There will be two in-class tests. Those will probably be in week 6 (two weeks time) and week 10. Each will be worth 10% of the final grade.

There a Course Handout on the webpage, which has all the definitions that are in the course.

We won't be asked for definitions in tests, but we will need to understand and be able to apply the definitions.

An Introduction to Relations

A relation is a connection between sets of objects.

Networking

Networks (connecting various devices) have topologies.

E.g. Ring, Star, etc.

For facebook, it's a graph of users, with relations indicating who is friends with who.

Relational Databases

Main questions:

- How to avoid redundant info?
- How to ensure updates are consistent?
- How to distinguish between different entities, or recognise that two are the same?

Use multiple tables. Each one is a relation, e.g. "is a mentor of".

For the moment we'll only consider relations between two sets, e.g. title and genre.

Representing Relations

Can use a matrix, with the (e.g.) module codes on one axis, students on another, and an X where the student is taking that module.

Can use a table, with one column of codes and one of students, but there's a lot of repetition of module codes then.

Can use a set of ordered pairs.

Can use an arrow diagram.

We will mostly use ordered-pair notation. This allows us to use set notation.

R is a relation between two sets A and B if and only if
$R \subseteq A \times B$.

"is_the_square_of" $\subseteq \{0,1,2,3,4,5,6,7,8,9\} \times \{0,1,2,3,4,5,6,7,8,9\}$

"is_the_square_of" = $\{ (0,0), (1,1), (4,2), (9,3) \}$

Notations:

Infix notation: a R b e.g. 2 is_a_divisor_of 6

Prefix notation: R(a, b)

Element notation: $(a, b) \in R$

Examples of binary relations are: (<, =, etc.)

Note that relations are ordered.
$(2,6) \in$ "is_a_divisor_of" but (6,2) isn't.

Every relation has an inverse.

If $R \subseteq A \times B$, then $(a, b) \in R$ if and only if $(b, a) \in R^{-1}$

A function is a special type of relation.

Functional Relations

A binary relation is a *function relation* if and only if for each $a \in A$ there is exactly one $b \in B$ such that $(a,b) \in R$.

A relation with the properties of a function, more or less.