990327189387786)) != 2\*sin(-1.3990327189387786/2)\*cos(-1.3990327189387786/2)

(1)/(cos(2.870884866938228)) != sin(2.870884866938228)\*sin(2.870884866938228)

(1)/(cos(3.1104548812111883)) != 1-(cos(3.1104548812111883) \* cos(3.1104548812111883))

(1)/(cos(-0.7620986726206662)) != (1-cos(2\*-0.7620986726206662))/(2)

PARTITION SUBSETSUM

[0, 73, 37, 78, 58, 44, 84, 11, 31, 40, 98, 96, 82, 92, 97, 49, 64, 51, 7, 70, 53, 19, 83, 54, 76, 72, 14, 93, 21, 25, 23, 69, 91, 65, 38, 5, 50, 33, 71, 52, 94, 74, 41, 59, 28, 13, 1, 10, 77, 9]

Sum of S: 2575

Partition does not exist

False

Time: 2.8587000088009518e-05

**N = 60**

DISCOVER TRIG IDENTITIES

Identities read from file:

['sin(x)', 'cos(x)', 'tan(x)', 'sec(x)', '-sin(x)', '-cos(x)', '-tan(x)', 'sin(-x)', 'cos(-x)', 'tan(-x)', 'sin(x)/cos(x)', '2\*sin(x/2)\*cos(x/2)', 'sin(x)\*sin(x)', '1-(cos(x) \* cos(x))', '(1-cos(2\*x))/(2)', '(1)/(cos(x))']

Equivalent Identities

sin(x) = 2\*sin(x/2)\*cos(x/2)

cos(x) = cos(-x)

tan(x) = sin(x)/cos(x)

-sin(x) = sin(-x)

-tan(x) = tan(-x)

sin(-x) = -sin(x)

cos(-x) = cos(x)

tan(-x) = -tan(x)

sin(x)/cos(x) = tan(x)

2\*sin(x/2)\*cos(x/2) = sin(x)

sin(x)\*sin(x) = 1-(cos(x) \* cos(x))

sin(x)\*sin(x) = (1-cos(2\*x))/(2)

1-(cos(x) \* cos(x)) = sin(x)\*sin(x)

1-(cos(x) \* cos(x)) = (1-cos(2\*x))/(2)

(1-cos(2\*x))/(2) = sin(x)\*sin(x)

(1-cos(2\*x))/(2) = 1-(cos(x) \* cos(x))

(1)/(cos(x)) = sec(x)

Time: 0.8733193620000748

Found: 17

Test Equalties:

sin(-2.5350211978949524) != cos(-2.5350211978949524)

sin(-3.127256961610928) != tan(-3.127256961610928)

sin(-3.0698869798839103) != mpmath.sec(-3.0698869798839103)

sin(2.578240358942894) != -sin(2.578240358942894)

sin(0.27932429695991967) != -cos(0.27932429695991967)

sin(2.308256357051211) != -tan(2.308256357051211)

sin(-2.8641846752092426) != sin(--2.8641846752092426)

sin(-0.2577180350395878) != cos(--0.2577180350395878)

sin(-2.278210842620311) != tan(--2.278210842620311)

sin(0.2594587347205368) != sin(0.2594587347205368)/cos(0.2594587347205368)

sin(0.8682343007175772) = 2\*sin(0.8682343007175772/2)\*cos(0.8682343007175772/2)

sin(0.2209080783702735) != sin(0.2209080783702735)\*sin(0.2209080783702735)

sin(0.11517950675833744) != 1-(cos(0.11517950675833744) \* cos(0.11517950675833744))

sin(1.0264508205595844) != (1-cos(2\*1.0264508205595844))/(2)

cos(2.271950322693332) != sin(2.271950322693332)

cos(-2.0011216654782356) != tan(-2.0011216654782356)

cos(-0.25864560656390045) != mpmath.sec(-0.25864560656390045)

cos(1.6544885564533995) != -sin(1.6544885564533995)

