

They Don't Care What You Know Until They Know That You Care

Math Tutoring and the Secondary Student

CalTech RISE Tutoring Program

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Pasadena Unified School District

Who Am I?

I have coached, enhanced self-esteem and bolstered confidence. I have seen the frustration and tears and have listened to what hasn't been said. I have altered lives and opened doors for people who did not know the door existed.

Who am I?

I am a Tutor

- Tutor (n): a person charged with the instruction and guidance of another



Tale of a Tutor

A tutor who taught on a flute
Tried to teach two tooters to toot.
Said the two to the tutor,
“Is it harder to toot, or
To tutor two tooters to toot?”



- anonymous limerick

Creating a Safe Learning Environment



They Don't Care What You Know Until They
Know That You Care

Safe Environment : "Do" s

- Introduce yourself and get to know the student(s)
- Set the ground rules and expectations
- If you don't understand the assignment or what the teacher is asking, admit it to the student
- Admit errors
- Allow students to say "I don't know (how)"
- Guide students with questions, "What would happen if...?" "What are you thinking you should do next?"
- Encourage the explanation of steps/answers
- Take responsibility for student not understanding an explanation "What questions do you still have?"

Safe Environment : "Don't"s

- Show approval based on correct answers or understanding of material
- Allow negative verbiage from the student, i.e., “I’m stupid”, “That was dumb” or “I can’t”
- Give answers to problems

What Should I Say?

Instead of ...

- “That’s not right”/ “That’s wrong”
- “Do you understand/Do you get it?”
- “ This is easy”



Say...

- “I disagree with...”
- “What questions do you still have?/You still seem confused with my explanation”
- “I see how this can be difficult to understand”

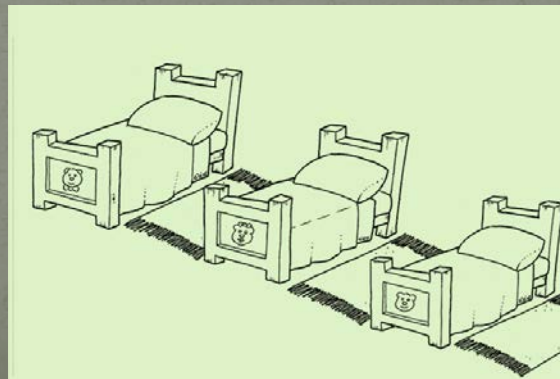
Helping Students Learn



You do not have to remember understanding.

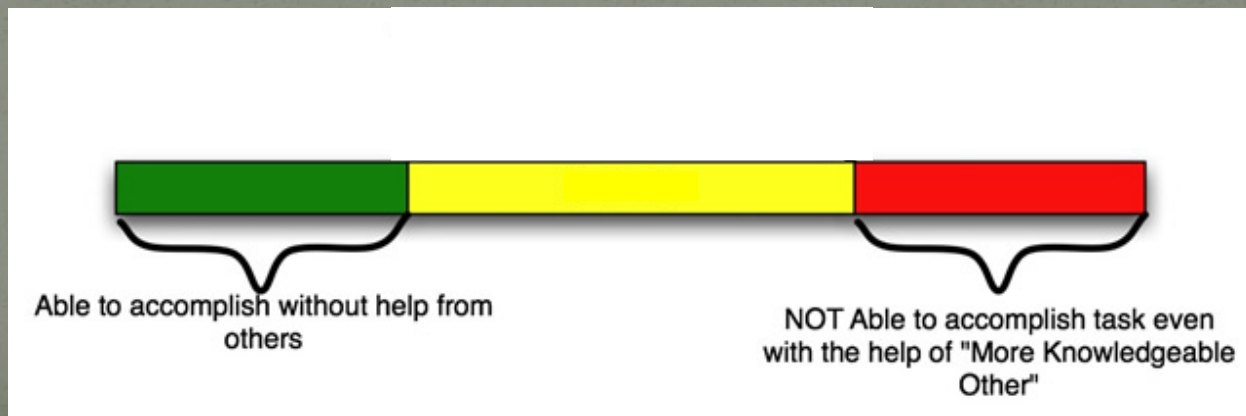
Zone of Proximal Development

- Lev Vygotsky, a Russian psychologist, came up with the concept of the zone of proximal development to describe the optimal learning environment.
- Think of it as something like a "Goldilocks Theory." Sometimes work is too easy. Sometimes work is too hard. And sometimes work is just right. When the work is just right, it creates an optimal learning environment.



