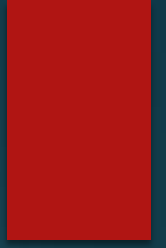


CHAPTER 3: INDICES



Chapter Analysis

- Laws of Indices
- Zero and Negative Indices
- Fractional Indices
- Solving Equations Involving Indices
- Use of Standard form, $A \times 10^n$, where $1 \leq A < 10$.
- Applications of Indices to Compound Interest



Laws of Indices



Property	Indices Law
Same Base	$a^m \times a^n = a^{m+n}$
	$\frac{a^m}{a^n} = a^{m-n}$
	$(a^m)^n = a^{mn}$
Same Power	$a^m \times b^m = (ab)^m$
	$\frac{a^m}{b^m} = \left(\frac{a}{b}\right)^m$

The 5 laws of indices focuses on “same base” and “same power”

Common Mistake

$$a^m + b^m = (a + b)^m \quad \mathbf{X}$$

Many students get confused and use the above in their solutions! However, this is **INCORRECT**

By substituting values of $a = 1$, $b = 2$ and $m = 3$

$$\text{LHS} = 1^3 + 2^3 = 9$$

$$\text{RHS} = (1 + 2)^3 = 27$$

LHS \neq RHS



Zero and Negative Indices

- Zero Indices: $x^0 = 1$

It doesn't matter what is the value of x , if the power is 0, it will always be equals to 1.

- Negative Indices: $a^{-n} = \frac{1}{a^n}$

*To switch the signs of the power from negative to positive and vice versa, we just need to "bring it to the other side" (e.g. from numerator to denominator)

Example:

1) $\frac{1}{a^{-2}} = a^2$: To turn the power from negative to positive, we just need to bring it from the denominator to numerator.

2) $\frac{1}{a^2} = a^{-2}$: To turn the power from positive to negative, we just need to bring it from the numerator to denominator.



Fractional Indices

- $\sqrt[n]{a^m} = a^{\frac{m}{n}}$

Rule of thumb: As long as you see a root/surd, the power will always be a fraction. The power inside the surd will be the numerator, while the power outside the surd will be the denominator.

Example: $\sqrt[3]{a^8} = a^{\frac{8}{3}}$



Solving Equations Involving Indices

Worked Example A1.7.3

Solve the equation

$$27^{2x-1} = 3^2(3^x)$$

[S4 TKGS P1/2011 PRELIM Qn 10(a)]

Solution

$$27^{2x-1} = 3^2(3^x)$$

$$3^{3(2x-1)} = 3^{2+x}$$

Comparing powers,

$$\therefore 3(2x - 1) = 2 + x$$

$$6x - 3 = 2 + x$$

$$5x = 5$$

$$x = 1$$

Things to take note when solving equations involving indices:

- 1) Always make the base the same so that we can compare the powers.
- 2) Try to make the bases into the simplest form (e.g., prime factors such as 2,3,5 etc.)
- 3) It will be a bonus if you can remember the basic perfect squares and cubes. It will help!



Standard Form

- Standard form is where the number is expressed in the form of:

$$A \times 10^n, \text{ where } 1 \leq A < 10.$$

Value (in terms of 10^x)	Prefix	Symbol
10^{-12}	pico -	p
10^{-9}	nano -	n
10^{-6}	micro -	μ
10^{-3}	milli -	m
10^{-2}	centi -	c
10^{-1}	deci -	d
10^3	kilo -	k
10^6	mega -	M
10^9	giga -	G
10^{12}	tera -	T

Tip:

- When you go from a higher prefix to lower, you multiply.
- When you go from a lower prefix to higher, you divide.



Application of Indices to Compound Interest

- ▶ Simple Interest: $\frac{P \times R \times T}{100}$
where P is the principal amount, R is the interest rate and T is the number of periods
- ▶ Compound Interest: $P \left(1 + \frac{R}{100}\right)^n$
where P is the principal amount, R is the interest rate and n is the number of compounding periods.
- If compounding frequency is more than once a year, we must change the interest rate and number of compounding periods accordingly*

Example:

Worked Example A10.1.1

Darby invested \$5 400 in a bank that pays $m\%$ interest per annum which is compounded half yearly. If she received \$5 847.89 after 2.5 years, calculate the value of m

[S4 HIHS P1/2015 PRELIM Qn 10]

- The new interest rate will be $\frac{m}{2}$, since it is compounded half yearly.
- The number of compounding periods will be $2.5 \times 2 = 5$ since its compounded half yearly, the amount will be compounded twice a year.



