翻轉數學課堂經驗分享

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Reboot the School

SALMAN KHAN'S YOUTUBE LESSONS HAVE ALREADY MADE HIM A GEEK CELEBRITY. NOW HE WANTS TO REINVENT HOMEWORK, BANISH CLASSROOM LECTURES—AND MAYBE SAVE EDUCATION

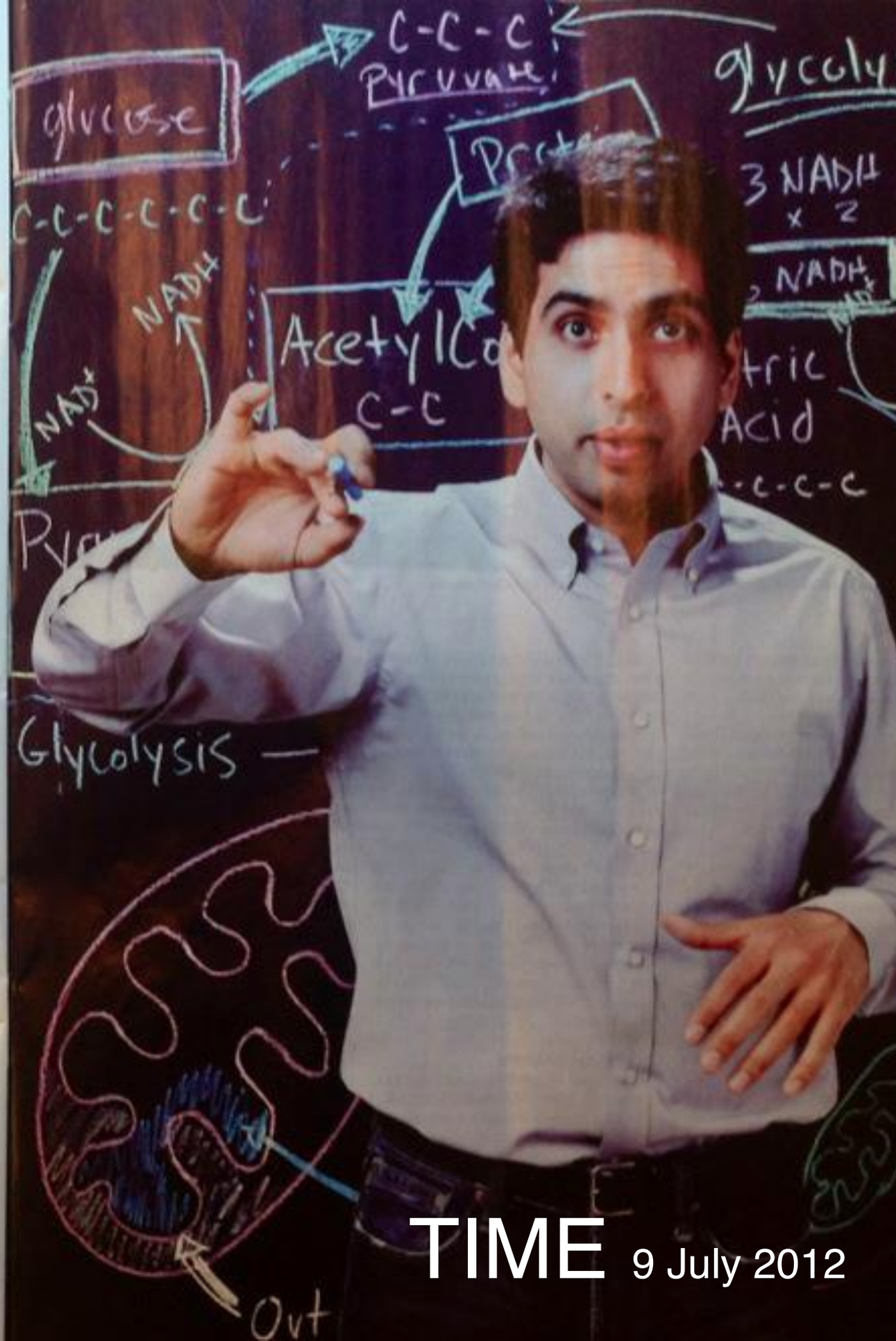
BY KAYLA WEISLEY

FIFTH GRADERS AT EASTSIDE College Preparatory School in East Palo Alto, Calif., sit at their desks with netbooks. They're in the middle of a math lesson, listening as a teacher explains how to convert percentages to decimals. "If we get rid of the percent sign, we just have to move the decimal sign two places to the left," the instructor says. Pens scribble across notebooks.

Eleven thousand kilometers away in Accra, Ghana, students at the African School for Excellence are studying logarithms. Their teacher is the same one firing off math tips in California—both groups of kids are learning by watching online videos. While the screen shows a march of equations and diagrams, the students never actually see the face of the lecturer. There's just a voice, deep, patient and unrehearsed—think NPR host crossed with Mister Rogers. His inflection rises at times to underscore a point or when he gets really excited. "Math is not just random things to memorize and regurgitate on a test next week," he says. "It's the purest way of describing the universe!"

