CSC 225: Proof of the Day

Prove by induction that:

$$\sum_{i=0}^{k} 2^i = 2^{k+1} - 1$$

Put your name on your answer and hand in your proof.

All attempts will be given full participation marks (correct or not).

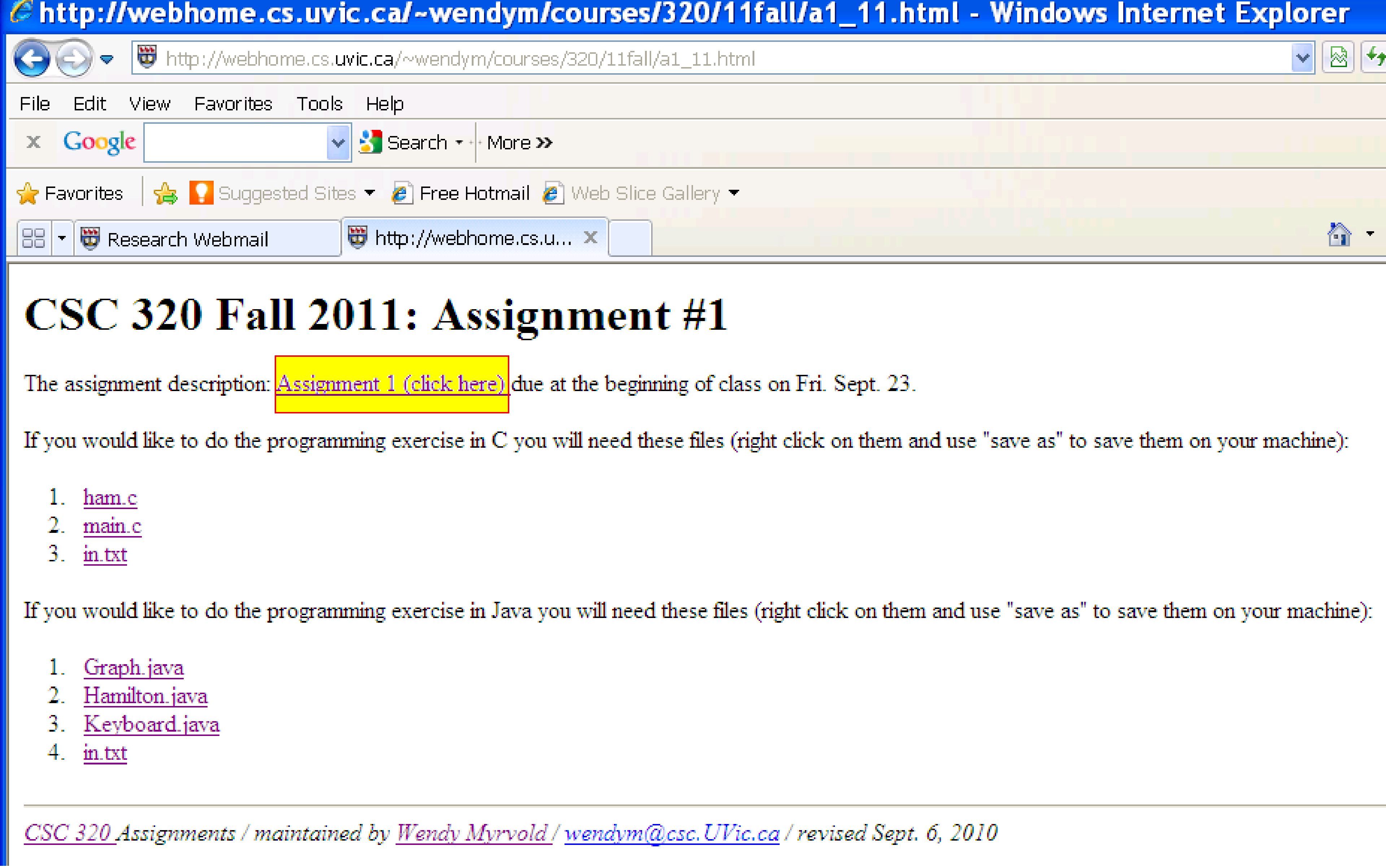
Announcements

Note: The midterm is scheduled on Wed. Oct. 26 so that I can hand it back marked before the drop deadline (Oct. 31).

Any questions about the course outline?

Assignment #1 and Tutorial #1 are posted. Tutorials start next week.

Bring your schedule to class on Tuesday (to help me in choosing office hours).



