# CEREBRUM

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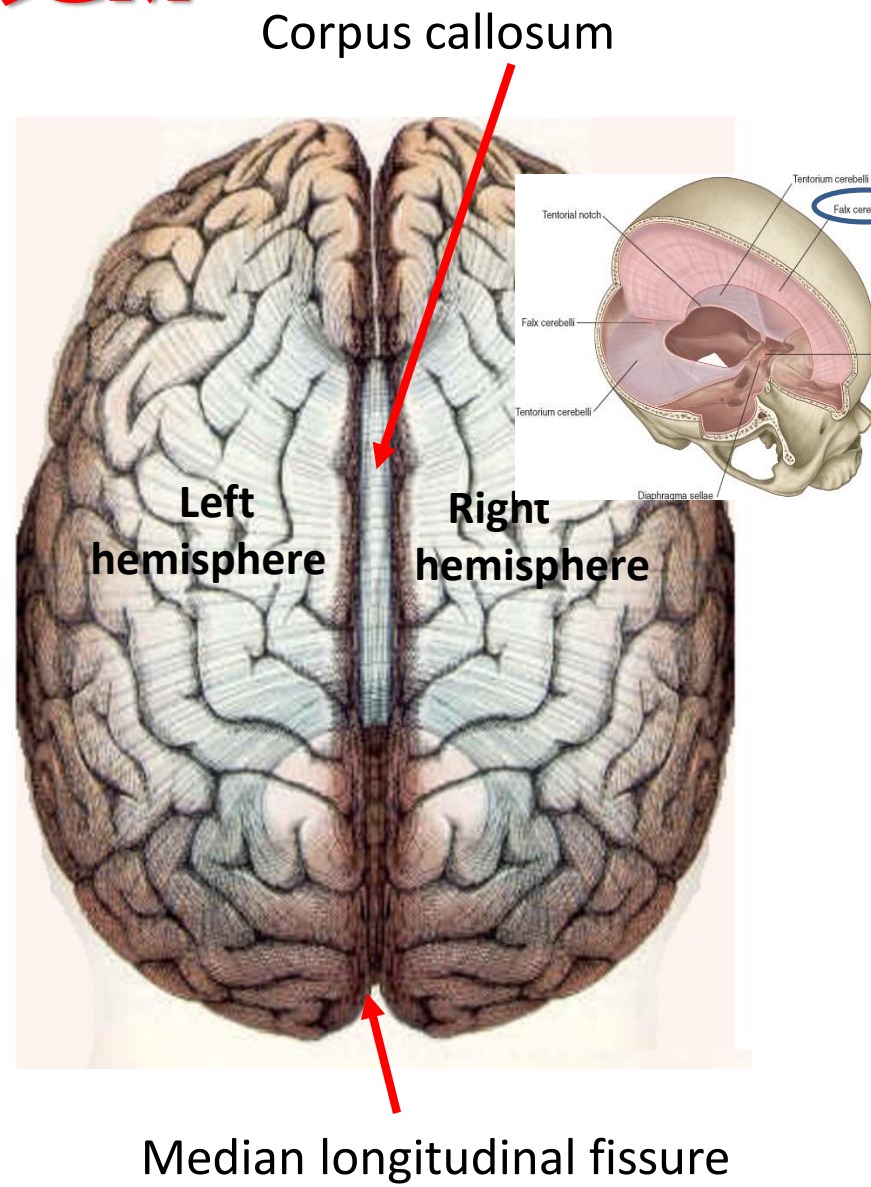
# Objectives

*At the end of the lecture, the student should be able to:*

- List the parts of the cerebral hemisphere (cortex, medulla, basal nuclei, lateral ventricle).
- Describe the subdivision of a cerebral hemisphere into lobes.
- List the important sulci and gyri of each lobe.
- Describe different types of fibers in cerebral medulla (association, projection and commissural) and give example of each type.