The voice belongs to Salman Khan, a 35-year-old hedge-fund manager turned YouTube professor to millions around the world. Thanks to his Khan Academy,

Photograph by Jamie Chung for TIME



TIME 9 July 2012

2012 暑假

中三數學科開始

1.1 Factorization Using Identities

$ab + ac = a(b + c)$ Taking out common factor

$ab + ac + xb + xc = (ab + ac) + (xb + xc)$
$= a(b + c) + x(b + c)$
$= (b + c)(a + x)$

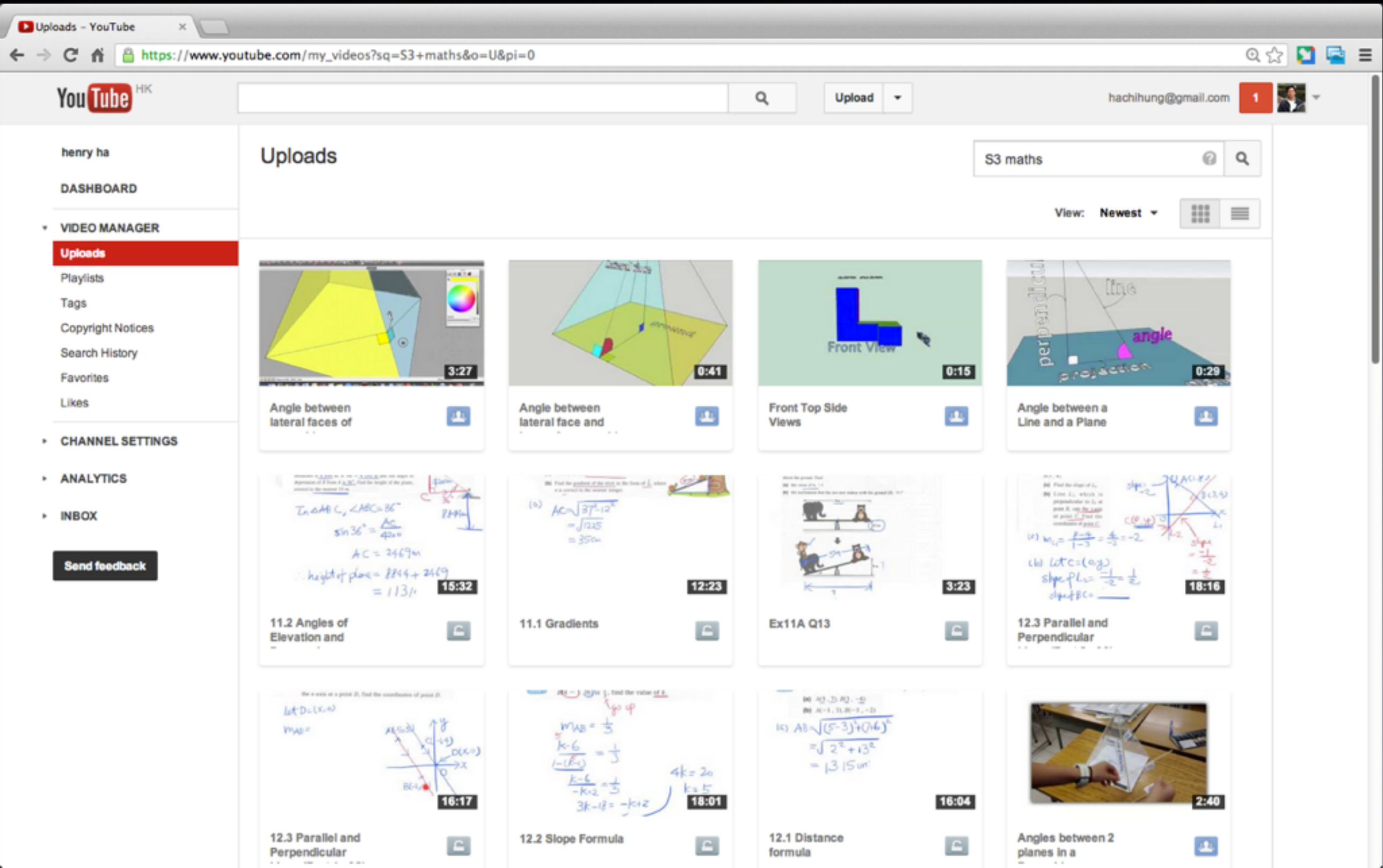
A Using the Difference of Two Squares Identity

$$a^2 - b^2 \equiv (a + b)(a - b)$$

Quick Example

Factorize $1 - a^2$.

