Learning Trajectories

Prof. Diana Franklin

Announcements

Readings are due prior to class, **not accepted late for credit** (unless hospitalization, etc.)

Midterm will be a take-home, non-timed exam, so **no proctoring / special circumstances apply**

Basic Learning Strategies

Incrementally teach material

Build on prior knowledge (in school and at home)

What is a Learning Trajectory?

A **learning trajectory** (LT) is a path from students' existing knowledge to some particular **learning goal** (LG).

One useful way to conceptualize an LT is to think of it as having three components:

1. An overarching learning goal;
2. A partially ordered list of incremental learning goals that suggest a pathway to the main learning goal; and
3. A set of learning activities that help students move along the path.

We will focus on **learning goals** and their **relationships**

Learning Goals

A sentence describing a single “nugget” of learning that can be **assessed.**

Knowledge - something they can answer questions about

Skill - something they can do

Brainstorm Multiplication learning goals

Multiplication is repeated additions

Ability to do single digit multiplication

Ability to multiply a 2-digit number by a 1-digit number

You can use division to divide a pizza between several people

You need to perform multi-digit subtraction in order to perform long division

Activity #1: Play Qupcakery

https://quander.cs.uchicago.edu/Lite

Learning Goals

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Relevant Game Mechanic	Associate with vocabulary	Identify pertinent characteristics	Understanding applied to area

Activity #2: Qupcakery Learning Goals

Relevant Game Mechanic	Associate with vocabulary	Identify pertinent characteristics	Understanding applied to area

You have to match cupcake colors to the customer's request

Devices change cupcake colors / flavors

You may have to use a combination of multiple gates to get the right colors

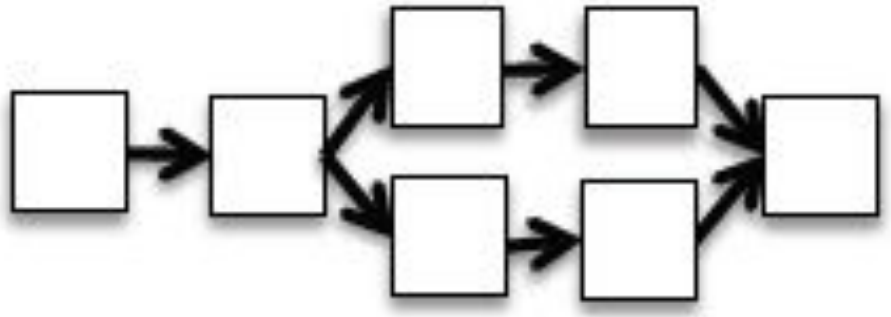
A NOT gate changes the color

A SWAP gate swaps the flavor of two cupcakes

A CNOT gate - if the control cupcake is chocolate, then it changes the color of the target cupcake

The system is depicted going left to right horizontally

How does theory influence Learning Trajectory shape?