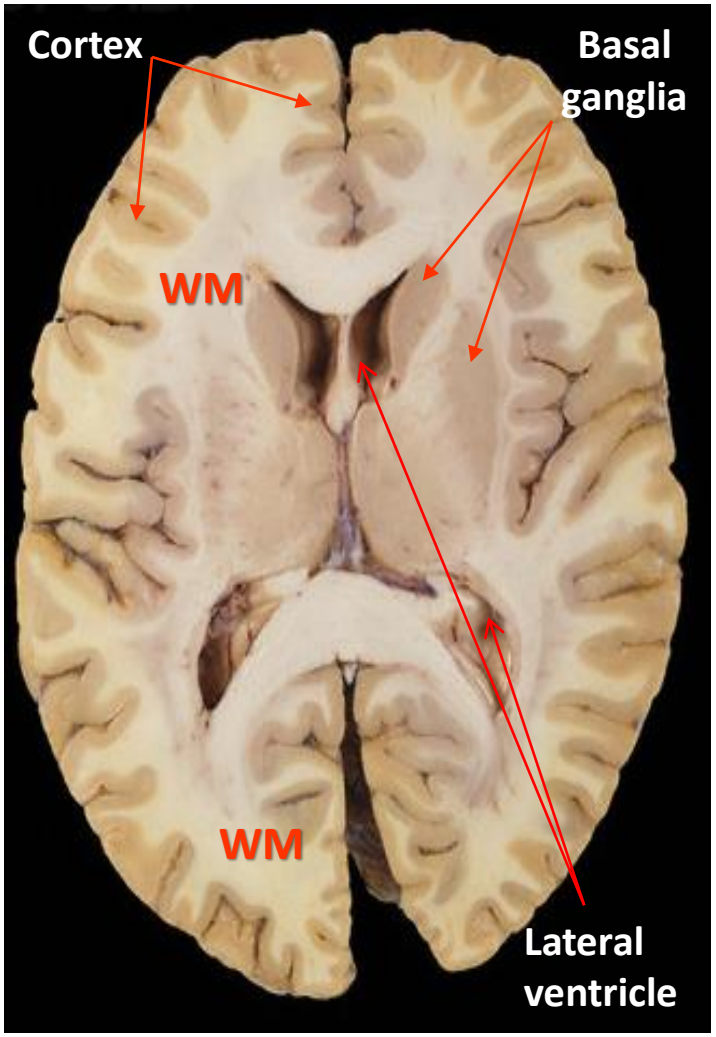
# CEREBRUM

- Largest part of the forebrain.
- Divided into two halves, the (**cerebral hemipheres**), which are separated by a deep median longitudinal fissure which lodges the falx cerebri.
- In the depth of the fissure, the hemispheres are connected by a bundle of fibers called the **corpus callosum.**



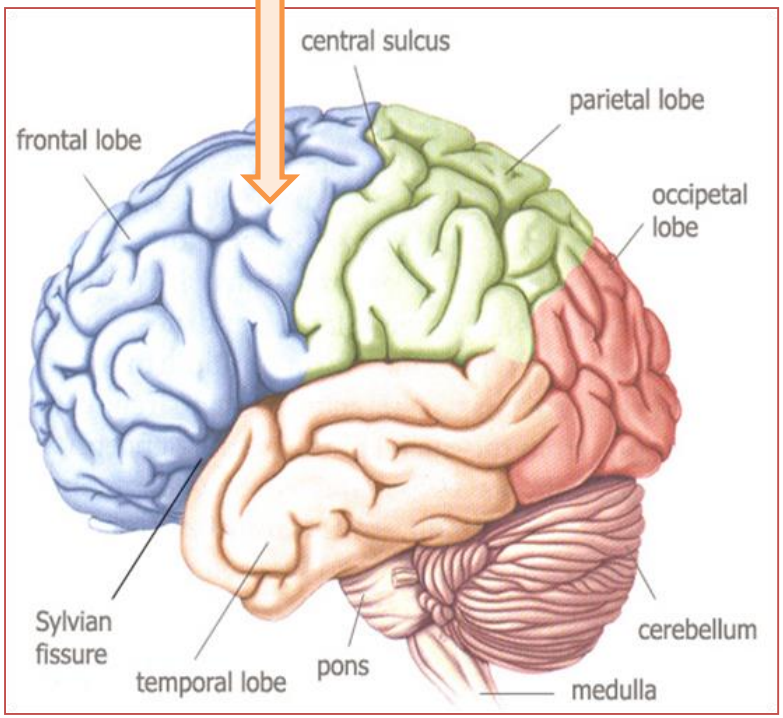
# STRUCTURE OF CEREBRUM

- **Cerebral cortex:** Superficial layer of grey matter
- **Medulla (White matter) :** Deeper to the cortex, contains axons to and from the cells of the cortex
- **Basal ganglia:** Number of nuclear masses buried within the white matter
- **Lateral ventricle:** The cavity of hemisphere

