

REFLECTIONS ON USING VIDEOS TO
TEACH MATHEMATICS

WODU MAJIN

- My motivation for using videos
- Available tools
- How I've used some tools
- Demo's

- Varying backgrounds/entry qualifications
- Struggles with pre-requisite material
- Variety of learning needs

"I could watch it whenever I needed it and as many times as I wanted."

"You can watch them again and again unlike lectures so you don't miss anything."

"I could watch them whilst doing questions over and over again."

"I could watch it whenever I needed it and as many times as I wanted to so it encouraged me to do the questions."

- Saves time
- A variety of topics available
- ‘Someone else’s take’

- Saves time
- A variety of topics available
- ‘Someone else’s take’ (Advantage and disadvantage)

YouTube GB Search YouTube...

$2 \times 3 = 2 + 2 + 2 = 6$

Exponent

$2^3 = 2 \cdot 2 \cdot 2 = 8$

$3^2 = 3 \cdot 3 = 9$

$5^4 =$

2:32 / 3:02

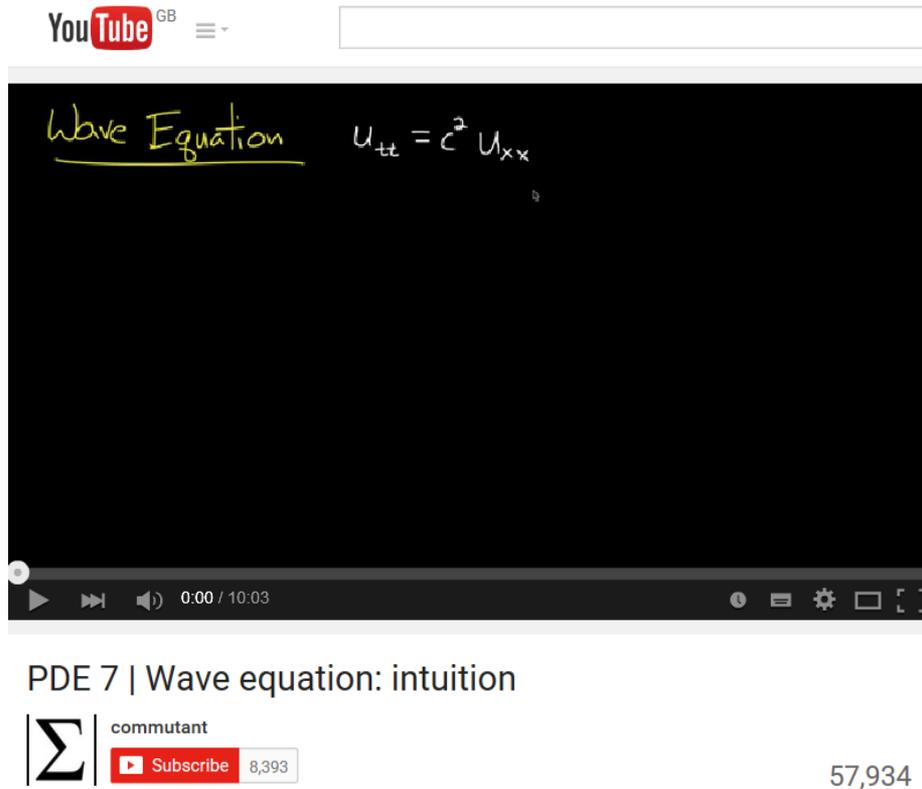
Introduction to exponents | Pre-Algebra | Khan Academy

Khan Academy

Subscribe 2,233,344

279,480

- Explains 'how' and 'why'
- Advanced topics (E.g. Line integrals, Stoke's theorem)



The image shows a YouTube video player interface. At the top left is the YouTube logo with 'GB' and a menu icon. A search bar is located at the top right. The video content is a blackboard with the text 'Wave Equation' written in yellow and underlined, followed by the equation $u_{tt} = c^2 u_{xx}$. Below the video is a playback control bar showing '0:00 / 10:03' and various icons. Underneath the video, the title 'PDE 7 | Wave equation: intuition' is displayed. To the left of the title is a channel logo featuring a summation symbol Σ and the name 'commutant'. Below the channel name is a red 'Subscribe' button with '8,393' subscribers. To the right of the channel information, the view count '57,934' is shown.