(a) Learning Progression

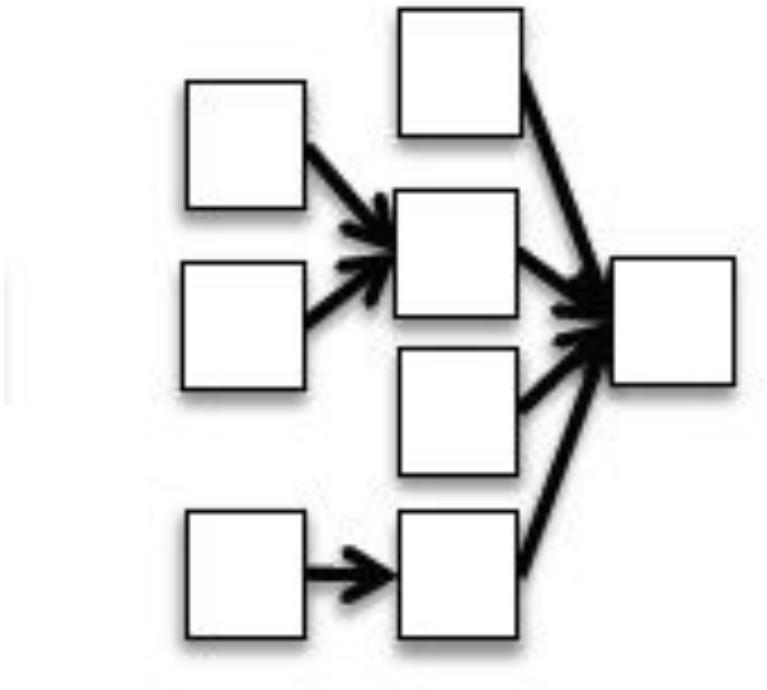
Pieces of Knowledge

- What factors influence order in which knowledge is learned?

  Social dynamics (social status of person having suggestion)

  The way the learning activity is designed