cos(-0.32497522902374554) != -cos(-0.32497522902374554)

cos(-1.3875706856148127) != -tan(-1.3875706856148127)

cos(1.6965699880086982) != sin(-1.6965699880086982)

cos(2.2250226137451836) = cos(-2.2250226137451836)

cos(1.4248560865037199) != tan(-1.4248560865037199)

cos(-0.15678961748855968) != sin(-0.15678961748855968)/cos(-0.15678961748855968)

cos(0.20817758170367862) != 2\*sin(0.20817758170367862/2)\*cos(0.20817758170367862/2)

cos(0.10902643585721883) != sin(0.10902643585721883)\*sin(0.10902643585721883)

cos(0.596301957929728) != 1-(cos(0.596301957929728) \* cos(0.596301957929728))

cos(-1.9880340112726187) != (1-cos(2\*-1.9880340112726187))/(2)

tan(2.2084082608625124) != sin(2.2084082608625124)

tan(1.5150369981859884) != cos(1.5150369981859884)

tan(-1.0918417400094658) != mpmath.sec(-1.0918417400094658)

tan(-0.1263789065537022) != -sin(-0.1263789065537022)

tan(-1.3917950917092614) != -cos(-1.3917950917092614)

tan(-2.930365964744083) != -tan(-2.930365964744083)

tan(-1.7880643759924828) != sin(--1.7880643759924828)

tan(-0.131262259720498) != cos(--0.131262259720498)

tan(1.8126175780174494) != tan(-1.8126175780174494)

tan(-2.9482942944361406) = sin(-2.9482942944361406)/cos(-2.9482942944361406)

tan(2.7017135445515805) != 2\*sin(2.7017135445515805/2)\*cos(2.7017135445515805/2)

tan(1.1568057359441433) != sin(1.1568057359441433)\*sin(1.1568057359441433)

tan(1.5624994214029932) != 1-(cos(1.5624994214029932) \* cos(1.5624994214029932))

tan(1.1099484544412919) != (1-cos(2\*1.1099484544412919))/(2)

mpmath.sec(1.3972010797116754) != sin(1.3972010797116754)

mpmath.sec(2.1548179785929795) != cos(2.1548179785929795)

mpmath.sec(3.054547335277557) != tan(3.054547335277557)

mpmath.sec(-1.5674784838318536) != -sin(-1.5674784838318536)

mpmath.sec(-1.3378775648986347) != -cos(-1.3378775648986347)

mpmath.sec(1.6405232893284758) != -tan(1.6405232893284758)

mpmath.sec(0.9573294825363821) != sin(-0.9573294825363821)

mpmath.sec(2.027286335597168) != cos(-2.027286335597168)

mpmath.sec(0.12927523842859534) != tan(-0.12927523842859534)

mpmath.sec(1.0486544091706058) != sin(1.0486544091706058)/cos(1.0486544091706058)

mpmath.sec(-0.18039644442065095) != 2\*sin(-0.18039644442065095/2)\*cos(-0.18039644442065095/2)

mpmath.sec(-1.0603543265813862) != sin(-1.0603543265813862)\*sin(-1.0603543265813862)

mpmath.sec(0.39870691248888823) != 1-(cos(0.39870691248888823) \* cos(0.39870691248888823))

mpmath.sec(-0.7195226574475111) != (1-cos(2\*-0.7195226574475111))/(2)

-sin(2.3270993201324908) != sin(2.3270993201324908)

-sin(-1.124668957135463) != cos(-1.124668957135463)

-sin(-2.8027273099856096) != tan(-2.8027273099856096)

-sin(-1.103930045233708) != mpmath.sec(-1.103930045233708)

-sin(2.368579061908127) != -cos(2.368579061908127)

-sin(0.6382465862065207) != -tan(0.6382465862065207)

-sin(-2.5187852241796804) = sin(--2.5187852241796804)

-sin(-1.6416544041898533) != cos(--1.6416544041898533)

-sin(2.6438045696550665) != tan(-2.6438045696550665)