- Focused on differential equations (PDEs and ODEs)
- Explains 'how' and 'why'

The video player shows a hand-drawn solution for the quadratic equation $9x^2 - 9x + 2 = 0$. The steps are as follows:

SOLVE:
 $9x^2 - 9x + 2 = 0$

$a = 9$
 $b = -9$
 $c = 2$

The quadratic formula is written as:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = x$$

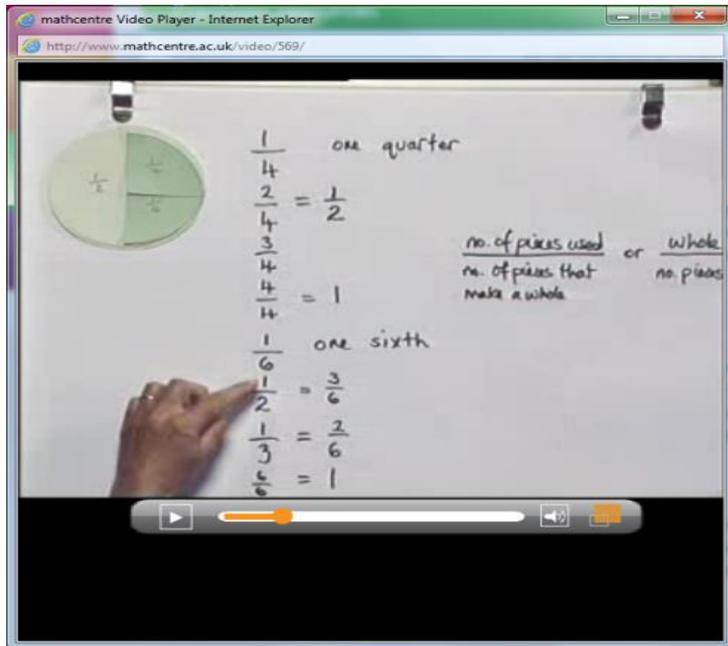
Substituting the values of a, b, and c:

$$x = \frac{-(-9) \pm \sqrt{(-9)^2 - 4(9)(2)}}{2(9)}$$

The video player interface includes a search bar at the top, a play button, a progress bar showing 2:24 / 4:27, and a video title "Solving Quadratic Equations using the Quadratic Formula - Example 1" by patrickJMT with 437,121 subscribers and 37,881 views.

- Clear explanations
- Many examples

An option with accompanying notes...



1. Introduction

What are fractions? Fractions are ways of writing parts of whole numbers. For example if we take a pizza, and divide it up equally between 4 people, each person will have $\frac{1}{4}$ or, written in words, one quarter of the pizza.

 $\frac{1}{4}$ pizza

If one person were to take 2 quarters of the pizza, they would have $\frac{2}{4}$, which is the same as $\frac{1}{2}$ or half the pizza. So

$$\frac{2}{4} = \frac{1}{2}$$

 $\frac{1}{2}$ pizza

If three pieces of the pizza have been eaten, then $\frac{3}{4}$ or three quarters has gone, and $\frac{1}{4}$ or one quarter remains.

 $\frac{3}{4}$ pizza

Finally, the whole pizza is $\frac{4}{4}$, or four quarters.

Some chocolate bars are conveniently marked to make them easier to break into pieces to eat. For instance, we might have a bar marked into 6 equal pieces, so each piece is $\frac{1}{6}$, or one sixth of the whole bar. So if we share this bar between 6 people, we would get 1 piece each.