- How is Pieces of Knowledge different from prior views of Learning Progressions?

How does theory influence Learning Trajectory shape?



(b) Pieces of Knowledge

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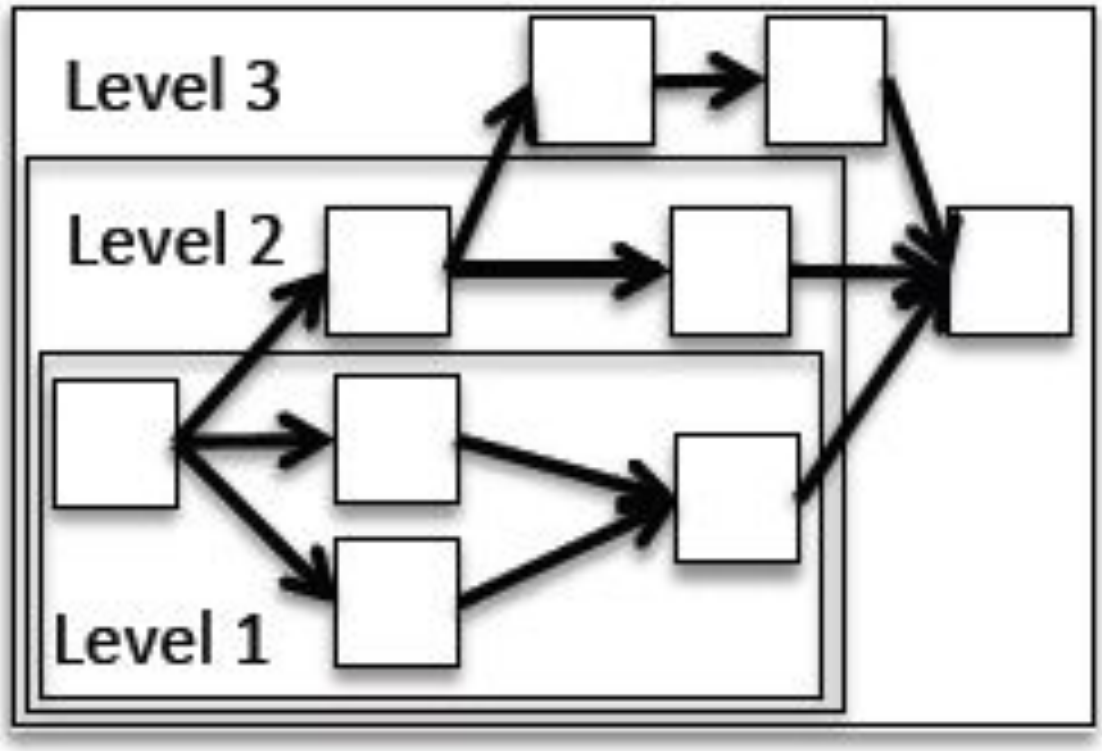
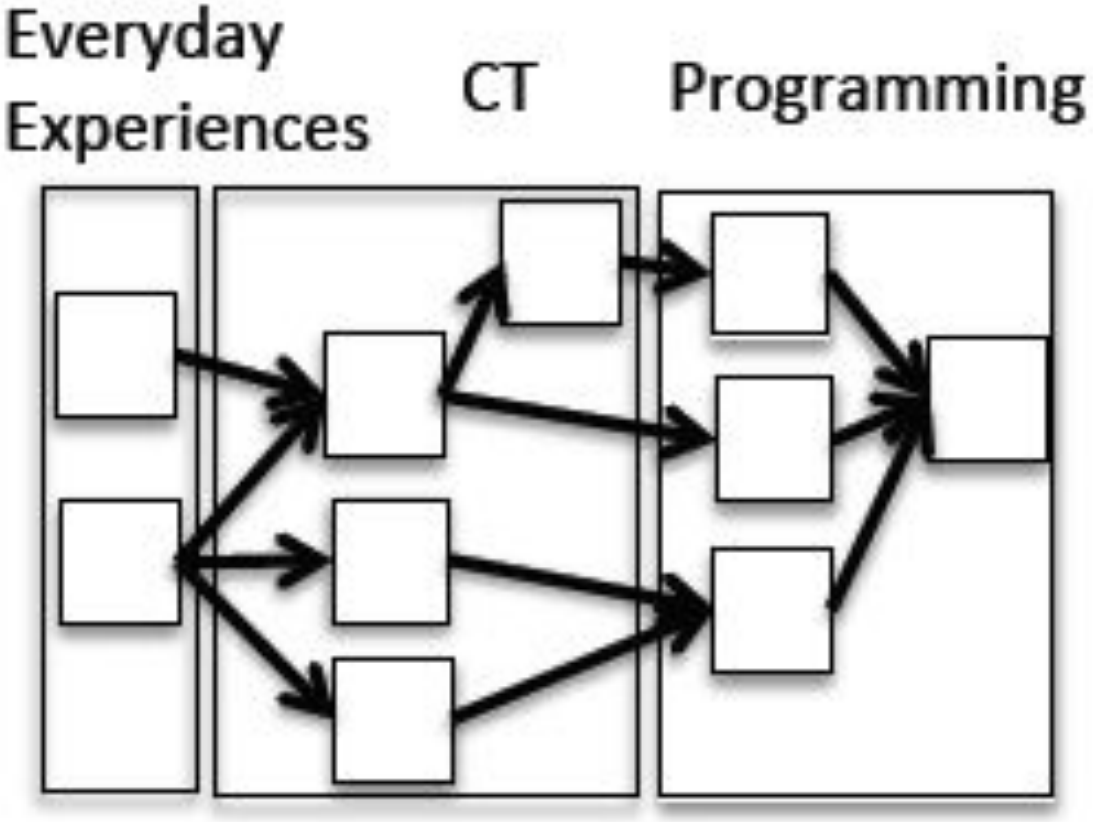


