

## Welcome Back MYP Math 9!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
<b>Monday</b> Date: <u>1/29</u> Topic: _____	0 1 2	I rested after FINALS :)
<b>Tuesday</b> Date: <u>1/30</u> Topic: _____	0 1 2	New Semester!
<b>Wednesday</b> Date: <u>1/31</u> Topic: <u>2B Index Laws</u>	0 1 2	
<b>Thursday</b> Date: <u>2-1</u> Topic: <u>Applying Index laws</u>	0 1 2	
<b>Friday</b> Date: _____ Topic: _____	0 1 2	

## ADVISORY BELL SCHEDULE (w/3 lunches)

<b>Lunch A</b>		
1st Hour	8:05-8:48	43 minutes
2nd Hour	8:53-9:36	43 minutes
Advisory	9:41-10:25	44 minutes
3rd Hour	10:30-11:13	43 minutes
<b>Lunch A</b>	11:18-11:48	30 minutes
4th Hour (Late)	11:53-12:36	43 minutes
5th Hour (Late)	12:41-1:24	43 minutes
6th Hour	1:29-2:12	43 minutes
7th Hour	2:17-3:00	43 minutes

<b>Lunch B</b>		
1st Hour	8:05-8:48	43 minutes
2nd Hour	8:53-9:36	43 minutes
Advisory	9:41-10:25	44 minutes
3rd Hour	10:30-11:13	43 minutes
4th Hour (Early)	11:18-12:01	43 minutes
<b>Lunch B</b>	12:06-12:36	30 minutes
5th Hour (Late)	12:41-1:24	43 minutes
6th Hour	1:29-2:12	43 minutes
7th Hour	2:17-3:00	43 minutes

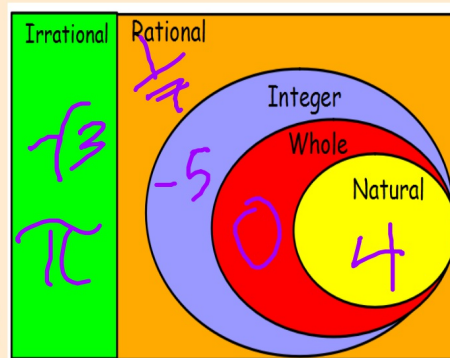
<b>Lunch C</b>		
1st Hour	8:05-8:48	43 minutes
2nd Hour	8:53-9:36	43 minutes
Advisory	9:41-10:25	44 minutes
3rd Hour	10:30-11:13	43 minutes
4th Hour (Early)	11:18-12:01	43 minutes
5th Hour (Early)	12:06-12:49	43 minutes
<b>Lunch C</b>	12:54-1:24	30 minutes
6th Hour	1:29-2:12	43 minutes
7th Hour	2:17-3:00	43 minutes

## Applying Properties of Exponents (Indices)

Warm-up: Classify the following values:

*Give as many classifications as possible!*

$$\left\{-5, 0, \sqrt{3}, \pi, \sqrt{16}, \frac{1}{7}\right\}$$



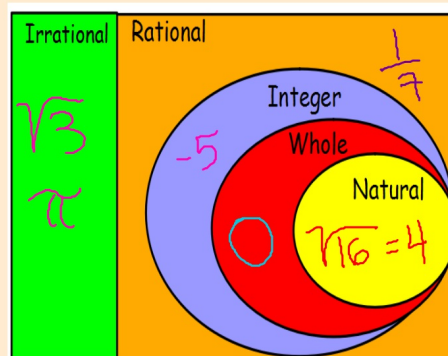
transcendental!