上載至影片分享平台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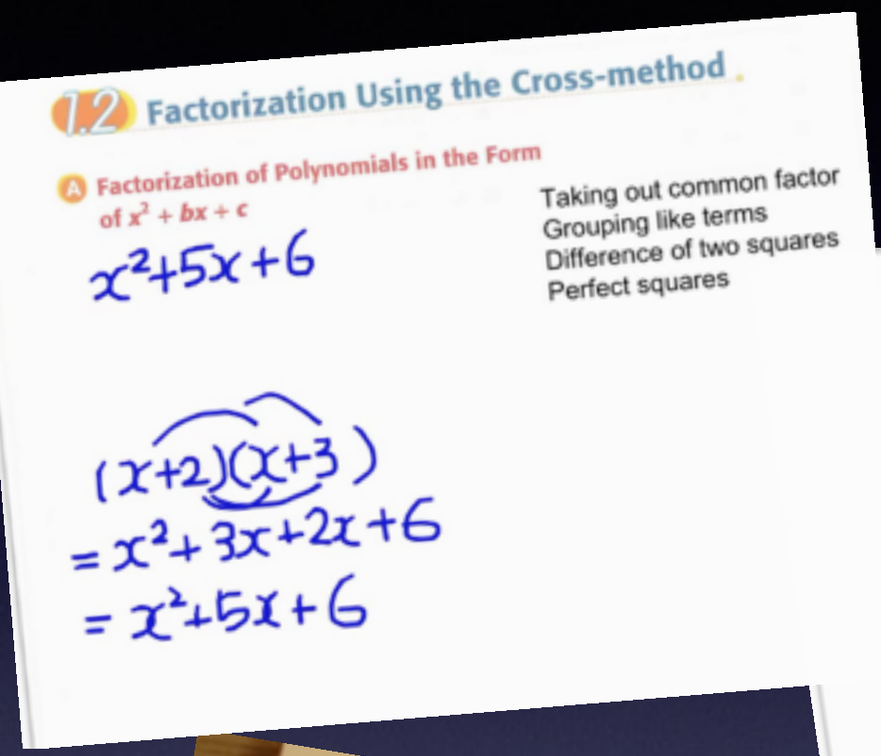
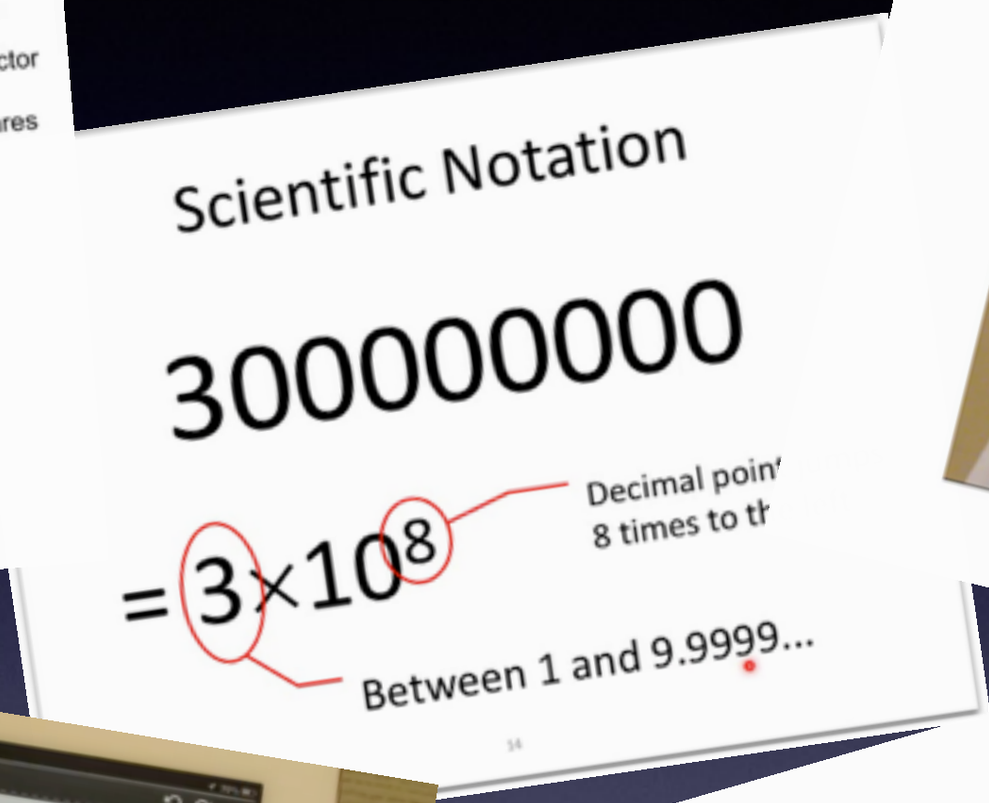
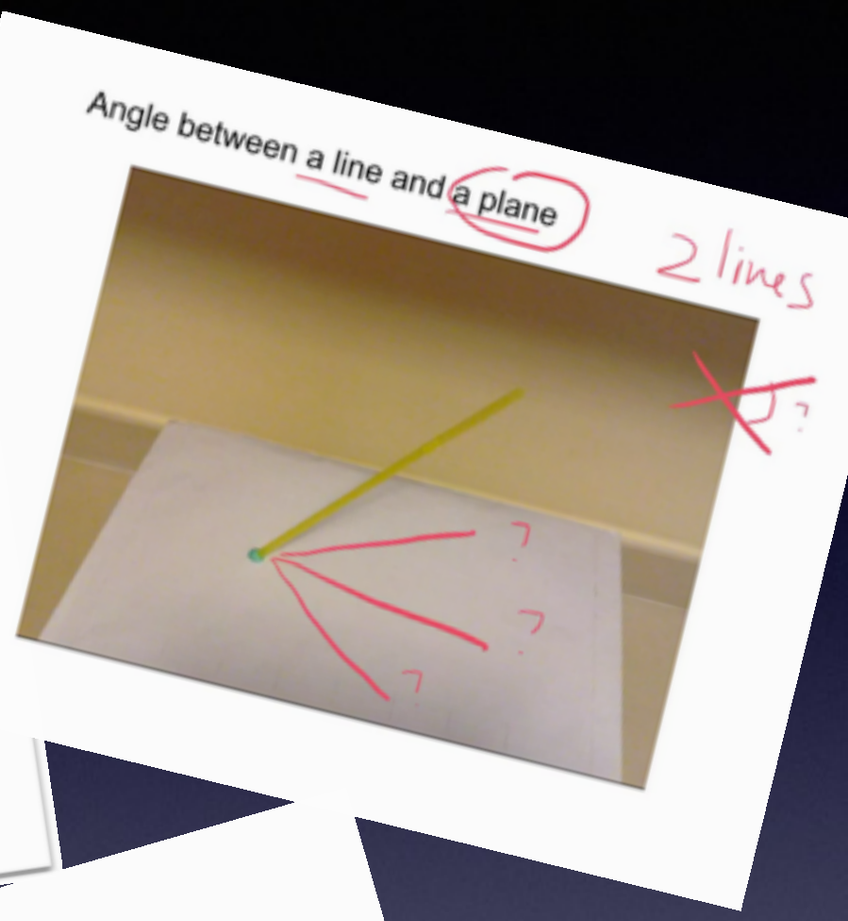
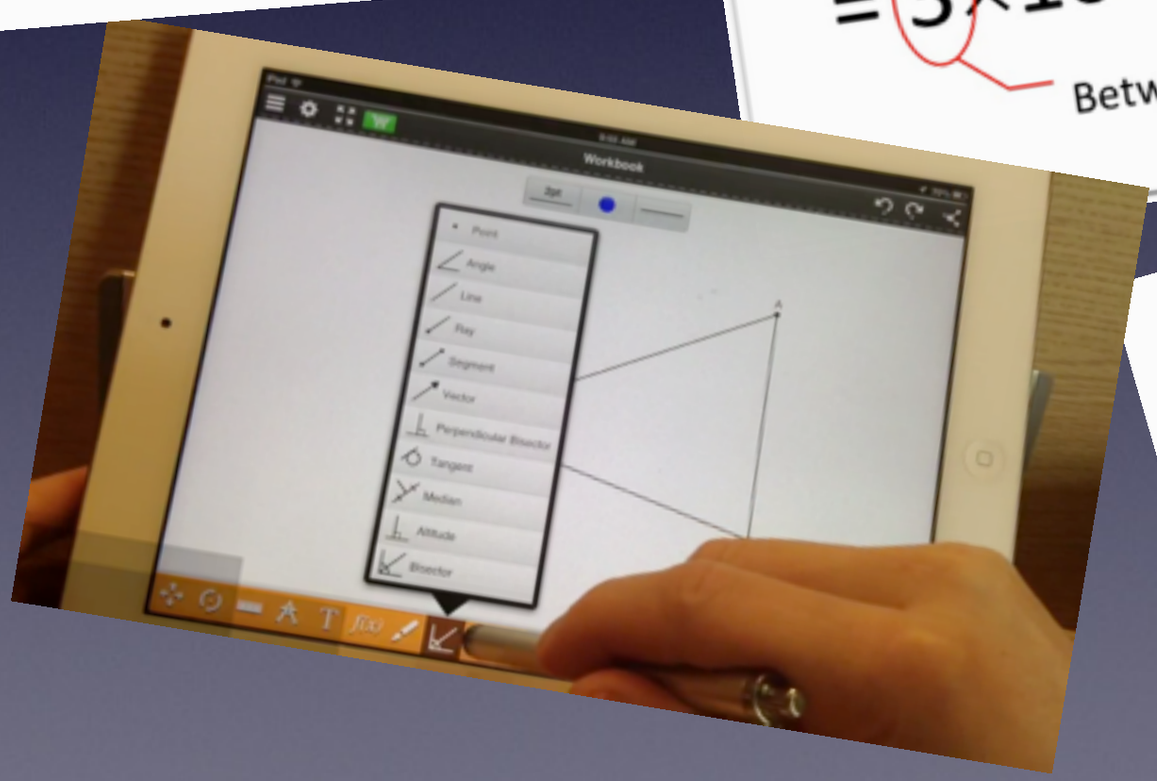
ANALYTICS
INBOX
Send feedback
Uploads
S3 maths
View: Newest
3:27
Angle between lateral faces of
0:41
Angle between lateral face and
Front View
0:15
Front Top Side Views
perpendicular
line
angle
projection
0:29
Angle between a Line and a Plane
15:32
11.2 Angles of Elevation and
12:23
11.1 Gradients
3:23
Ex11A Q13
18:16
12.3 Parallel and Perpendicular
16:17
12.3 Parallel and Perpendicular
18:01
12.2 Slope Formula
16:04
12.1 Distance formula
2:40
Angles between 2 planes in a