CSC 320 Fall 2011: Assignment #1

The assignment description: Assignment 1 (click here) due at the beginning of class on Fri. Sept. 23.

If you would like to do the programming exercise in C you will need these files (right click on them and use "save as" to save them on your machine):

1. ham.c
2. main.c
3. in.txt

If you would like to do the programming exercise in Java you will need these files (right click on them and use "save as" to save them on your machine):

1. Graph.java
2. Hamilton.java
3. Keyboard.java
4. in.txt

CSC 320 Assignments / maintained by Wendy Myrvold / wendym@csc.UVic.ca / revised Sept. 6, 2010

Computer Science COOP

Application deadline: Thursday Sept. 15

Application form available outside the ECSM Co-op Office (ECS 204).

To learn more about the Co-operative Education Program and and Career Services on campus, visit:

http://www.uvic.ca/coopandcareer

OR see/email:

Duncan Hogg (dshogg@uvic.ca), ECS 230

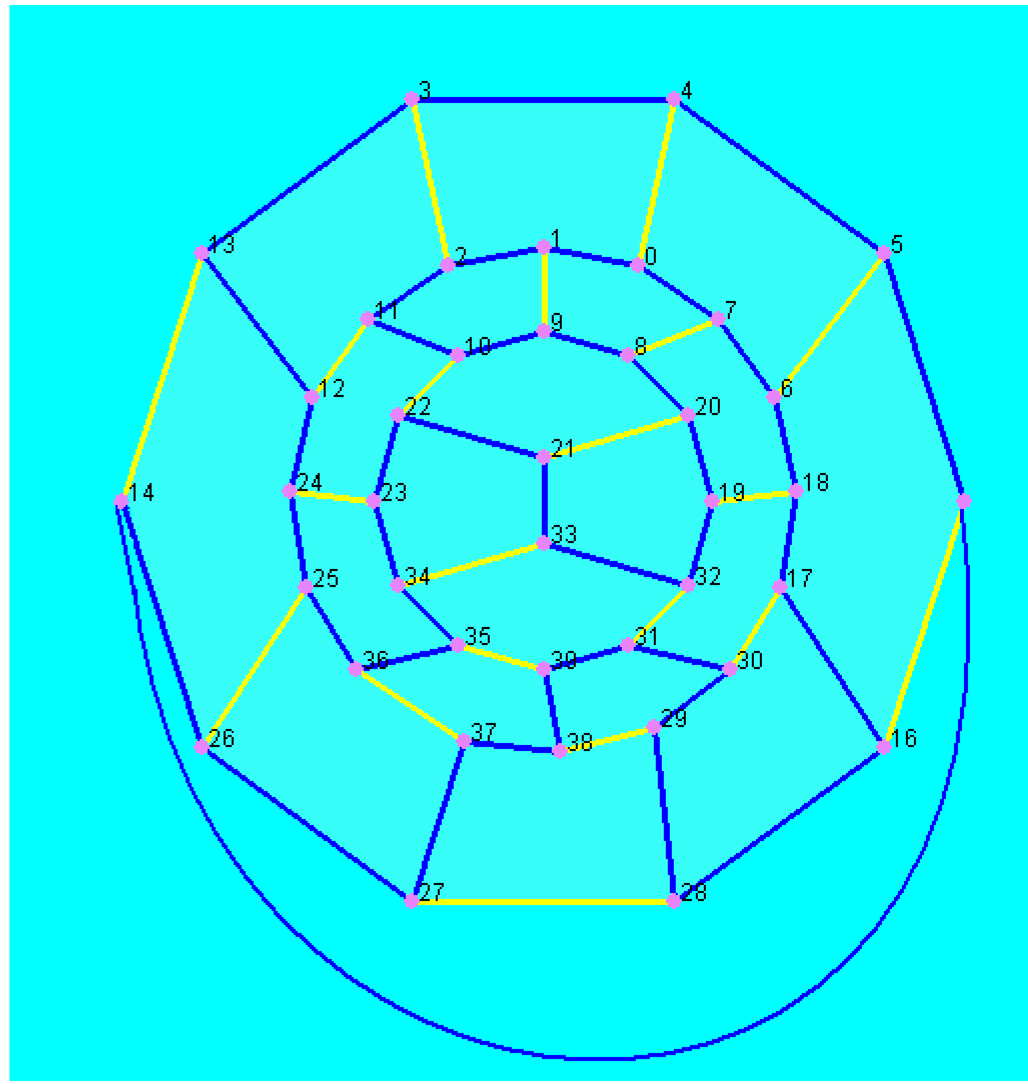
Computer Science also offers a work experience program for students wanting the benefits of work experience but not a full COOP program.

