The Overtone Series

A Method for Young Musicians

Workbook

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PA #3, August, 2009
Brought to you by

Name: _____ Period:_____

This workbook is intended to provide supplementary material for the Keynote Presentation "Overtone Series, a Method for Young Musicians."
These worksheets should be done in accordance with instructions from your teacher.

Table of Contents

What is the Overtone Series?

Directions: *Fill in the blanks with the correct answer.*

1.) Within one pitch, there is actually a spectrum of _____ , a whole set of different pitches.

2.) The evenly divided subdivisions are called _____.

3.) Why is it important for brass musicians to know the Overtone Series? What can they do with this knowledge?

_____

_____

4.) The Overtone Series is made up of the _____ plus 15 _____.

5.) The lowest note in the series, the _____, is often referred to as a _____ _____.

Constructing the Overtone Series

Overtone Series Rule #1:

Hint: The rules are referenced on page 6. Try to write them out from memory first, before you go looking....

Write out Rule #1:

6.)_____

_____

Now draw in the notes for partials 2, 4, 8, and 16 and label them below:

7.)

Overtone Series Rule #2 and #3

Write out Rule #2:

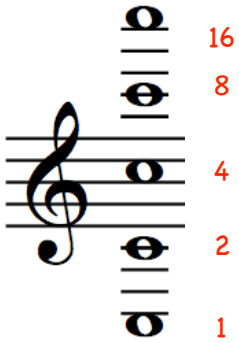
8.)_____

_____

_____

Now draw in the notes for partials 3, 6, and 12 and label them below:

9.)



Write out Rule #3:

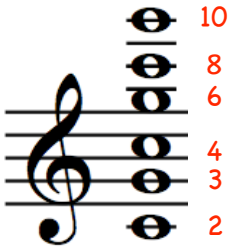
10.)_____

_____

_____

Now draw in the notes for partials 5 and 10 and label them below:

11.)



Overtone Series Rule #4 and #5

Write out Rule #4:

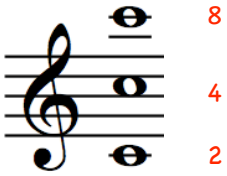
12.)_____

_____

_____

Now draw in the notes for partials 7, and 14 label it below:

13.)



Write out Rule #5:

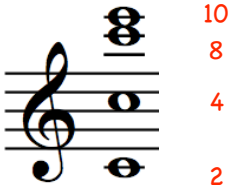
14.)_____

_____

_____

Now draw in the notes for partials 9 and 11, and label it below:

15.)



Overtone Series Rule #6

Write out Rule #6 below:

16.)_____

_____

REVIEW RULE #1

Partials 1, 2, 4, 8, and 16 are all octaves apart based from the Fundamental Pitch

REVIEW RULE #2

Partials 3, 6, and 12 are Perfect Fifths (P5) from the Fundamental Partials

REVIEW RULE #3

Partials 5 and 10 are Major 3rds (M3) above Fundamental Partials 4 and 8

REVIEW RULE #4

Partial 7and 14 are minor 7ths (m7) above the Fundamental Partial 4 &8

REVIEW RULE #5

Partials 9 and 11 are whole step (M2) above the 8th and 10th, respectively.

REVIEW RULE #6

Partial 13 is a Major 2nd (M2) from 12 and Partial 15 is a minor 2nd (m2) from 14

Time To Practice!

Before getting started, think about the following...

You only need to memorize the following partials:

1, 3, 5, 7, 9 (odd numbers)

Here's why.....

1 - The fundamental partials are multiples of 2 and all octaves apart

3 - The P5 Partials are multiples of 3 and are each a perfect 5th above one of the funamental partials.

5 - The M3 Partials are multiples of 5 and are major thirds above the fundamental partials.

7 - Multiples of 7, 7 and 14 are the m7 partials. They are each a minor seventh above one of the fundamental partials.