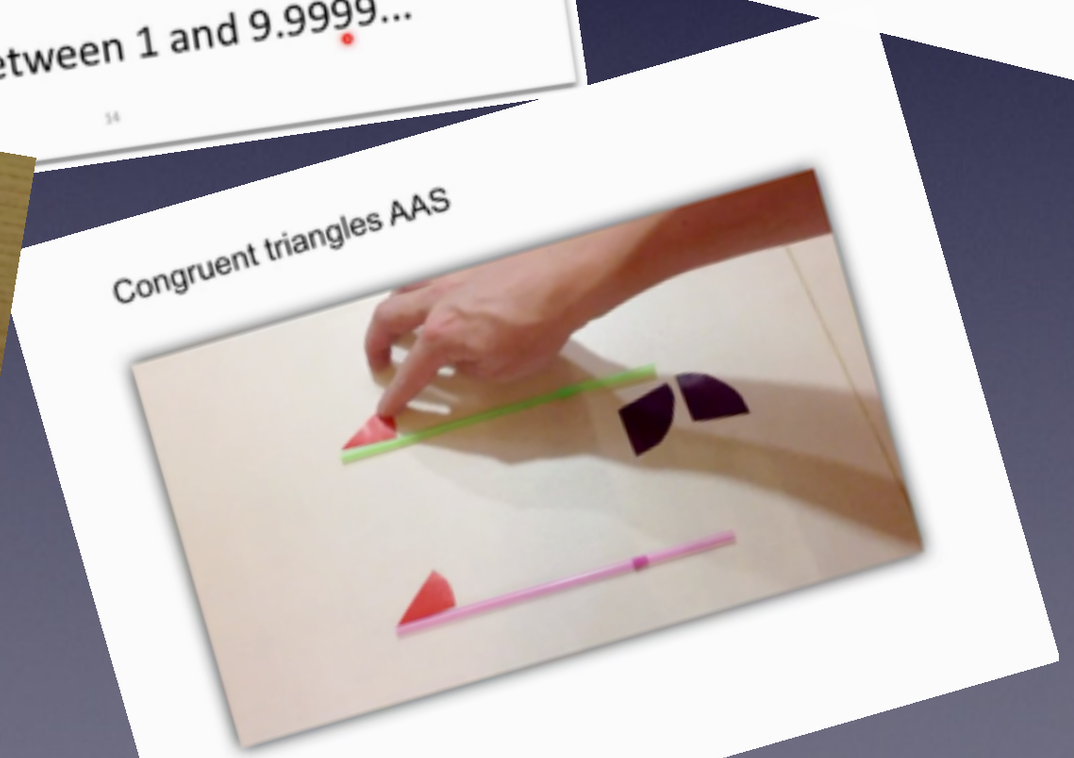
餐搵餐食 餐餐唔夠食


1.2 Factorization Using the Cross-method
A Factorization of Polynomials in the Form of $x^2 + bx + c$
x^2+5x+6
Taking out common factor
Grouping like terms
Difference of two squares
Perfect squares
$(x+2)(x+3)$
$=x^2+3x+2x+6$
$=x^2+5x+6$


Scientific Notation
300000000
$=3\times10^8$
Decimal poin
8 times to th
Between 1 and 9.9999...


Angle between a line and a plane
2 lines


Workbook
Point
Angle
Line
Ray
Segment
Vector
Perpendicular Bisector
Tangent
Median
Altitude
Bisector


Congruent triangles AAS

學生自願申報學習進度

Recent - Google Drive | Watch and Do Maths Awa

https://docs.google.com/spreadsheet/ccc?key=0AjN3IGzgW6EjdDBkb2ZqdnVJWEs5aDdjQm1hUzE2Q2c#gid=0

hachihung@gmail.com

Watch and Do Maths Award Scheme 睇片做數獎勵計劃 (12-13)

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1				Factorization												Indices									F
2				Video	Exercise	Video	Exercise	Video	Exercise	Video	Exercise	Video	Exercise	Video	Exercise	Video	Exercise	Video	Exercise	Video	Video	Video	Video	Ex	Video
3	No	cName	eName	1.1a	1A	1.1b	1B	1.2a	1C	1.2b	1D	1.3	1E	1.4	Suppl	2.1	2A	2.2	2B	2.3	2.4	3.0	3.1	3A	3.2
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5	2			Watched	Done	Watched	Done	Watched	Done	Watched	Done	Watche	Done			Watch	Done	Watch	Done				Watch		
6	3			Watched	Done		Done		Done		Done		Done				Done								
7	4			Watched	Done		Done		Done		Done		Done		Done		Done								
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29	26			Watched	Done	Watched	Done	Watched	Done	Watched		Watche		Watch		Watch									
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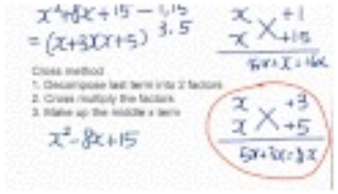
35	32			Watched	Done	Watched	Done	Watched																	
36	33			Watched		Watched		Watched	Done	Watched		Watche	Done	Watch		Watch	Done								

Term1 | Seating Plan

henry ha ›



1.2a Cross Method

Created: Aug 20, 2012 • Duration: 21:10 •

VIDEO

YouTube 提供大量統計數據

Aug 20, 2012 – Oct 29, 2012

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Compare metric ▾ Daily ▾ Show growth

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Explain Everything

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自己拍片

遷就學生程度

親切感

自主內容

工作量

時間

能否持續

長期對著電腦教學

會否變成宅男宅女?