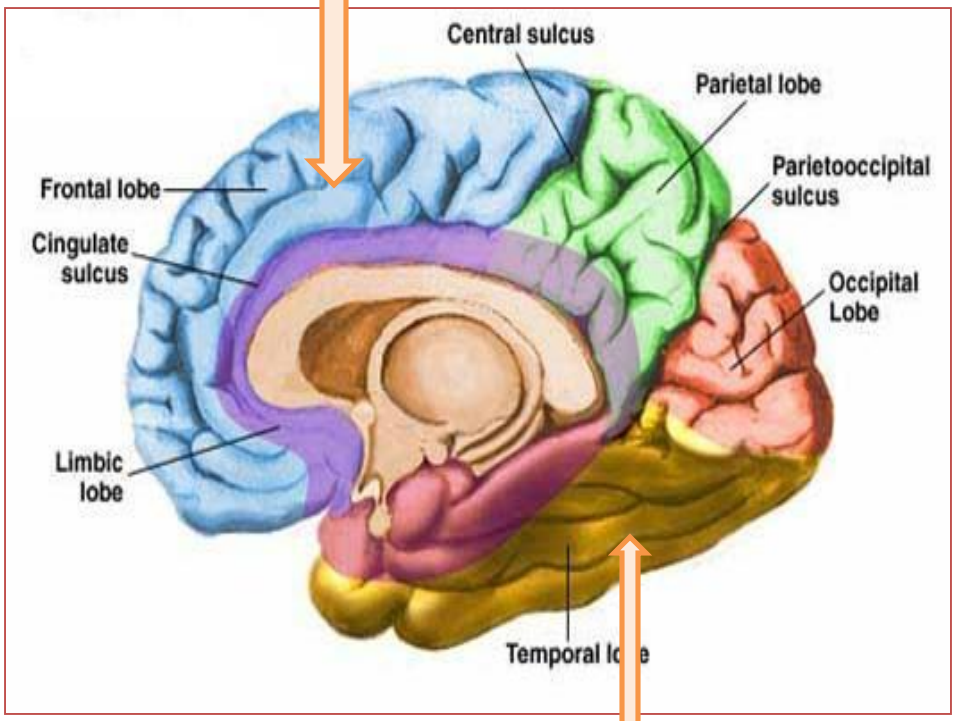


# Surfaces(3)

## Superolateral




## Medial

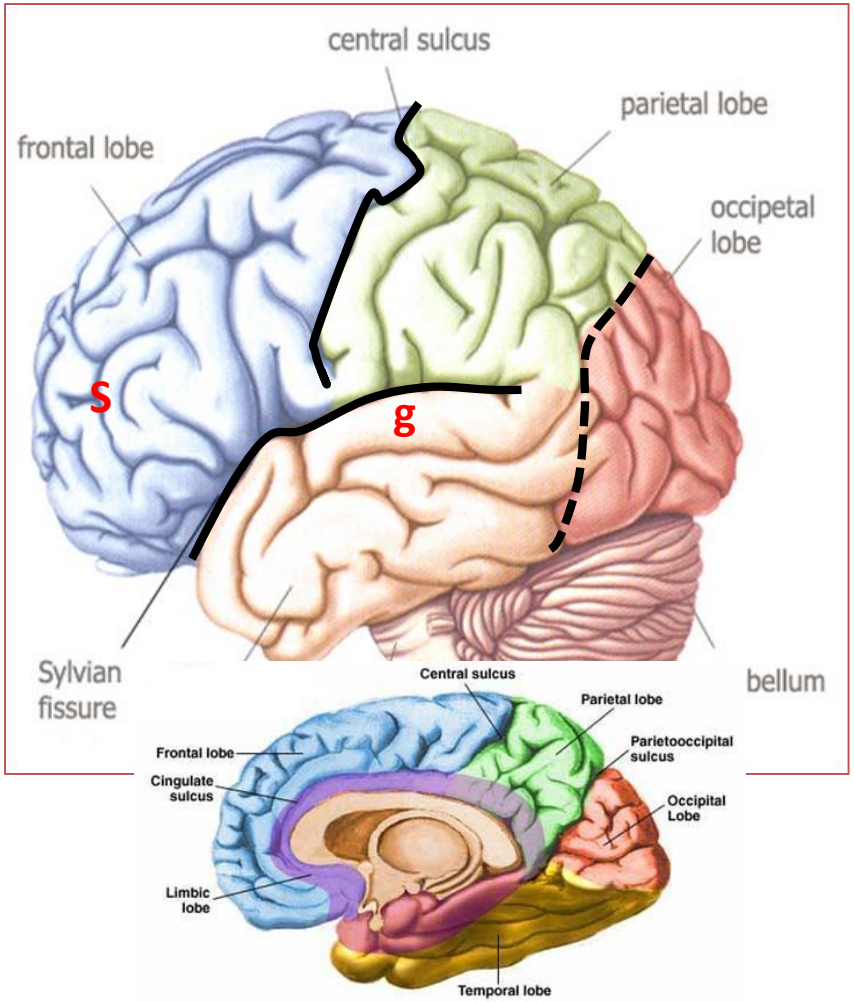



## Inferior (tentorial)

# LOBES OF CEREBRUM

The superficial layer of grey matter is highly convoluted to form a complex pattern of ridges **(gyri)** and grooves **(sulci).** This arrangement maximizes the surface area of the cerebral cortex (about 70% is hidden within the depths of sulci).

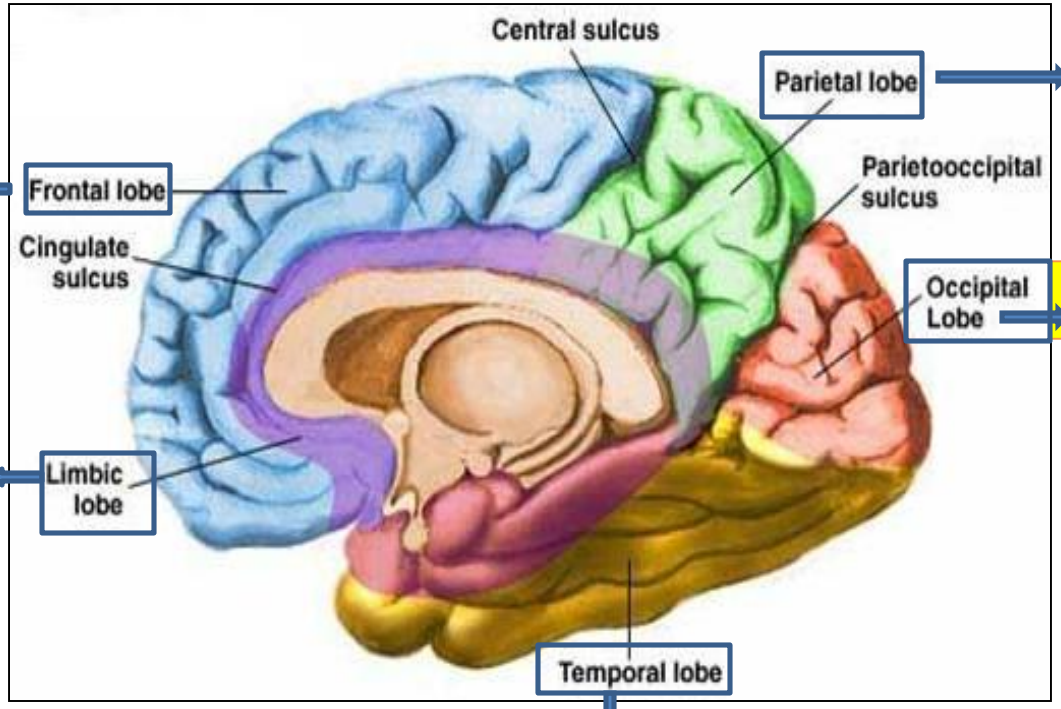
- **Three sulci**, consistent in position, named **central, lateral (sylvian) & parieto-occipital,** divide each hemisphere into **FOUR** lobes: **Frontal**, **Parietal**, **Temporal** & **Occipital** (named after overlying bones) Functionally each hemisphere contains a '**limbic lobe**' on the medial surface.