## Applying Properties of Exponents (Indices)

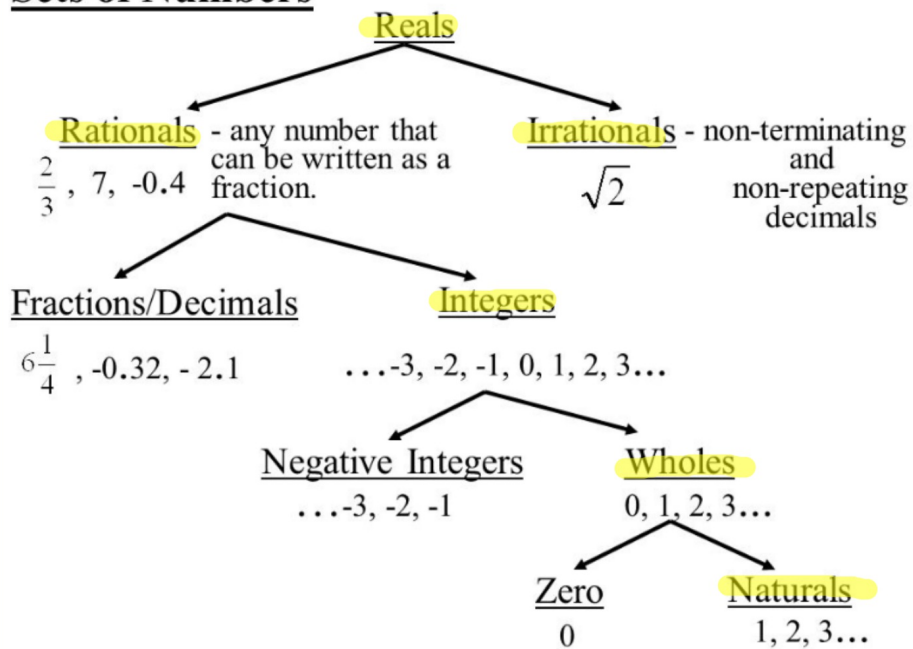
Warm-up: Classify the following values:

*Give as many classifications as possible!*

$$\left\{-5, 0, \sqrt{3}, \pi, \sqrt{16}, \frac{1}{7}\right\}$$



## Sets of Numbers



[http://images.slideplayer.com/20/5947325/slides/slide\\_4.jpg](http://images.slideplayer.com/20/5947325/slides/slide_4.jpg)

## Class Plan:

1. Warm-up
2. Homework Questions?
3. Investigation: Rational Index Laws
4. Practice
5. 10th grade courses

## Today's joke!

*I'd like to buy a new boomerang please.*

*Also, can you tell me how to throw the old one away?*



## Properties of Rational Exponents

### D Chapter 2

### RATIONAL INDICES

#### Rational Numbers

##### Definition

The **rational numbers** are the numbers that can be written in the form  $\frac{n}{d}$ , where  $n$  and  $d$  are integers and  $d$  is nonzero.

##### Examples

$$\frac{3}{7}$$

$$\frac{-2}{5}$$

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



## Investigation: Rational Indices

A **rational** number is a number which can be written in the form  $\frac{p}{q}$  where  $p$  and  $q$  are integers and  $q \neq 0$ . The integers themselves are rational numbers, since for example  $5 = \frac{5}{1}$ .

The index laws can be applied not just to integer indices, but to rational indices in general. This helps to give meaning to values such as  $3^{\frac{1}{2}}$  and  $2^{\frac{1}{3}}$ .

**Do: Use properties of exponents to complete the rational index rules**

✓ 2. Complete the rule:  $\sqrt{a} = \sqrt[2]{a^1} = \underline{\hspace{2cm}}$

✗ 4. Complete the rule:  $a^{\frac{1}{n}} = \underline{\hspace{2cm}}$  and  $\sqrt[n]{a} = \underline{\hspace{2cm}}$

✗ 6. Complete the rule:  $a^{\frac{m}{n}} = \underline{\hspace{2cm}}$  and  $\sqrt[n]{a^m} = \underline{\hspace{2cm}}$

When done: Help others & show teacher

## Investigation: Rational Indices

1. Complete the following operations:

a)  $5^{\frac{1}{2}} \cdot 5^{\frac{1}{2}} = 5^{\frac{1}{2} + \frac{1}{2}} = 5^{\boxed{1}} = \underline{5}$       b)  $(\sqrt{5})^2 = (\sqrt{5})(\sqrt{5}) = \underline{5}$

c)  $3^{\frac{1}{2}} \cdot 3^{\frac{1}{2}} = 3^{\boxed{\phantom{1}}} = \underline{\phantom{5}}$       d)  $(\sqrt{3})^2 = (\sqrt{3})(\sqrt{3}) = \underline{\phantom{5}}$

2. Complete the rule:  $\sqrt{a} = \sqrt[2]{a^1} = \underline{\phantom{a}}$

## Investigation Solutions

1. Complete the following operations:

$$\text{a) } 5^{\frac{1}{2}} \cdot 5^{\frac{1}{2}} = 5^{\frac{1}{2} + \frac{1}{2}} = 5^{\boxed{\frac{1}{2}}} = \underline{5} \quad \text{b) } (\sqrt{5})^2 = (\sqrt{5})(\sqrt{5}) = \underline{5}$$

$$\text{c) } 3^{\frac{1}{2}} \cdot 3^{\frac{1}{2}} = 3^{\boxed{\frac{1}{2}}} = \underline{3} \quad \text{d) } (\sqrt{3})^2 = (\sqrt{3})(\sqrt{3}) = \underline{3}$$