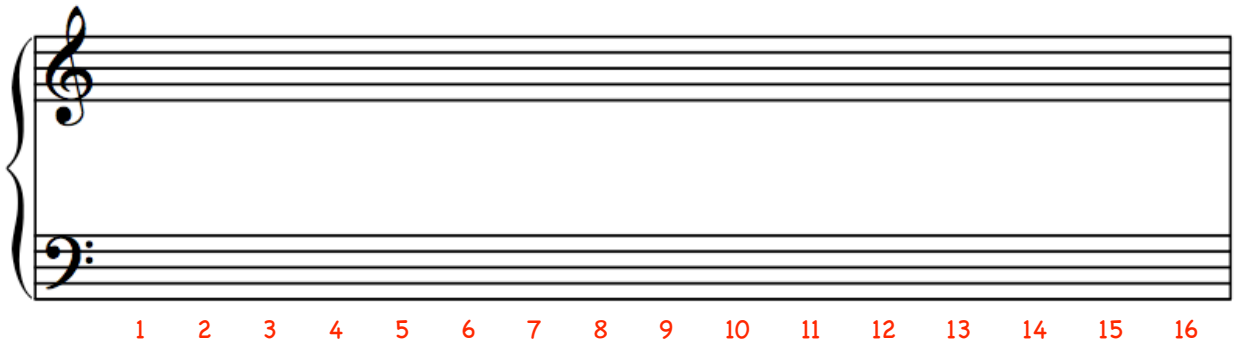
9 - 9th is a 9th! Or a major second (M2) from the fundamental.

Rarely will you utilize any of the partials beyond 10

1	2	4	8	16	Octaves
3	6	12			P5
5	10				M3
7	14				m7
9	11				M2

Your Turn...

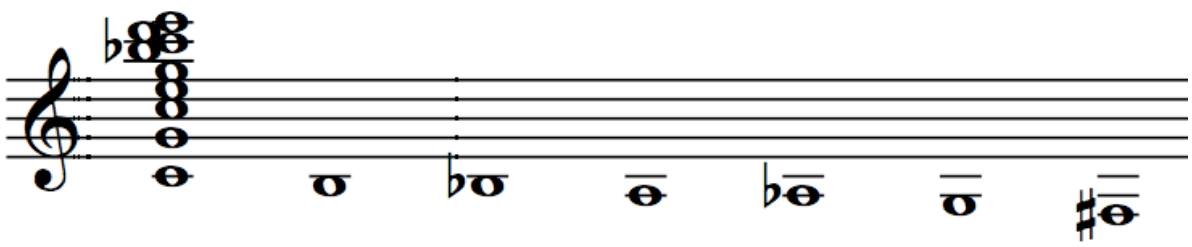
17.)



1. Write in the fundamental partials on the grand staff above.
2. Now write in the P5 partials
3. Now write in the M3 partials
4. Now write in the m7 partials
5. Lastly, write in the M2 partials
6. What's left? 13 and 15 (M2 and m2)

The Entire Harmonic Overtone Series...

18.)

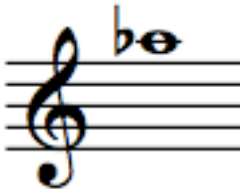


1. Using only partials 2 through 10, you will construct the entire harmonic overtone series. The first one is already completed for you.
2. Remember to follow the steps....
    1. Fundamental Partials (2, 4, 8)
    2. P5 Partials (3, 6)
    3. M3 Partials (5, 10)
    4. m7 Partial (7)
    5. M2 Partial (9)

Name That Partial

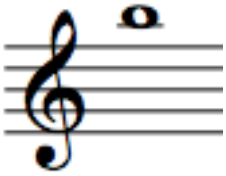
For each of the following notes, practice naming the different partials that are possible. Remember that there are sometimes up to three options...

19.)

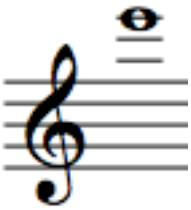


Answer(s)...

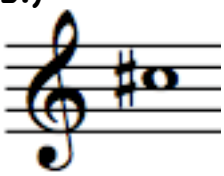
20.)



21.)



22.)