# FUNCTION OF LOBES

motor function, motivation, aggression, smell and mood

emotions, memory storage & Linking conscious intellectual functions with the unconscious autonomic functions,




reception and evaluation of sensory information

visual processing

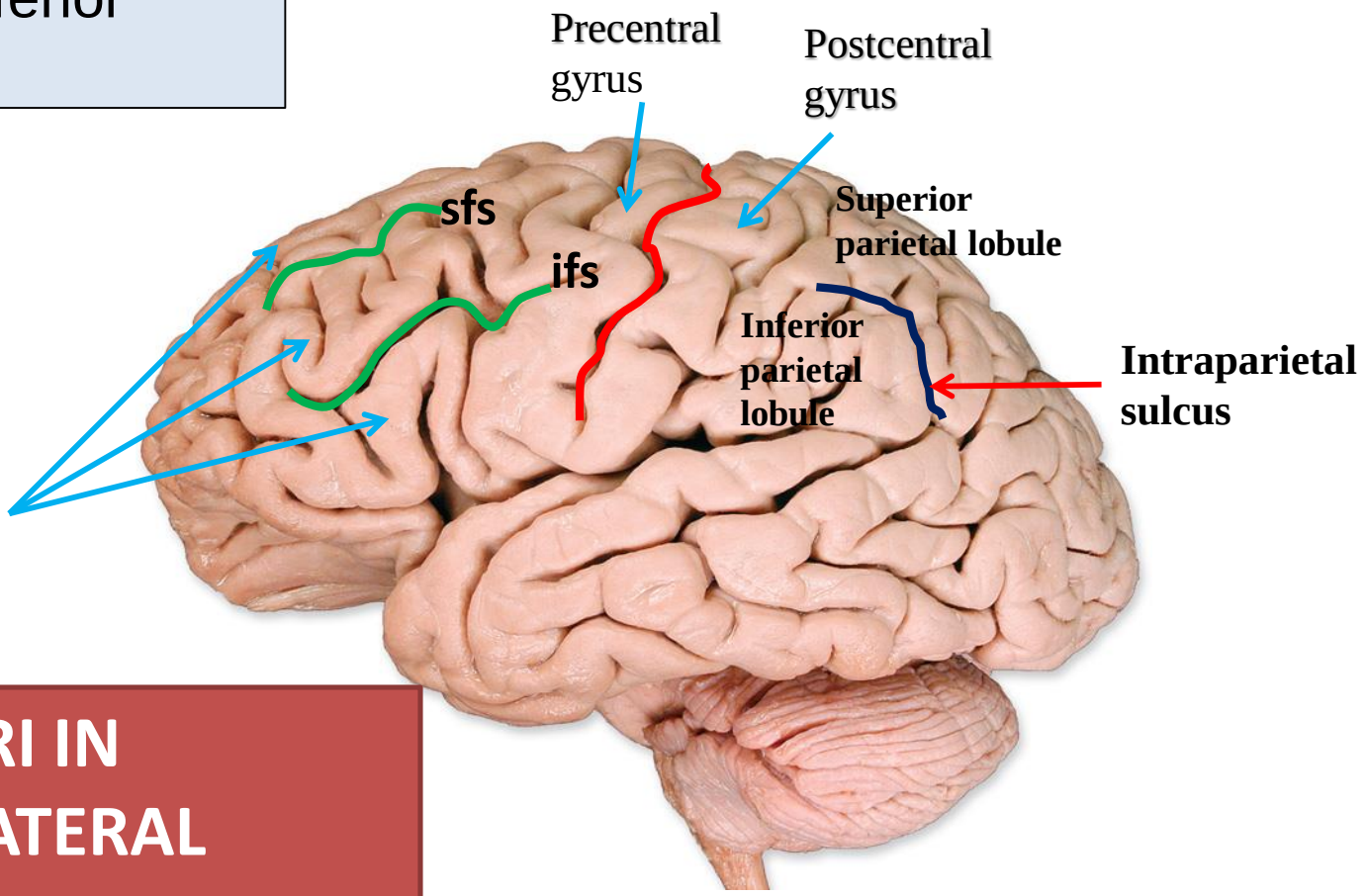
smell, hearing, memory and abstract thought

## ❑ Frontal lobe:

- Precentral gyrus.
- Superior & inferior frontal sulci divide the lobe into superior, middle & inferior frontal gyri.

