


6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

Mathematics for Computer Science
MIT 6.042J/18.062J


DAG's & Scheduling


 Albert R Meyer March 20, 2013 scheduling.1

6	9	13	7
12		10	5
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Some Course 6 Prerequisites

18.01 → 6.042 8.02 → 6.002
 18.01 → 18.02 18.03, 6.002 → 6.004
 18.01 → 18.03 6.001, 6.004 → 6.033
 6.001 → 6.034 6.033 → 6.857
 6.042 → 6.046 6.046 → 6.840



 Albert R Meyer March 20, 2013 scheduling.2

6	9	13	7
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indirect prerequisites

u is an *indirect prereq* of v
 when there is a positive
 length path from u to v in
 the prerequisite digraph R :

$$u R^+ v$$


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6	9	13	7
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a minimal subject?


a minimal subject has no
 prerequisites --a Freshman
 subject

nothing → d

18.01

8.02

6.001


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6	9	13	7
12		10	5
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a **minimum** subject?

minimum means earliest of all:
 an indirect prereq. of everything
none in this example
 there used to be one at MIT:
 orientation week seminar on
 on summer book assignment

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6	9	13	7
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Some Course 6 Prerequisites

18.01 → 6.042 8.02 → 6.002
 18.01 → 18.02 18.03, 6.002 → 6.004
 18.01 → 18.03 6.001, 6.004 → 6.033
6.001 → 6.034 6.033 → 6.857
 6.042 → 6.046 6.046 → 6.840

identify minimal elements

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6	9	13	7
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Constructing a Term Schedule

18.01 8.02 6.001

start schedule with them

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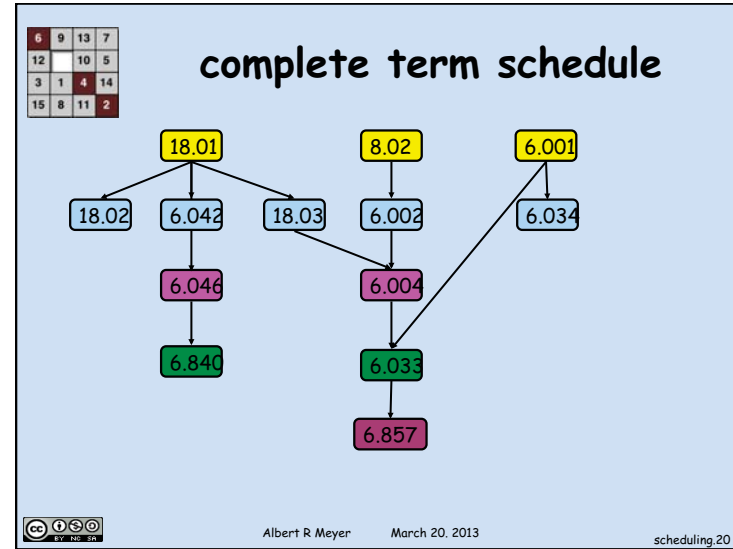
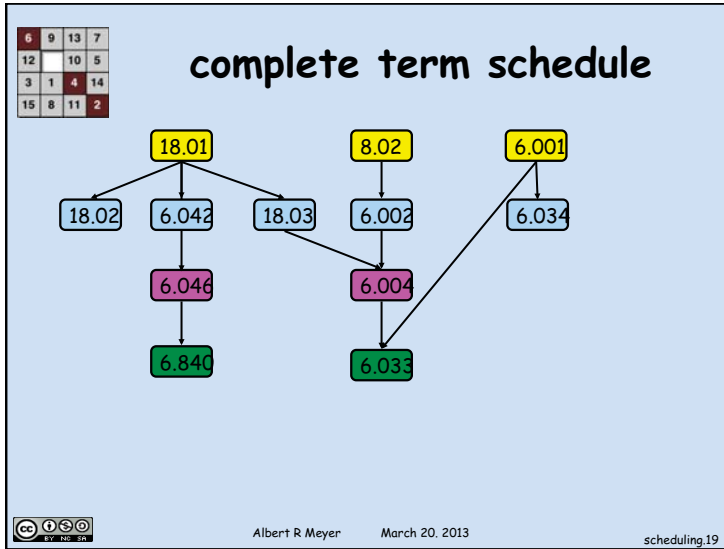
6	9	13	7
12		10	5
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15	8	11	2