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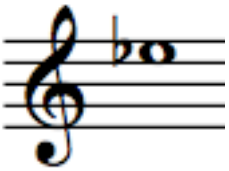
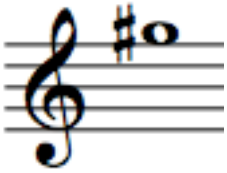
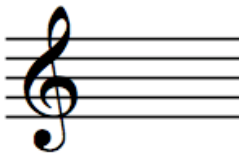


24.)



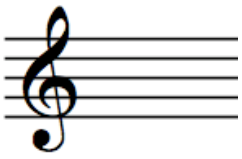
Now, in reverse, draw in the note that the directions ask for...

25.)



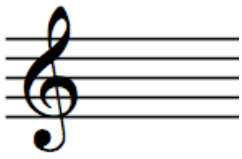
4th partial of Ab

26.)



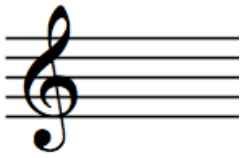
10th partial of F#

27.)



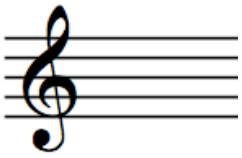
3rd partial of B

28.)



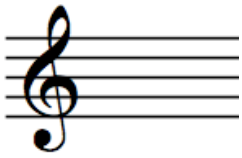
9th partial of C

29.)



7th partial of Bb

30.)



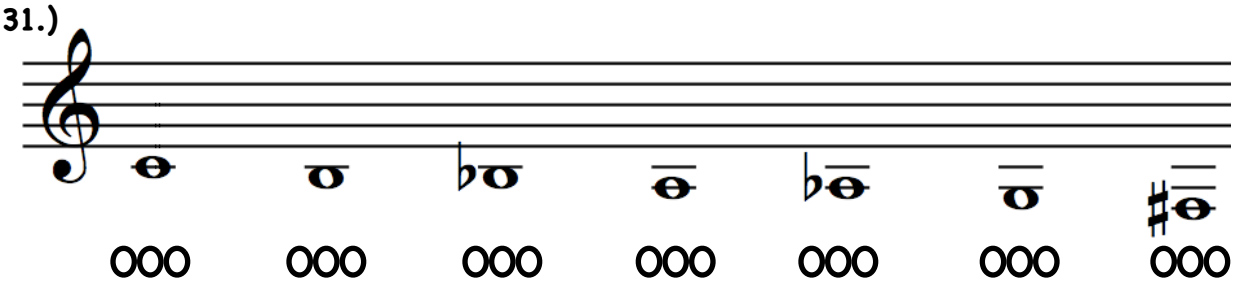
5th partial of G

Applying The Knowledge...

Constructing the Trumpet Fingering Chart...

For the notes below, fill in the holes to show the correct fingerings for the trumpet.

31.)



For a complete fingering chart, fill in the rest of the partials for each fingering, up to partial 10.

Relating the Trumpet Fingerings to French Horn

If you know your Trumpet fingerings, you can then easily figure out your French horn fingerings.

The French horn, as played by most student and professional musicians, is a double instrument, meaning, there are actually two horns in one, and a thumb valve, or "trigger" switches from one to the other.

When the trigger is not engaged, the French horn is a Bb instrument. When the trigger is pressed down, the horn is actually shortened, making it an F instrument with an extended range. It's easier just to remember the rules....

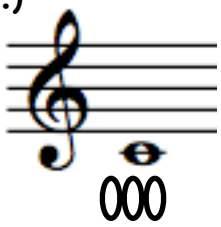
FRENCH HORN RULES

#1 - Without the trigger, think up a P5 and use trumpet fingerings.

#2 - With a trigger, think up an octave and use trumpet fingerings

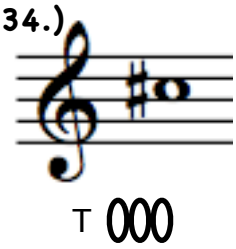
Drill the above two rules to remember them! Then, without looking, fill in the correct fingering for French horn for the following examples...
("T" means that the trigger is engaged.)

32.)