chocolate bar $\frac{1}{6}$ bar each

If we share it between just 2 people, we could have half the bar each, which would be 3 pieces each. So

$$\frac{3}{6} = \frac{1}{2}$$

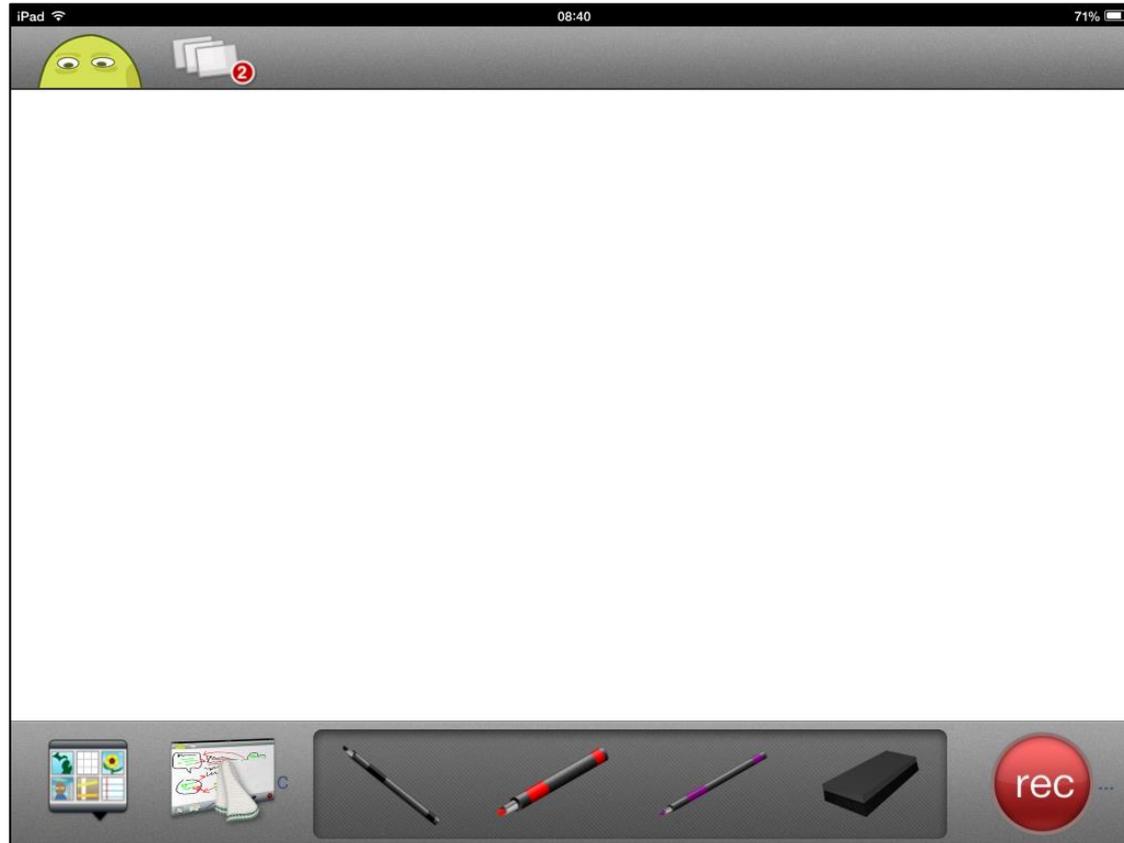
chocolate bar $\frac{1}{2}$ bar each

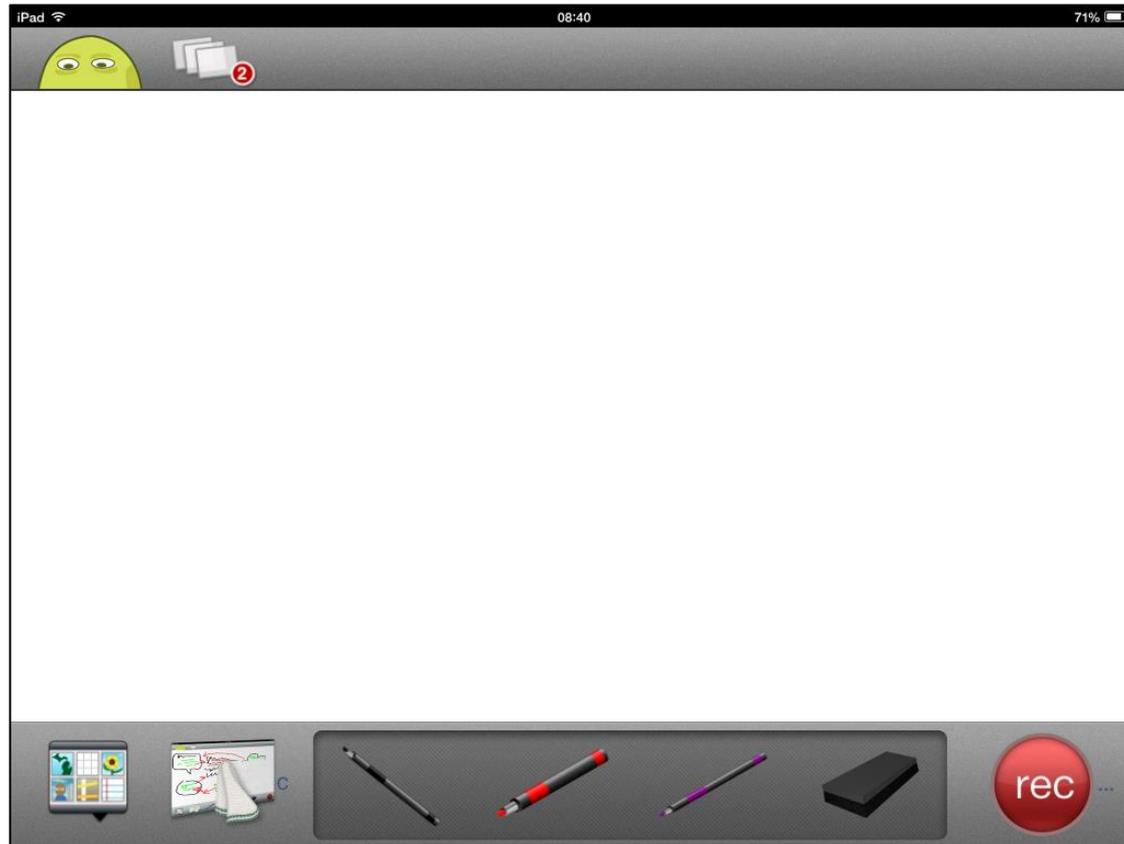
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- Can be made to complement course resources
- Can be customised for individual needs

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- Can be customised for individual needs