(c) Spiral Curriculum

Spiral Curriculum – 3 key aspects

- Same concepts revisited
- Revisited in more depth
- Connections made to previous visit

How does theory influence Learning Trajectory shape?



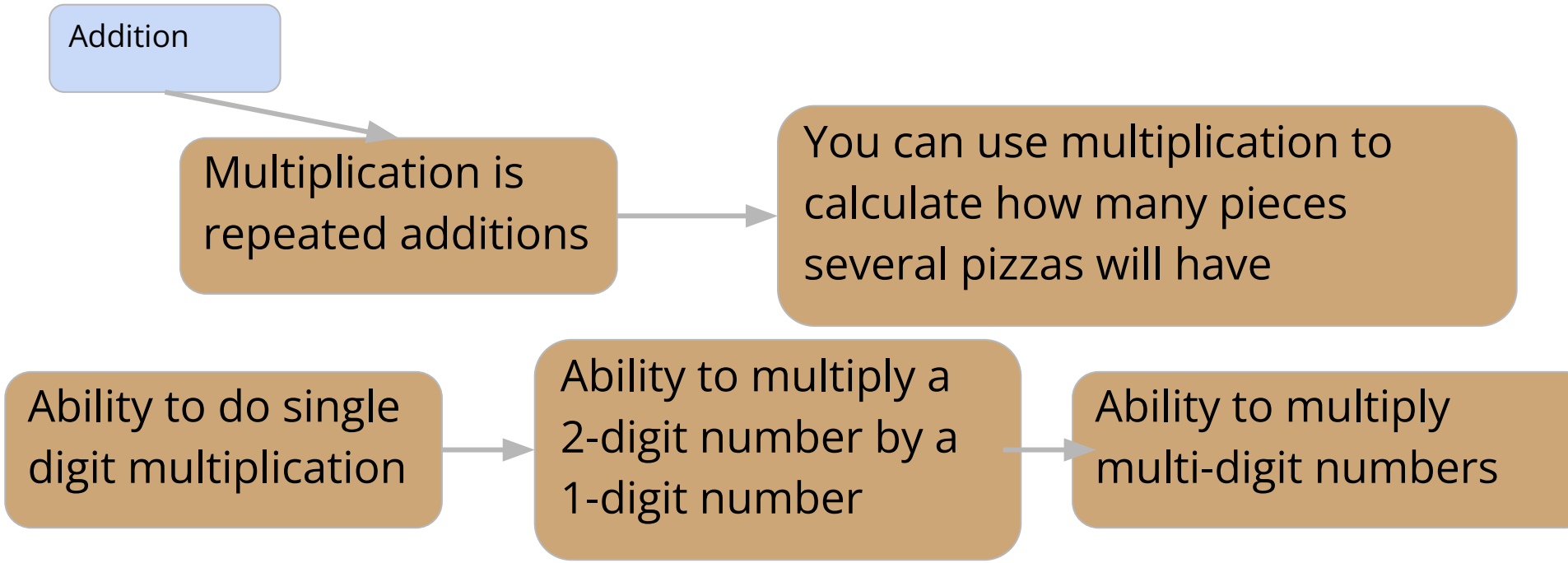
(d) Constructivism

Learning Trajectories

- Content, not teaching method
- Provide ***possible orderings*** for presenting material that builds upon itself
- Identifies points of understanding to focus on before going to next level

Arrange into a learning trajectory

Lower Anchorpoints (required prior knowledge)



Activity #2: Qupcakery Learning Trajectory

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Project

- Groups of 2-3 (1 with special permission)
- Choose a subject to teach
- Choose what level to teach (3^{rd} – 9^{th} grade)
  - Grade level used to identify lower anchor points
- Main target must be different from yourself in meaningful ways (age, interests, opportunities, culture, language, etc.)

Content Attributes

- Must have
  - A character that moves
  - A character that interacts with other objects on screen
  - multiple “scenes” (background)
    - Opening / welcome screen with multiple choices (e.g., About, Play)
    - Internal screen with game
- Cannot be
  - memorization (e.g. flashcards)
  - teach through “quiz”
  - teaching things that non-learning games often teach
    - Physics of projectiles
    - Finances through running a farm

Project

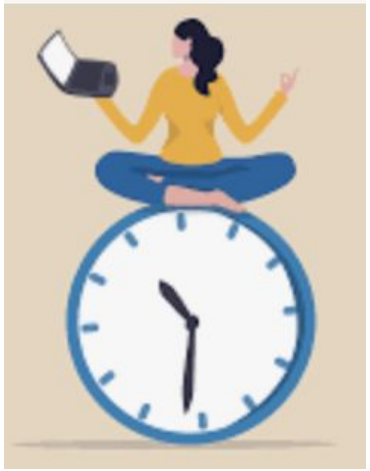
- Design
  - Complete design
  - No resource constraints (time, $)
- Implementation
  - Agreed-upon subset of full design
  - Reasonable to complete by end of quarter
  - Illustrates the design of the game and principles of course

What makes a good partner?