Some Course 6 Prerequisites

~~18.01 → 6.042~~ ~~8.02 → 6.002~~
~~18.01 → 18.02~~ 18.03, 6.002 → 6.004
~~18.01 → 18.03~~ ~~6.001, 6.004 → 6.033~~
~~6.001 → 6.034~~ 6.033 → 6.857
 6.042 → 6.046 6.046 → 6.840

remove minimal elements

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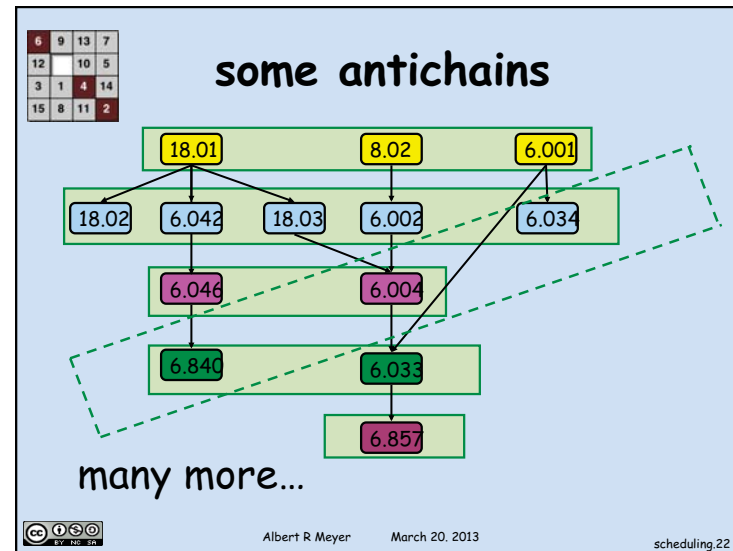
6	9	13	7
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an antichain

a set of subjects with no indirect prereqs among them
 --so can be taken in **any order**
 --called "incomparable"

Def: u is **incomparable** to v iff
no path from u to v and
no path from v to u

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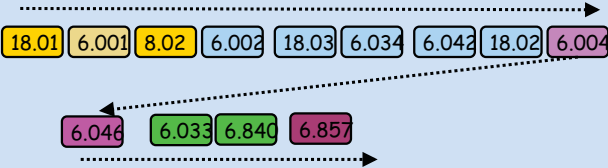


6	9	13	7
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a leisurely schedule

Graduate taking only 1 subject/term?

Sure,



a topological sort

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scheduling.23

6	9	13	7
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a chain

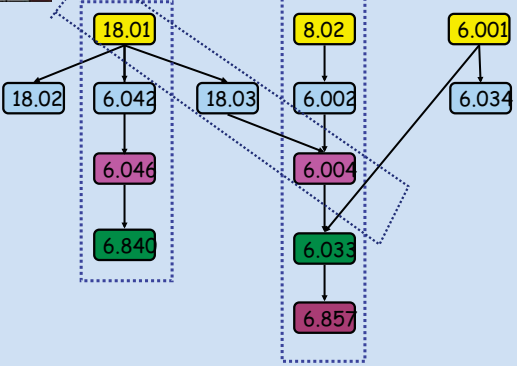
sequence of subjects that must be taken in order
(subjects are **comparable**)

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scheduling.24

6	9	13	7
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some chains

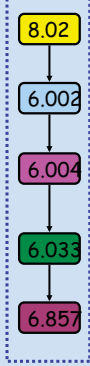


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scheduling.25

6	9	13	7
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some chains



Albert R Meyer March 20, 2013

scheduling.26

6	9	13	7
12		10	5
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some chains

8.02

↓

6.004

↓

6.857

} still a chain

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6	9	13	7
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maximum length chain

18.01

↓

18.02

↓

6.042

↓

6.046

↓

6.840

8.02

↓

6.002

↓

6.004

↓

6.033

↓

6.857

6.001

↓

6.034

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6	9	13	7
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how many terms to graduate?

5 terms are **necessary** to graduate --because max chain length is 5

and 5 are **sufficient**

--if you can take unlimited subjects per term...