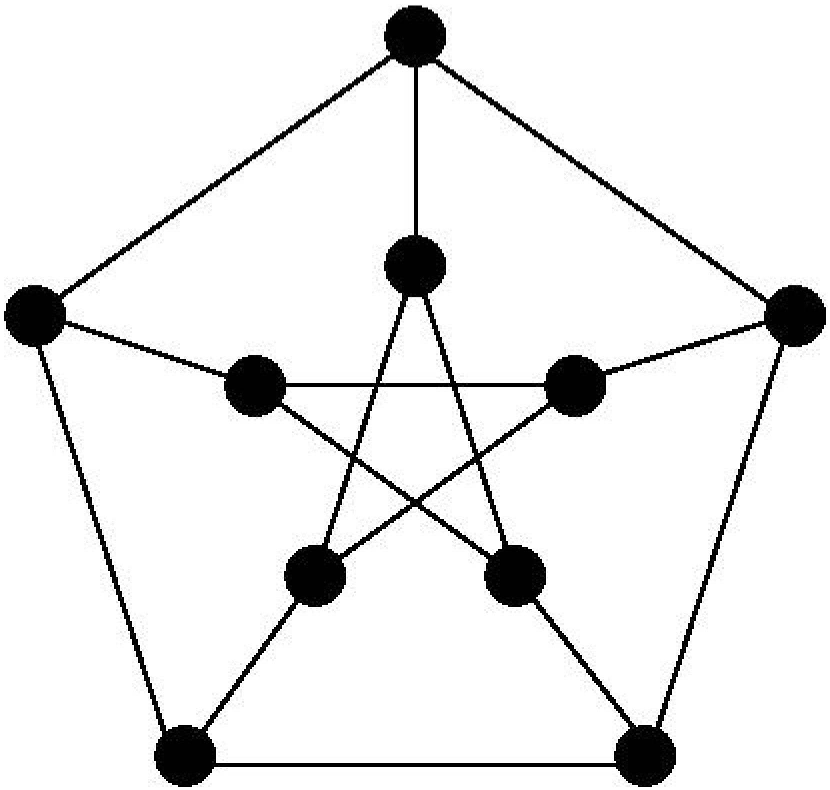
Hamilton Cycles

A cycle which includes all the vertices of a graph.

Fullerenes: 3-regular planar graphs, face sizes 5 and 6.

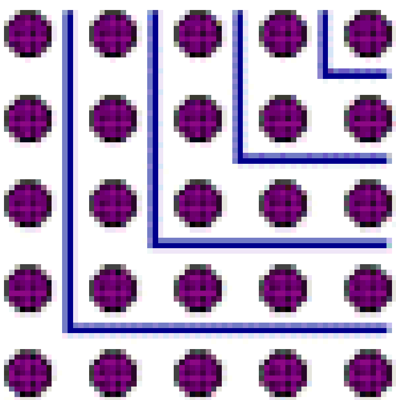
Conjecture: Every fullerene has at least one Hamilton cycle.

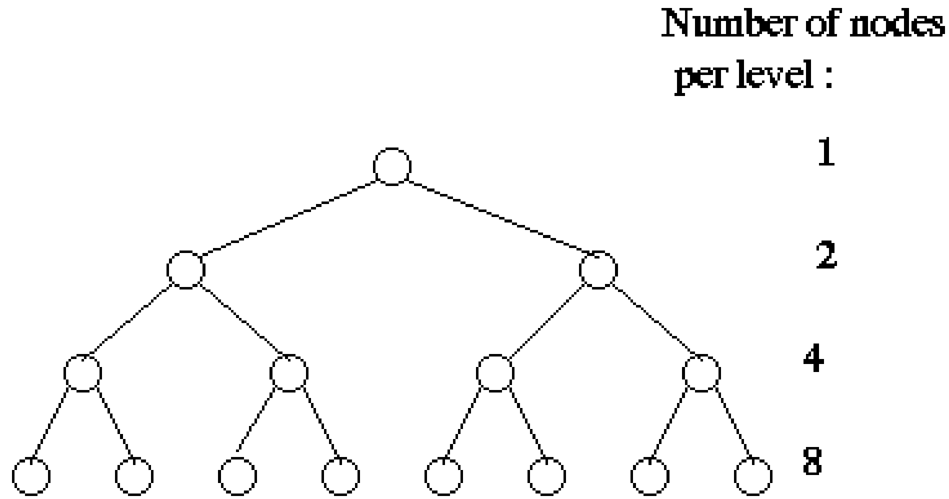




The Petersen graph has no Hamilton cycles.