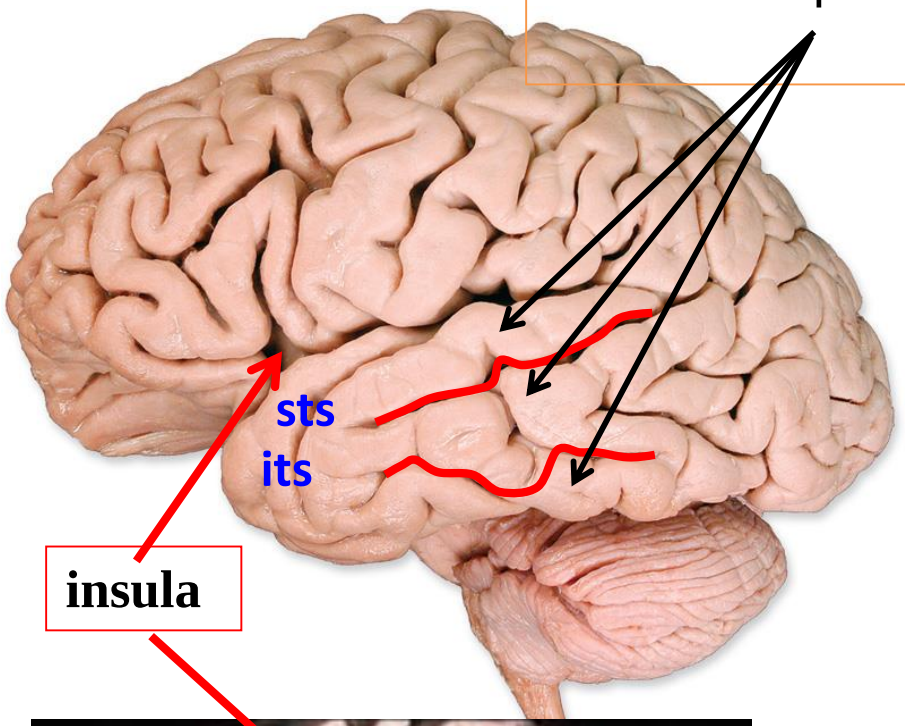
## ❑ Parietal lobe:

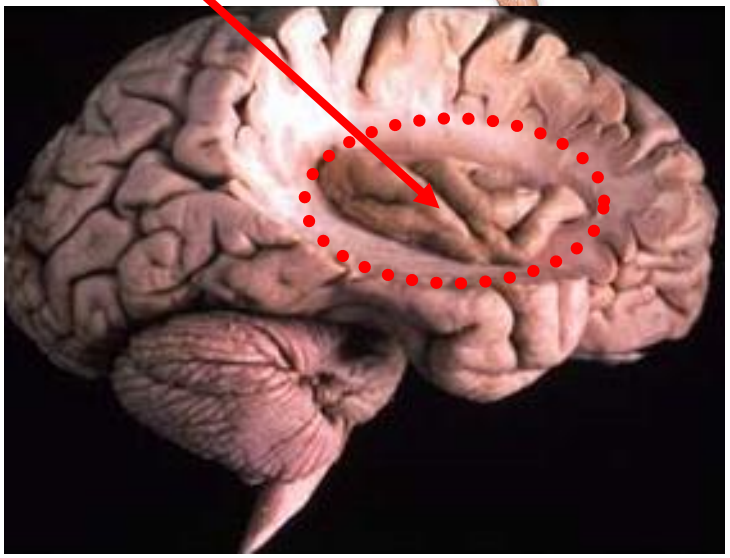
- Postcentral gyrus.
- Intraparietal sulcus divide the lobe into superior & inferior parietal lobules.