Helpful actions

Unhelpful actions

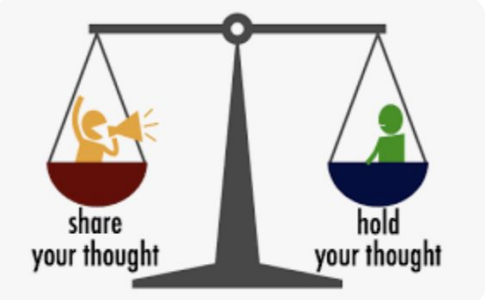
Being a Good Partner: Prep



On Time

Prepared

Being a Good Partner: Design



Listen

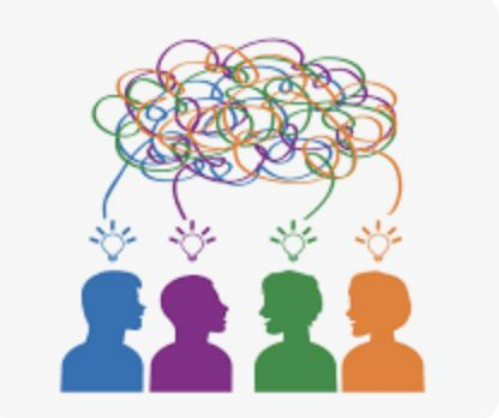
Positive Mindset

Refine, not Reject

Many users, Many ideas

Filter later

Being a Good Partner: Joint Work



**Discuss,
not Dictate**

**Patient,
Supportive**

Being a Good Partner: Solo Work

On Time

Dig for Solutions

Project Milestone #1

- Choose content area
- Choose age range (narrow, lacking important general skills)
- Choose specific learning goals
- **Define three user profiles**
- **Create a learning trajectory**

Activity #3: Practice LT

- Try to get together with someone you think might be your project partner. Groups of 2-3, so if a good friend is absent, you can still save room for them (just do a group of 2).
- Those who find their partners move towards back, those still without a partner, mill around towards front.
- Repeat until everyone has someone they *might* work with – no partnerships formed today are set in stone
- If you are going to do the project alone, get together with someone else who is going to do the project alone for in-class group work
- Pick a topic that *could* become your real topic but doesn't have to
- Go through the LG / LT process