2. Complete the rule:

$$\sqrt{a} = \sqrt[2]{a^1} = \underline{a^{\frac{1}{2}}}$$

$$\begin{aligned} \text{Square root} &= a^{\frac{1}{2}} \\ \sqrt[2]{9} &= 3 = 9^{\frac{1}{2}} \end{aligned}$$

## Investigation: Rational Indices

3. Complete the following operations:

$$\text{a) } \left(27^{\frac{1}{3}}\right)^3 = 27^{\frac{1}{3}} \cdot 27^{\frac{1}{3}} \cdot 27^{\frac{1}{3}} = 27^{\frac{1}{3} + \frac{1}{3} + \frac{1}{3}} = 27^{\boxed{1}} = \underline{27}$$

$$\text{b) } \left(16^{\frac{1}{4}}\right)^4 = 16^{\frac{1}{4}} \cdot 16^{\frac{1}{4}} \cdot 16^{\frac{1}{4}} \cdot 16^{\frac{1}{4}} = 16^{\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4}} = 16^{\boxed{1}} = \underline{16}$$

$$\text{c) } \sqrt[3]{27^3} = \underline{27} \quad \text{d) } \sqrt[4]{16^4} = \underline{16} \quad \text{e) } \sqrt[5]{818^5} = \underline{818}$$

4. Complete the rule:  $a^{\frac{1}{n}} = \sqrt[n]{a}$  and  $\sqrt[n]{a} = a^{\frac{1}{n}}$

$n^{\text{th}}$  root

## Investigation Solutions

3. Complete the following operations:

$$\text{a) } \left(27^{\frac{1}{3}}\right)^3 = 27^{\frac{1}{3}} \cdot 27^{\frac{1}{3}} \cdot 27^{\frac{1}{3}} = 27^{\frac{1}{3} + \frac{1}{3} + \frac{1}{3}} = 27^{\boxed{\frac{3}{3}}} = \underline{27}$$

$$\text{b) } \left(16^{\frac{1}{4}}\right)^4 = 16^{\frac{1}{4}} \cdot 16^{\frac{1}{4}} \cdot 16^{\frac{1}{4}} \cdot 16^{\frac{1}{4}} = 16^{\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4}} = 16^{\boxed{\frac{4}{4}}} = \underline{16}$$

$$\text{c) } \sqrt[3]{27^3} = \underline{27} \quad \text{d) } \sqrt[4]{16^4} = \underline{16} \quad \text{e) } \sqrt[5]{818^5} = \underline{818}$$

4. Complete the rule:  $a^{\frac{1}{n}} = \underline{\sqrt[n]{a}}$  and  $\sqrt[n]{a} = \underline{a^{\frac{1}{n}}}$

 The "nth" root!

## Investigation: Rational Indices

5. Complete the following operations:

a)  $\sqrt[2]{3^4} = 9$

b)  $\sqrt[2]{4^3} = 8 = 4^{3/2}$

c)  $\sqrt[3]{64^2} = \sqrt[3]{4096} = 16$

d)  $\sqrt[4]{64^2} = 64^{2/4} = \sqrt[2]{64} = 8$

e)  $\sqrt[4]{81^3} = 27$

f)  $\sqrt[5]{100000^2} = 100$

6. Complete the rule:  $a^{m/n} = \sqrt[n]{a^m}$  and  $\sqrt[n]{a^m} = a^{m/n}$

$n = \text{root}$

## Investigation Solutions

5. Complete the following operations:

a)  $\sqrt{3^4} = \sqrt{81} = 9$

b)  $\sqrt[2]{4^3} = \sqrt{64} = 8$

c)  $\sqrt[3]{64^2} = \sqrt[3]{4096} = 16$

d)  $\sqrt[4]{64^2} = \sqrt{4096} = 8$

e)  $\sqrt[4]{81^3} = \sqrt[4]{531,441} = 27$

f)  $\sqrt[5]{100000^2} = \sqrt[5]{10,000,000,000} = 100$

6. Complete the rule:  $a^{\frac{m}{n}} = \sqrt[n]{a^m}$  and  $\sqrt[n]{a^m} = a^{\frac{m}{n}}$

## D Chapter 2

## RATIONAL INDICES

$$a^{\frac{1}{2}} = \sqrt{a}$$

and

$$a^{\frac{1}{3}} = \sqrt[3]{a}$$

$$a^{\frac{1}{n}} = \sqrt[n]{a} \quad \text{where } \sqrt[n]{a} \text{ is called the } n\text{th root of } a.$$