Review of Induction





$$n^2 = 1 + 3 + 5 + \ldots + (2n - 1)$$

Overview

- Questions from last class
- Review of induction

Induction is very similar to recursion and one goal of this class is to become skilled at writing recursive programs.

It is a useful tool for proving that programs are correct.

Time complexities of algorithms will be computed by solving recurrence relations. Induction can then be used to prove that the answers you find are correct.

Natural Numbers

$\mathbb{N} = \{ 0, 1, 2, 3, 4, \ldots \}$

Inductive Definition:

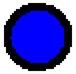
[Basis] 0 is in the set $\mathbb{N}$

[Inductive step]:

If k is in $\mathbb{N}$

then k+1 is in $\mathbb{N}$

Complete Binary Trees:



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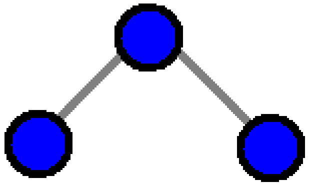

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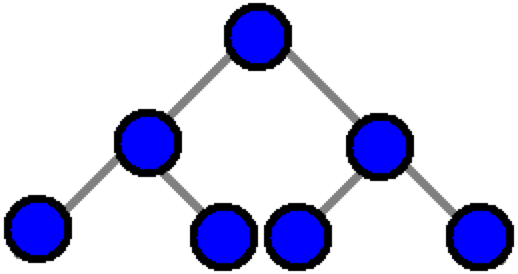

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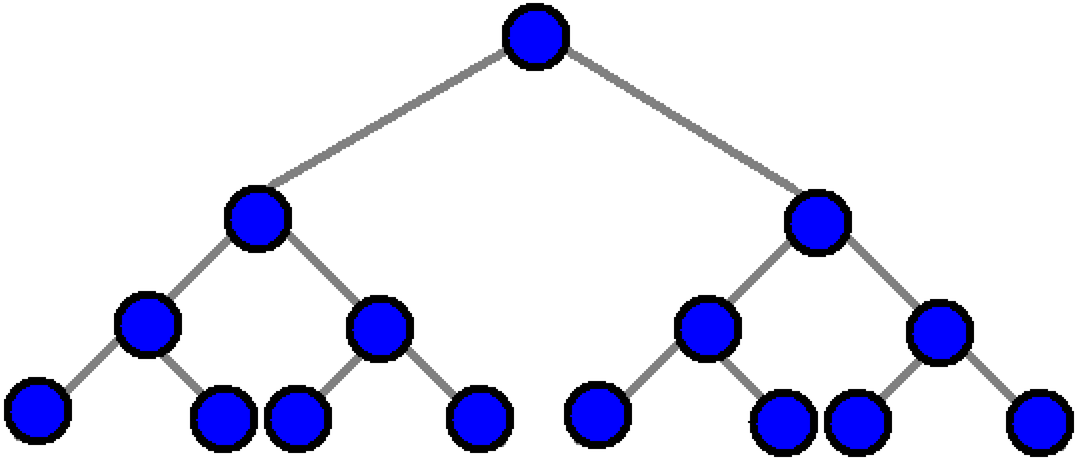

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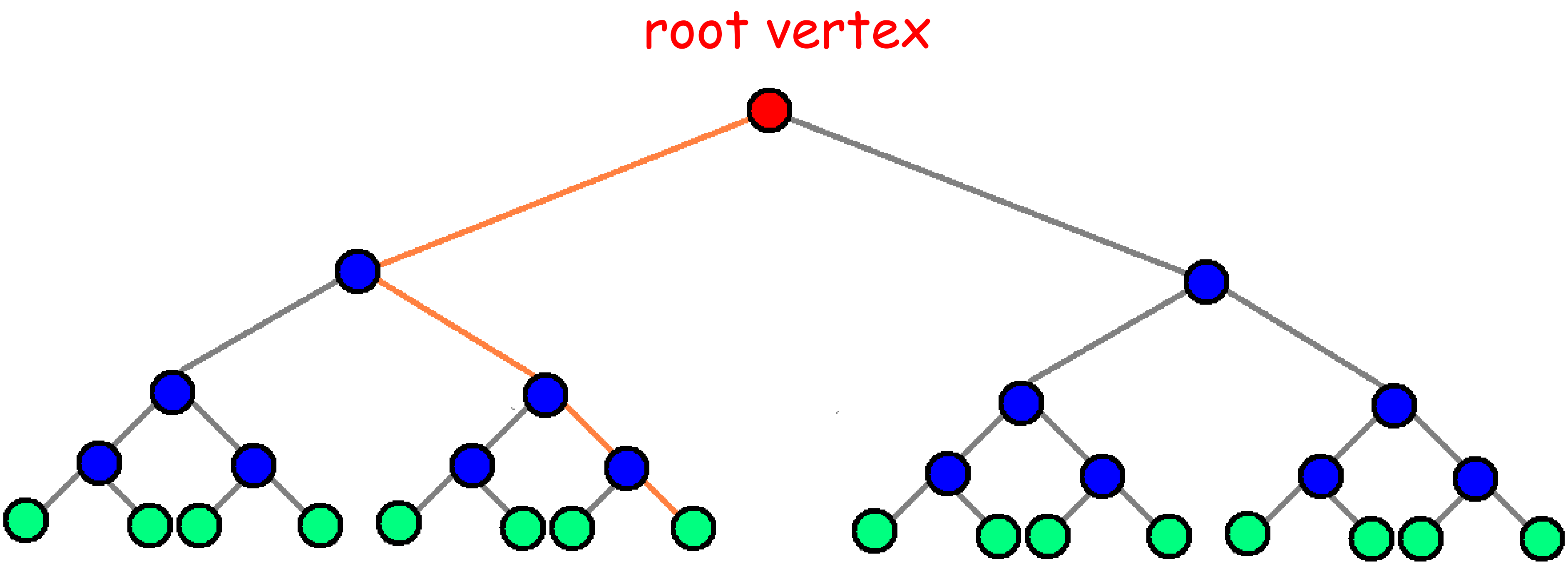
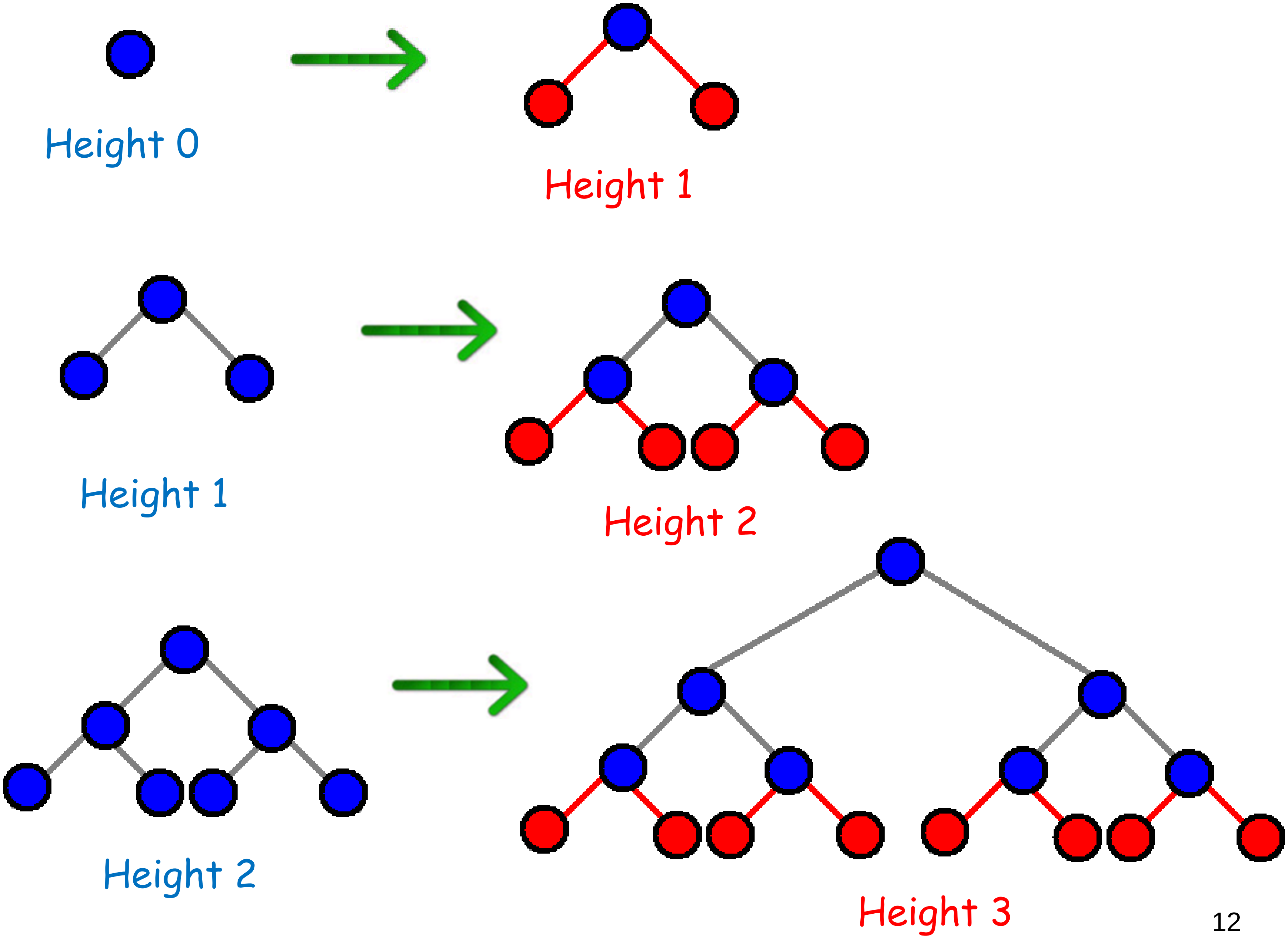


Leaves: vertices with one incident edge

Height: maximum distance from root to a leaf measured by number of edges on the path.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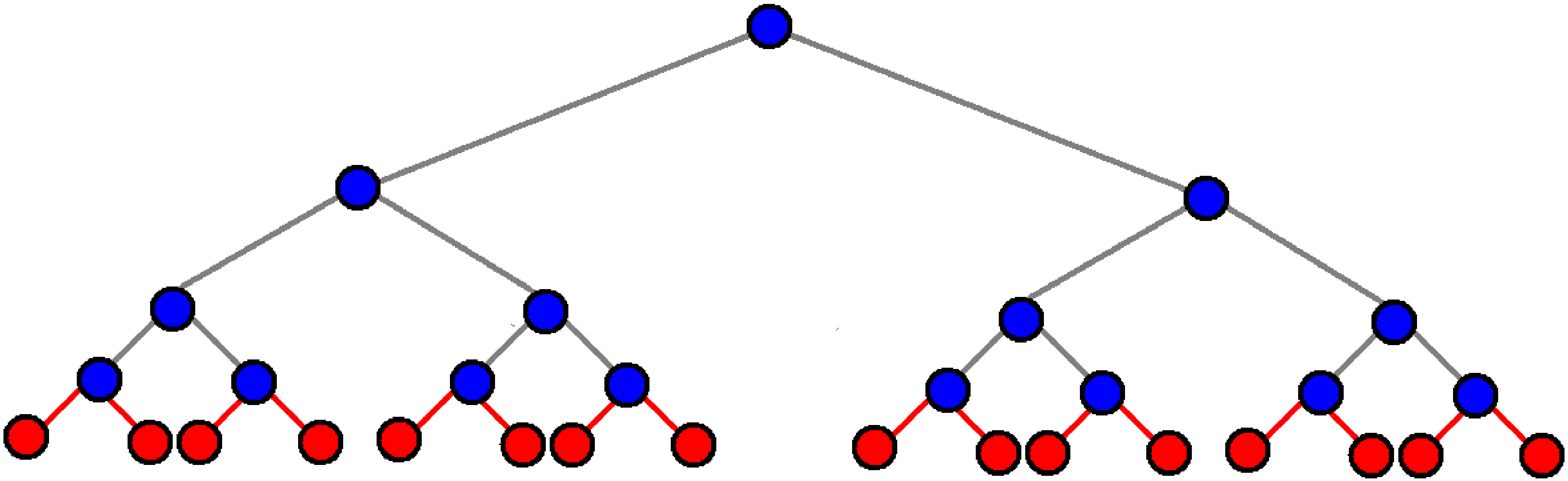

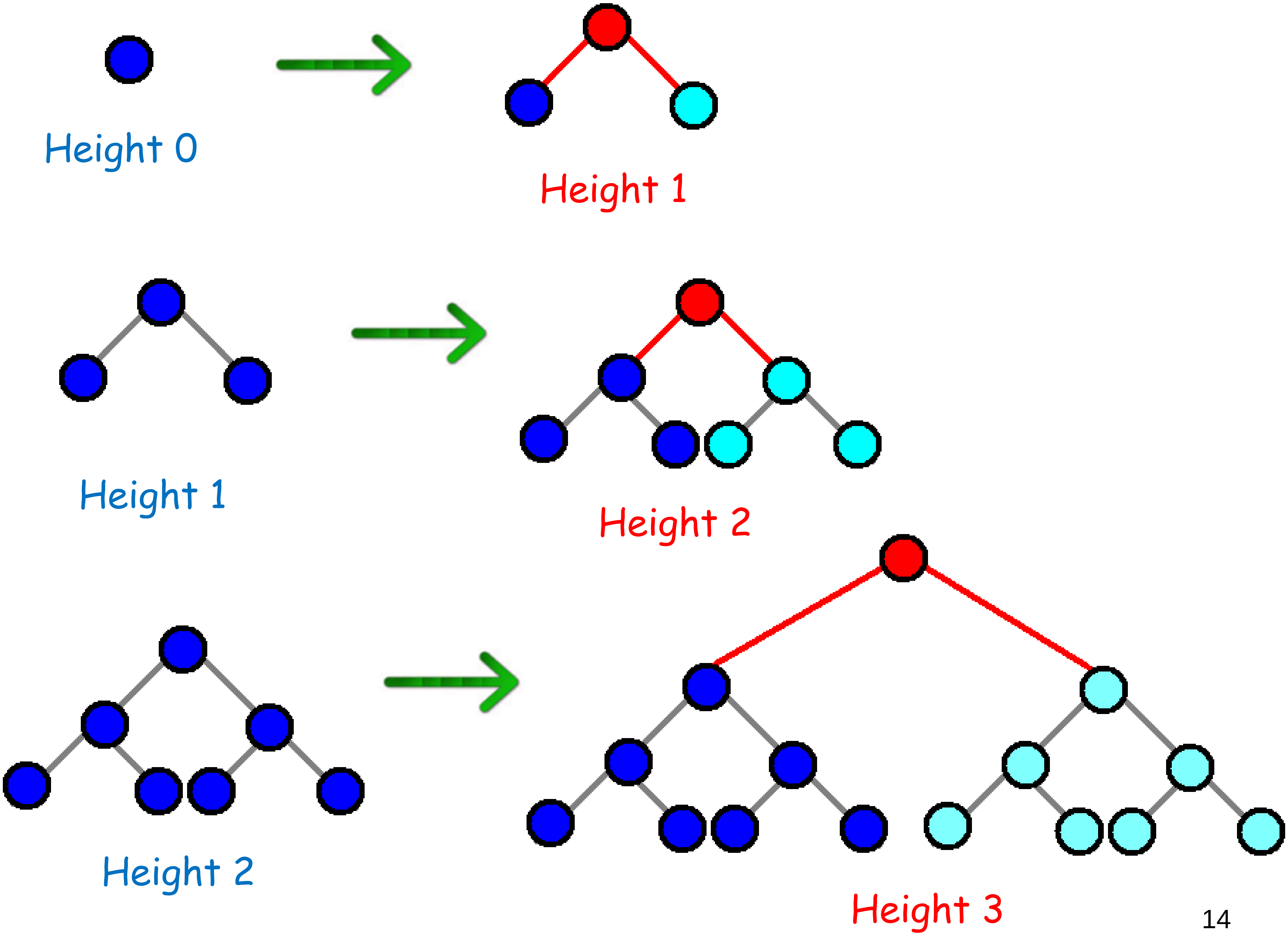
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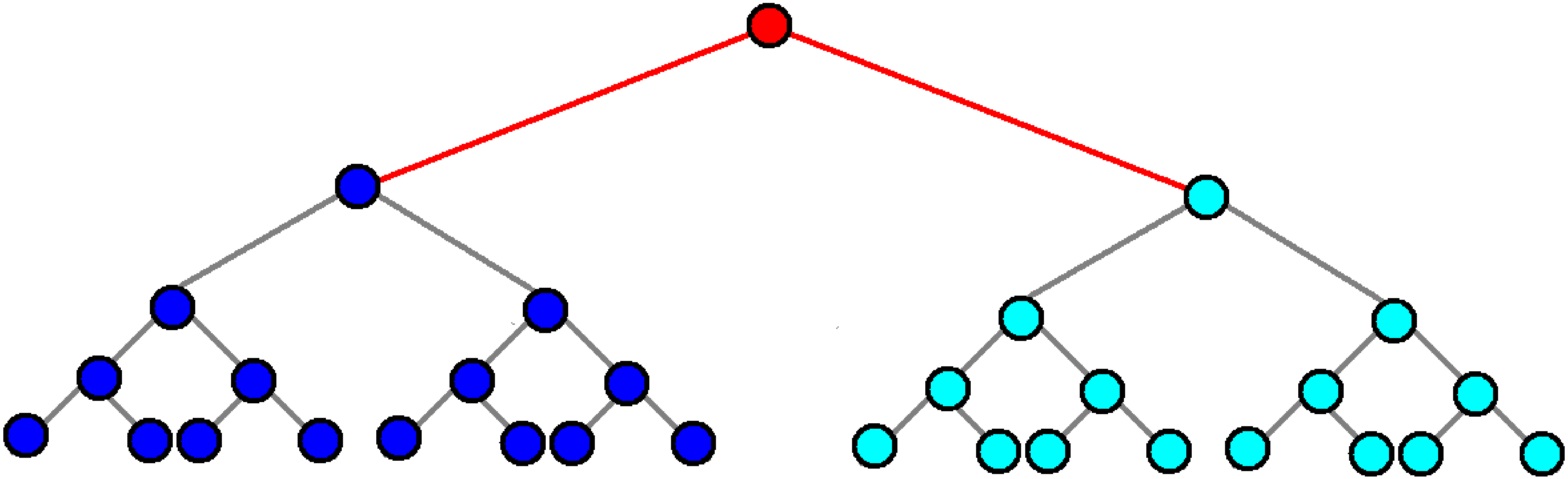

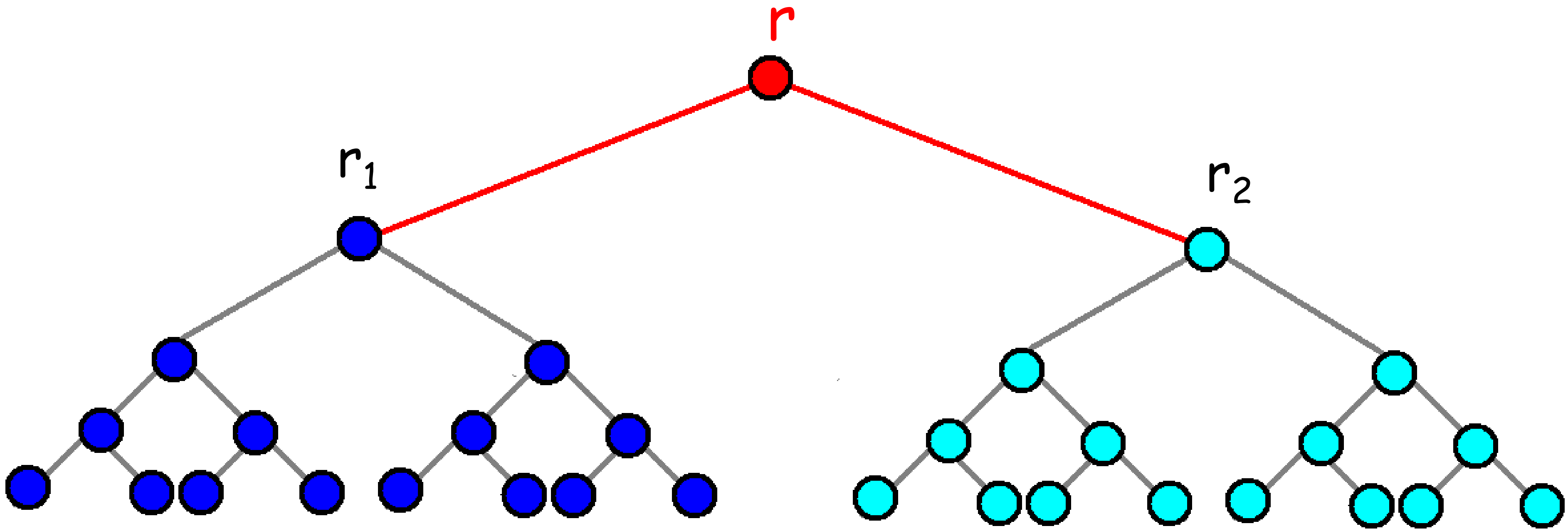
r
r_1
r_2

How can we give an inductive definition of a complete binary tree of height h?

How many nodes does a complete binary tree of height h have?

Prove the answer is correct by induction.

Create a recurrence relation T(h) where T(h) gives the number of nodes of a complete binary tree of height h.

Solve your recurrence relation and prove the answer is correct by induction.