

## CRANIAL NERVES

Pure Motor	Pure Sensory	Mixed	Parasympathetic	Contain Taste Fibers
3, 4, 6, 11, 12	1, 2, 8	5, 7, 9, 10	3, 7, 9, 10	7, 9, 10

	1	2	3	4	5	6	7	8	9	10	11	12
Motor			✓	✓		✓					✓	✓
Sensory	✓	✓						✓				
Mixed					✓		✓		✓	✓		
Parasympathetic			✓				✓		✓	✓		
Taste fiber							✓		✓	✓		

## FUNCTIONS

Cranial Nerve	Opening in skull	Functions
I Olfactory	Cribriform plate	<ul style="list-style-type: none"> <li><b>Sensory</b> to olfaction (smell)</li> </ul>
II Optic	Optic canal	<ul style="list-style-type: none"> <li><b>Sensory</b> to vision</li> </ul>
III Oculomotor	Superior orbital fissure	<ul style="list-style-type: none"> <li><b>Motor</b> to the superior, inferior, medial rectus muscles, the inferior oblique muscle, the levator palpebrae superioris muscle</li> <li><b>Parasympathetic</b> innervation to constrict pupil and accommodate eye</li> </ul>
IV Trochlear	Superior orbital fissure	<ul style="list-style-type: none"> <li><b>Motor</b> to the superior oblique muscle that turns the eye downward and laterally</li> </ul>
V Trigeminal	V1: Superior orbital fissure V2: Foramen rotundum V3: Foramen ovale	<b>V1</b> <ul style="list-style-type: none"> <li><b>Sensory</b> to cornea, skin of the forehead, scalp, eyelids, and nose; mucous membrane of the paranasal sinuses and nasal cavity</li> </ul>
		<b>V2</b> <ul style="list-style-type: none"> <li><b>Sensory</b> to skin of face over the maxilla and upper lip; teeth of upper jaw; mucous membrane of the nose; maxillary air sinus</li> </ul>
		<b>V3</b> <ul style="list-style-type: none"> <li><b>Sensory</b> to skin of the cheek, skin over the mandible, and side of head; teeth of lower jaw and TMJ; mucous membrane of the mouth and anterior two-thirds of the tongue</li> <li><b>Motor</b> to muscles of mastication (temporalis, masseter, medial and lateral pterygoids), anterior belly of the digastric, mylohyoid, tensor tympani, and tensor veli palatini</li> </ul>
VI Abducens	Superior orbital fissure	<ul style="list-style-type: none"> <li><b>Motor</b> to the lateral rectus muscle – turns eye laterally</li> </ul>
VII Facial	Internal auditory meatus, facial canal, stylomastoid foramen	<ul style="list-style-type: none"> <li><b>Motor</b> to muscles of facial expression, stapedius, stylohyoid, posterior belly of the digastric</li> <li><b>Taste</b> from the anterior two-thirds of the tongue, and palate</li> <li><b>Parasympathetic innervation</b> of the submandibular and sublingual salivary glands, lacrimal gland, and glands of the nose and palate</li> </ul>
VIII Vestibulocochlear	Internal auditory meatus	<ul style="list-style-type: none"> <li><b>Vestibular nerve:</b> Position and movement of the head</li> <li><b>Cochlear nerve:</b> Hearing</li> </ul>
IX Glossopharyngeal	Jugular foramen	<ul style="list-style-type: none"> <li><b>Motor</b> to the stylopharyngeus muscle</li> <li><b>Taste</b> from the posterior third of the tongue</li> <li><b>Sensory</b> to general sensation from pharynx, sensory fibers from the carotid sinus</li> <li><b>Parasympathetic innervation</b> of the parotid gland</li> </ul>
X Vagus	Jugular foramen	<ul style="list-style-type: none"> <li><b>Motor:</b> innervates constrictor muscles of the pharynx and intrinsic muscles of the larynx</li> <li><b>Parasympathetic innervation</b> to structures in the neck, thorax and most of abdomen to splenic flexure of colon</li> <li><b>Taste</b> from valleculae and epiglottis</li> <li><b>Afferent fibers</b> (sensation) from above structures</li> </ul>
XI Accessory	Jugular foramen	<ul style="list-style-type: none"> <li><b>Motor</b> to the SCM and trapezius muscles</li> </ul>
XII Hypoglossal	Hypoglossal canal	<ul style="list-style-type: none"> <li><b>Motor</b> to the intrinsic and extrinsic muscles of the tongue (except the palatoglossus muscle)</li> </ul>

<b>Mnemonics</b>	<b>Mnemonic to Remember Names of the Cranial Nerves</b>
	On Old Olympus' Towering Top, A Finn And German Vaulted And Hopped
	<b>Mnemonic to Remember Whether Nerve is Sensory, Motor, or Both</b>
	Some Say Marry Money, But My Brother Says Bad Business Marrying Money

CRANIAL NERVE

CRANIAL NERVE		S/M		FUNCTION	EXAMINATION	
I	<b>Olfactory</b>	O	S	Sense of smell	Identify odors with eyes closed	
II	<b>Optic</b>	O	S	Vision	Test peripheral vision with one eye covered	
III	<b>Oculomotor</b>	O	M	Pupillary contraction, opening the eye, and most extraocular movements	Peripheral vision, eye chart, reaction to light	
IV	<b>Trochlear</b>	T	M	Downward, inward movement of the eye	Test ability to depress & adduct eye	
V	<b>Trigeminal</b>	T	B	M	Temporal and masseter muscles (jaw clenching), also lateral movement of the jaw	Face sensation & clench teeth
			S	Facial. The nerve has three divisions: ① ophthalmic ② maxillary ③ mandibular		
VI	<b>Abducens</b>	A	M	Lateral deviation of the eye	Test ability to abduct eye past midline	
VII	<b>Facial</b>	F	B	M	Facial movements, including those of facial expression, closing the eye, and closing the mouth	Close eyes & smile; detect various tastes - sweet, sour, salty, bitter
			S	Taste for salty, sweet, sour, and bitter substances on the anterior 2/3 of the tongue		
VIII	<b>Acoustic (Vestibulocochlear)</b>	A	S	Hearing (cochlear division) and balance (vestibular division)	Hearing; balance-feet together, eyes open/closed x 5sec; test for past-pointing	
IX	<b>Glossopharyngeal</b>	G	B	M	Pharynx	Swallow & say "ah"; use tongue depressor to elicit gag reflex
			S	Posterior portions of the eardrum and ear canal, the pharynx, and the posterior tongue, including taste (salty, sweet, sour, bitter)		
X	<b>Vagus</b>	V	B	M	Palate, pharynx, and larynx	
			S	Pharynx and larynx		
XI	<b>Accessory</b>	A	M	the sternomastoid and upper portion of the trapezius	Turn head (sternocleidomastoid muscles); shrug shoulders (trapezius muscles)	
XII	<b>Hypoglossal</b>	H	M	Tongue	Protrude tongue (watch for lateral deviation)	

MNEMONIC TO REMEMBER

Names of the Cranial Nerves	
●	On Old Olympus' Towering Top, A Finn And German Vaulted And Hopped
Whether Nerve is Sensory, Motor, or Both	
●	Some Say Marry Money, But My Brother Says Bad Business Marrying Money

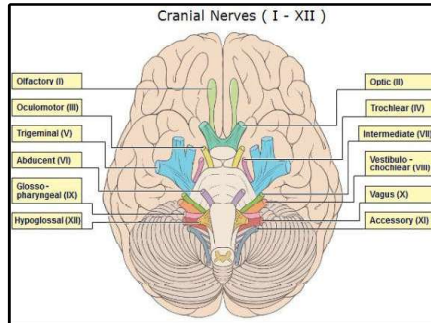
EXAMINATION

CN	Examination of the cranial nerves
1	Smell
2	Visual acuity, visual fields, and ocular fundi
2, 3	Pupillary reactions
3, 4, 6	Extraocular movements
5	Corneal reflexes, facial sensation, and jaw movements
7	Facial movements
8	Hearing
9, 10	Swallowing and rise of the palate, gag reflex
5, 7, 10, 12	Voice and speech
11	Shoulder and neck movements
12	Tongue symmetry and position

# Cranial Nerves

- **Cranial nerves** are the nerves that emerge directly from the brain (including the brainstem) in contrast to spinal nerves (which emerge from segments of the spinal cord).