# MAIN GYRI IN SUPEROLATERAL SURFACE

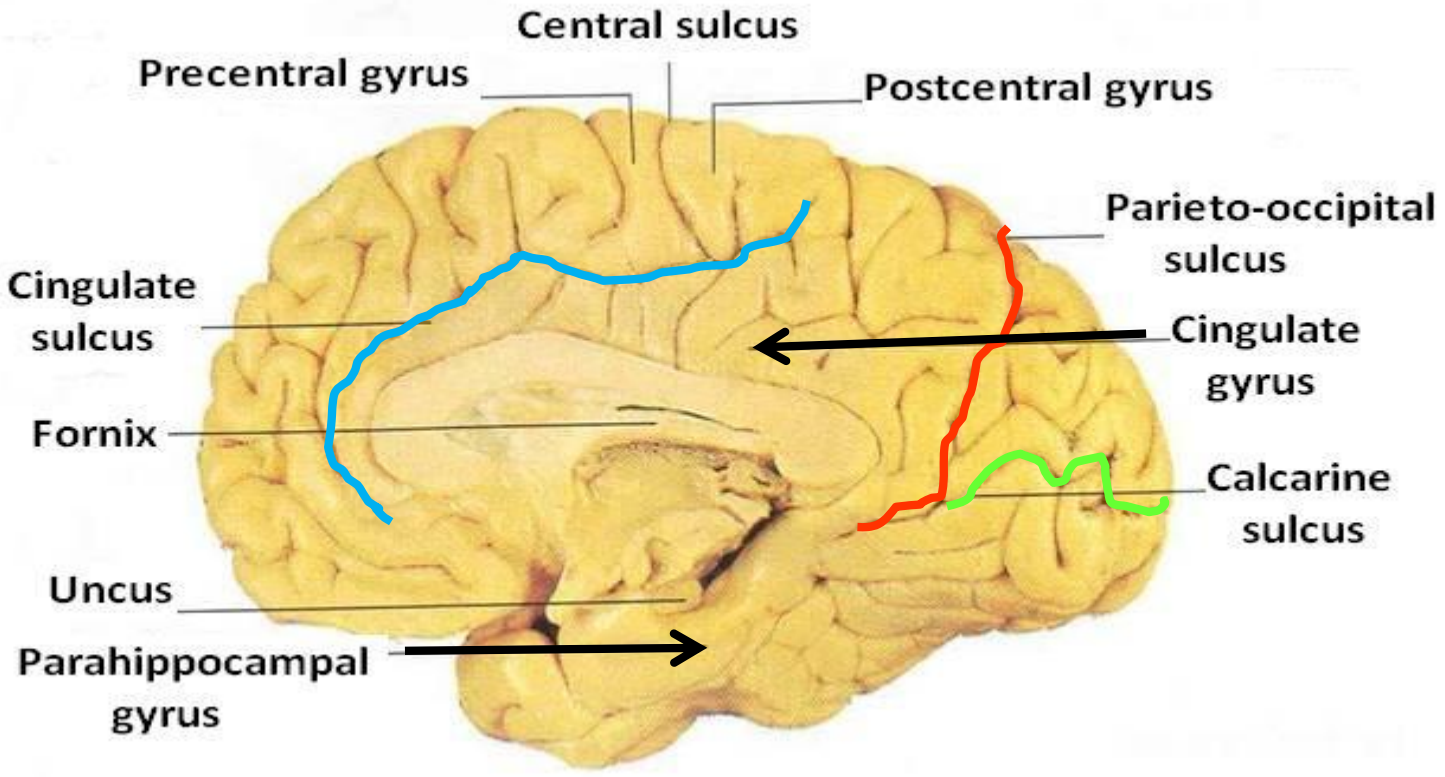
- **Temporal lobe:**
  - Superior & inferior temporal sulci giving rise to superior, middle & inferior temporal gyri.
  - **Insula**: the gyrus in the depth of lateral sulcus, covered by parts of frontal, parietal & temporal lobes called the opercula (removed in lower picture.).



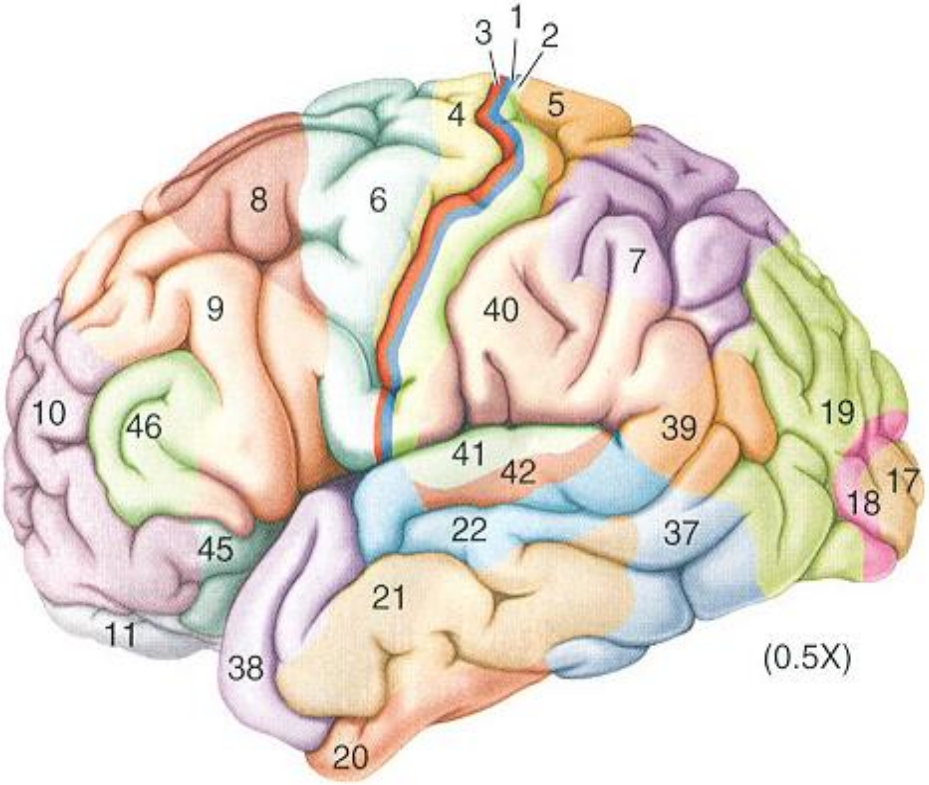
# MEDIAL SURFACE

- Sulci: Parietooccipital, Calcarine, Cingulate
- Gyri: Cingulate, Parahippocampal



# BRODMANN'S MAP

- Brodmann produced a numbered, cytological map of cerebral cortex based upon its regional histological characteristics.
- Subdivisions with similar cellular and laminar structure are called **'areas'**
- Brodmann's numbering of these cortical locations has become one of the standard ways to identify brain areas.