- How to make them?



- Free interactive whiteboard on iPad/iPhone
- Write directly on screen
- Record, upload to cloud and share
- Alternatively, download mp4 and share (email individual students, upload to VLE etc.)

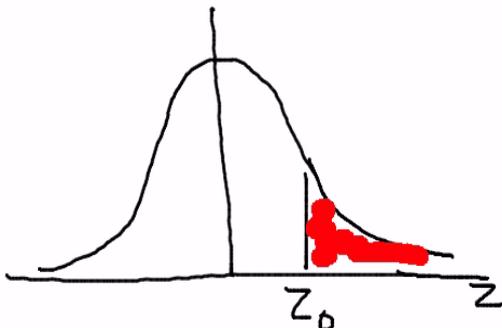


NormDistrEx_top10perc

File Edit View Window Help

Problems 5, Q 3 (ii) Pg 36

Pay rates of top 10%?



$P(Z \leq Z_0) = 0.9$
(0.8997)

$Z_0 = 1.28$

$$Z = \frac{x - \mu}{\sigma}$$

00:02:30

⏪ ⏩ ⏴ ⏵ ⏸

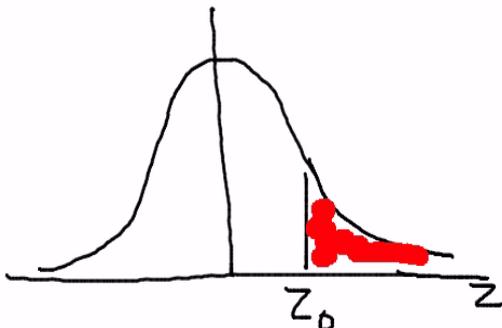
Display \propto stylus!