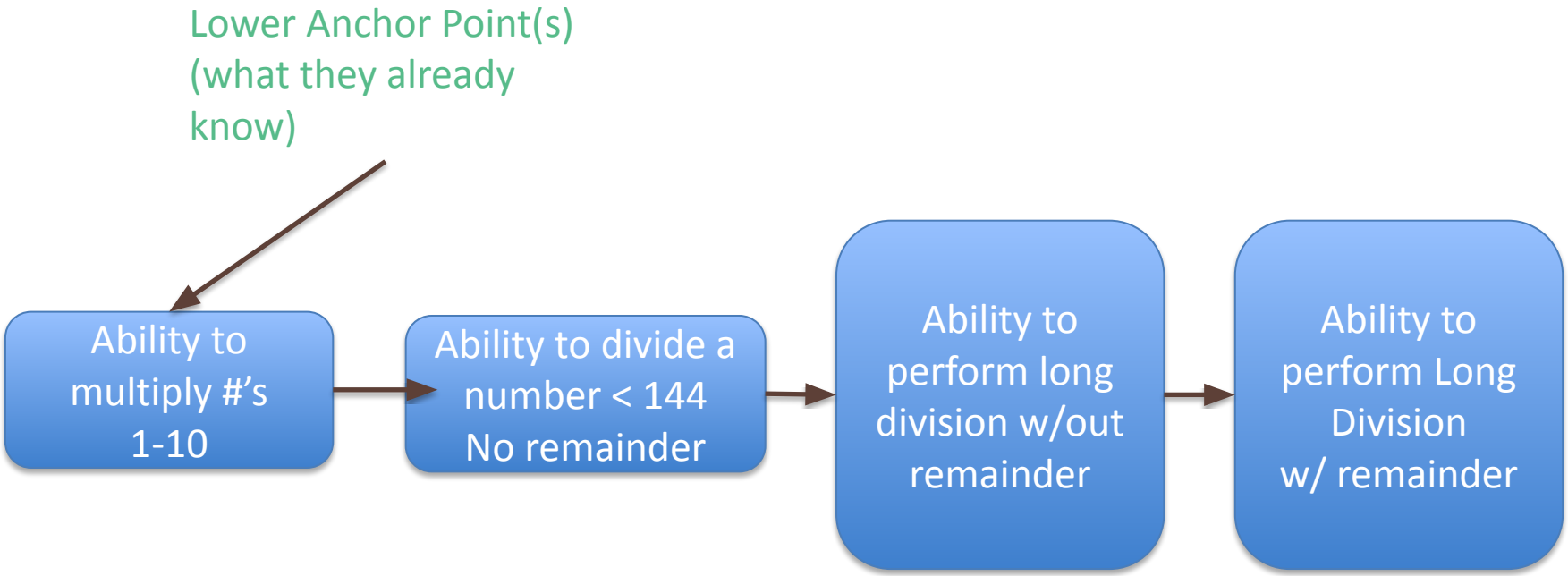
Let's try making an LT

- Learning Goal (endpoint)
- Prior knowledge necessary / helpful

Is this useful?

Too coarse-grained – "division" is not one learning goal
Too much content – won't teach this all in one activity
Potentially too easy – division (from products < 13) is memorization, not understanding

Stepwise Refinement – Break it Down!



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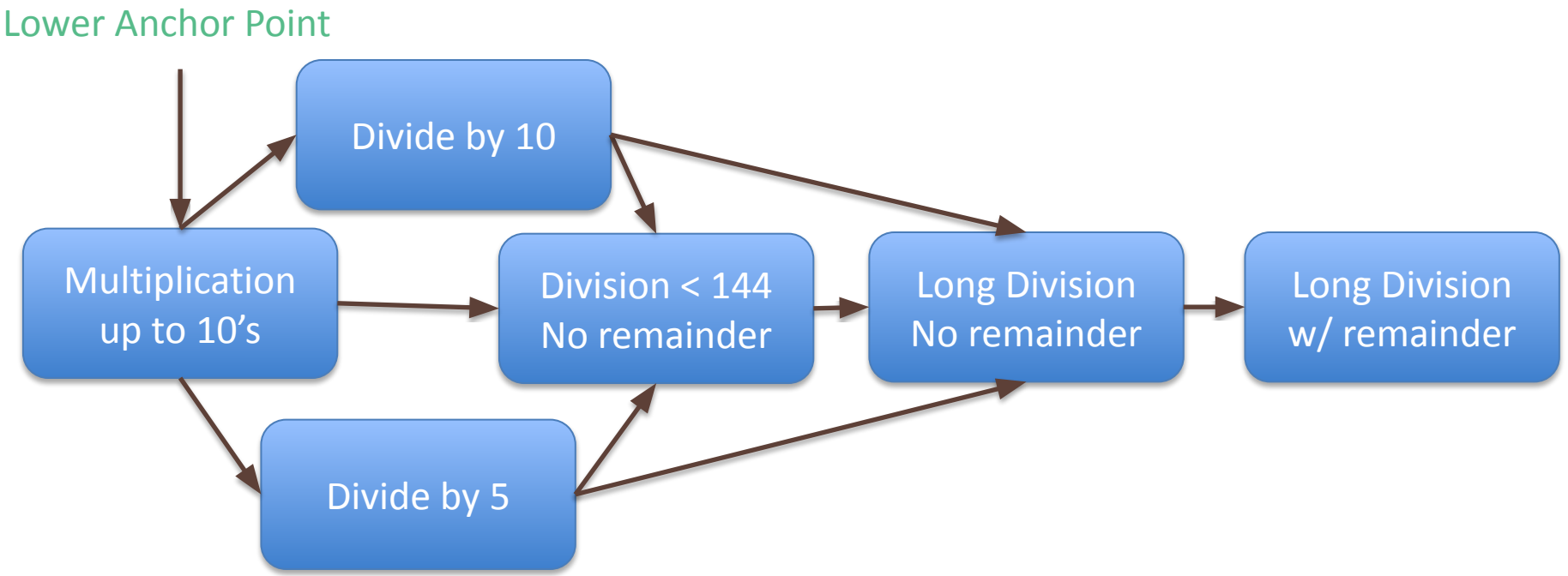