Each of twelve pairs of nerves that arise directly from the brain, not from the spinal cord, and pass through separate apertures in the skull.



# Mnemonics

<b>O</b> n	<b>O</b> lfactory (CN I)	<b>S</b> ensory	<b>S</b> ome
<b>O</b> ccasion	<b>O</b> ptic (CN II)	<b>S</b> ensory	<b>S</b> ay
<b>O</b> ur	<b>O</b> culomotor (CN III)	<b>M</b> otor	<b>M</b> arry
<b>T</b> rusty	<b>T</b> rochlear (CN IV)	<b>M</b> otor	<b>M</b> oney
<b>T</b> ruck	<b>T</b> rigeminal (CN V)	<b>B</b> oth**	<b>B</b> ut
<b>A</b> cts	<b>A</b> bducens (CN VI)	<b>M</b> otor	<b>M</b> y
<b>F</b> unny	<b>F</b> acial (CN VII)	<b>B</b> oth	<b>B</b> rother
<b>V</b> ery	<b>V</b> estibulocochlear (CN VIII)	<b>S</b> ensory	<b>S</b> ays
<b>G</b> ood	<b>G</b> lossopharyngeal (CN IX)	<b>B</b> oth	<b>B</b> ig
<b>V</b> ehicle	<b>V</b> agus (CN X)	<b>B</b> oth	<b>B</b> rains
<b>A</b> ny	<b>A</b> ccessory (CN XI)	<b>M</b> otor	<b>M</b> atter
<b>H</b> ow	<b>H</b> ypoglossal (CN XII)	<b>M</b> otor	<b>M</b> ore

# Mnemonics

1. Oily Oranges On Tower Tickle Ants Funnily And Give Velvety Angry Hands
2. Oh Oh Oh Time Traveler Again Fool Angry Gods Victory Are His
3. O O O To Touch And Feel Very Good Varies After Hyperactivity
4. Old Open Oceans Trouble Tribesmen About Far Ventures, Global Vacations, Accusing Hydrophobia
5. Orange Oregon O-lineman Tried Track And Field, Victory Gave Virginia School Honor
6. On Occasion Our Trusty Truck Acts Funny, Very Good Vehicle Any How
7. Once One Openly Told Tourists About Fighting Vampires Gobling Various Antelope\_Herds
8. On Old Olympus' Towering Top, A Friendly Viking Grew Vines And Hops
9. Oh Once One Takes The Anatomy Final Very Good Vacations Are Heavenly.
10. Oh, Oh, Oh, To Touch And Feel Very Good' Velvet Aah Hah
11. Old Optics Operate To TRY And Fake Very Good VEGAS Safe Houses
12. Oh, Oh, Oh, To Touch And Fondle A Gorgeous Very Super Human
13. Oh, Oh, Oh, To Touch And Feel Very Green Vegetables, Such Heaven
14. Oh, Oh, Oh, To Take A Family Vacation! Go Vegas After Hours
15. Old Opie Occasionally Tries Trigonometry And Feels Very Gloomy, Vague And Hypoactive
16. Oh, Oh, Oh, To Touch And Feel Vintage Green Velvet, Simply Heaven
17. Oprah Ought Order Tasty Treats And Finally Value Growing Voluptuous And Happy
18. Old Officers Often Trust The Army For A Glory Vague And Hypothetical
19. Old Oppressive Oceanic Trout Trick Aquatic Fauna Very Greedily; Valiant Sharks Hunt (them).
20. Oh Oh Oh Try Try Again Failure Victory Gives Value And Harmony

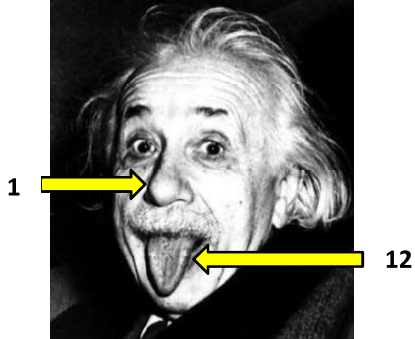
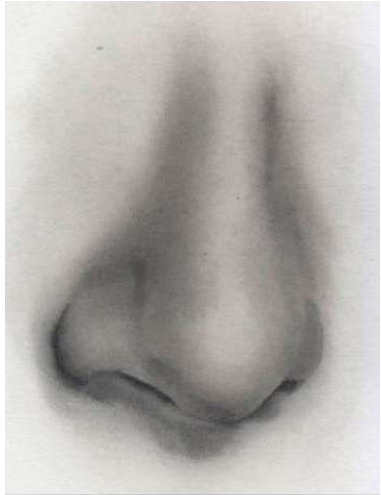
# Memo

# Tricks to Remember the Cranial Nerves **WITHOUT** Mnemonics

- Reference books**
- Bates' Guide to Physical Examination and History Taking
  - Current Diagnosis & Treatment - Neurology

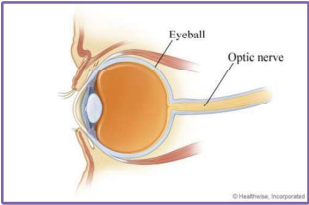
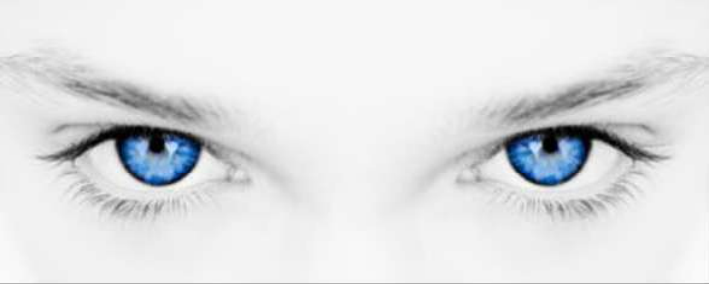
## CN 1. Olfactory