-sin(-0.7701142504976786) != sin(-0.7701142504976786)/cos(-0.7701142504976786)

-sin(-1.756273549627899) != 2\*sin(-1.756273549627899/2)\*cos(-1.756273549627899/2)

-sin(-2.739767716387816) != sin(-2.739767716387816)\*sin(-2.739767716387816)

-sin(-0.5308861535542224) != 1-(cos(-0.5308861535542224) \* cos(-0.5308861535542224))

-sin(-1.862534268018556) != (1-cos(2\*-1.862534268018556))/(2)

-cos(2.7108841767170233) != sin(2.7108841767170233)

-cos(-2.7868322207832965) != cos(-2.7868322207832965)

-cos(1.7973404874983796) != tan(1.7973404874983796)

-cos(2.4207009063538596) != mpmath.sec(2.4207009063538596)

-cos(1.9618638721107464) != -sin(1.9618638721107464)

-cos(-2.246423483669596) != -tan(-2.246423483669596)

-cos(3.0275229354011826) != sin(-3.0275229354011826)

-cos(3.0570650654166327) != cos(-3.0570650654166327)

-cos(-1.833394228830166) != tan(--1.833394228830166)

-cos(-2.4154751207474146) != sin(-2.4154751207474146)/cos(-2.4154751207474146)

-cos(-0.32749995353747563) != 2\*sin(-0.32749995353747563/2)\*cos(-0.32749995353747563/2)

-cos(0.5534254733842787) != sin(0.5534254733842787)\*sin(0.5534254733842787)

-cos(-1.7691682711824104) != 1-(cos(-1.7691682711824104) \* cos(-1.7691682711824104))

-cos(0.2197259336403814) != (1-cos(2\*0.2197259336403814))/(2)

-tan(-0.6927336187253537) != sin(-0.6927336187253537)

-tan(0.40142040005028834) != cos(0.40142040005028834)

-tan(-3.006627833271327) != tan(-3.006627833271327)

-tan(-3.022088517255052) != mpmath.sec(-3.022088517255052)

-tan(-0.6059615541022128) != -sin(-0.6059615541022128)

-tan(-2.8227700220269436) != -cos(-2.8227700220269436)

-tan(-1.0133698256587018) != sin(--1.0133698256587018)

-tan(1.3726717841660614) != cos(-1.3726717841660614)

-tan(-2.1908484207970575) = tan(--2.1908484207970575)

-tan(-1.680791780992689) != sin(-1.680791780992689)/cos(-1.680791780992689)

-tan(1.7254944380363133) != 2\*sin(1.7254944380363133/2)\*cos(1.7254944380363133/2)

-tan(-2.906847659269849) != sin(-2.906847659269849)\*sin(-2.906847659269849)

-tan(-1.7670991578365498) != 1-(cos(-1.7670991578365498) \* cos(-1.7670991578365498))

-tan(2.288584652792042) != (1-cos(2\*2.288584652792042))/(2)

sin(--3.085307010706418) != sin(-3.085307010706418)

sin(--1.1937737647876134) != cos(-1.1937737647876134)

sin(-0.10315061619225441) != tan(0.10315061619225441)

sin(-2.648448507377383) != mpmath.sec(2.648448507377383)

sin(--1.8933225830901155) = -sin(-1.8933225830901155)

sin(--2.0338580415076777) != -cos(-2.0338580415076777)

sin(-1.3439621765731733) != -tan(1.3439621765731733)

sin(--1.2033809905225226) != cos(--1.2033809905225226)

sin(--3.0165780049321067) != tan(--3.0165780049321067)

sin(--0.21077117363114928) != sin(-0.21077117363114928)/cos(-0.21077117363114928)

sin(-1.9701343071578474) != 2\*sin(1.9701343071578474/2)\*cos(1.9701343071578474/2)

sin(-0.5719848489006063) != sin(0.5719848489006063)\*sin(0.5719848489006063)

sin(-0.9748325996498499) != 1-(cos(0.9748325996498499) \* cos(0.9748325996498499))

