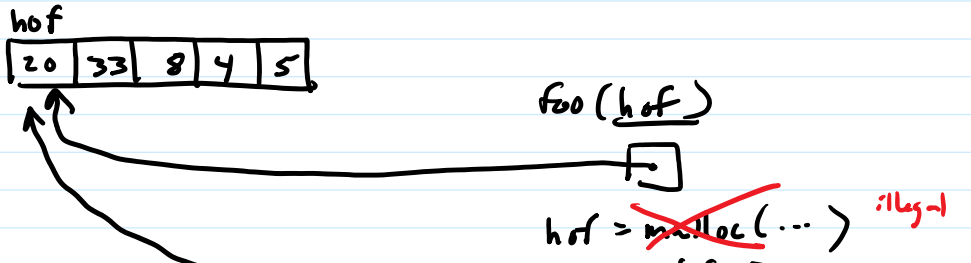
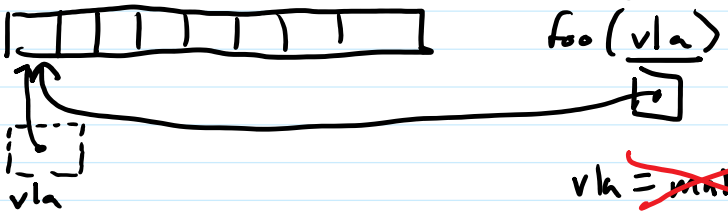
Arrays and Pointers

Stack Heap

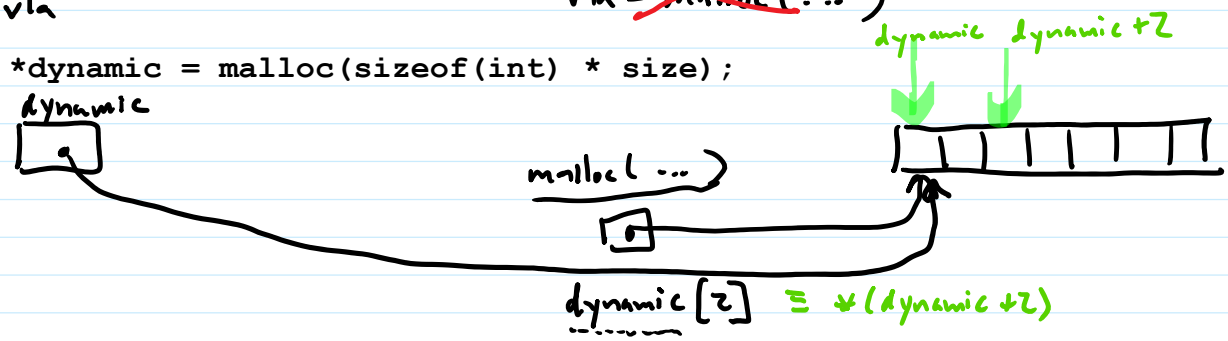
```
int hof[] = {20, 33, 8, 4, 5};
```



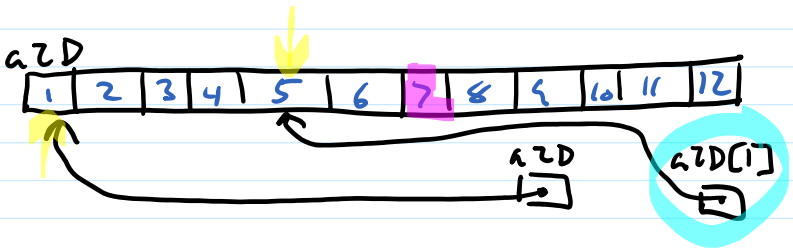

```
int vla[size];
```




```
int *dynamic = malloc(sizeof(int) * size);
```



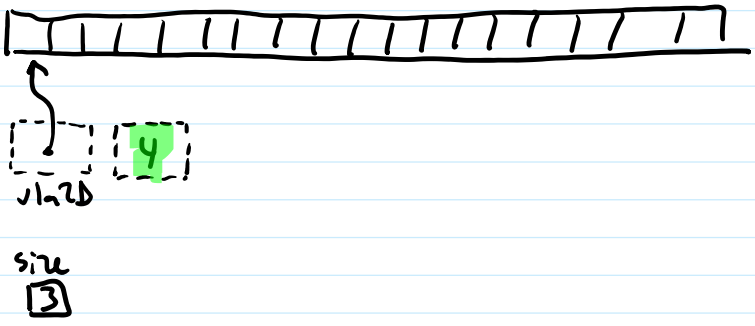

```
int a2D[3][4] = {{1, 2, 3, 4}, {5, 6, 7, 8}, {9, 10, 11, 12}};
```

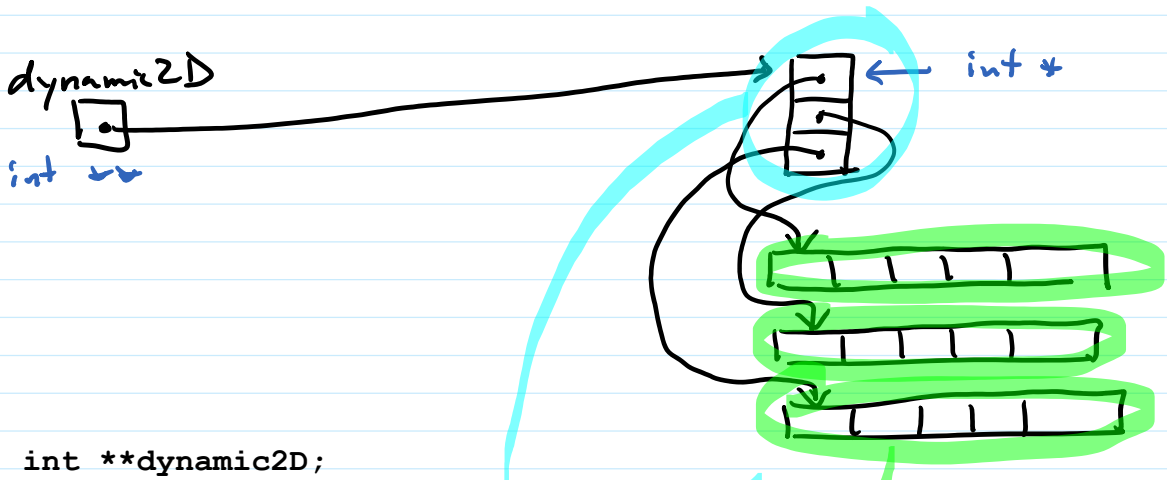


a2D[1][2]

a2D is ptr to row
ptr to array of 4 ints
a2D[1] is ptr to next row of 4 ints

```
int vla2D[size][size + 1];
```






```
int **dynamic2D;
dynamic2D = malloc(h * sizeof(int *));
for (int i = 0; i < h; i++)
{
  dynamic2D[i] = malloc(w * sizeof(int));
  for (int j = 0; j < w; j++) { /* initialize ind elts */}
}
...
for (int i = 0; i < h; i++)
{
  free(dynamic2D[i]);
}
free(dynamic2D);
```

can have different width for each row (useful for triangular arrays)

free each row

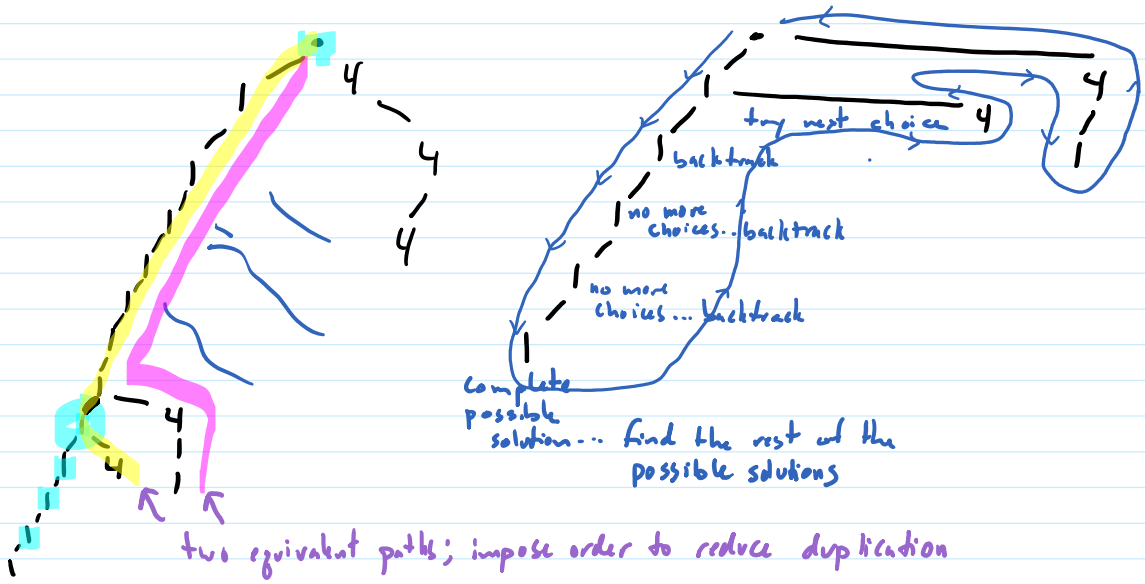
free array of rows

Backtracking

Problem: given positive integer n, determine how to write n as the sum of as few squares as possible

Examples: $5 = 1^2 + 2^2$

		$12 = 2^2 + 2^2 + 2^2$
		$2018 = 13^2 + 43^2$



recursion on partial solution:
    if partial solution is 1+1+1,
        find best solution for 1+1+1+1
        find best solution for 1+1+1+4
        find best solution for 1+1+1+9

for each next piece of solution
    add it to current partial solution
    recursively optimize the new partial solution
    (remove it from partial soln so we can add the next later)

Revisit this problem later in the semester? (dynamic programming)