想像：自己在課室
向學生講解教學內容

易入迷思

拍片 = 翻轉課堂

2013-14

~~拍片~~

專注課堂設計

高階思維訓練

電子學習

主動學習

翻轉課堂

日間課堂活動

F.3C Maths (Ha sir)

No: _____ Name: _____

Probability

5.1 Probability

P(event) = favourable outcomes / total no. of possible outcomes.

$0 \le$ ____ ≤ 1

Probability = The likeliness of something occurring

1. A student is chosen randomly (隨機) from your class. Find the probability that her English name

(a) begins with the letter "K".
(b) ends with the letter "e".

$P(\text{"K"}) = \frac{5}{40} = \frac{1}{8}$

$P(\text{end with "e"}) = \frac{16}{40} = \frac{2}{5}$

2. A number is selected randomly from 1 to 20 inclusively. Find the probability that it is

(a) an odd number
(b) a prime number

~~inclusive~~ 1 and 20 ~~exclusively~~

$P(\text{odd}) = \frac{10}{20} = \frac{1}{2}$

$P(\text{prime}) = \frac{8}{20} = \frac{2}{5}$

2, 3, 5, 7, 11, 13, 17, 19

3. There are 4 red socks, 6 blue socks and 2 green socks in a drawer. A sock is drawn randomly from the drawer. Find the probability that it is

4R
6B
2G

(a) a blue sock
(b) not a red sock
(c) a green or red sock

$P(\text{blue}) = \frac{6}{12} = \frac{1}{2}$

$P(\text{not red}) = \frac{8}{12} = \frac{2}{3}$

$P(\text{green/red}) = \frac{6}{12} = \frac{1}{2}$

4 pigeon-hole principle

4. A card is selected at random from a pack of 52 playing cards. Find the probability that the card is

(a) a king
(b) a spade
(c) a heart queen
(d) an even number

5. The number of students in the class 3C and 3D who can and cannot swim are listed as follows.

Class	~~Can swim~~	~~Cannot swim~~	
3C	30	10	= 40
3D	25	10	= 35

If a student is chosen randomly from the two classes, find the probability that the student is

(a) a 3C student who cannot swim
(b) a form 3 student who can swim
(c) a form 3 student

a. $P(\text{3C cannot swim}) = \frac{10}{75} = \frac{2}{15}$

b. $P(\text{F3 swim}) = \frac{55}{75} = \frac{11}{15}$

c. $P(\text{F3}) = \frac{75}{75} = 1$ certain event

指派較難問題
讓學生討論

指派較難問題

讓學生討論

老師四處行

提供協助

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設計多元化
教學活動

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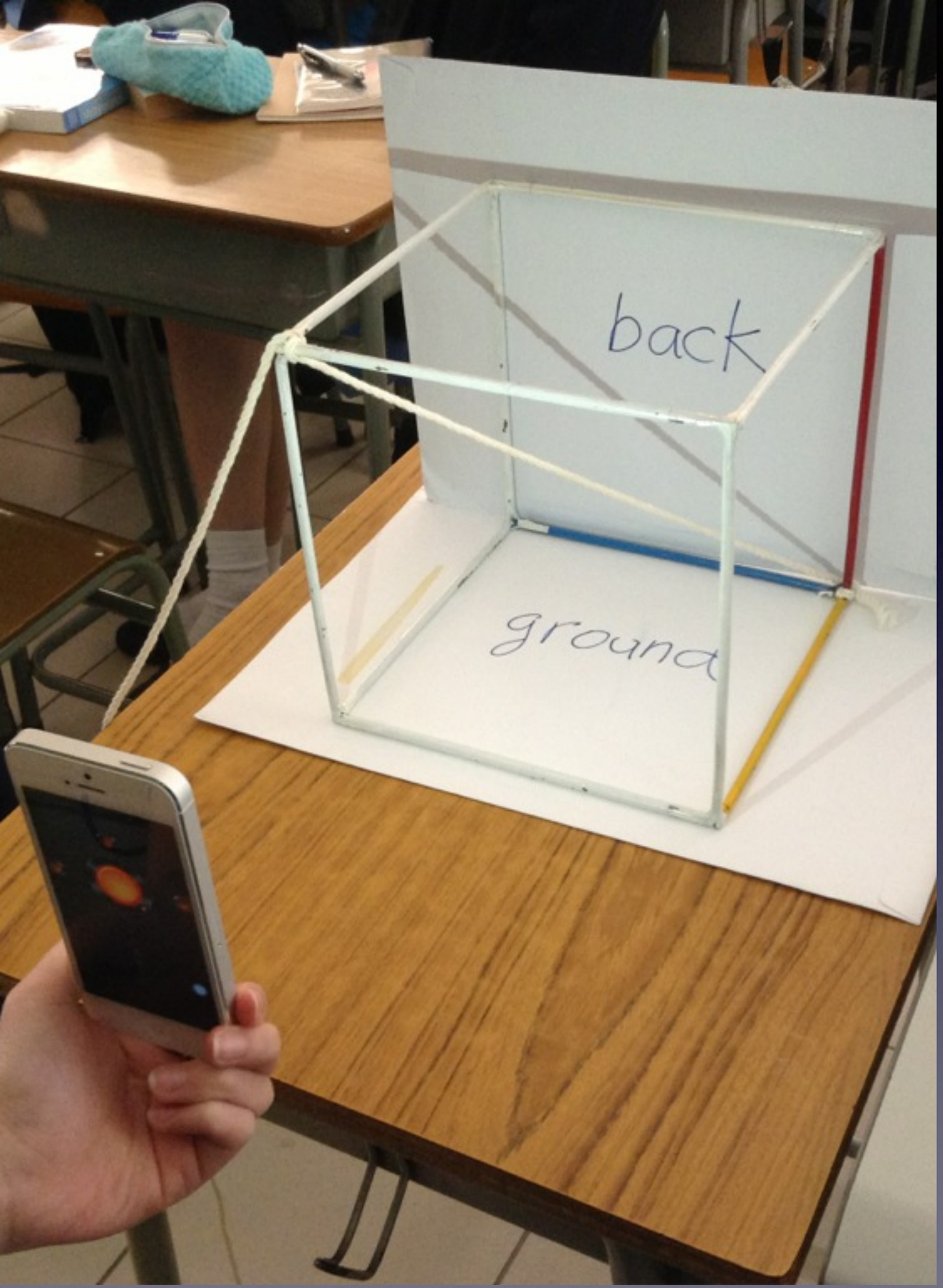
教學活動