sin(-1.2668545229045023) != (1-cos(2\*1.2668545229045023))/(2)

cos(--2.5800708833028096) != sin(-2.5800708833028096)

cos(-2.1462412245718347) = cos(2.1462412245718347)

cos(--1.9148358296792267) != tan(-1.9148358296792267)

cos(-2.84479647631526) != mpmath.sec(2.84479647631526)

cos(-0.6892555892005272) != -sin(0.6892555892005272)

cos(--1.068816424910033) != -cos(-1.068816424910033)

cos(-1.157695961842963) != -tan(1.157695961842963)

cos(-0.3201140783290457) != sin(-0.3201140783290457)

cos(-2.736426775191685) != tan(-2.736426775191685)

cos(--0.11485286855285004) != sin(-0.11485286855285004)/cos(-0.11485286855285004)

cos(-1.3437031873820304) != 2\*sin(1.3437031873820304/2)\*cos(1.3437031873820304/2)

cos(-2.7315778913109323) != sin(2.7315778913109323)\*sin(2.7315778913109323)

cos(-2.2011418205536213) != 1-(cos(2.2011418205536213) \* cos(2.2011418205536213))

cos(-0.2532345549059358) != (1-cos(2\*0.2532345549059358))/(2)

tan(-0.44557736155131744) != sin(0.44557736155131744)

tan(-2.503057232163968) != cos(2.503057232163968)

tan(--0.4247609429928425) != tan(-0.4247609429928425)

tan(-1.9507887169889377) != mpmath.sec(1.9507887169889377)

tan(--2.546752760388576) != -sin(-2.546752760388576)

tan(-0.8302478264189466) != -cos(0.8302478264189466)

tan(--0.17561501741852625) = -tan(-0.17561501741852625)

tan(--1.6531316570309518) != sin(--1.6531316570309518)

tan(-0.9530539710557164) != cos(-0.9530539710557164)

tan(--0.7901042705905352) != sin(-0.7901042705905352)/cos(-0.7901042705905352)

tan(-0.7206804081357112) != 2\*sin(0.7206804081357112/2)\*cos(0.7206804081357112/2)

tan(--2.2759081670143013) != sin(-2.2759081670143013)\*sin(-2.2759081670143013)

tan(--0.5573192468030452) != 1-(cos(-0.5573192468030452) \* cos(-0.5573192468030452))

tan(--1.7591183611566226) != (1-cos(2\*-1.7591183611566226))/(2)

sin(-0.11510559712834434)/cos(-0.11510559712834434) != sin(-0.11510559712834434)

sin(-0.6291469744856779)/cos(-0.6291469744856779) != cos(-0.6291469744856779)

sin(-1.4960329805193797)/cos(-1.4960329805193797) = tan(-1.4960329805193797)

sin(-0.7419634589244724)/cos(-0.7419634589244724) != mpmath.sec(-0.7419634589244724)

sin(-2.826321340726749)/cos(-2.826321340726749) != -sin(-2.826321340726749)

sin(-2.144345629742106)/cos(-2.144345629742106) != -cos(-2.144345629742106)

sin(-2.8880350215994803)/cos(-2.8880350215994803) != -tan(-2.8880350215994803)

sin(-1.6264128255072625)/cos(-1.6264128255072625) != sin(--1.6264128255072625)

sin(-2.3712634742759735)/cos(-2.3712634742759735) != cos(--2.3712634742759735)

sin(2.1180851000231096)/cos(2.1180851000231096) != tan(-2.1180851000231096)

sin(-0.1038990653713614)/cos(-0.1038990653713614) != 2\*sin(-0.1038990653713614/2)\*cos(-0.1038990653713614/2)

sin(-2.3051412747488267)/cos(-2.3051412747488267) != sin(-2.3051412747488267)\*sin(-2.3051412747488267)

sin(-0.15336866494234247)/cos(-0.15336866494234247) != 1-(cos(-0.15336866494234247) \* cos(-0.15336866494234247))

sin(1.9046317360139744)/cos(1.9046317360139744) != (1-cos(2\*1.9046317360139744))/(2)