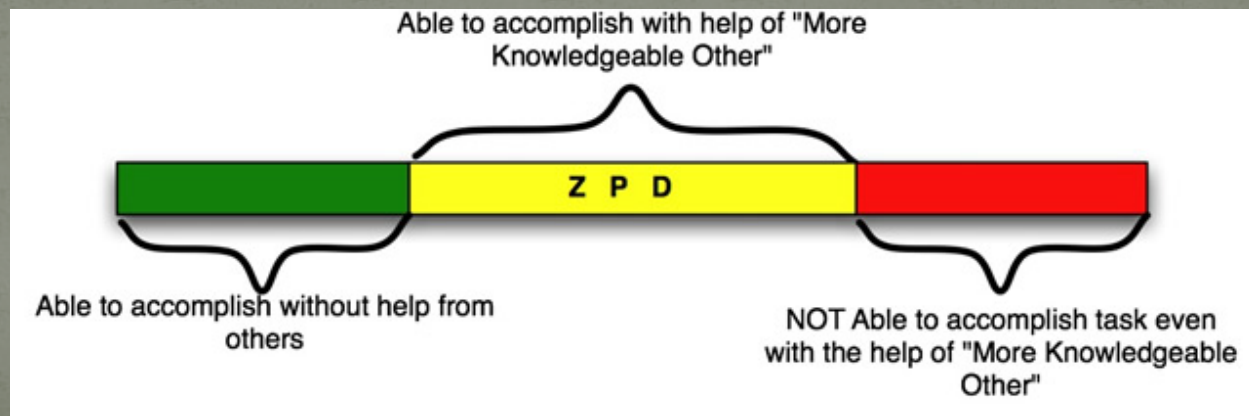
Zone of Promixal Development

When work is easy, learners can do the work on their own without any help. It is their "comfort zone." If all the work a learner is asked to do is always in the comfort zone, no learning will take place. In fact, a learner will eventually lose interest. When the work is too hard, on the other hand, the learner becomes frustrated. Even with help, learners in the "frustration zone" are likely to give up.



Zone of Promixal Development

The area between the comfort zone and the frustration zone is the one where learning will take place. It is the area where a learner will need some help or will need to work hard to understand the concept or complete the task. This is the zone proximal development. A learner is neither bored nor frustrated, but appropriately challenged.



Tell me and I forget. Show me
and I remember. Involve me and
I understand.



The Frayer Model

- *Used to build vocabulary*
- *A chart with 4 sections*
 - Definition or Essential Characteristics
 - Characteristics/facts or Non-essential Characteristics
 - Examples
 - Non-examples.

**Definition/ Essential
Characteristics**

**Characteristics/Facts
Non-essential Characteristics**

CONCEPT/WORD

Examples

Non-examples

What is ...?

Essential Characteristics

- contains water
- has a shore
- is surrounded by land except at areas where it meets another body of water
- larger than a pond

Nonessential Characteristics

- may contain water plants and fish
- likely contains fresh water
- may provide an area for recreational activity
- may provide a habitat for wildlife
- may be formed by glaciers
- may be an expanded part of a river
- may be formed by a dam

?