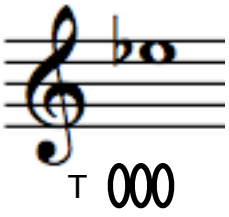


33.)

34.)

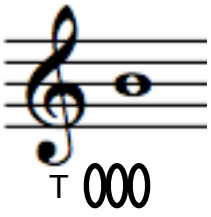


35.)



36.)

37.)



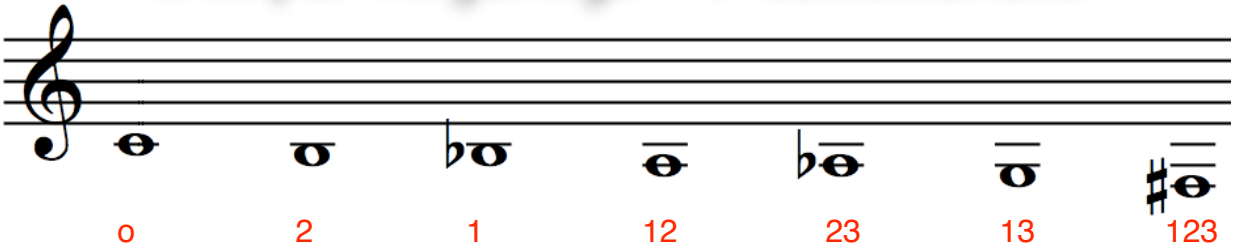
Comparison to the Trombone...

There are 7 positions on a trombone, and 7 fingering combinations on a trumpet. Overtone series is exactly the same!

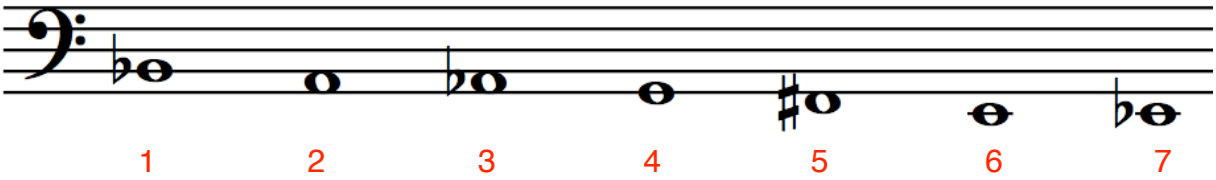
TROMBONE RULE

#1 Trombone system is the same, however pitch is one M9 below the trumpet.

Trumpet Fingerings - 7 Combinations



Trombone Slide - 7 Positions



Comparison to the Baritone and Tuba...

BARITONE RULE

#1 From the written Baritone Pitch, think up a M9 and use trumpet fingerings

TUBA RULE

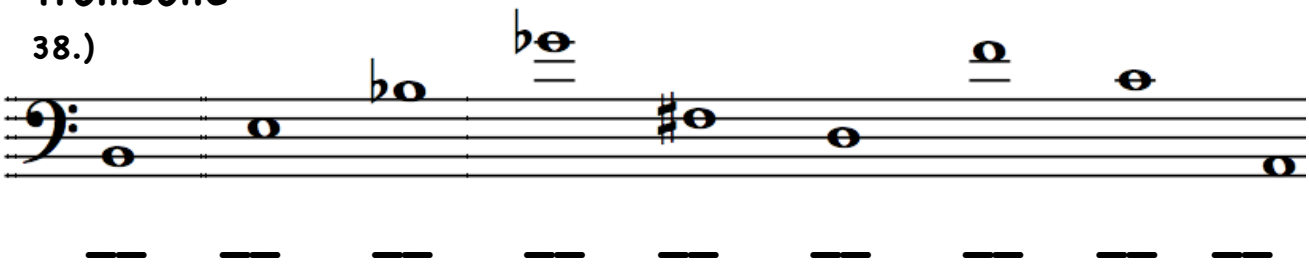
#1 From the written Tuba Pitch, think up a M9 PLUS an octave and use trumpet fingerings

Knowing the Fingering....

Write in the fingering or positions for the following notes....
Work as fast as you can, use the rules!