MEET THE OVERMUGGED TEAM

MEET OUR ALL-STAR TUTORS

All our tutors have between **7-13 years of teaching experience** and have guided countless batches of students to excel at 'O' Levels & 'A' Levels.

UNLOCK YOUR FULL POTENTIAL.





07

LOCATIONS

We have classes across 7 locations in Singapore, with **3 main branches**.

20+

TUTORS

We have a team of 20+ tutors, each specialising in their respective subjects.

70%

RESULTS

About **70%** of OVERMUGGED students score an A1/A2 at 'O' Levels/'A' Levels.

700+

STUDENT UNDER OUR CARE

We have about 700+ students under our care which we work closely with on a week-on-week basis!

SOME STATS

SG FASTEST GROWING TUTORIAL BRAND

We believe in uplifting the student community!



OVERMUGGED, 'O' Levels Channel
6,214 subscribers



OVERMUGGED, 'A' Levels Channel
2,778 subscribers

One of SG largest Telegram student community



LEADERS IN THE CHANGING EDUCATION LANDSCAPE

FEATURED ON STRAITS TIMES


Our efforts to go out of our way to support our students were captured by local new publications.

OVERMUGGED was SG first tuition center to host large scale mock exam!

Our student's needs comes first!

Vulcan Post 12h

Overmugged launched a tuition subscription plan for 'O' Levels subjects to make education more affordable and accessible, and has achieved a six-figure revenue in its first year.



TODAY June 16 at 5:49 PM

One Primary 6 student who is sitting mock exams told TODAY: "I feel stress didn't do any exams all the way until prelims and PSLE... I'll be unfamiliar with environment and I cannot concentrate."

OVERMUGGED: This 28-year-old built Singapore's first online tuition subscription service

You and 8 others Like Comment Share



TODAYONLINE.COM

Hundreds sign up for tuition centre mock exams costing up to \$100 after scrapping of all mid-year school exams

53 Like

With midterms scrapped, students take mock exams at tuition centres



Students taking a mock exam paper at tuition centre Overmugged. Tuition centres said they organised such sessions following strong demand after mid-year exams were scrapped for all primary and secondary schools from 2023. Education Minister Chan Chun Sing said the move would give students space to develop their interests and skills over the long holiday and the on-going.

MOE said it would continue to support schools to provide quality learning experiences for students, such as having more time to design and provide a wider variety of learning experiences based on students' needs.

"Students have in turn shared that they enjoy more opportunities and strengths, as well as time to act on their interests."

MOE noted that schools can provide more learning opportunities for students to build confidence and familiarity themselves with the format of the national exams.

"These workshops provide useful and timely feedback to students to improve learning and enable teachers to adjust their teaching practices to better support students."

There are those who believe it is beneficial for students to take mock exams, although not necessarily paying for the privilege of attending a tuition centre.

Mr Alex Lee, head of staff at Admitted Learning Centre, said many tuition centres have arranged exam papers, instead of using the question banks, to give students a better sense of what it would be like to sit for the national exams.

Mr Victor Hong, 38, who has a son in Primary 6, said he will be doing mock exams at Master Mark on top of the practice papers he has at home.

"It's good to get more practice doing exams to see how students perform during the time during the PSLE," said Mr Hong.

Assistant Professor James Tan from the National Institute of Education said he understands parents want their children to be familiar with the exam-taking experience.

He said "Using national exams involves some degree of exam-taking skills, such as not being able to bring external resources, taking time to read the questions, and being psychologically that you are taking the exam." He said he will have important consequences and keeping to a time limit.

Associate Professor Jason Tan from the National Institute of Education said he understands parents want their children to be familiar with the exam-taking experience.

Many in Primary 6 and Secondary 4 seek to build experience ahead of national exams

Wong Shihyng

Handfuls of students are seen in a tuition centre to take mock exams. The centre's founder, Mr John Monaghan, said he will consider opening up mock exams in 2023 for students not with the centre if Learning, Joyful Education Centre, which offers English and primary, secondary and JC prep, has received registration for Primary School Learning Institute from 2023. It charges \$90 per mock exam session for Primary 6 and Secondary 4 students, and a 20 per cent increase for students aged 16 to 18 for five mock exams. The service is free for students aged 12 to 15.

Master Mark Education Centre is offering complimentary mock exams for PSLE and Primary 6 and Secondary 4 students.

MOE said schools will continue to use a range of assessments and activities to monitor students' learning progress.

Students who signed up to sit mock exams, as well as their parents, said it was necessary to take them to be better prepared for the high-stakes PSLE and O levels.