Brodmann's map

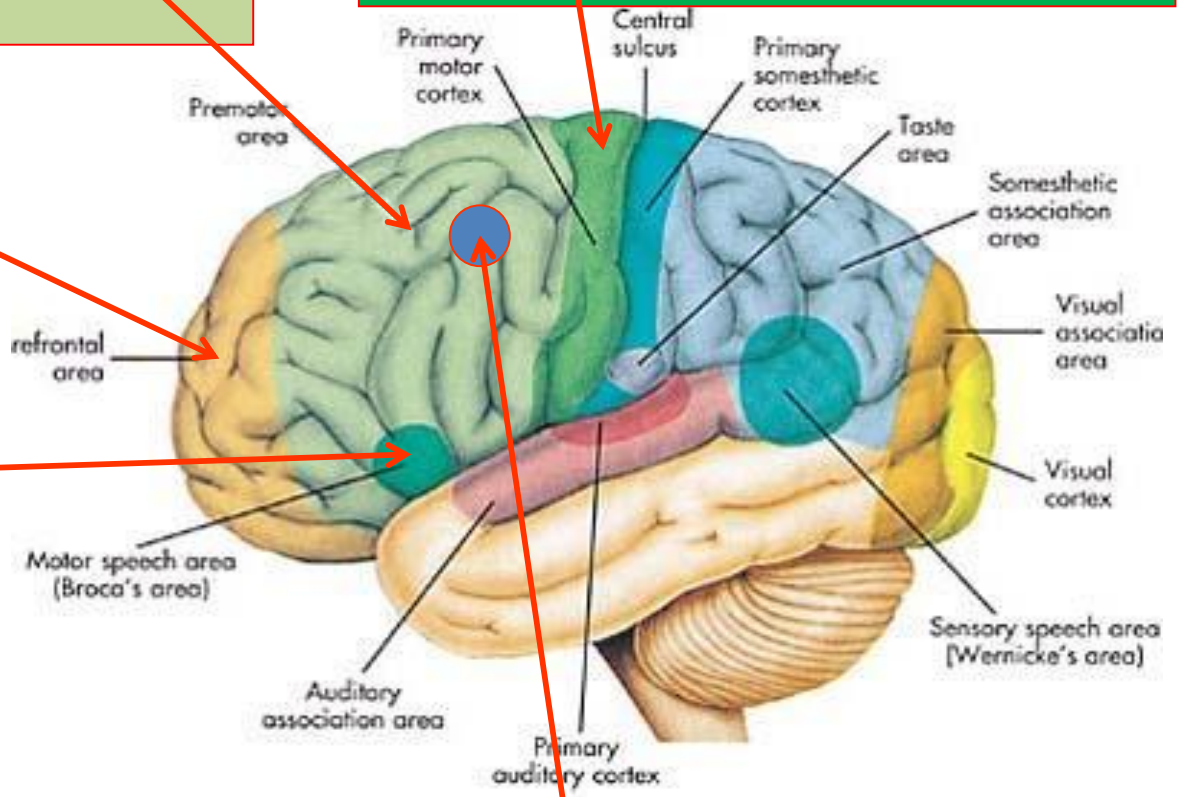
# FUNCTIONAL AREAS OF THE CEREBRAL CORTEX

# FRONTAL LOBE

**Premotor cortex**: Located in the region immediately anterior to the precentral gyrus **(Brodmann's area 6).**

**Primary motor cortex:** Located in precentral gyrus **(Brodmann area 4).**

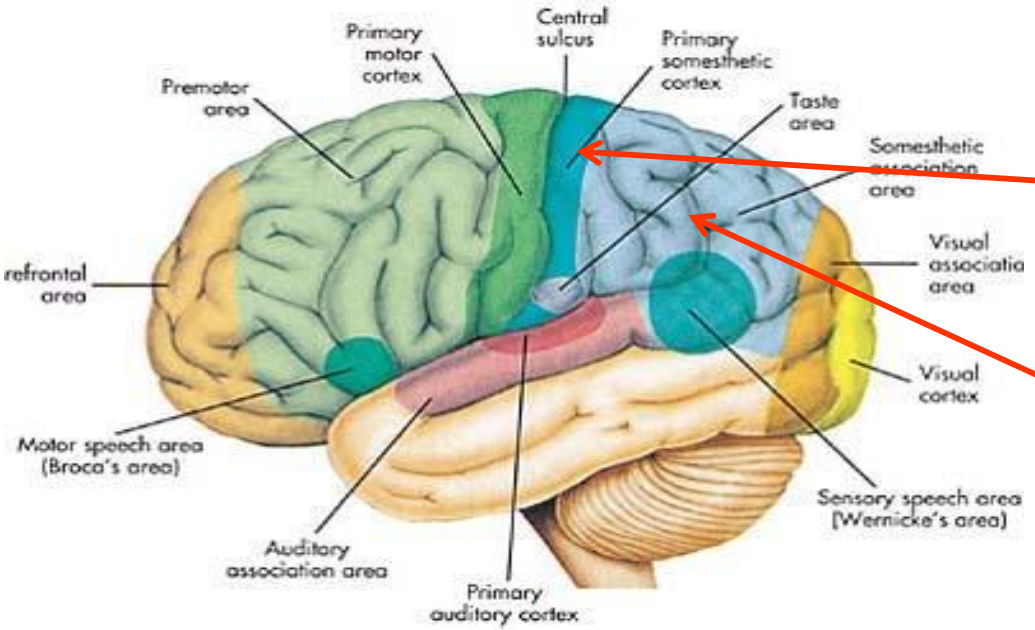
**Prefrontal cortex:** Extensive region of the frontal lobe anterior to premotor area.




