MATHEMATICS TEACHERS CONFERENCE 2017: 1st June @NTU/NIE

Mathematics Instruction: Goals, Tasks & Activities

**Designing Rich Mathematics Activities
for
Conceptual and Relational Understanding**

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Lateral Thinking

to boost your Brainpower for Mathematics
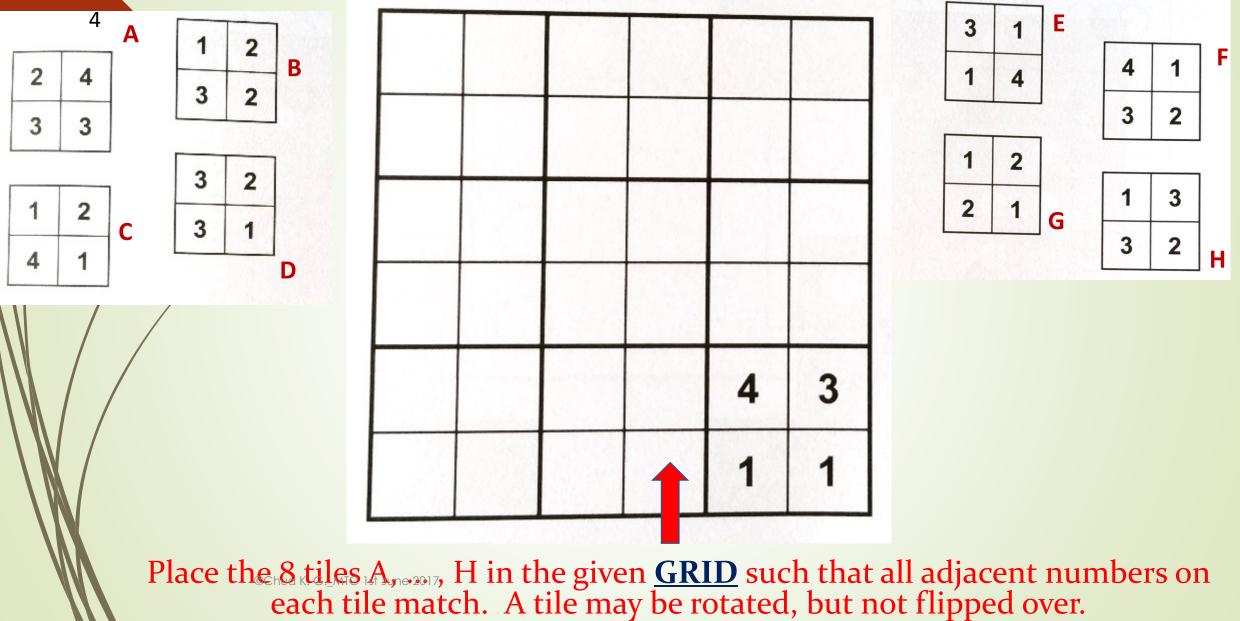
3

Which letter was originally in the bottom right corner?

Which symbol has been removed?
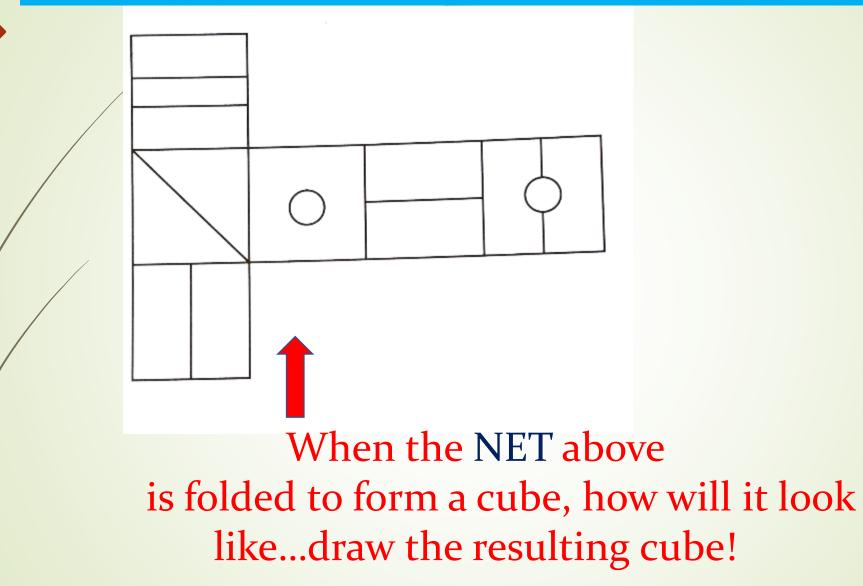
Which symbol has changed from black to white?