指派較難問題
讓學生討論

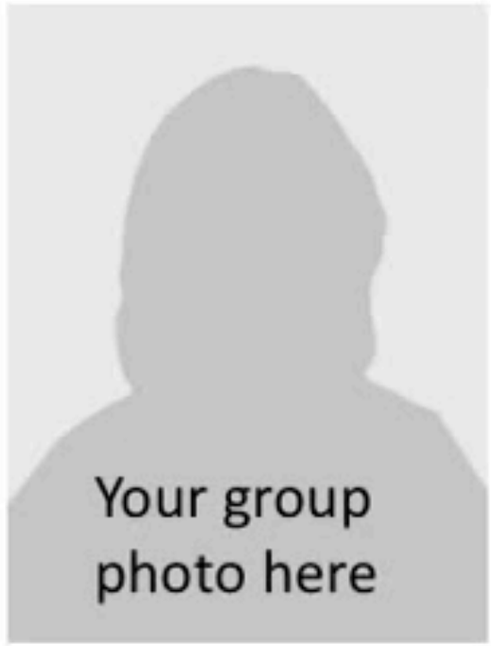
老師四處行
提供協助

設計多元化
教學活動

課堂示範

學生解釋數學題目

Explain Your Answer@HKDSE 2013 Maths MC



Group Members

_____

_____

學生學會甚麼？

重整自己所學

思考如何解釋

運用學科詞彙

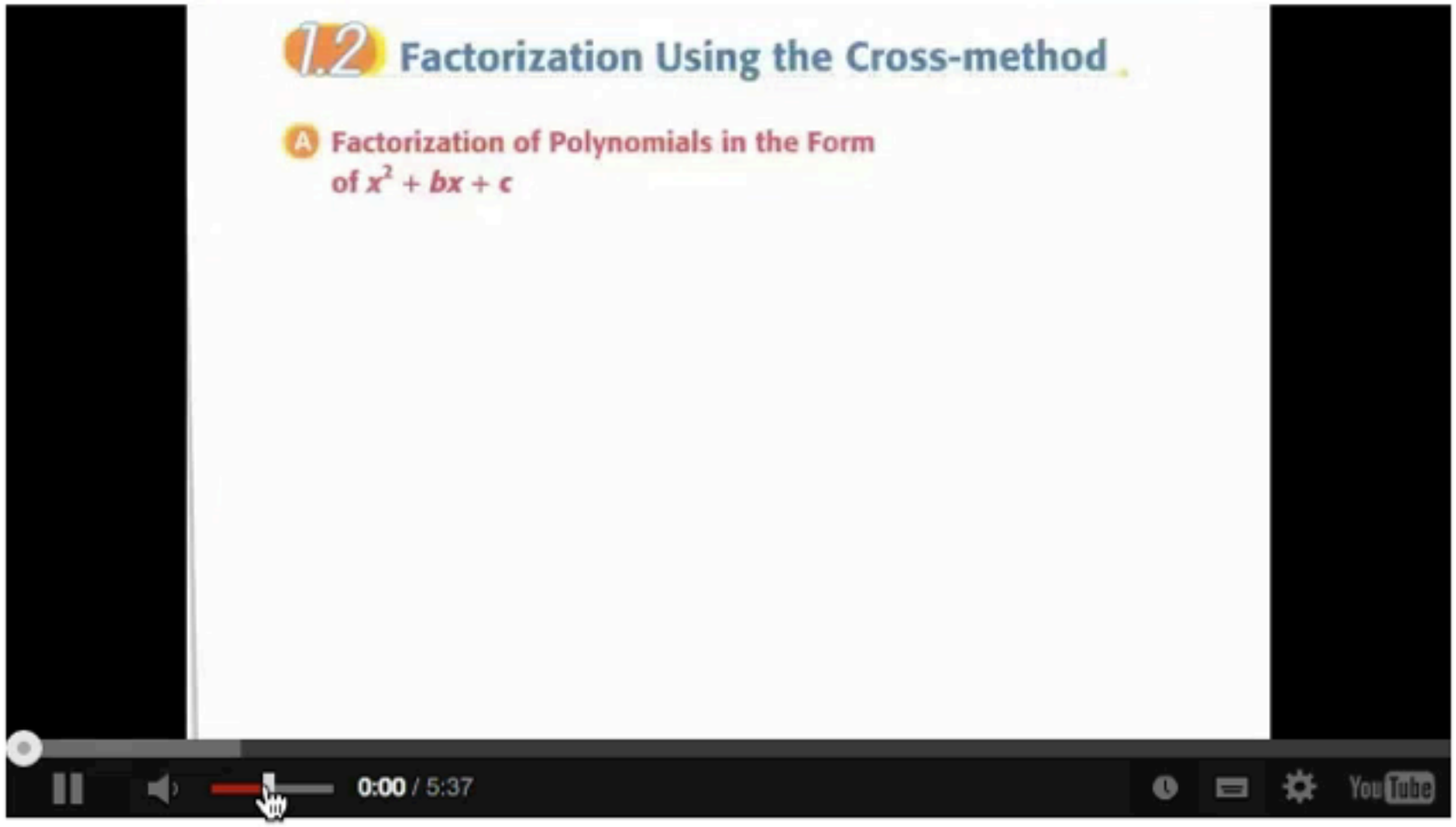
2014-15

收集數據平台

預習工作紙

1.2a Cross Method

Question 1 (10 points)



Factorize $x^2 + 4x + 3$.

- a $(x + 2)^2$
- b $(x - 1)(x - 3)$
- c $(x + 1)(x + 3)$

S3 Maths (Ha sir) 1.1a Difference of Two Squares

Pre-learning Worksheet (備課工作紙)

1. Login http://www.schoology.com/ or scan the QR code using your smart phone, iPad or Tablet PC. This will lead you to the on-line quiz with explanation videos on Schoology.
2. Work out the answers of the multiple choice questions in this pre-learning worksheet, in case you don't know how, watch the videos in Schoology.
3. Input your answers in Schoology to check your performance. In addition, I can also know it before the lesson.

1. Factorize $xy + yz$

A. $x(y + z)$
B. $y(x + z)$
C. $z(x + y)$

2. Factorize $ax + ay - bx - by$

A. $(a - b)(x - y)$
B. $(a + b)(x - y)$
C. $(a - b)(x + y)$

3. Factorize $9x^2 - 25y^2$

A. $(3x - 5y)^2$
B. $(3x - 5y)(3x + 5y)$
C. $(9x - 25y)(9x + 25y)$

4. Factorize $4 - (x - y)^2$