2\*sin(0.17272358751540295/2)\*cos(0.17272358751540295/2) = sin(0.17272358751540295)

2\*sin(0.3981360780161123/2)\*cos(0.3981360780161123/2) != cos(0.3981360780161123)

2\*sin(3.0679141269369765/2)\*cos(3.0679141269369765/2) != tan(3.0679141269369765)

2\*sin(-2.3077042577180826/2)\*cos(-2.3077042577180826/2) != mpmath.sec(-2.3077042577180826)

2\*sin(2.734134743206325/2)\*cos(2.734134743206325/2) != -sin(2.734134743206325)

2\*sin(1.9424856416320369/2)\*cos(1.9424856416320369/2) != -cos(1.9424856416320369)

2\*sin(1.480531878290571/2)\*cos(1.480531878290571/2) != -tan(1.480531878290571)

2\*sin(0.5404002639501839/2)\*cos(0.5404002639501839/2) != sin(-0.5404002639501839)

2\*sin(-1.376563670491996/2)\*cos(-1.376563670491996/2) != cos(--1.376563670491996)

2\*sin(-0.9939560868186845/2)\*cos(-0.9939560868186845/2) != tan(--0.9939560868186845)

2\*sin(-2.1916010394272005/2)\*cos(-2.1916010394272005/2) != sin(-2.1916010394272005)/cos(-2.1916010394272005)

2\*sin(0.492071102160363/2)\*cos(0.492071102160363/2) != sin(0.492071102160363)\*sin(0.492071102160363)

2\*sin(-1.5190421055694228/2)\*cos(-1.5190421055694228/2) != 1-(cos(-1.5190421055694228) \* cos(-1.5190421055694228))

2\*sin(1.3396427947745266/2)\*cos(1.3396427947745266/2) != (1-cos(2\*1.3396427947745266))/(2)

sin(-2.561653822843803)\*sin(-2.561653822843803) != sin(-2.561653822843803)

sin(1.1050911919786728)\*sin(1.1050911919786728) != cos(1.1050911919786728)

sin(-1.143757879544955)\*sin(-1.143757879544955) != tan(-1.143757879544955)

sin(0.535678362370521)\*sin(0.535678362370521) != mpmath.sec(0.535678362370521)

sin(2.4111295579004297)\*sin(2.4111295579004297) != -sin(2.4111295579004297)

sin(-3.124476466657049)\*sin(-3.124476466657049) != -cos(-3.124476466657049)

sin(1.9190012857024792)\*sin(1.9190012857024792) != -tan(1.9190012857024792)

sin(0.13925658369191307)\*sin(0.13925658369191307) != sin(-0.13925658369191307)

sin(1.3127423486286531)\*sin(1.3127423486286531) != cos(-1.3127423486286531)

sin(-0.9825150778014833)\*sin(-0.9825150778014833) != tan(--0.9825150778014833)

sin(2.879286855017969)\*sin(2.879286855017969) != sin(2.879286855017969)/cos(2.879286855017969)

sin(-0.9724669686160587)\*sin(-0.9724669686160587) != 2\*sin(-0.9724669686160587/2)\*cos(-0.9724669686160587/2)

sin(1.0275485001530216)\*sin(1.0275485001530216) = 1-(cos(1.0275485001530216) \* cos(1.0275485001530216))

sin(2.877431627128292)\*sin(2.877431627128292) = (1-cos(2\*2.877431627128292))/(2)

1-(cos(1.4446519763898573) \* cos(1.4446519763898573)) != sin(1.4446519763898573)

1-(cos(-1.9673013352597761) \* cos(-1.9673013352597761)) != cos(-1.9673013352597761)

1-(cos(-0.47582282525944297) \* cos(-0.47582282525944297)) != tan(-0.47582282525944297)

1-(cos(-0.28492017389677127) \* cos(-0.28492017389677127)) != mpmath.sec(-0.28492017389677127)