Place the 8 tiles A, ..., H in the given **GRID** such that all adjacent numbers on each tile match. A tile may be rotated, but not flipped over.

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When the NET above
is folded to form a cube, how will it look
like...draw the resulting cube!

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Nature of Mathematics

REASONING

Themes in Mathematics

1. ***Properties***
2. Operations
3. Algorithms
4. ***Relationships***

5. ***Representations***
6. Applications
7. Extensions
8. Truths

BIG IDEAS
in Maths Syllabus
[wrt Pedagogy]
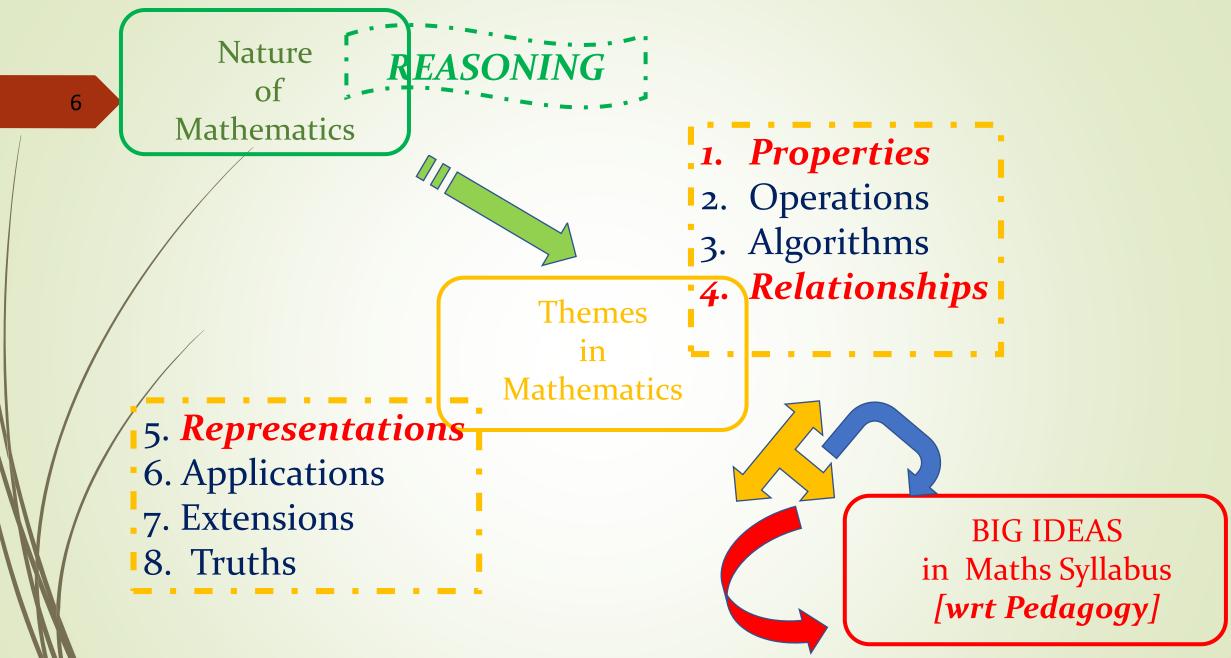
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E.G. Tay, Sharing@ AME annual meeting 29th May 2017

Conceptual knowledge: *an integrated and functional grasp of mathematical ideas*

Kilpatrick (2011)

Conceptual knowledge: *rich in relationships and can be thought of as a connected web of knowledge*

Hiebert (1986)

translate teaching to learning

=> *"ensure" conceptual & relational understanding*

Rich Assessment Tasks/ Activities

- Connect naturally with what has been taught/learnt

- Address a range of outcomes in one task/activity

- Engage the learners

- Provide a measure of choice or "openness" – using different methods/approaches

- Are worthwhile for learners' learning

- Are time efficient and manageable

- Represent authentically the ways the knowledge and skills will be used in the future