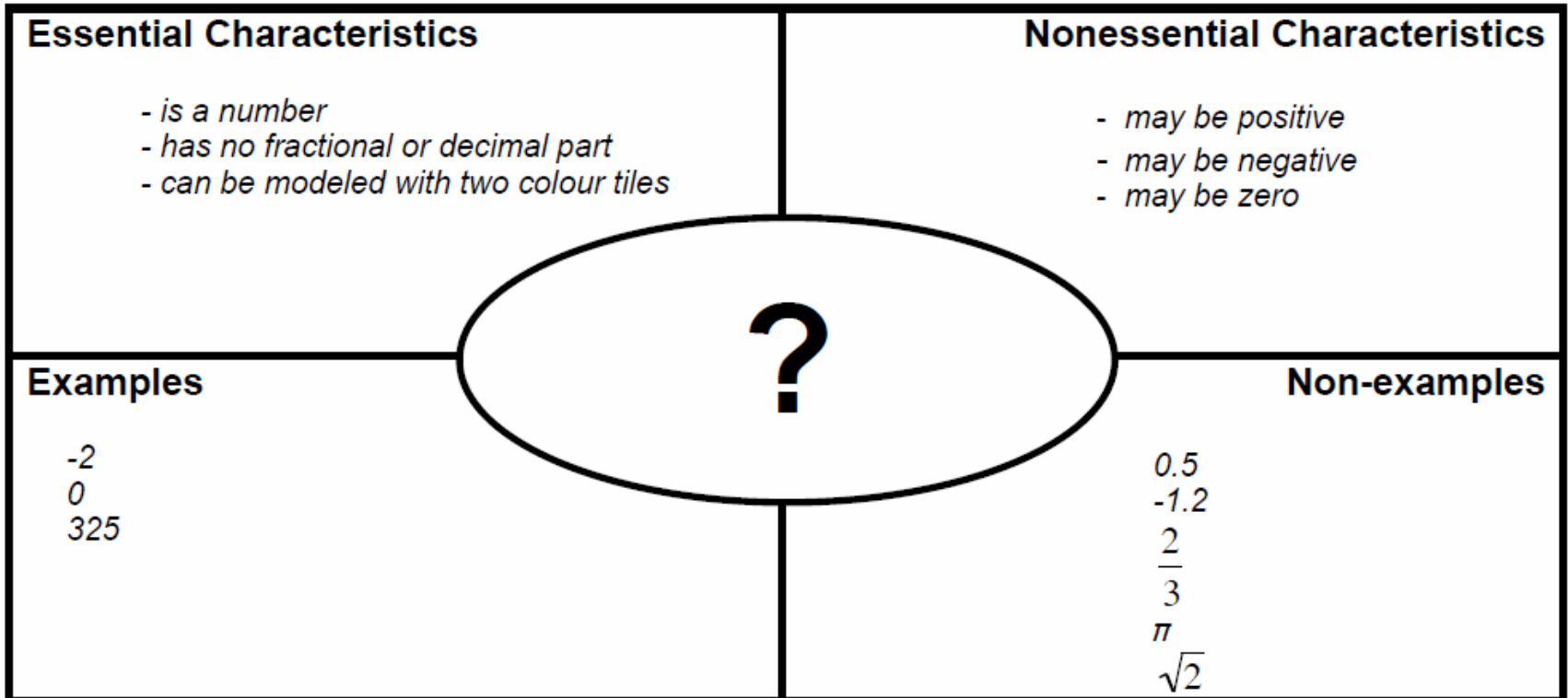
Examples

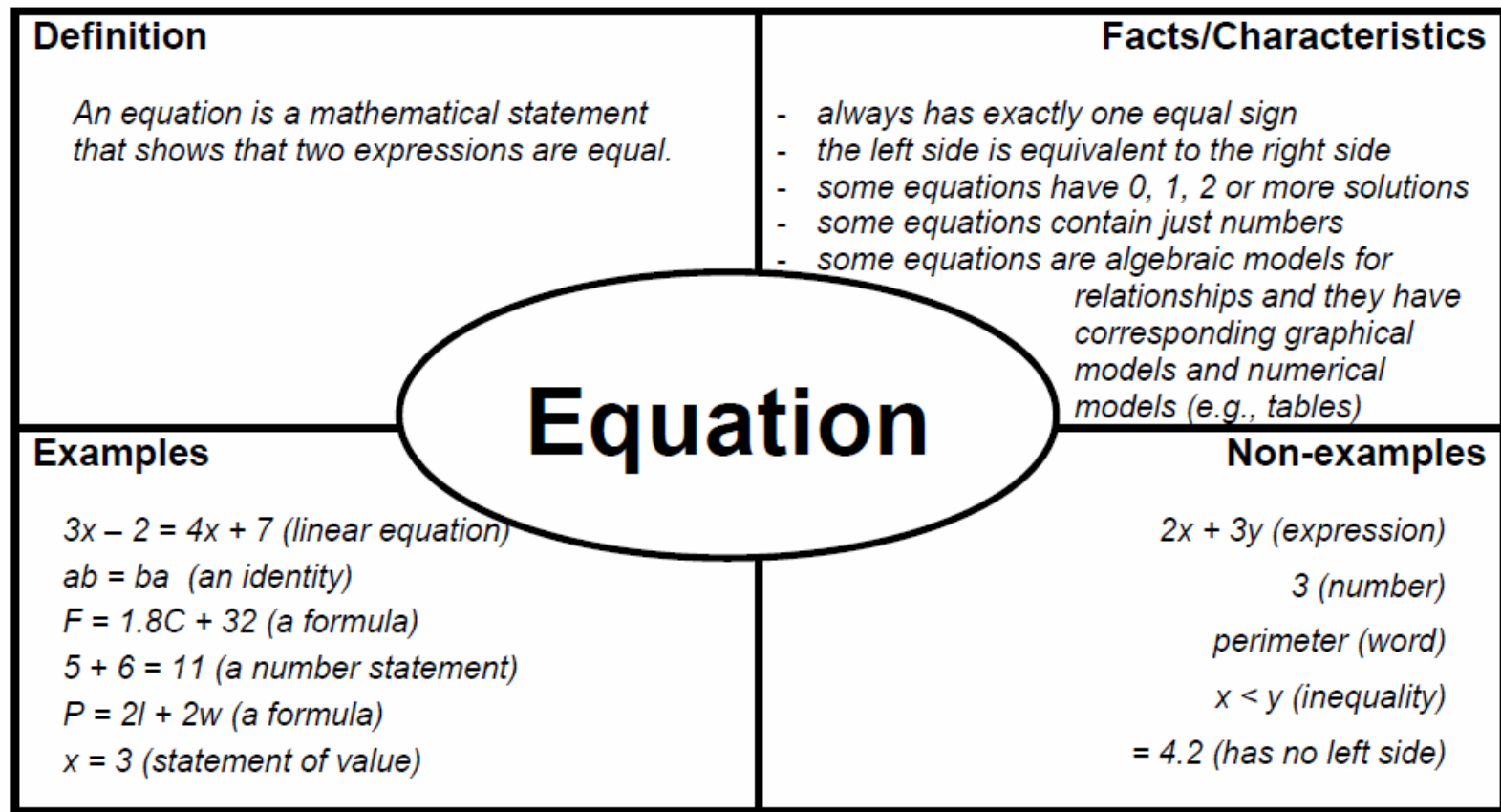
- _____ Ontario
- _____ Simcoe
- _____ Temagami
- Ramsey _____
- _____ Victoria
- Loch Ness
- Lac Champlain
- (replace _____ with the unknown word)

Non-examples

- pond
- puddle
- swimming pools
- Elliot Lake (town)
- Georgian Bay
- Pacific Ocean
- St. Lawrence River

What is ...?





THINK and DISCUSS:

How does thinking about non-examples help clarify students' understanding about the word?