S



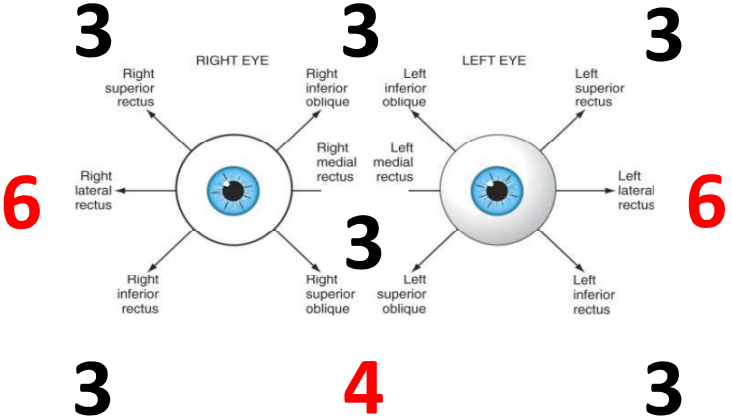
## CN 2. Optic

S



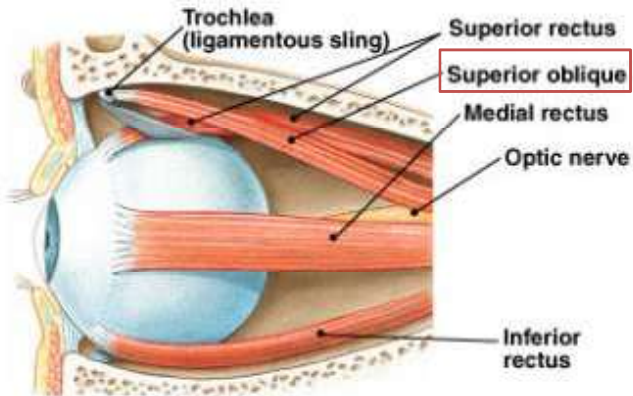
## CN 3. Oculomotor

LR<sub>6</sub> = Lateral Rectus / SO<sub>4</sub> = Superior Oblique



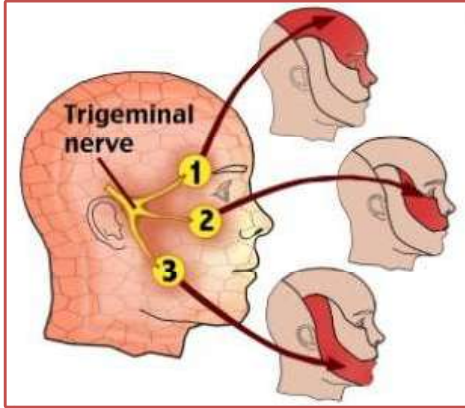
M

# CN 4. Trochlear



M

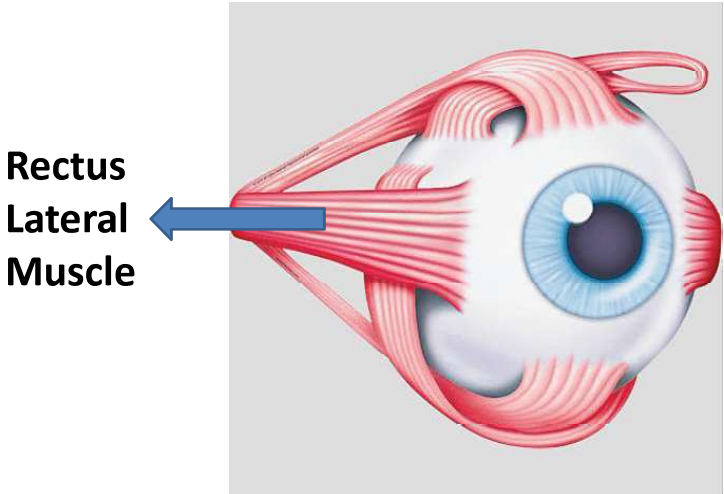
# CN 5. Trigeminal



SM

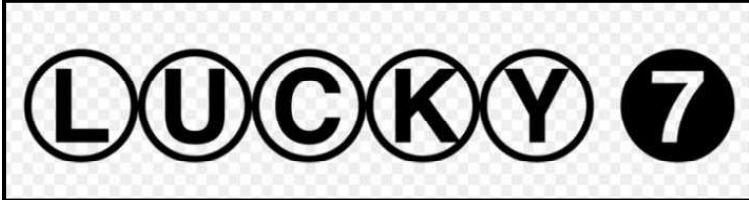
- CN5 = 3 branches
- CN7 = 5 branches

# CN 6. Abducent



M

# CN 7. Facial

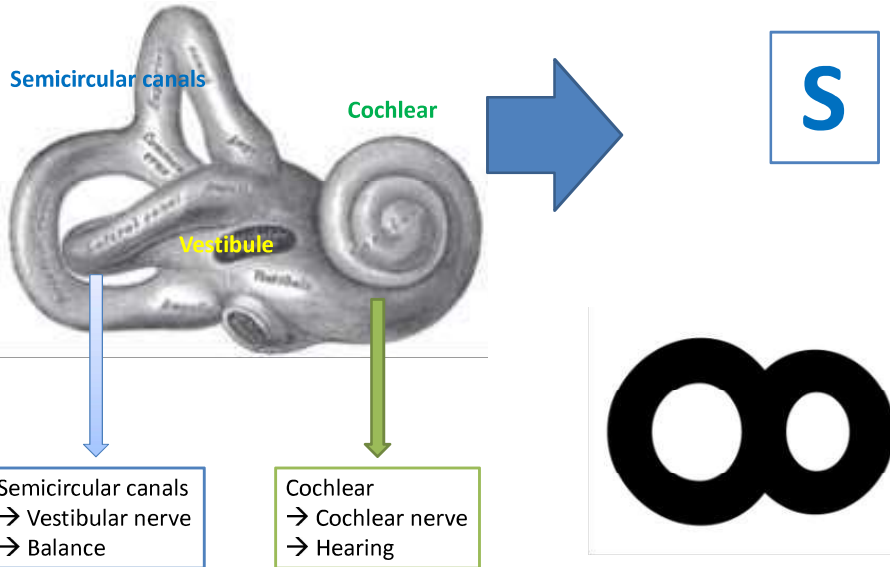


Lucky Face

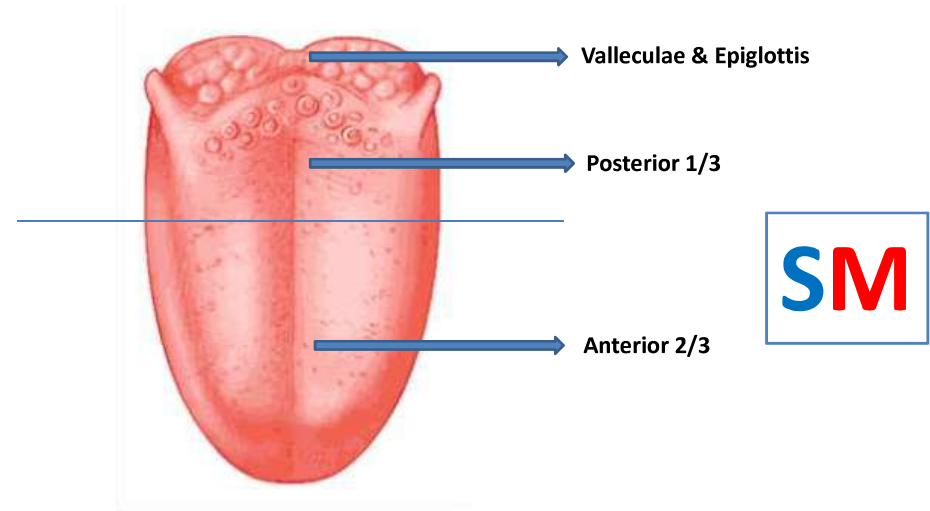
SM



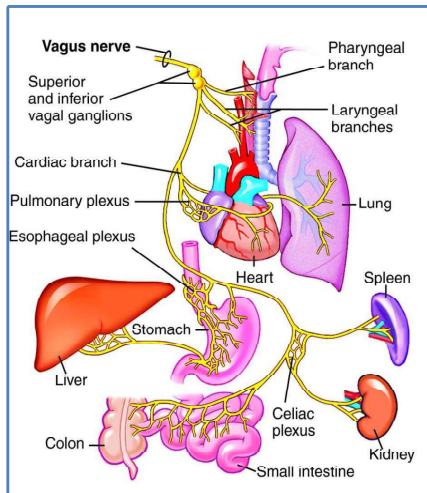
# CN 8. Vestibulocochlear



# CN 9. Glossopharyngeal



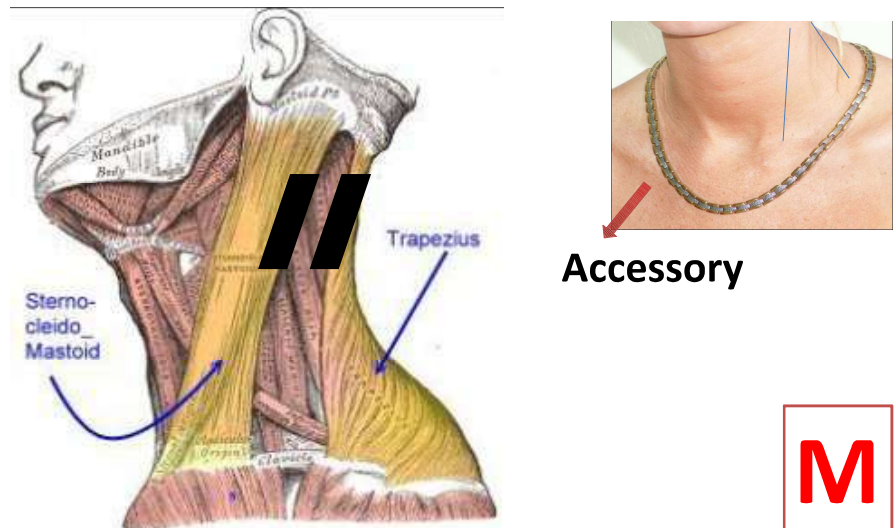
# CN 10. Vagus



- Mixed M + S
- Parasympathetic
- Taste Fibers

SM

# CN 11. Accessory



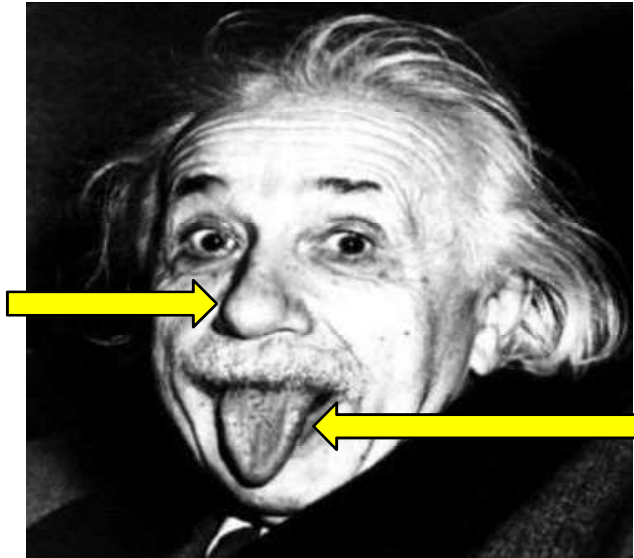
M

# CN 12. Hypoglossal

M

S

1



12

M

## Examination of the Cranial Nerves

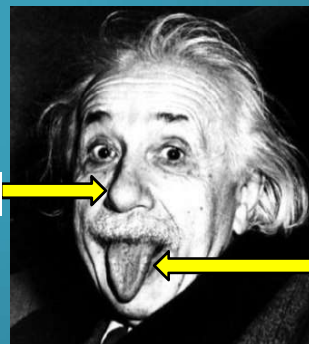
CN	Examination of the cranial nerves