1-(cos(-2.4989435765779398) \* cos(-2.4989435765779398)) != -sin(-2.4989435765779398)

1-(cos(-2.3670447683286677) \* cos(-2.3670447683286677)) != -cos(-2.3670447683286677)

1-(cos(-2.5115860580123472) \* cos(-2.5115860580123472)) != -tan(-2.5115860580123472)

1-(cos(-2.3623872077182164) \* cos(-2.3623872077182164)) != sin(--2.3623872077182164)

1-(cos(0.7823301275245957) \* cos(0.7823301275245957)) != cos(-0.7823301275245957)

1-(cos(-0.6177413165568466) \* cos(-0.6177413165568466)) != tan(--0.6177413165568466)

1-(cos(1.2524797224876583) \* cos(1.2524797224876583)) != sin(1.2524797224876583)/cos(1.2524797224876583)

1-(cos(1.3430658289544146) \* cos(1.3430658289544146)) != 2\*sin(1.3430658289544146/2)\*cos(1.3430658289544146/2)

1-(cos(2.8744888181313426) \* cos(2.8744888181313426)) = sin(2.8744888181313426)\*sin(2.8744888181313426)

1-(cos(1.770622490806998) \* cos(1.770622490806998)) = (1-cos(2\*1.770622490806998))/(2)

(1-cos(2\*-1.2077236899182127))/(2) != sin(-1.2077236899182127)

(1-cos(2\*2.144223454187361))/(2) != cos(2.144223454187361)

(1-cos(2\*-1.1745035330731404))/(2) != tan(-1.1745035330731404)

(1-cos(2\*-2.591676559127018))/(2) != mpmath.sec(-2.591676559127018)

(1-cos(2\*-0.8997212640337495))/(2) != -sin(-0.8997212640337495)

(1-cos(2\*0.0031935472455772995))/(2) != -cos(0.0031935472455772995)

(1-cos(2\*-0.10319049239489742))/(2) != -tan(-0.10319049239489742)

(1-cos(2\*-1.2373129393195264))/(2) != sin(--1.2373129393195264)

(1-cos(2\*-0.3952289664118074))/(2) != cos(--0.3952289664118074)

(1-cos(2\*-0.87000934697795))/(2) != tan(--0.87000934697795)

(1-cos(2\*1.8948666240672818))/(2) != sin(1.8948666240672818)/cos(1.8948666240672818)

(1-cos(2\*-1.1512420962993097))/(2) != 2\*sin(-1.1512420962993097/2)\*cos(-1.1512420962993097/2)

(1-cos(2\*2.2210065158713217))/(2) = sin(2.2210065158713217)\*sin(2.2210065158713217)

(1-cos(2\*2.7804229619665755))/(2) = 1-(cos(2.7804229619665755) \* cos(2.7804229619665755))

(1)/(cos(-0.9718436264407946)) != sin(-0.9718436264407946)

(1)/(cos(-3.0698916263006275)) != cos(-3.0698916263006275)

(1)/(cos(-1.2447447276484802)) != tan(-1.2447447276484802)

(1)/(cos(0.7391416583358508)) = mpmath.sec(0.7391416583358508)

(1)/(cos(-2.531428714540744)) != -sin(-2.531428714540744)

(1)/(cos(0.684181521300256)) != -cos(0.684181521300256)

(1)/(cos(1.0287500749467746)) != -tan(1.0287500749467746)

(1)/(cos(0.1373089727828365)) != sin(-0.1373089727828365)

(1)/(cos(-2.8514046706577405)) != cos(--2.8514046706577405)

(1)/(cos(-1.302428852368713)) != tan(--1.302428852368713)

(1)/(cos(1.166392674097792)) != sin(1.166392674097792)/cos(1.166392674097792)

(1)/(cos(-1.257031642511546)) != 2\*sin(-1.257031642511546/2)\*cos(-1.257031642511546/2)

(1)/(cos(1.0062639069885488)) != sin(1.0062639069885488)\*sin(1.0062639069885488)