Supporting Student Learning



Supporting Student Learning

- Guide students to do the work as much as possible
- The pencil should always be in the student's hand
- Any dictated steps **must** be clear
- Students should use the language/vocabulary of the subject
- Use analogies to help with understanding
- Have students dictate the steps to you or to write a proof as he/she does a problem
- Use error analysis/counterexamples/contradictions
- Scaffold – use easier versions of a problem/concept to build understanding (ZPD)
- Use various methods to explain

You Don't Forget Understanding

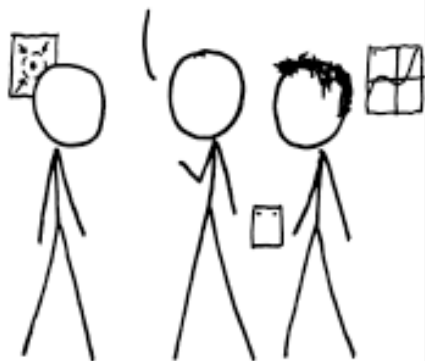
~~Algorithm vs Concept~~

	Pros	Cons
Algorithm Only	<ul style="list-style-type: none">• Shorter instructional time• Sequences and rules	<ul style="list-style-type: none">• Creates gaps through confusion• Transferability can be problematic
Concept Only	<ul style="list-style-type: none">• Greater transferability to other problem sets	<ul style="list-style-type: none">• Longer process• Transition to algorithm often skipped by instructor

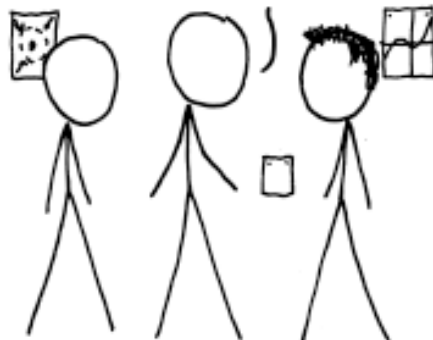
Algorithm AND Concept

LOS ALAMOS, 1945...

WE HAVE A DECISION. IF WE'VE DONE OUR MATH RIGHT, THIS TEST WILL UNLEASH HEAVEN'S FIRE AND MAKE US AS GODS.



BUT IT'S POSSIBLE WE MADE A MISTAKE, AND THE HEAT WILL IGNITE THE ATMOSPHERE, DESTROYING THE PLANET IN A CLEANSING CONFLAGRATION.



WOW. UM. QUESTION: JUST TO DOUBLE-CHECK— ALTHOUGH I'M 99% SURE—



IS IT "SOH CAH TOA" OR "COH SAH TOA"?

OH, FOR THE LOVE OF... CAN SOMEONE REDO STEVE'S WORK?