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A. Downtown, R. Knight, D. Clarke & G. Lewis (2006)

Topic I: Percent
{Sense making & Reasoning}

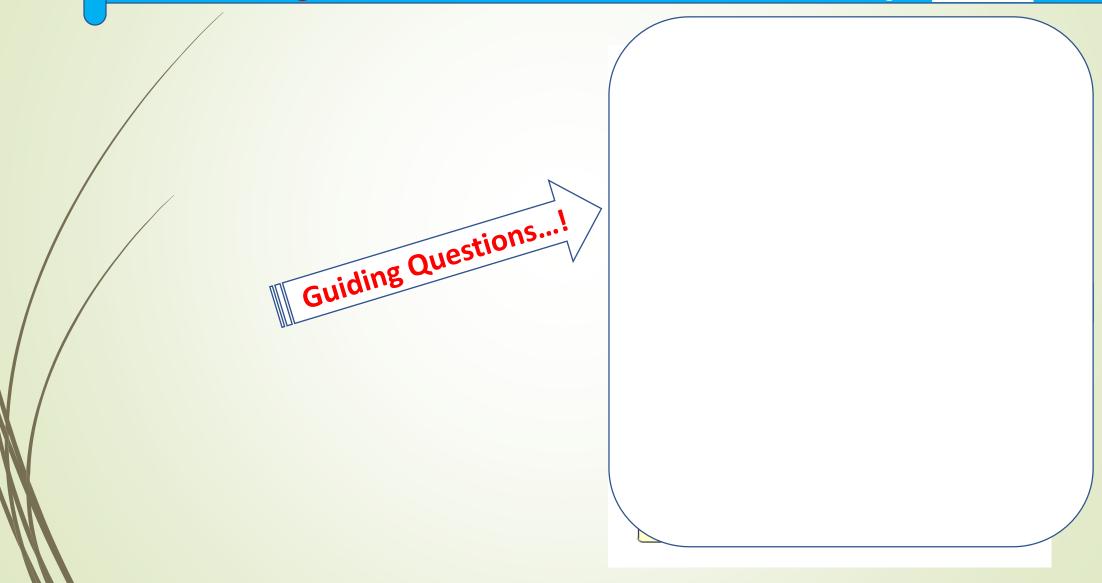# Let's Recall/Reflect! :

% Reasoning ⊂ Proportional Reasoning

❖A special ratio

=>

proportion of a part to a whole of 100 and the units used in the part and whole must be the same.

1. Which is a better buy?
2. Support your answer with some mathematical calculations.
3. Explain briefly.

Promotion A:
Chicken or Sausage Set

Promotion   B:
Chicken or Potatoes Combo

Discounts:

*Does **higher discount amount** means better buy? **Why?***

Guiding Questions…!

LET'S REFLECT!

*More discount (savings) is <u>not useful</u> to decide which is a better buy.

*Reason: the <u>base is different</u>
*Hence, we need to compute <u>% discount</u>

LET'S REFLECT!
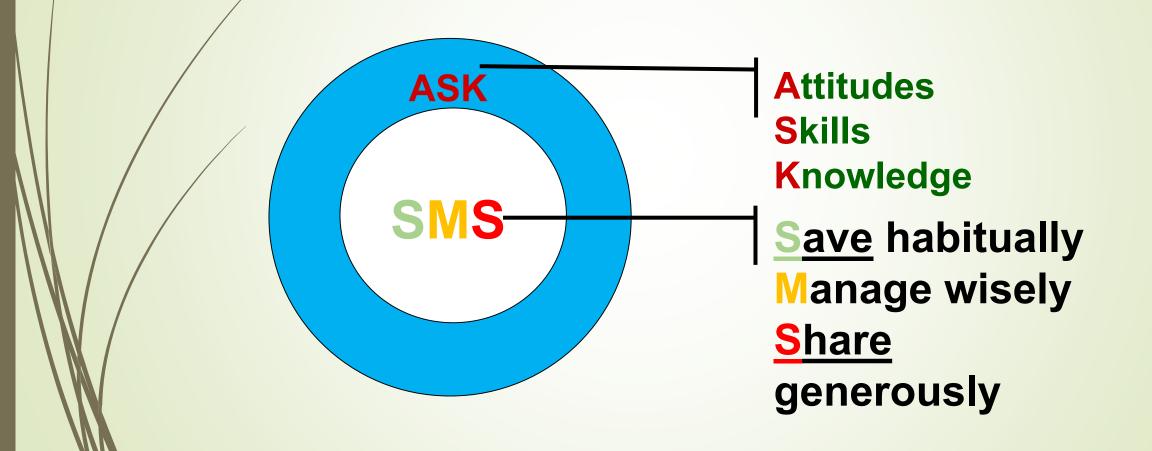
*What can we do
with the savings
from
the discounted buy?*