### Rational Exponents

For any real number  $a$  and integers  $m$  and  $n > 1$

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



**Example 21**

Evaluate:

**a**  $16^{\frac{1}{2}}$

**b**  $8^{\frac{1}{3}}$

**c**  $16^{-\frac{1}{2}}$

**d**  $8^{-\frac{1}{3}}$

**a**  $16^{\frac{1}{2}}$   
 $= \sqrt{16}$   
 $= 4$

**b**  $8^{\frac{1}{3}}$   
 $= \sqrt[3]{8}$   
 $= 2$

**c**  $16^{-\frac{1}{2}}$   
 $= \frac{1}{16^{\frac{1}{2}}}$   
 $= \frac{1}{\sqrt{16}}$   
 $= \frac{1}{4}$

**d**  $8^{-\frac{1}{3}}$   
 $= \frac{1}{8^{\frac{1}{3}}}$   
 $= \frac{1}{\sqrt[3]{8}}$   
 $= \frac{1}{2}$

**Example 22**

Write in index form:

**a**  $\sqrt{3}$

**b**  $\sqrt[3]{7}$

**c**  $\frac{1}{\sqrt[4]{7}}$

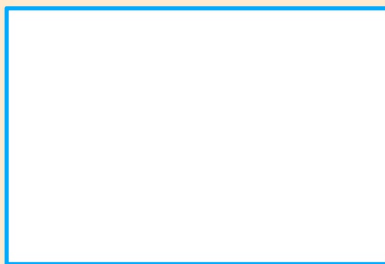
**a**  $\sqrt{3}$   
 $= 3^{\frac{1}{2}}$

**b**  $\sqrt[3]{7}$   
 $= 7^{\frac{1}{3}}$

**c**  $\frac{1}{\sqrt[4]{7}}$   
 $= \frac{1}{7^{\frac{1}{4}}}$   
 $= 7^{-\frac{1}{4}}$

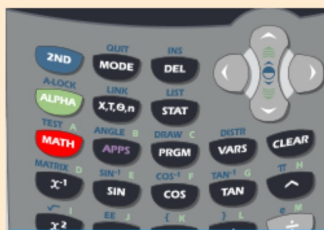
### Example 23

Use your calculator to find  $\sqrt[4]{50}$ , rounded to 2 decimal places.



50^(1/4)  
2.659147948

**OR...**



NUM CPX PRB  
1: Frac  
2: Dec  
3:  $\pi$   
4:  $\pi$   
5:  $\times^{\square}$   
6: Min(  
7: Max(  
8:  $\square$

$\sqrt[4]{50}$   
2.659147948

## Additional Examples:

$$64^{\frac{2}{3}}$$

$$(16x^2)^{\frac{1}{2}}$$

$$(1000n^9)^{\frac{1}{3}}$$

## Additional Examples:

$$64^{\frac{2}{3}}$$

$$\sqrt[3]{64^2}$$

$$\sqrt[3]{4096}$$

$$\boxed{16}$$

$$(16x^2)^{\frac{1}{2}}$$

$$16^{\frac{1}{2}} \cdot x^{2 \cdot \frac{1}{2}}$$

$$\sqrt{16} \cdot x$$

$$\boxed{4x}$$

$$(1000n^9)^{\frac{1}{3}}$$

$$1000^{\frac{1}{3}} \cdot n^{9 \cdot \frac{1}{3}}$$

$$\sqrt[3]{1000} = 10$$

$$n^{9 \cdot \frac{1}{3}} = n^3$$

$$\boxed{10n^3}$$

## Additional Examples:

$$(49r^6)^{\frac{3}{2}}$$

$$(64n^9)^{\frac{5}{3}}$$

$$625^{\frac{3}{4}}$$

## Additional Examples:

$$(49r^6)^{\frac{3}{2}}$$

$$\begin{aligned} &49^{\frac{3}{2}} \cdot r^{6 \cdot \frac{3}{2}} \\ &49^{\frac{3}{2}} \cdot r^9 \\ &\sqrt[2]{49^3} \cdot r^9 \\ &\sqrt[2]{7649} r^9 \\ &\boxed{343r^9} \end{aligned}$$

$$(64n^9)^{\frac{5}{3}}$$

$$\begin{aligned} &64^{\frac{5}{3}} \cdot n^{9 \cdot \frac{5}{3}} \\ &64^{\frac{5}{3}} \cdot n^{15} \end{aligned}$$

$$\boxed{1024n^{15}}$$

$$625^{\frac{3}{4}}$$

$$\begin{aligned} &\text{Calculator!} \\ &625 \wedge \left(\frac{3}{4}\right) \\ &\text{OR} \\ &\sqrt[4]{625^3} \end{aligned}$$

## Exercises: 2D #1-3

### EXERCISE 2D

1 Evaluate without using a calculator:

a  $4^{\frac{1}{2}}$

b  $4^{-\frac{1}{2}}$

c  $9^{\frac{1}{2}}$

d  $9^{-\frac{1}{2}}$

e  $36^{\frac{1}{2}}$

f  $36^{-\frac{1}{2}}$

g  $27^{\frac{1}{3}}$

h  $27^{-\frac{1}{3}}$

i  $1000^{\frac{1}{3}}$

j  $1000^{-\frac{1}{3}}$

5 = k  $125^{\frac{1}{3}}$

l  $125^{-\frac{1}{3}}$

$$27^{\frac{2}{3}} = \sqrt[3]{27^2}$$

$$5 = k$$

$$\sqrt[3]{1000} = 10 \left[ \frac{1}{5} \right] = \frac{1}{125^{\frac{1}{3}}} = \frac{1}{\sqrt[3]{125}}$$



## Exercises: 2D #1-3

2 Write in index form:

a  $\sqrt{11}$

b  $\frac{1}{\sqrt{11}}$

c  $\sqrt{12}$

d  $\frac{1}{\sqrt{12}}$

e  $\sqrt[3]{26}$

f  $\frac{1}{\sqrt[3]{26}}$

g  $\sqrt[4]{7}$

h  $\frac{1}{\sqrt[5]{7}}$

3 Use your calculator to evaluate the following, rounded to 2 decimal places:

a  $\sqrt[4]{20}$

b  $\sqrt[5]{300}$

c  $\frac{1}{\sqrt[4]{80}}$

d  $\frac{1}{\sqrt[6]{12}}$

## Additional Exercises:

1)  $216^{\frac{4}{3}}$

2)  $10000^{\frac{5}{4}}$

3)  $49^{\frac{1}{2}}$

4)  $81^{\frac{1}{2}}$

5)  $(p^{12})^{\frac{3}{4}}$

6)  $(100x^4)^{\frac{3}{2}}$

7)  $(b^8)^{\frac{3}{2}}$

8)  $(1000n^9)^{\frac{1}{3}}$

# Solutions to 2D

## EXERCISE 2D

<b>1</b>	<b>a</b> 2	<b>b</b> $\frac{1}{2}$	<b>c</b> 3	<b>d</b> $\frac{1}{3}$	<b>e</b> 6	<b>f</b> $\frac{1}{6}$
	<b>g</b> 3	<b>h</b> $\frac{1}{3}$	<b>i</b> 10	<b>j</b> $\frac{1}{10}$	<b>k</b> 5	<b>l</b> $\frac{1}{5}$
<b>2</b>	<b>a</b> $11^{\frac{1}{2}}$	<b>b</b> $11^{-\frac{1}{2}}$	<b>c</b> $12^{\frac{1}{2}}$	<b>d</b> $12^{-\frac{1}{2}}$		
	<b>e</b> $26^{\frac{1}{3}}$	<b>f</b> $26^{-\frac{1}{3}}$	<b>g</b> $7^{\frac{1}{4}}$	<b>h</b> $7^{-\frac{1}{5}}$		
<b>3</b>	<b>a</b> $\approx 2.11$	<b>b</b> $\approx 3.13$	<b>c</b> $\approx 0.33$	<b>d</b> $\approx 0.66$		

## Solutions to Additional Exercises:

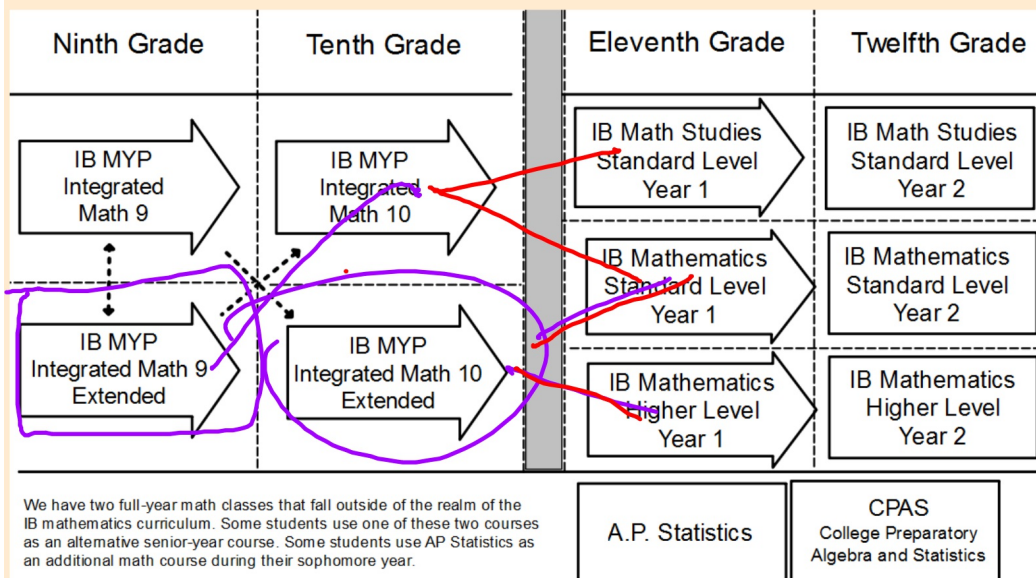
1) 1296  
5)  $p^9$

2) 100000  
6)  $1000x^6$

3) 7  
7)  $b^{12}$

4) 9  
8)  $10m^3$

## Where will you go next year?.....



**Directions:** Quietly complete survey, turn in.  
Your teacher(s) will give you feedback of which class **we** feel you will find the most success.

10<sup>th</sup> Grade Course Survey      Name \_\_\_\_\_

1) What goals do you have for when you are finished with school? (After college or high school)

2) (i) Place an **X** next to the math class you plan to take as a 10<sup>th</sup> grader.

\_\_\_\_\_ MYP 10 Standard Level Math      \_\_\_\_\_ MYP 10 Extended Level Math

(ii) List all the Honors **AND/OR** AP courses you plan to take as a 10<sup>th</sup> grader. (**For example:** AP U.S. History, Honors Chemistry, Honors English, others????)

3) Additional comments, questions, concerns??

Teacher Feedback..... I recommend that you take \_\_\_\_\_ as a 10<sup>th</sup> grader.

## IB Mathematical Studies Standard Level Course

<b>Topic 1</b> Numbers and algebra
<b>Topic 2</b> Descriptive statistics
<b>Topic 3</b> Logic, sets and probability
<b>Topic 4</b> Statistical application
<b>Topic 5</b> Geometry and trigonometry
<b>Topic 6</b> Mathematical models
<b>Topic 7</b> Introduction to different calculus
<b>Project</b> An individual piece of work involving the collection of information or the generation of measurements, and subsequent the analysis and evaluation.

At Southwest, we add ACT  
test preparation

## IB Mathematics Standard Level

<b>Topic 1</b> Algebra
<b>Topic 2</b> Functions and equations
<b>Topic 3</b> Circular functions and trigonometry
<b>Topic 4</b> Vectors
<b>Topic 5</b> Statistics and probability
<b>Topic 6</b> Calculus
<b>Mathematical exploration</b> Internal assessment in mathematics SL is an individual exploration. This is a piece of written work that involves investigating an area of mathematics.

## IB Mathematics Higher Level Course

**Topic 1**  
Algebra

**Topic 2**  
Functions and equations

**Topic 3**  
Circular functions and trigonometry

**Topic 4**  
Vectors

**Topic 5**  
Statistics and probability

**Topic 6**  
Calculus

### **Option syllabus content**

Students must study one of the following options.

**Topic 7**  
Statistics and probability

**Topic 8**  
Sets, relations and groups

**Topic 9**  
Calculus

**Topic 10**  
Discrete mathematics

### **Mathematical exploration**

A piece of individual written work that involves investigating an area of mathematics.