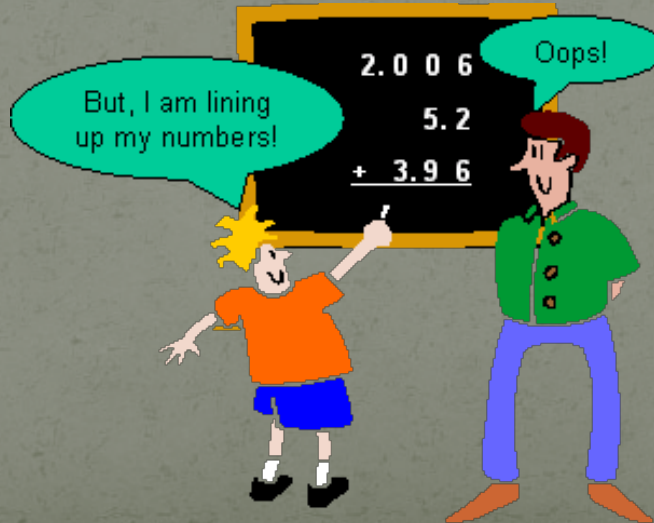
Misconceptions

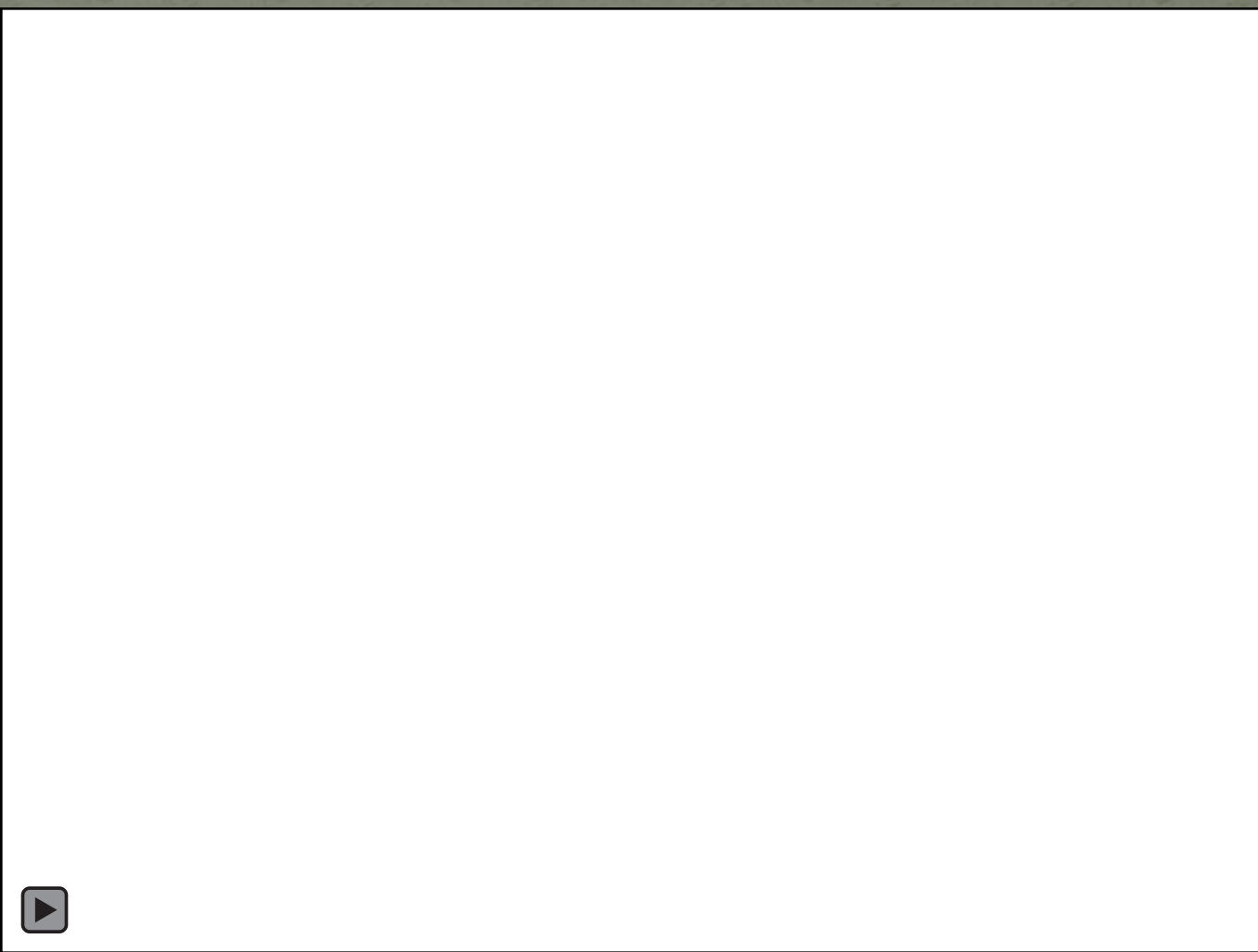
Ⓐ $4 + 2 = 8$
 $2 \times 3 = 5$
 $7^2 = 14$



Q. Find the area of the right angled triangle

A. Area = $\frac{1}{2} \times 5 \times 13$
= 32.5 sq cm





In the end, it starts with....



Relationships!

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