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Addressing a knowledge gap: $P(X) = \frac{n!}{(n-X)!X!} p^X q^{n-X}$

What is a factorial?

Tool	Platform	Cost
ShowMe (Basic)	iPad/iPhone	Free
ShowMe (Pro)		£40/yr
Explain Everything	Android device	£3
Screencast-O-Matic	<ul style="list-style-type: none"> • PC • Graphics tablet (From £50) • Stylus (from £20) 	Free
Screencast-O-Matic (Pro)		£10/yr
Camtasia		>£130

- Smartpen (£100-£170, depending on type)
- Notebook (~£5 for A4 size)
- Paper (can be *printed* for free with appropriate colour laser printer)
- Ink (£10 for 8-pack, a few colours available)
- Smartphone, tablet or PC

BEST OF BOTH WORLDS:

- Write on paper as normal
- Record writing and speech
- Get digital version (PDF or 'Pencast')
- PDF and share

To: Student X

From: Wodu Majin

Subject: Re: Progress File entry of Thursday, 26th March 2015

Message: Dear Student X,

20-4554: Mathematical Methods

'Differential equations again this week. The lecture was at a faster pace than usual and hard to keep up with. In the tutorial I tried to do the exercises for this week but I didn't finish question 1 and couldn't work it out from my notes'

Hi Student X,

Is it question 1 on page 31? Let me know and I can send you a solution.

Wodu

METHODS: Exercise 39, Q1 Solution

$$4 \frac{d^2y}{dt^2} - 4 \frac{dy}{dt} + y = e^{4t} \quad (1)$$

$$y = C.F. + P.I.$$

$$y = y_c + y_p \quad (*)$$

C.F.

Auxiliary equation: $4m^2 - 4m + 1 = 0$

$$m = \frac{4 \pm \sqrt{16 - 16}}{8}$$

$$m = \frac{4}{8} \Rightarrow m = \frac{1}{2}$$

Repeated root. Using results from notes,

$$y_c = c_1 e^{\frac{1}{2}t} + c_2 t e^{\frac{1}{2}t}$$

P.I

Comparing with R.H.S of (1), try $y_p = Ae^{4t}$

$$\text{Then } y_p' = 4Ae^{4t}, \quad y_p'' = 16Ae^{4t} \quad (2)$$

Substituting (2) into (1)

$$4(16Ae^{4t}) - 4(4Ae^{4t}) + Ae^{4t} = e^{4t}$$

$$64Ae^{4t} - 16Ae^{4t} + Ae^{4t} = e^{4t}$$

$$49Ae^{4t} = e^{4t}$$

$$\Rightarrow 49A = 1$$

			
Sync and Transfer			
Technology used to transfer notes from smartpen	Bluetooth®	WiFi / USB	USB
Real-time transfer of notes to supported devices	●		
Supported systems/platforms (for transfer of content)	iOS 7 or newer	Evernote®	Win/Mac
Save, Search and Organize			
Software/service used to manage notes	Livescribe+	Evernote	Echo Desktop
Search handwriting	●	●	●
Organize notes/notebooks with tags	●	●	
Sort notes into custom notebooks/collections		●	●
Convert handwriting to text	●		MyScript
Use notes to create task lists & reminders	●		
Send notes to other applications	●		
Add photos or typed notes alongside handwritten notes	●	●	
Add documents & webpages alongside handwritten notes		●	
Record and Playback Pencasts (audio synced to handwriting)			
Record audio with a smartpen microphone		●	●
Record audio with the microphone on paired mobile device	●		
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Using Videos to teach Mathematics

CUSTOM VIDEOS : Smartpen

			
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OTHER POSSIBLE USES:

- Challenge/engage 'more able' students
- One-on-one (project students, maths support centres)
- Personal use: (mark schemes, audio-enabled notes)

<http://www.livescribe.com/uk/>

<http://www.techsmith.com/screenchomp.html>

<http://www.khanacademy.org>

<http://www.patrickjmt.com>

<http://www.mathcentre.ac.uk/>

<http://www.youtube.com/user/commutant>