A. $(2 - x + y)^2$
B. $(4 - x + y)(4 + x - y)$
C. $(2 - x - y)(2 + x - y)$
D. $(2 - x + y)(2 + x - y)$

5. Factorize $3a^2 - 27b^2$

A. $(3a - 27b)(3a + 27b)$
B. $3(a - 3b)(a + 3b)$
C. $3(a - 3b)^2$
D. $3(a - 9b)(a + 9b)$

連結至 Schoology Quiz

網上題目列印版

預習工作紙

指示學生課前於家中完成

混合模式

預習工作紙

學生作手寫草算

預習提醒

紙筆

網上練習

教學影片支援

學生對答案

即時回饋

數碼

平台收集了關鍵學習數據

S3 Maths Ha sir (Flipped Learning): Term 1 ▸ Tests/Quizzes

1.1a Difference of Two Squares

Available

Questions | Settings | Preview | **Results** | Comments

View by Student · **View by Question**

Question Summary

要解釋的題目

要關注的學生

Question ...tats

See stats | View Responses

x(y + z): 1 (100%)

Points Earned – **Most:** 10 · **Least:** 10 · **Avg:** 10

Question 2: Factorize ax + ay – bx – by.

See stats | View Responses

(a – b)(x + y): 1 (100%)

Multiple Choice – 10 points

Points Earned – **Most:** 10 · **Least:** 10 · **Avg:** 10

Question 3: Factorize 9x2 – 25y2.

See stats | View Responses

(3x – 5y)(3x + 5y): 1 (100%)

Multiple Choice – 10 points

Points Earned – **Most:** 10 · **Least:** 10 · **Avg:** 10

翌日課堂安排

跟進學生預習情況	主動學習 / 電子學習 / 高階思維活動
十分鐘	三十分鐘

翻轉課堂安排

學生睇片做數預習	跟進學生預習情況	主動學習 / 電子學習 / 高階思維活動
廿分鐘	十分鐘	三十分鐘

謝謝!