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6	9	13	7
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...sufficient

18.01

↓

18.02

↓

6.046

↓

6.840

8.02

↓

6.002

↓

6.004

↓

6.033

↓

6.857

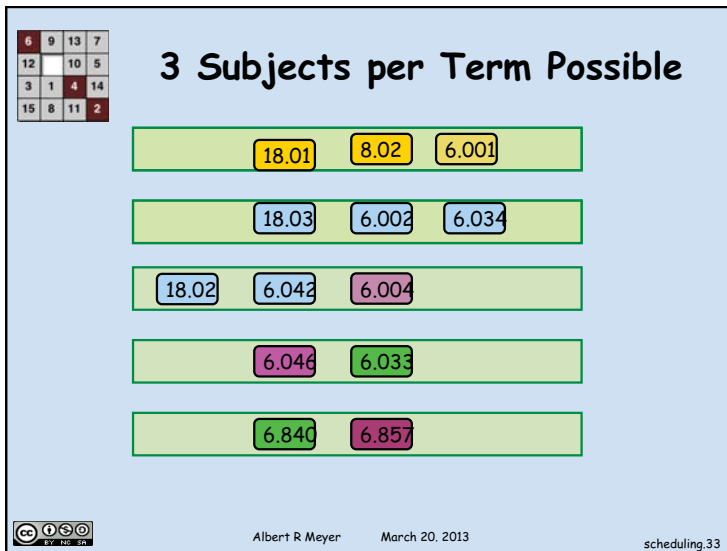
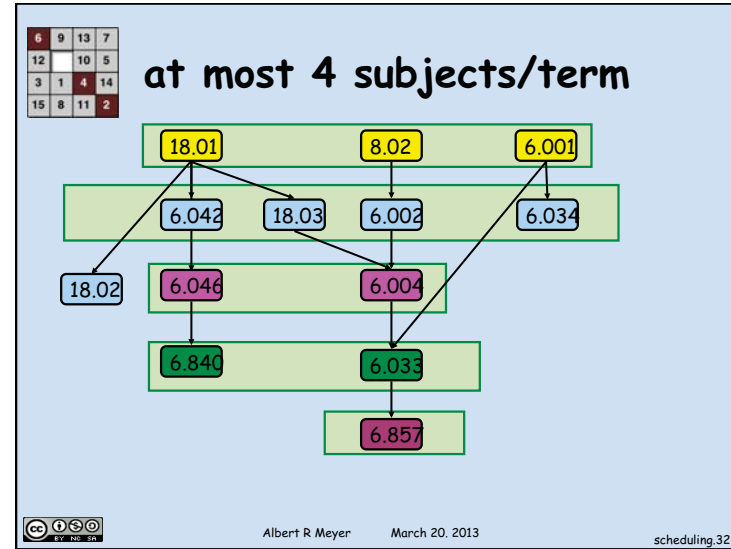
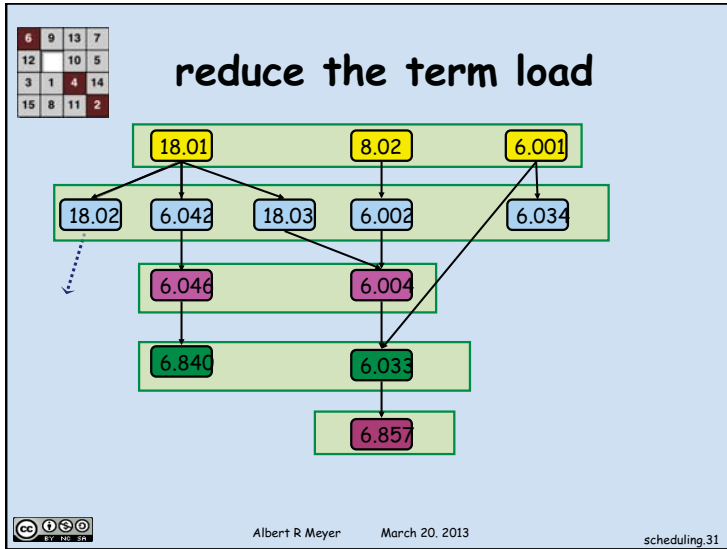
6.001

↓

6.034

heavy term: 5 subjects

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