Li Li Ting, a 36-year-old Singapore Chinese Girls' School, said mock exams would help her to identify areas where she has to improve. She said she will be taking mock exams for mathematics, chemistry, physics and biology.

Wong Shihyng The Straits Times



P6 and Sec 4 students flock to tuition centres for mock exams after scrapping of school midterms



Wong Shihyng The Straits Times



OUR LOCATIONS



BUKIT TIMAH
Tan Kah Kee
2 min walk from Tan Kah Kee MRT.



Kovan
Upper Serangoon Road
5min walk from Kovan MRT.



MARINE PARADE
PARKWAY CENTER
Upcoming TE line in 2024.



TOA PAYOH
CLASSROOM
Conveniently located near Toa Payoh MRT



JURONG EAST
CLASSROOM
Right beside Jurong East MRT



WOODLANDS
CLASSROOM
Right beside Woodlands MRT



TAMPINES
READY IN 2024
Right beside Tampines MRT



OUR SECRET TO PRODUCE TOP RESULTS?



**CONSISTENT HARD WORK,
OVER A LONG PERIOD OF TIME.**

We work hard consistently alongside you, week in, week out.

We grind hard when no one is watching because we know that when it comes time for exams, we will be one cut above the rest.



LEARNING RESOURCES

IF YOU THOUGHT THE FREE MATERIALS ARE GOOD,
Wait till you see the resources our own students get!



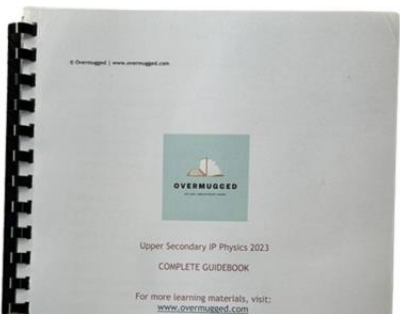
WEEKLY WORKSHEETS

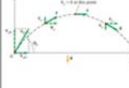

Topical, Thematic, Mock Test, Mock Exam,
Prelim Prep, Practical Prep



EXCLUSIVE CHEATSHEETS

Revision booklets, extra cheatsheets,
Practical Assessment booklet



TOPIC: KINEMATICS			
Concept	Definition	Formula	Remarks
Linear motion	<ul style="list-style-type: none"> Object that is moving in a straight line 1-D motion 	$v = u + at$ $s = ut + \frac{1}{2}at^2$ $v^2 = u^2 + 2as$	<ul style="list-style-type: none"> Motion can be represented (upwards or right) or -ve (down or left) sign. Equations can only be used if acceleration is constant.
2-D Motion	<ul style="list-style-type: none"> Object that is moving in a projectile trajectory (x and y directions) 2-D motion Acceleration is experienced in both axes Vertical and horizontal motion are independent of each other 	<p>Horizontal motion (acceleration = 0)</p> $v_x = u_x$ $s_x = u_x t$ <p>Vertical motion (uniform vertical acceleration = g)</p> $v_y = u_y + at$ $s_y = u_y t + \frac{1}{2}at^2$ $v_y^2 = u_y^2 + 2as$	<ul style="list-style-type: none"> Acceleration always act down Projectile will free fall and parabolic if resistance is negligible 
2 Vectors resolution	Analyse the horizontal and vertical motion separately	 <p>For a vector \vec{v} pointing at an angle θ from the horizontal:</p> $v_x = v \cos\theta \text{ (horizontal)}$ $v_y = v \sin\theta \text{ (vertical)}$ $v = \sqrt{v_x^2 + v_y^2}$ $\tan\theta = \frac{v_y}{v_x} \Rightarrow \theta = \tan^{-1}\left(\frac{v_y}{v_x}\right)$	

MARCH PRACTICE QUESTIONS 2021
SECONDARY 4 EXPRESS
SECONDARY 5 NORMAL ACADEMIC

ELEMENTARY MATHEMATICS 4048/01

Specimen Paper
Date: 3 March 2021
Candidates answer on separate writing paper

Mean THESE INSTRUCTIONS FIRST

Answer all questions.
If working is needed for any question it must be shown with the answer.
Division of marks for correct working will result in total marks.
You are expected to use a scientific calculator to evaluate explicit numerical expressions.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures.
Give answers in degrees to one decimal place.
For π , use either your calculator value of 3.142, unless the question requires the answer in terms of π .

Topic names will be listed above each question for your benefit and revision

Upon completion of solutions:
Each candidate have exactly 2 weeks to submit their solution.
Take a picture or send the digital version of your solutions to me (Kahen) via Telegram (@Kahen_tutari) or WhatsApp (90583779).
Ensure that all workings are clear and legible.
Solutions will be marked based on your presentation, accuracy and completeness of your solution.
A markers' report and the full solutions will be provided at the end of the month.

Setter: Ong Kai Wen
This question paper consists of 2 printed pages including the cover page

not reached in a time t if $v_y = 0$	$v_y^2 = (u \sin\theta)^2 - 2gh$ $\Delta H = \frac{u^2 \sin^2\theta}{2g}$	<ul style="list-style-type: none"> With air resistance, Drag force acts in the same as the weight of object. Net acceleration $>> g$ Maximum height reached lower.
if $v_y = 0$	$v_y = u \sin\theta - gt_{up}$ $\Delta t_{up} = \frac{u \sin\theta}{g}$	<ul style="list-style-type: none"> With air resistance, Drag force acts in the same as the weight of object. Net acceleration $>> g$ Final vertical speed smaller than vertical speed Average speed upwards $>> g$

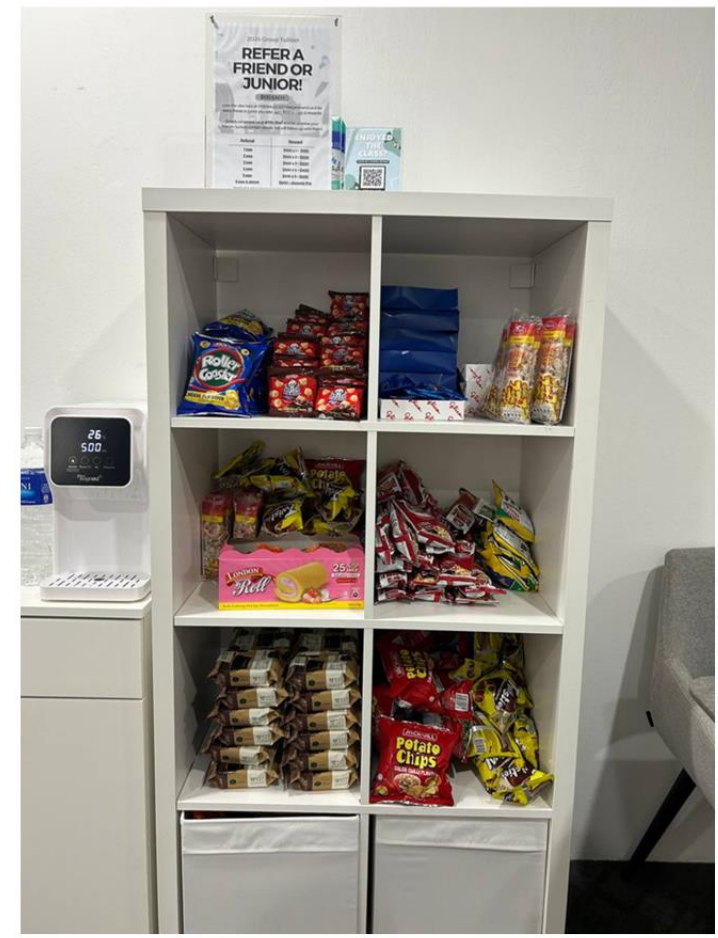




WELFARE, ALL DAY EVERYDAY



NEED FOOD TO THINK
Unlimited snack shelf





Our Policy

- No deposit fee.
- No extra material fee.
- Unlimited access to study lounge.
- Unlimited snacks.
- Free consultations.
- Special discounts for holiday program.

TUITION RATES

'O' LEVELS

- \$80/lesson
- \$85/lesson (weekend)

INTEGRATED PROGRAM

- \$90/lesson
- \$95/lesson (weekend)

'A' LEVELS

- \$100/lesson
- \$105/lesson (weekend)
- 10% if signing up for 2 'A' Levels subject & above*

Fees are collected at the start of the term (every 3 months).



ACADEMIC YEAR

TERM 1: NOV – JAN

Topical Recaps

Key highlight: Christmas Party

TERM 2: FEB – APR

Topical Mastery

Key highlight: March Holiday Cohesion Program

TERM 3: MAY – JUL

Prelim/EOY Preparation

Key highlight: Mock Prelim/EOY

TERM 4: AUG – OCT

'O' Levels / 'A' Levels Preparation

Key highlight: Mock Exams, Science Practical Assessment





Sign up for a free trial lesson today!

Class Schedule:

SCAN ME



Whatsapp us:



SCAN ME

Any enquiries?

Whatsapp: 8770 2540

Email: overmugged@gmail.com

Website: www.overmugged.com

IG/Tiktok: @overmugged