

PAPER

Discrete Math Model by ANU

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Abstract

Motivation: Learn how to develop discrete math model to solve or represent abstract thing.**How to apply:** When solving a problem, we need to simplify the world into a model. This course explain how to represent object, process and algorithm to solve the problem.**Key words:**

1. Representation

1.1. Object

1. set = {1, 2, 3}
2. multiset = {1, 2, 3, 3}
3. sequence = (1, 2, 3, 4)
4. tuple = (1, 2)
5. matrix $A = \begin{bmatrix} a_1 & a_2 \\ b_1 & b_2 \end{bmatrix}$

1.2. Relation

1. **Relation** is a relation R from object a to Object b or aRb
2. **Function** is a special type of relation. A function $f(x) = x$

2. Graph Theory

2.1. Object

1. vertex

2.2. Object

2. edge
3. direct edge
4. weight edge

3. Code

```
set = c(1,2,3)
multiset= c(1,2,3,3)
sequence = 1:10
sequence = seq(from = 1, to = 10, by = 1)
tuple = list(1, "word", TRUE)
matrix = matrix(c("a1", "a2", "b1", "b2"),
               nrow = 2, ncol = 2, byrow = FALSE)
```

```
df = data.frame(ID=1:3,code=letters[1:3])

# Creates tables that follow OUP guidelines
# using xtable
library(xtable)
print(xtable(df,caption="This is a xtable table.",
             label="tab:tab1"),
      comment=FALSE,caption.placement="top")
```

Table 2. This is a kable table.

ID	code
1	a
2	b
3	c

You can reference this table as follows: Table 2.

Table 1. This is a xtable table.

	ID	code
1	1	a
2	2	b
3	3	c

3.3. Table spanning two columns

Tables can span two columns by setting `table.envir = "table"` in `knitr::kable`.

You can reference this table as follows: Table 1.

3.2. Generate a table using kable

```
df = data.frame(ID=1:3,code=letters[1:3])

# kable can also be used for creating tables
knitr::kable(df,caption="This is a kable table.",
             booktabs=TRUE,label="tab2")
```

```
df = data.frame(ID=1:3,code1=letters[1:3],
               code2=letters[4:6],
               code3=letters[7:9],
               code4=letters[10:12],
               code5=letters[13:15])

# kable can also be used for creating tables
knitr::kable(df,caption="This is a wide kable table.",
             #format="latex",
             table.envir="table*",
             booktabs=TRUE,label="tab3")
```

Table 3. This is a wide kable table.

ID	code1	code2	code3	code4	code5
1	a	d	g	j	m
2	b	e	h	k	n
3	c	f	i	l	o