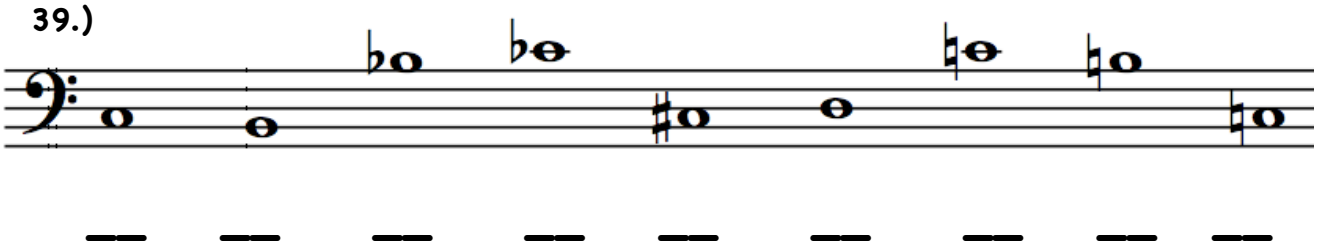
Trombone

38.)



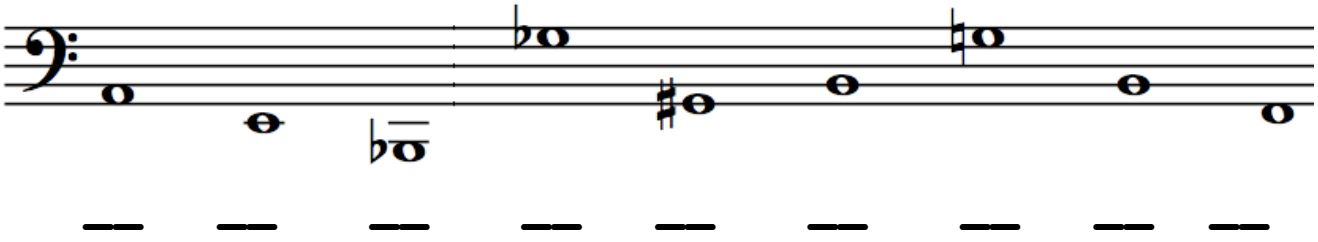
Baritone

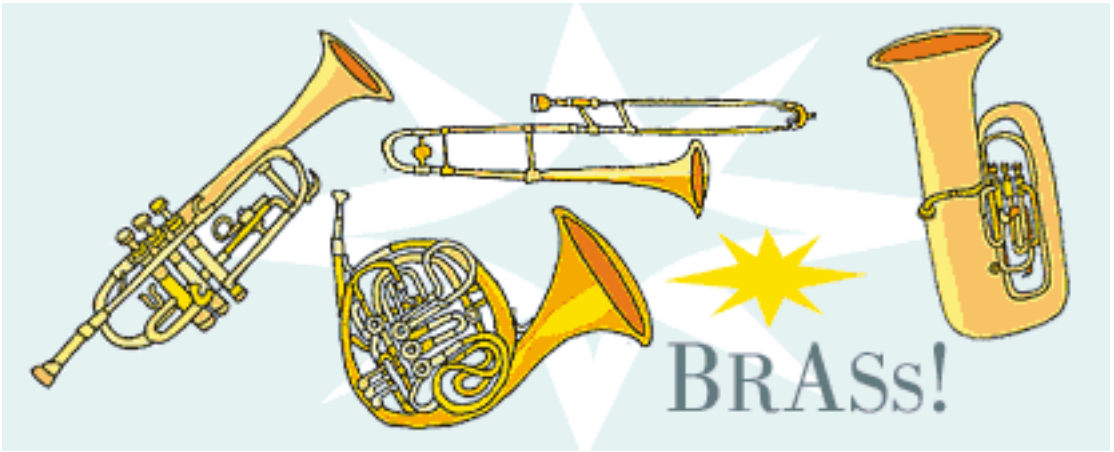
39.)



Tuba

40.)





To Be a Better Musician

How can in depth knowledge of the overtone series and brass fingerings make you a better musician?