(1)/(cos(0.28931712864660275)) != 1-(cos(0.28931712864660275) \* cos(0.28931712864660275))

(1)/(cos(-1.800348488069777)) != (1-cos(2\*-1.800348488069777))/(2)

PARTITION SUBSETSUM

[45, 12, 67, 86, 99, 28, 26, 94, 0, 10, 50, 25, 24, 90, 22, 2, 75, 35, 18, 31, 89, 74, 79, 64, 77, 83, 38, 72, 23, 56, 32, 1, 47, 36, 59, 3, 62, 98, 43, 14, 6, 84, 34, 21, 54, 76, 48, 60, 44, 29, 4, 42, 68, 71, 11, 63, 51, 87, 53, 33]

Sum of S: 2828

Partition Exists for [45, 12, 67, 86, 99, 28, 26, 94, 0, 10, 50, 25, 24, 90, 22, 2, 75, 35, 18, 31, 89, 74, 79, 64, 77, 83, 38, 72, 23, 56, 32, 1, 47, 36, 59, 3, 62, 98, 43, 14, 6, 84, 34, 21, 54, 76, 48, 60, 44, 29, 4, 42, 68, 71, 11, 63, 51, 87, 53, 33]

([22, 2, 56, 32, 1, 47, 36, 59, 3, 62, 98, 43, 14, 6, 84, 34, 21, 54, 76, 48, 60, 44, 29, 4, 42, 68, 71, 11, 63, 51, 87, 53, 33], [45, 12, 67, 86, 99, 28, 26, 94, 0, 10, 50, 25, 24, 90, 75, 35, 18, 31, 89, 74, 79, 64, 77, 83, 38, 72, 23])

Time: 0.00025770600018404366

# Conclusions

Overall, I learned the more varied applications for dynamic programming and how to help solve for new trig identities. I also saw that partitioning with backtracking behaves similarly to how we used the disjoint set forest to find if two indexes were in the same set. It makes me think that algorithm can permeate anywhere and finding more real-world applications would be a really fun challenge to explore.

# Appendix

"""

Course: CS 2302 [MW 1:30-2:50]

Author: Kimberly Morales

Assignment: Lab 8

Instructor: Olac Fuentes

TA(s): Anindita Nath , Maliheh Zargaran

Date: 5/9/2019

Date of last modification: 5/9/2019

Purpose of program:

To implement interesting algorithms to solve problems that often require a

more efficient algorithm with faster times.

These two problems are to discover trig identities with a randomized algorithm

and to find two equal subsets of a set with backtracking.

"""

import random

import numpy as np

import math

import mpmath

from math import \*

import timeit

#################################################################################################

#TRIG DISCOVERY METHODS

#################################################################################################

#Finds equivalent identiites and is modified to accomodate sec

def equal(f1, f2, tries=1000,tolerance=0.0001):

for i in range(tries):

x = random.uniform(-math.pi,math.pi)

if f1 == 'sec(x)':

f1 = 'mpmath.sec(x)'

if f2 == 'sec(x)':

f2 = 'mpmath.sec(x)'

y1 = eval(f1)

y2 = eval(f2)

if np.abs(y1-y2)>tolerance:

return False

return True

#Gets list of strings read from the file and inserts random values where x is

def gen\_rand\_trig(exp,x):

for l in exp:

if l == "x":

exp = exp.replace(l,str(x))

return exp

def discover\_trig(fx):

found = 0 #found: Counts the total number of identities found

allE = [] #allE: All expressions

E = [] #Contains only indentities

print('Equivalent Identities')

#Goes through each trig function read from the file

for i in range(len(fx)):

for j in range(len(fx)-1):

#Make sure no functions are repeated

if i != j:

f1 = fx[i]

f2 = fx[j]

allE.append([f1,f2])

#If the functions are equal then add to E and count

if equal(f1,f2):

print(f1, ' = ', f2)