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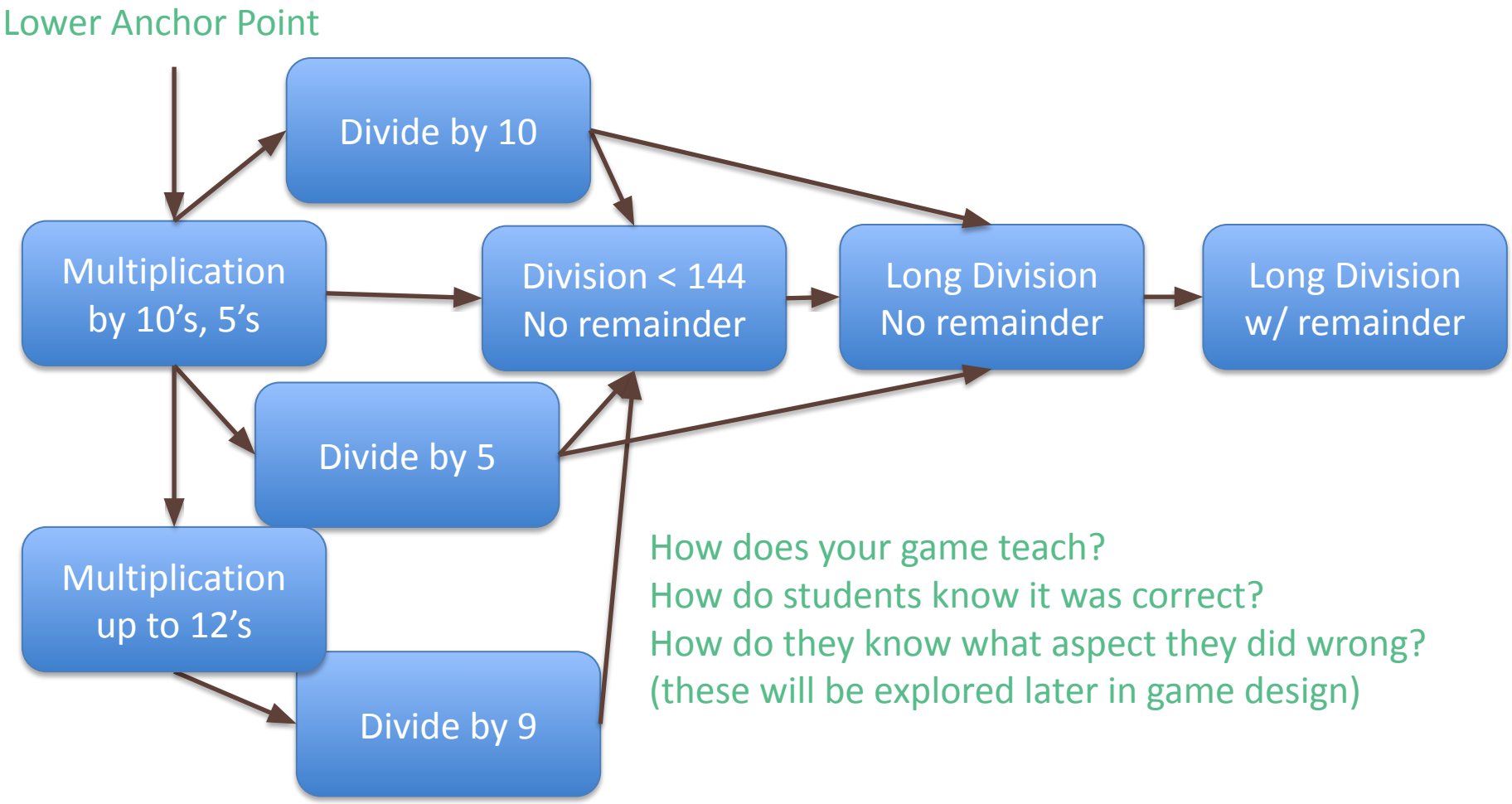

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