1 - Brass Family Knowledge

The ability to substitute on, or transfer to another brass instrument with ease will not only help your band if needed, but it also opens up opportunities for you as a musician.

2 - Alternate Fingerings for Ease

If you are asked to play music that seems impossible, chances are, there is an easier way to finger it. Knowing where the notes lay in other overtone series, helps you decide an alternate route.

3 - Alternate Fingerings for Pitch

Some of the partials are naturally out of tune.
Some of the fingering combinations are naturally out of tune
Knowing your overtone series helps you avoid problems

Rules of Pitch Tendencies...

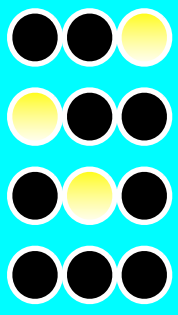
Partials of the 3rd overtone are slightly sharp
Partials of the 5th overtone are slightly flat
Partials of the 7th overtone are very flat

RULES:

3 6 12 = Sharp
5 10 = Flat
7 = Very flat

MORE RULES

Valve Combinations:



= Sharp
= Flat
= Sharp
= Very #

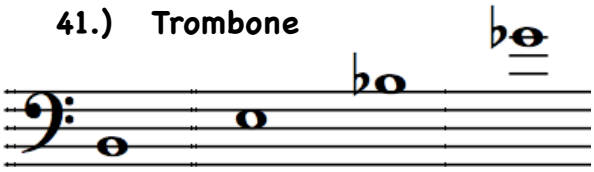
Practice Alternate Fingerings

With the rules of natural pitch tendencies for both the partials and the valve combinations in mind, practice figuring out alternate fingerings for notes accordingly.

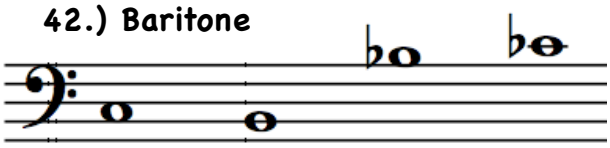
For the examples below, provide as many alternate fingerings as you can think of under every note, circling the most ideal one.

A couple of sentences to remember is:
- Choose the fingering with the least amount of valves.
- Avoid the 7th partial.
- Avoid the 3rd valve.

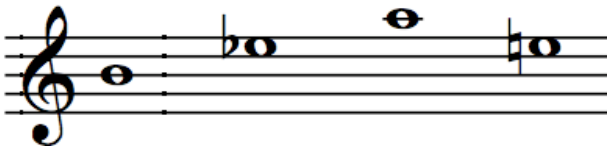
41.) Trombone



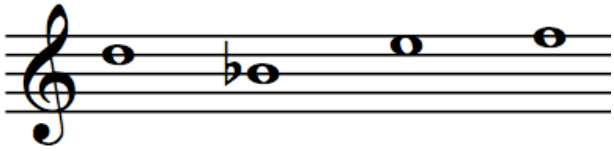
42.) Baritone



43.) Trumpet



44.) French horn



How to Use the Trombone Trigger:
- **Think up a P4 from written note.**
- **Depress Trigger for that note**
- **Place slide at position that the new note.**

When to Use the 4th Valve:
If a brass instrument has 4 valves, the 4th valve can be used for the following out of tune combinations to adjust pitch:
- **Instead of 1-3, just use 4**
- **Instead of 1-2-3, just use 2-4**

Wrap Up

Now that you have an introductory knowledge of the overtone series and how is applied to brass instruments, it is important that you continue to practice so that it becomes an instinctual part of your music making.

Look at your music in your folder. If you are a brass musician, scan through your parts in preparation for your next rehearsal. Look for the following:

- Held out notes that are 3rd, 5th, or 7th partials
- Note patterns with tricky fingering maneuvers.
- Long passages of notes with either a 1-2-3 valve combination, or a 1-2, or a 1,3

After you scan your parts, identify the possible alternates and write them in with pencil. Try the new fingerings and see if you are more successful!

Each and every time you play music, think about the overtone series and how you can incorporate it into your life. It takes time, but the benefit of being fluent amongst the brass instruments far outweighs the effort required to practice it.