E.append([f1,f2])

found += 1

#Returns the number of identities found, equivalent identities, and all expressions

return found,E,allE

#Tests each expression with randomized values

def test\_equals(stmt,tries=1000,tolerance=0.0001):

for e in stmt:

b = True #b: boolean flag to see if expression is equal

x = random.uniform(-math.pi,math.pi)

#Replaces x with random value for both functions

t1 = gen\_rand\_trig(e[0],x)

t2 = gen\_rand\_trig(e[1],x)

#Concatenates strings for sec functions

if t1 == 'sec(' + str(x) + ')':

t1 = 'mpmath.sec(' + str(x) + ')'

if t2 == 'sec(' + str(x) + ')':

t2 = 'mpmath.sec(' + str(x) + ')'

y1 = eval(t1)

y2 = eval(t2)

if np.abs(y1-y2)>tolerance:

b = False

#Identities are printed if true with '='

# '!=' indicates it is not equivalent

if b:

print(t1, ' = ', t2)

else:

print(t1, ' != ', t2)

#Reads in trig functions from a text file and appends to a string list

def read\_file(filename):

fx = []

with open(filename) as f:

for line in f:

fx.append(line.replace('\n',''))

return fx

#################################################################################################

#PARTITION SUBSETSUM METHODS

#################################################################################################

def subsetsum(S,last,goal):

if goal ==0:

return True, []

if goal<0 or last<0:

return False, []

res, subset = subsetsum(S,last-1,goal-S[last]) # Take S[last]

if res:

subset.append(S[last])

return True, subset

else:

return subsetsum(S,last-1,goal) # Don't take S[last]

#Finds two equal subsets of set S

def partition(S):

p\_exist = False #p\_exist: If a subset can exist

#If the sum of the set is even then a solution is possible

if sum(S) % 2 == 0 :

#The goal is half of the set since the two subsets will equal to S

p\_exist,s = subsetsum(S,len(S)-1,sum(S)/2)

if p\_exist:

print("Partition Exists for ",S)

#Since subsetsum gets one solution, look through other half of list for second solution

for se in s:

index = 0

for se2 in S:

if se == se2:

S.pop(index)

index += 1

return s, S

else:

print("There are no equal subsets")

else:

print("Partition does not exist")

return p\_exist

#################################################################################################

#MAIN

#################################################################################################

if \_\_name\_\_ == "\_\_main\_\_":

#Reads in file with trig identities and prints list

print("DISCOVER TRIG IDENTITIES")

fx = read\_file('t.txt')

#If the file cannot be read due to OS then here is the hardcoded list

"""

fx = ['sin(x)', 'cos(x)', 'tan(x)', 'sec(x)', '-sin(x)', '-cos(x)', '-tan(x)',

'sin(-x)', 'cos(-x)', 'tan(-x)', 'sin(x)/cos(x)', '2\*sin(x/2)\*cos(x/2)',

'sin(x)\*sin(x)', '1-(cos(x) \* cos(x))', '(1-cos(2\*x))/(2)', '(1)/(cos(x))']

"""

print('Identities read from file: ')

print(fx)

print()

startd = timeit.default\_timer()

results = discover\_trig(fx)

stopd = timeit.default\_timer()

print('Time: ', stopd - startd)

#Prints results and equality test

print('Found: ', results[0])

#If you do not want to see the dump then comment out here

#########################################################

#print('\nTest Equalties: ')

#test\_equals(results[2])

#########################################################

print()

#Answers question two with partitions

print("PARTITION SUBSETSUM")

S = [20,0,10,10]

print("Sum of S: ", sum(S))

start = timeit.default\_timer()

print(partition(S))

stop = timeit.default\_timer()

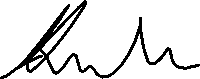
print('Time: ', stop - start)

f

# Academic Honesty

“I certify that this project is entirely my own work. I wrote, debugged, and tested the code being presented, performed the experiments, and wrote the report. I also certify that I did not share my code or report or provided inappropriate assistance to any student in the class.”

Name: Kimberly Morales



Signature: