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x = range(1, 21, 2)
y = ["hello", 3.14, 2020]

# convert x to a list
list(x)

# check if an object is a list
type(y) == list

# add element to a list
y.append("new")

# if appending a list to a list, it will be appended as a single element
# if you want to add all elements of a list to a new list, use extend
c = [1, 2, 3]
d1, d2 = c[:], c[:]
d1.append(["new", "year", 2020])
d2.extend(["new", "year", 2020])
print(d1)
print(d2)

# indexing, starts at 0
print(y[0])
print(y[0][4])

# indexing from the end, starts at -1
# y is now ['hello', 3.14, 2020, 'new']
print(y[-1])
print(y[-4][-1])

# modify list elements
y[0] = "hello there!"

# slicing, [including : excluding]
print(y[0:2])

# in and not in operators
print(3.14 in y)
print(3.14 not in y)

```

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# list concatenations
z = ["ok", 999] + y
z += [17] # can't do z += 17!

# length of a list is the number of elements
print(f"length of z is {len(z)}")

# nested lists: for example, element of a list is another list
nested = ["zero index", y, z]
print(nested)
print(f"length of nested is {len(nested)}")
print(nested[2][2][6:11])

# remove an element using its VALUE (removes first element only!)
y.remove(2019)
print(y)

x = [1, 2, 4, 1, 6, 1, 1, 8, 1]
x.remove(1)
print(x)

# use 'while' and 'in' to remove all the elements equal to a give value
while 1 in x: x.remove(1)
print(x)

```