1	Smell
2	Visual acuity, visual fields, and ocular fundi
2, 3	Pupillary reactions
3, 4, 6	Extraocular movements
5	Corneal reflexes, facial sensation, and jaw movements
7	Facial movements
8	Hearing
9, 10	Swallowing and rise of the palate, gag reflex
5, 7, 10, 12	Voice and speech
11	Shoulder and neck movements
12	Tongue symmetry and position

# CN 1. Olfactory

S



1



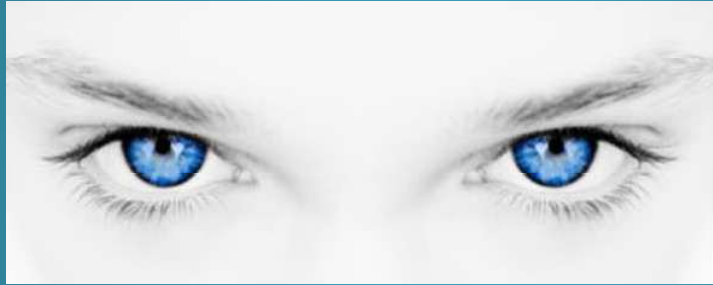
12

## I (olfactory)

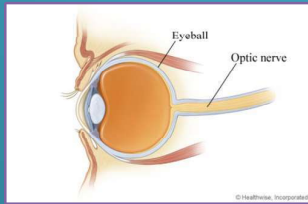
- Test the sense of smell by presenting the patient with familiar and nonirritating odors.
- Not tested routinely
  - unless there is suspicion for inferior frontal lobe disease (e.g. meningioma)



# CN 2. Optic

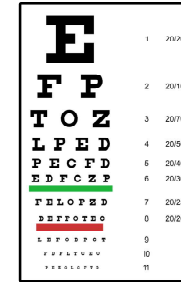


S



# II (optic)

- Visual acuity
  - Snellen eye chart

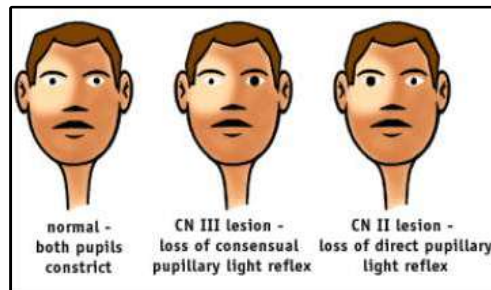
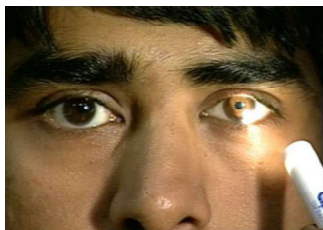


- Visual fields
  - by confrontation



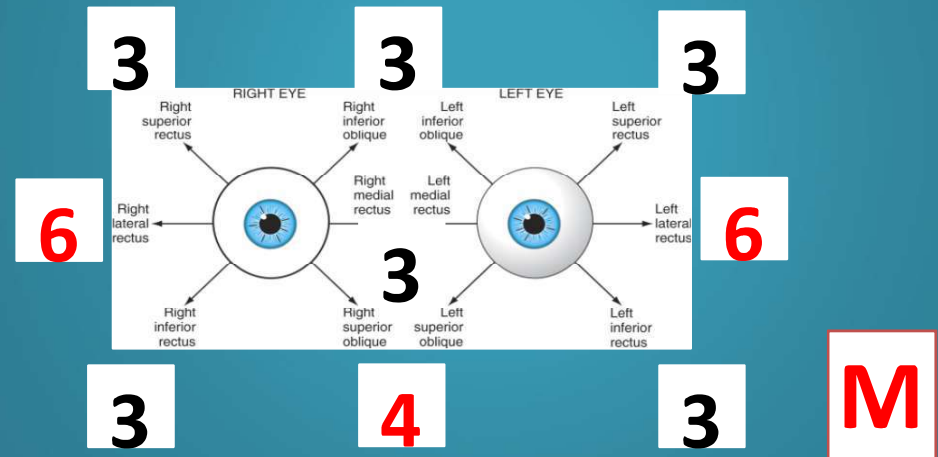
# II (optic) & III (oculomotor)