Financial Literacy

was defined in the UK by Noctor, Stoney and Stradling (1992) as the ability

to make

_____

and to take

_____

regarding the *use* and *management* of money

Financial Literacy

ASK

SMS

Attitudes
Skills
Knowledge

Save habitually
Manage wisely
Share generously

Koh, N.K. (2011) Financial Literacy Curriculum Framework, Technical Report

Saving & Sharing

2016 GCE 'O' Item : Manage wisely

**P2_Q2c
4016_old
syllabus**

2016 GCE 'O' Item : Manage wisely

*P1_Q12
4048_new
syllabus*

2016 GCE 'NA' Item: Manage wisely

*P2_Q10
4045_new
syllabus*

Authentic Context

Now, do your calculation with this new bill!

- **How do you calculate the service charges?**
- **How do you calculate the GST?**

Remarks: GST is calculated based on
sum of sub-total and SVC

Discounts:

Which item is the best buy?
Show your working to support your choice

.

A

B

C

D

Include the value of freebie in your computation!

Which item is the best buy? {kettle, camera & notebook}

Show your working to support your choice.

Let's focus on
Sense making and % Reasoning!

➡ *Justify each given concluding statement with correct % reasoning and sense making*

➡ *Refute each given concluding statement with % reasoning and sense making*

S. W. Teo , (2016)

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Ann

Betty

➡ *If I sign up for 30-hour revision packages as 2 sets of 15-hour revision packages.*
I will enjoy 20% discount off the total tuition fee.

➡ *If I sign up for 30-hour revision packages as 2 sets of 15-hour revision packages.*
I will enjoy 10% discount off the total tuition fee.

Category	Specific problem [TIMSS 2007]	% performance
Ratio task with context[27] that is familiar to students in Singapore	On a school trip, there was 1 teacher for every 12 students. If 108 students went on the trip, how many teachers were on the trip? (A) 7 (B) 8 (C) 9 (D) 10	Singapore (95%) International (79%)
A special ratio (per cent) task with context that could be less familiar to students in Singapore	The total cost of the journey for all the students must be 500 zeds or less. There are 30 students in the class Here are the costs for round trip ticket visiting each town. **Acton or Camford** Student Rate 25 zeds $\frac{1}{3}$ off for groups of 25 or more students **Burkey or Durley** Student Rate 20 zeds 10% off for groups of 15 or more students Which towns can they afford to visit? Show your work.	Singapore (40%) International (8%) *Foy & Olson , (2009)*

Context Distance...

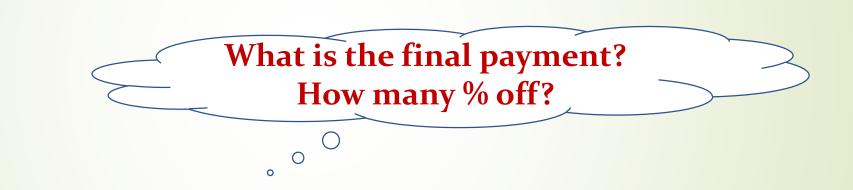- Influences the students' performance

- Changes the motivating tool

- Task context engagement and sequence is also important.

