SORTING

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WHAT CAN BE SORTED?

- Lists / arrays of numbers

ARRAY OF NUMBERS

```perl
my @numbers = (12, 4, 66, 7, 23, 5, 19);
print join ",", @numbers; # Print comma-separated list
print "\n";
```

Sort numerically vs. sort as characters

SYNTAX FOR SORT

```perl
my @numbers = (12, 4, 66, 7, 23, 5, 19);
my @sort1 = sort {$a <=> $b} @numbers;
print join ",", @numbers;
print "\n";
```

- `sort SUBROUTINE ARRAY` (no comma)
- Special variables `$a` and `$b`
- How to sort descending?

SORT ASCENDING VS DESCENDING

```perl
my @numbers = (12, 4, 66, 7, 23, 5, 19);
my @sort1 = sort {$a <=> $b} @numbers;
my @sort2 = sort {$b <=> $a} @numbers;
print join ",", @sort1;
print join ",", @sort2;
```

WHAT'S THE DIFFERENCE?

```perl
my @numbers = (12, 4, 66, 7, 23, 5, 19);
my @sort1 = sort {$a <=> $b} @numbers;
my @sortA = sort {$a cmp $b} @numbers;
print join ",", @sort1;
print join ",", @sortA;
```

WHAT CAN BE SORTED?

- Lists / arrays of numbers
- Lists / arrays of character strings

SORTING CHARACTER STRINGS

```perl
my @names = ("Leonardo", "Donatello", "Raphael", "Michaelangelo")
my @sortA = sort {$a cmp $b} @names;
my @sortB = sort {$b cmp $a} @names;
print join ",", @sortA;
print join ",", @sortB;
```

SORTING TABLES

Turtle	Pizza
Leonardo	Anchovies
Donatello	Tuna
Raphael	Pepperoni
Michaelangelo	Cheese

What kind of data structure should I use?

SORTING HASHES

```perl
my %tp = ("Leonardo" => "Anchovies",
          "Donatello" => "Tuna",
          "Raphael" => "Pepperoni",
          "Michaelangelo" => "Cheese");
```

File `hash_template.pl`

Which is the key, which is the value?

REVIEW: GETTING KEYS OF A HASH

Getting keys of a hash

```perl
my %tp = ("Leonardo" => "Anchovies",
          "Donatello" => "Tuna",
          "Raphael" => "Pepperoni",
          "Michaelangelo" => "Cheese");
print join ",", (keys %tp);
```

- What kind of variable is `(keys %tp)`?
- What order are they reported? (Try running a few times)

REVIEW: GETTING VALUES OF A HASH

You tell me....

SORT VALUES BY KEYS

- Get the keys
- Sort the keys
- For each key...
- Report the value

SORT VALUES BY KEYS

```perl
my %tp = ... # etc
foreach my $key (sort {$a cmp $b} keys %tp) {
  print $tp{$keys};
  print ",";
}
```

Identify the steps

SORT KEYS BY VALUES

```perl
my %tp = ... # etc
foreach my $key (sort {$tp{$a} cmp $tp{$b}} keys %tp) {
  print $key
}
```

- Keys guaranteed to be unique
- Values are not

WHAT CAN BE SORTED? (SUMMARY)

- Lists / arrays of numbers
- Lists / arrays of character strings
- Hashes by keys
- Hashes by values