- Pupillary reactions to light
  - II = sensory
  - III = motor



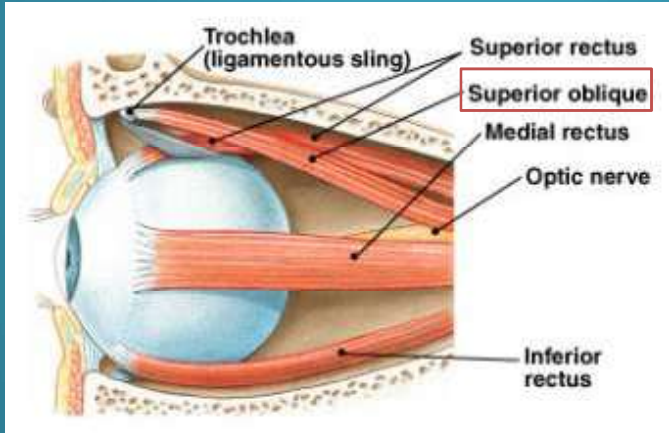
# CN 3. Oculomotor

LR<sub>6</sub> = Lateral Rectus / SO<sub>4</sub> = Superior Oblique



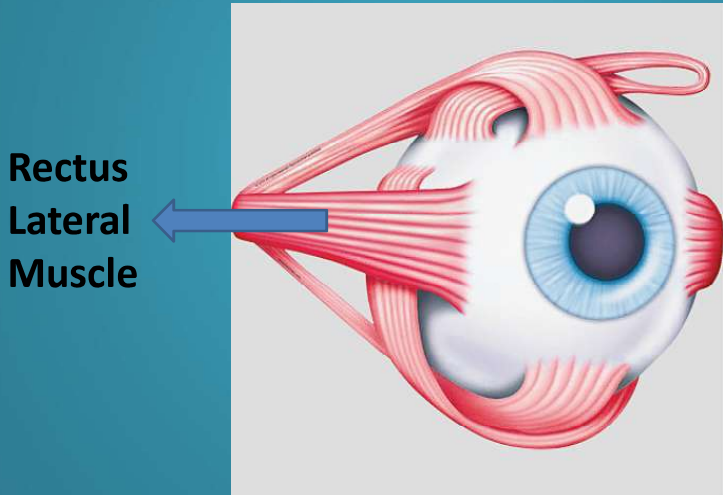


# CN 4. Trochlear



**M**

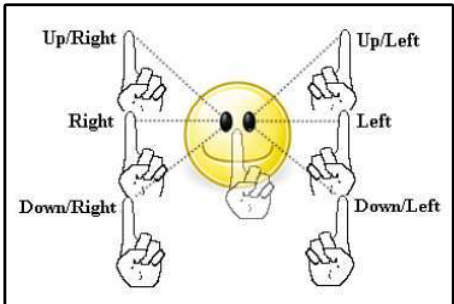
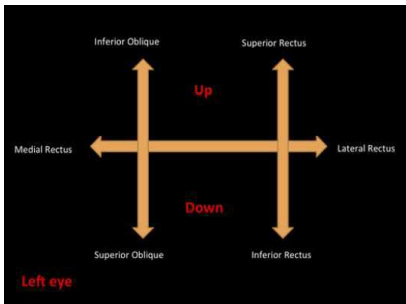
# CN 6. Abducent



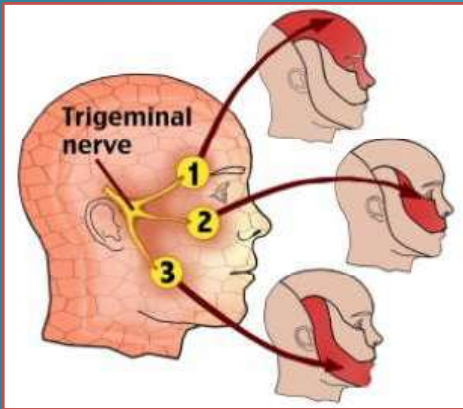
**M**

## III (oculomotor), IV (trochlear), VI (abducens)

- Test the extraocular movements in the six cardinal directions of gaze, and look for loss of conjugate movements in any of the six directions, which causes diplopia.



# CN 5. Trigeminal



**SM**

- CN5 = 3 branches
- CN7 = 5 branches

# V (trigeminal)

**Test:** Have patient bite down while you palpate the masseter muscle



**MOTOR**



**Test:** Touch patient with an open paperclip and ask "sharp or dull"

**SENSORY**



**Test:** Touch cornea with a wisp of cotton. Patient should blink

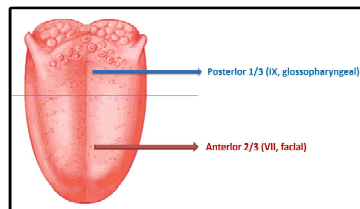
**CORNEAL REFLEX**

# VII (facial)

- Motor
  - smile, frown, raise eyebrows, show teeth, puff out cheeks



- Sensory
  - Taste on anterior 2/3 of tongue
  - Not tested routinely



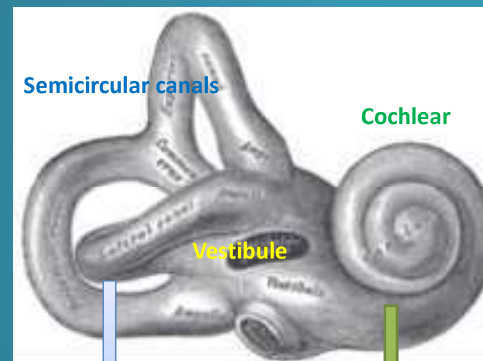
# CN 7. Facial

**LUCKY 7**

Lucky Face

**SM**

# CN 8. Vestibulocochlear



**S**

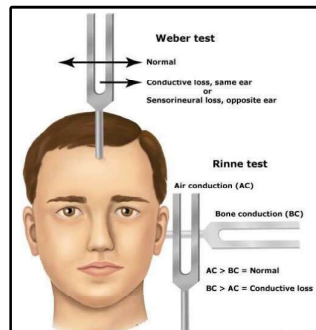
Semicircular canals  
→ Vestibular nerve  
→ Balance

Cochlear  
→ Cochlear nerve  
→ Hearing

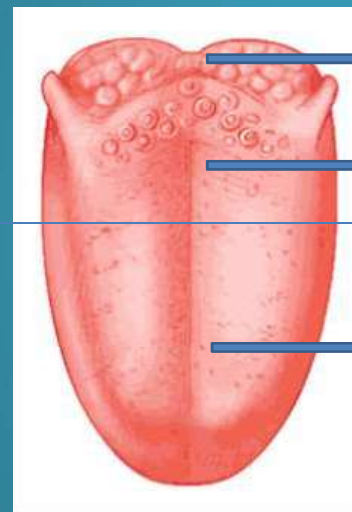
**∞**

# VIII (vestibulocochlear)

- Access hearing acuity
  - Ability to hear normal conversation
  - Whispered voice test
  - Weber and Rinne tuning fork test



# CN 9. Glossopharyngeal



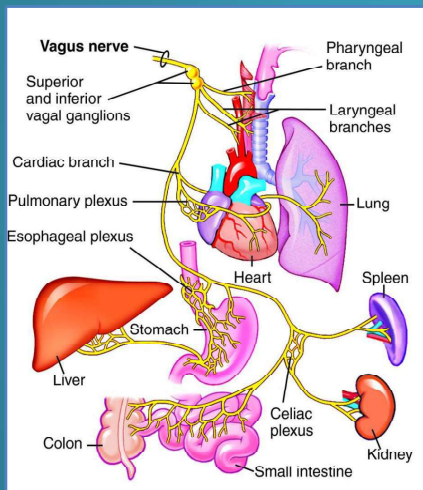
Valleculae & Epiglottis

Posterior 1/3

Anterior 2/3



# CN 10. Vagus



- Mixed M + S
- Parasympathetic
- Taste Fibers

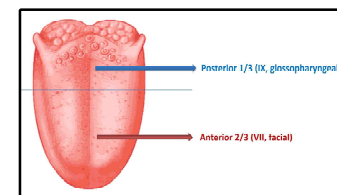


# IX (glossopharyngeal) & X (vagus)

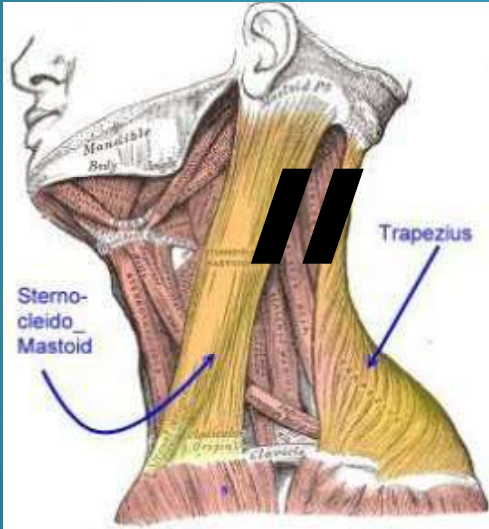
- Motor
  - Swallow
  - Ask the patient to say “ahhh” or to yawn as you watch the movements of the soft palate and the pharynx.
  - Gag reflex (IX = sensory, X = motor)



- Sensory
  - Taste on posterior 1/3 of tongue
  - Not routinely tested



## CN 11. Accessory



Accessory

M

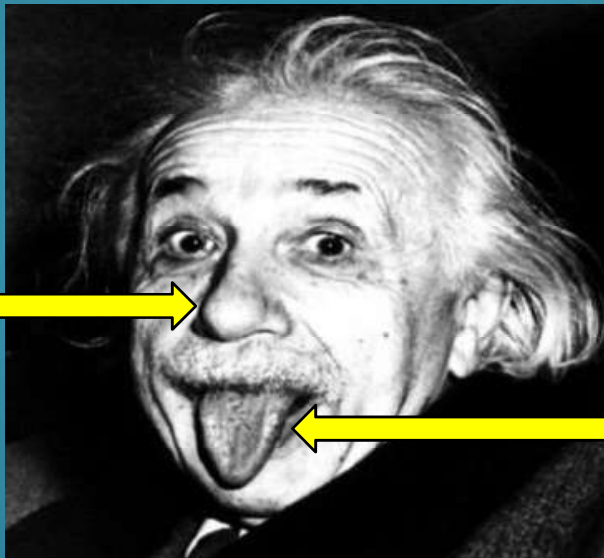
## XI (Accessory)

- Rotate head against resistance
- Shrug shoulders against resistance



## CN 12. Hypoglossal

M



S

1

12

M

## XII (hypoglossal)

- Have patient protrude tongue
  - No wasting or tremors
  - Tongue midline
- Say “light, tight, dynamite”
  - Not if clear and distinct





# Motor / Sensory / Mixed

Pure Motor	Pure Sensory	Mixed	Parasympathetic	Contain Taste Fibers
3, 4, 6, 11, 12	1, 2, 8	5, 7, 9, 10	3, 7, 9, 10	7, 9, 10

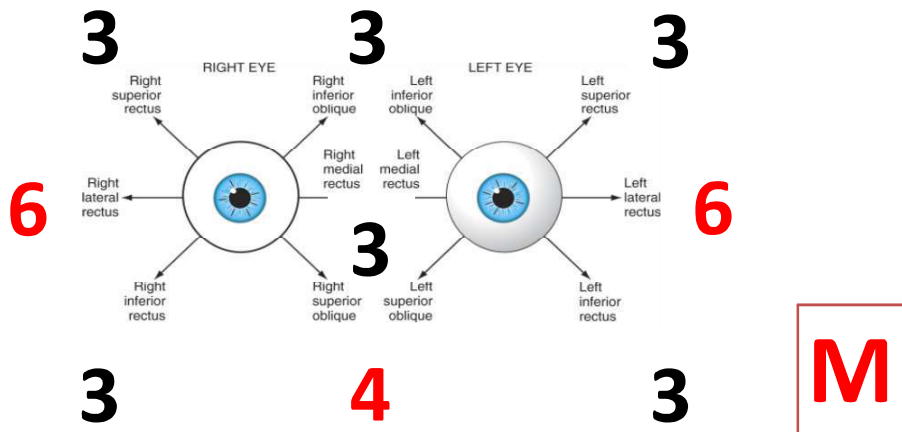
	1	2	3	4	5	6	7	8	9	10	11	12
Motor			✓	✓		✓					✓	✓
Sensory	✓	✓						✓				
Mixed					✓		✓		✓	✓		
Parasympathetic			✓				✓		✓	✓		
Taste fiber							✓		✓	✓		

## Pure Motor

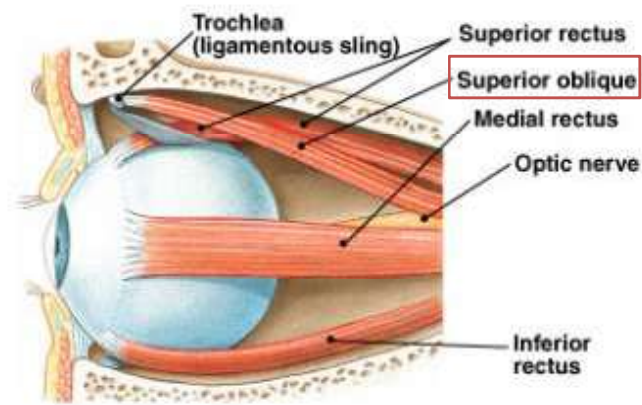
- 3 eyeball
- 4 eyeball, SO4
- 6 eyeball, LR6
- 11 SCM, trapezius muscle
- 12 tongue muscle

## CN 3. Oculomotor

LR<sub>6</sub> = Lateral Rectus / SO<sub>4</sub> = Superior Oblique

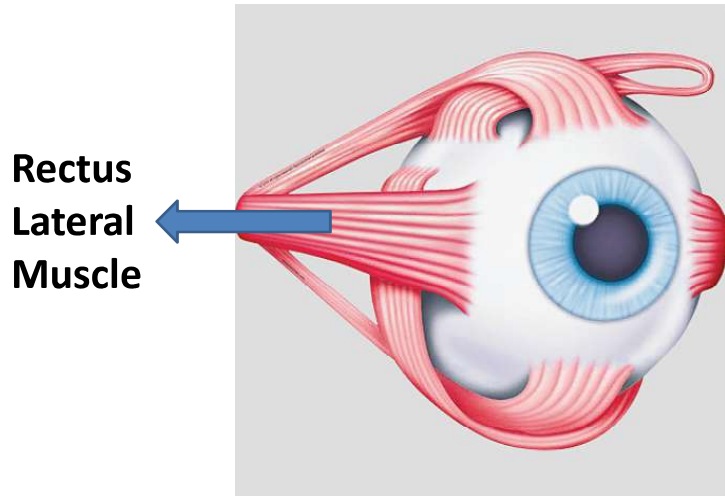


## CN 4. Trochlear



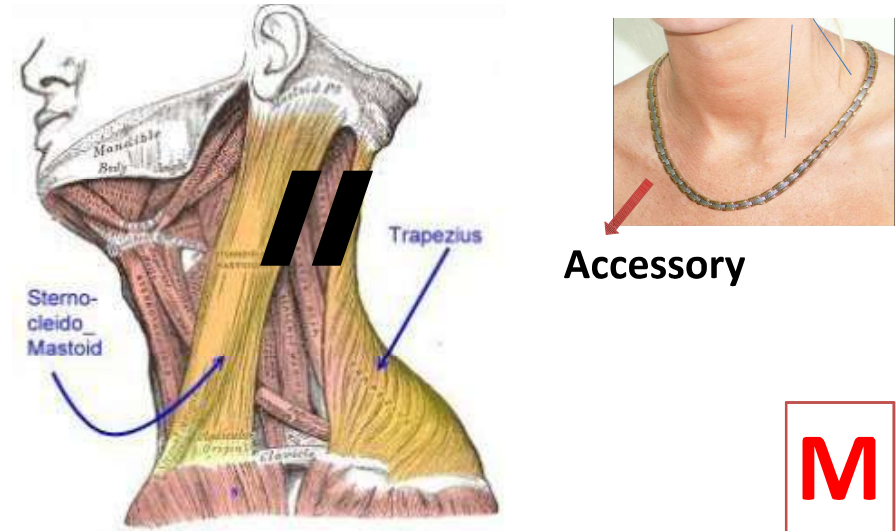


# CN 6. Abducent



M

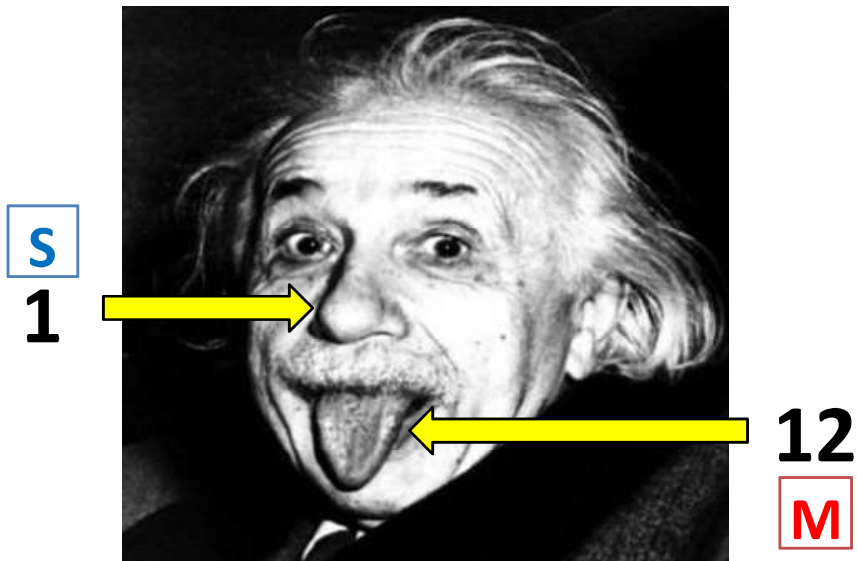
# CN 11. Accessory



M

# CN 12. Hypoglossal

M



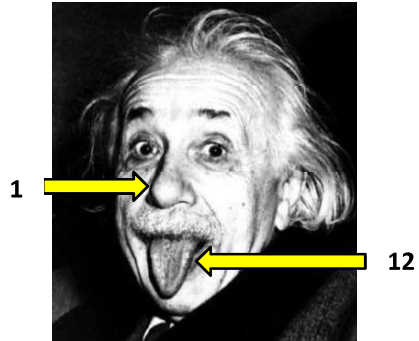
## Pure Sensory

- 1 smell
- 2 vision
- 8 hearing

# CN 1. Olfactory



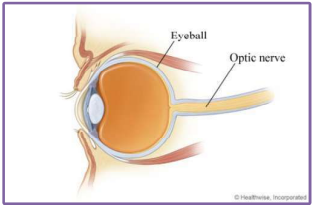
S



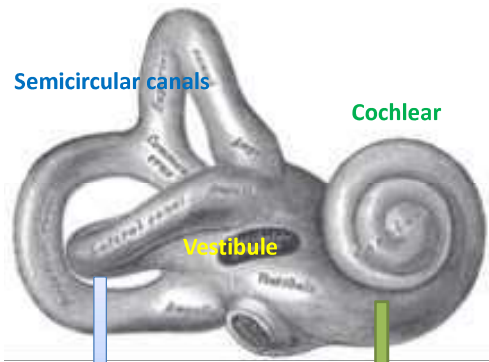
# CN 2. Optic



S



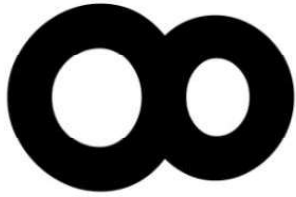
# CN 8. Vestibulocochlear



S

Semicircular canals  
→ Vestibular nerve  
→ Balance

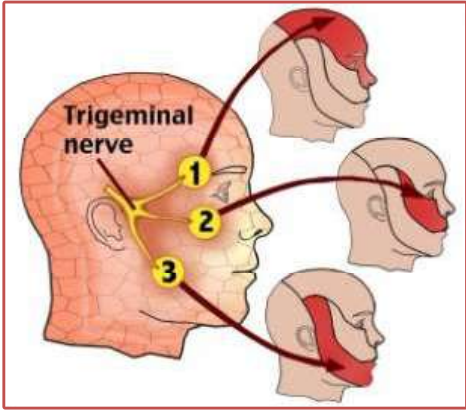
Cochlear  
→ Cochlear nerve  
→ Hearing



## Mixed

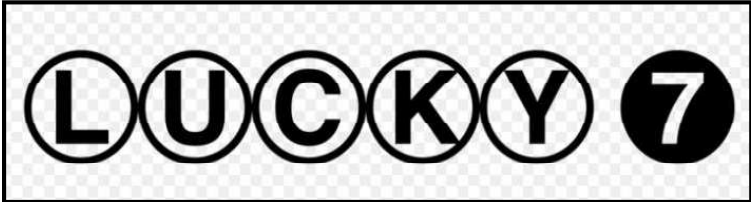
- 5           trigeminal sensory + mastication
- 7           facial expression + taste
- 9           stylopharyngeus muscle + taste
- 10          pharynx, larynx + taste

# CN 5. Trigeminal



- CN5 = 3 branches
- CN7 = 5 branches

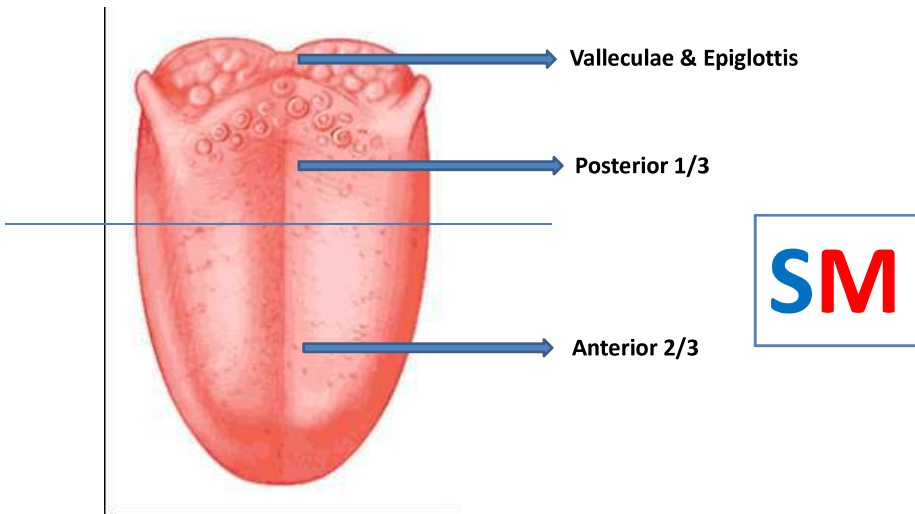
# CN 7. Facial



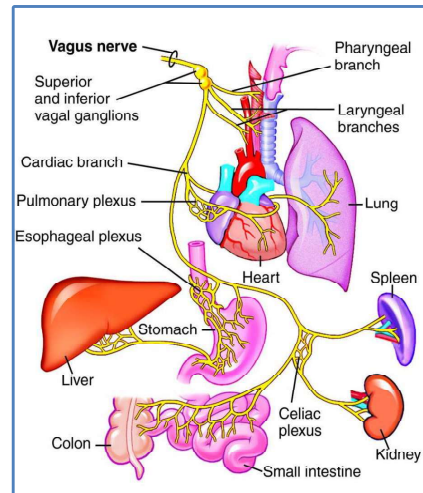
Lucky Face



# CN 9. Glossopharyngeal



# CN 10. Vagus



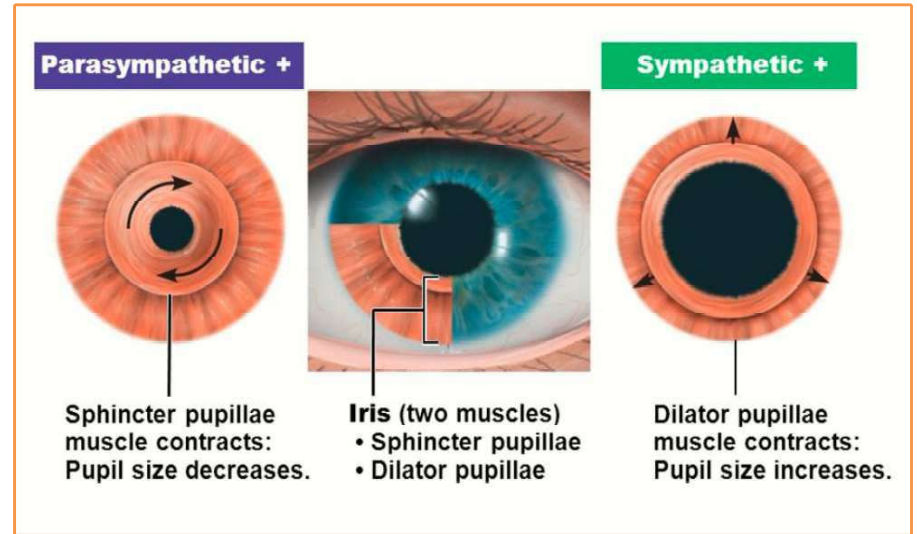
- Mixed M + S
- Parasympathetic
- Taste Fibers



## Parasympathetic

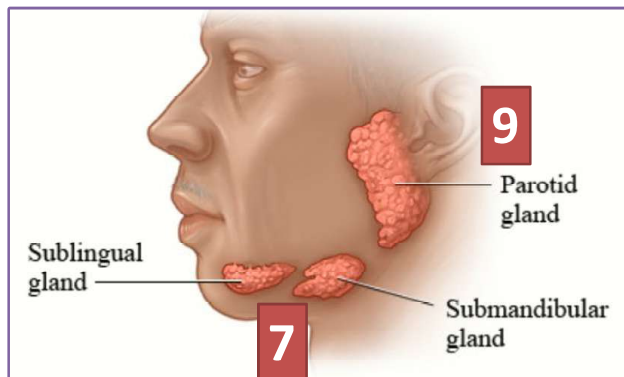
- 3
  - constrict pupil and accommodate eye
- 7
  - submandibular and sublingual salivary glands, lacrimal gland, and glands of the nose and palate
- 9
  - parotid gland
- 10
  - structures in the neck, thorax and most of abdomen to splenic flexure of colon

## CN 3. Oculomotor



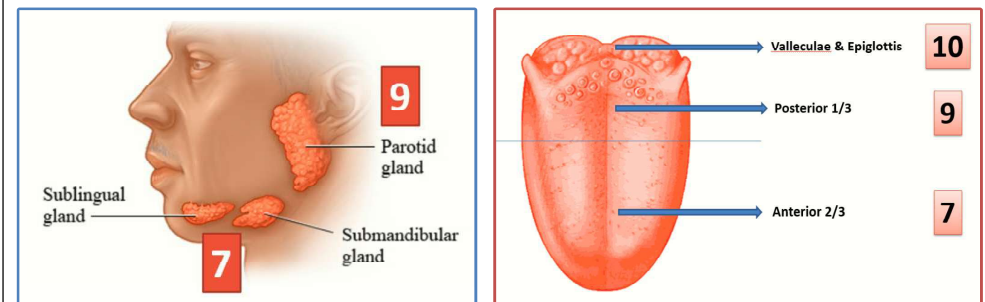
## CN 7. Facial

**LUCKY 7**



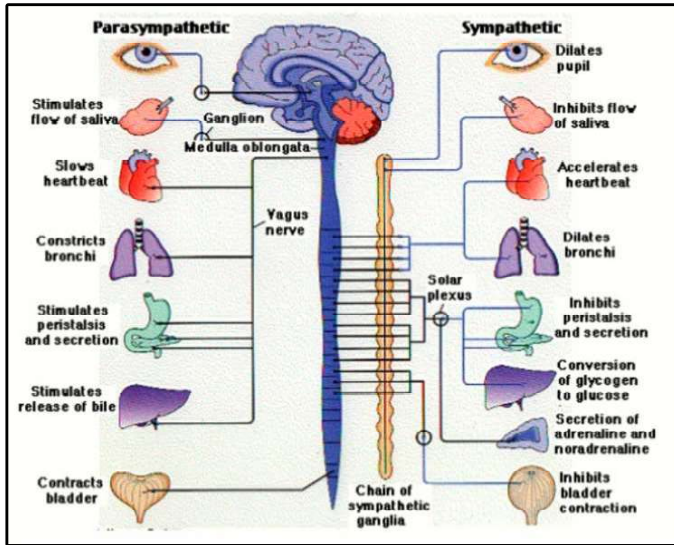
Lucky Face  
Lucky Tongue  
Lucky Saliva

## CN 9. Glossopharyngeal





# CN 10. Vagus

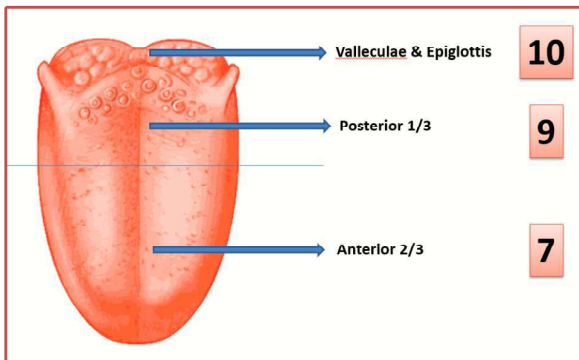


## Contain Taste Fibers

- 7 = anterior 2/3
- 9 = posterior 1/3
- 10 = vallecula and epiglottis

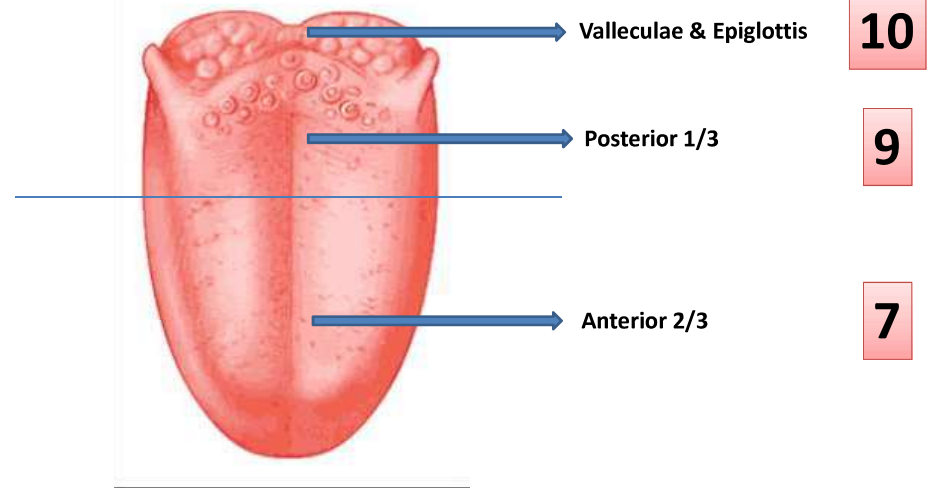
# CN 7. Facial

**LUCKY 7**



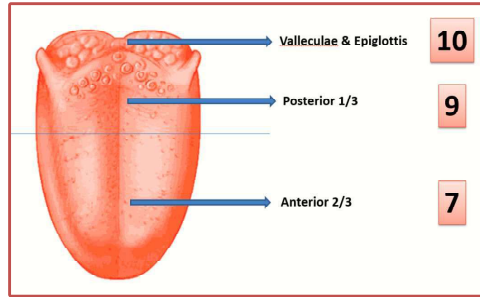
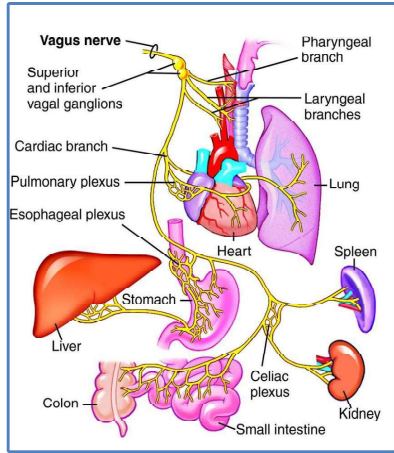
Lucky Face  
Lucky Tongue

# CN 9. Glossopharyngeal





# CN 10. Vagus



## MEMO

## MEMO

## MEMO