**What is the final payment?
How many % off?**

Reasons for not making sense of the mathematical statements in real life:

- *Suspending sense making while solving mathematical problems*

- *Forming imperfect concept image leading to misconceptions*

- *Not coping with task complexity*

- *Being unfamiliar with the terminology of the task context.*

S. W. Teo (2016)

Topic II: Geometry

{concept & properties of polygons}

Shape memory Game

➡️Show 2D shapes for 6 minutes

➡️Remove the shapes

➡️Ask students to

*classify the shapes

*justify their classifications

➡️ ***Mathematical Content:*** visualization & properties

Paper Folding Activities: Exploring properties of polygons

❖ *Begin with a sheet of A4 paper*

❖ *What is the important concept commonly used in this activity?*

❖ *What other pre-requisites are needed?*

➡ **Regular triangle**

❖ **Regular quadrilateral**

➡ **Regular pentagon**

➡ **Regular hexagon**

➡ **Rhombus & parallelogram**

➡ **Rectangle**

➡ **Trapezium**

Polygon (special name)	No of Sides	No. of Diagonals	Nature of Diagonals	No. of equal Sides	No. of equal Angles	Sum of int. Angles	Special Remarks
Regular triangle							
Regular quadrilateral							
Regular pentagon							
Regular hexagon							
Rhombus							
Parallelogram							
Trapezium							
Rectangle							
Kite							

What will my quadrilateral look like?

A quadrilateral has perpendicular diagonals but it is neither a square nor rhombus!

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Find the area of the trapezium if the ratio of the longer side to the shorter side to the perpendicular height between them is 3: 2 : 1.
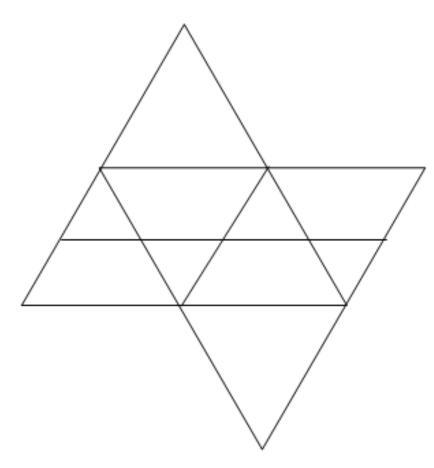
Given that the longer side is $3x + 3$, where x = 3.

32 % of a Sec 3 IP students could not solve this problem ...

WHY?

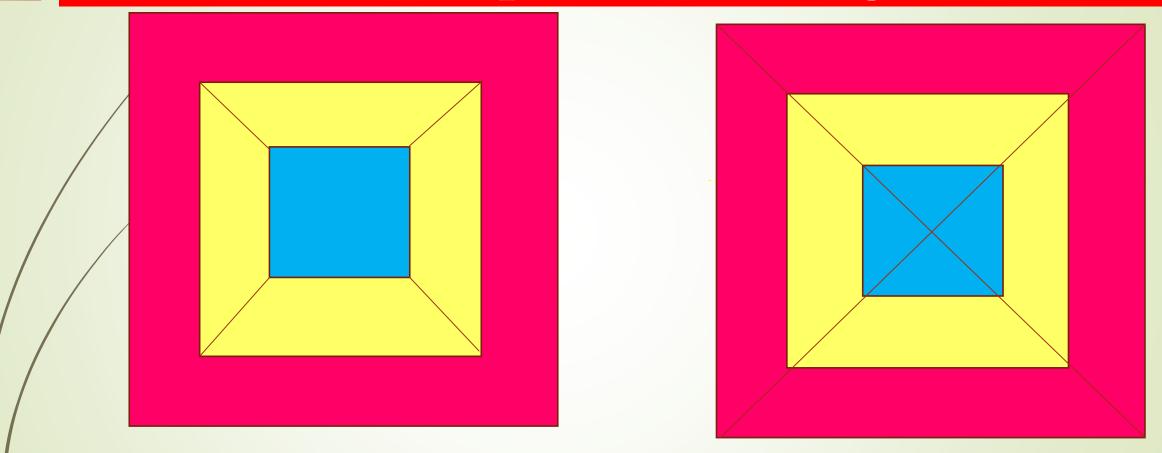How many trapezia, parallelograms and triangles can you find in this diagram?

Polygon	Trapezium	Parallelogram	Triangle
Number			

Using the figure below: design a task related to a topic in Geometry

Find an example in a real life context similar to the above figure!