**Broca's (motor speech) area:** Located in the inferior frontal gyrus of the dominant hemisphere, usually left **(Brodmann's area 44 & 45).**

**Frontal eye field:** Located in the middle frontal gyrus immediately in front of motor cortex **(Brodmann's area 8).**

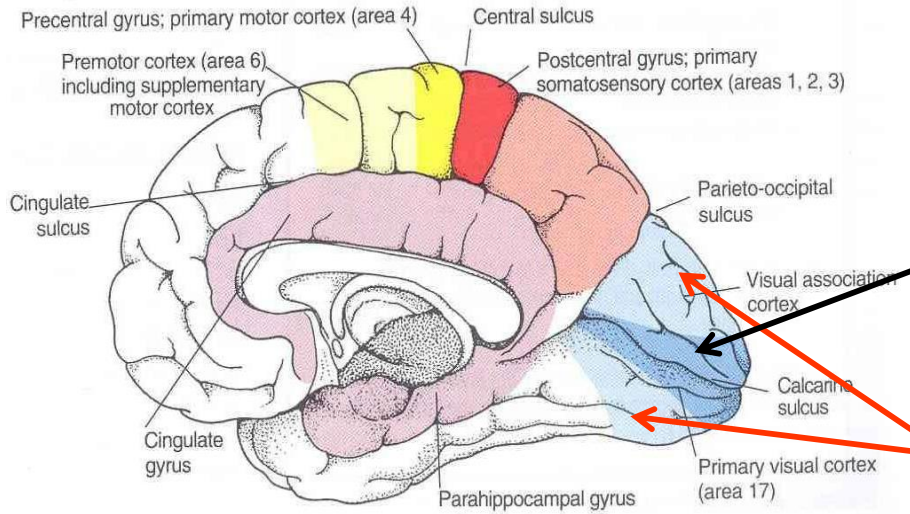
# PARIETAL LOBE




**Primary somatosensory cortex**: located in postcentral gyrus **(Brodmann's area 1, 2, 3).**

**Parietal association cortex:** located posterior to primary somatosensory cortex.

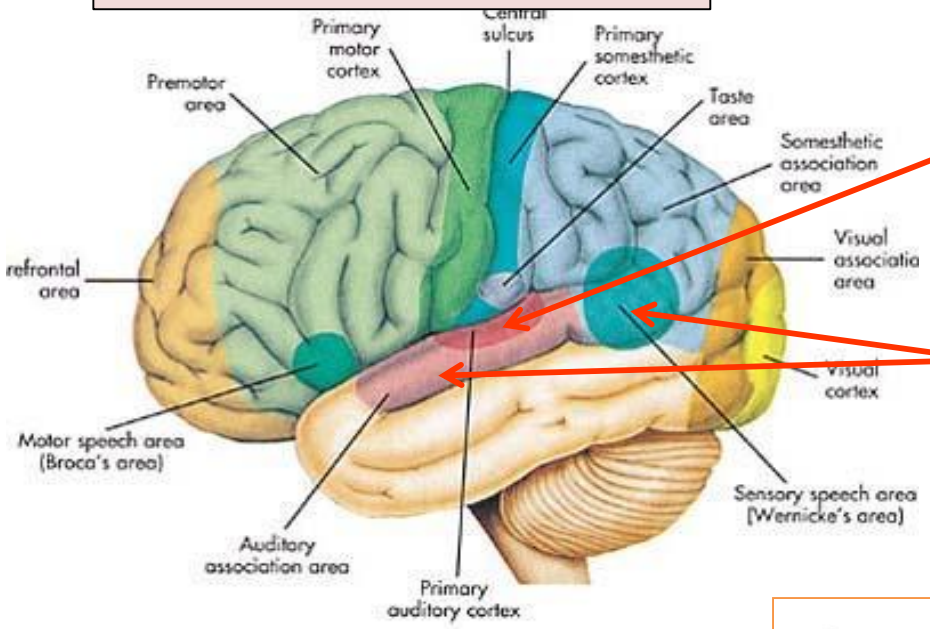
# Occipital lobe




**Primary visual cortex**: located on the medial surface of the hemisphere, in the gyri surrounding the calcarine sulcus **(Brodmann's area 17).**

**Visual association cortex**: located around the primary visual cortex. Area 19

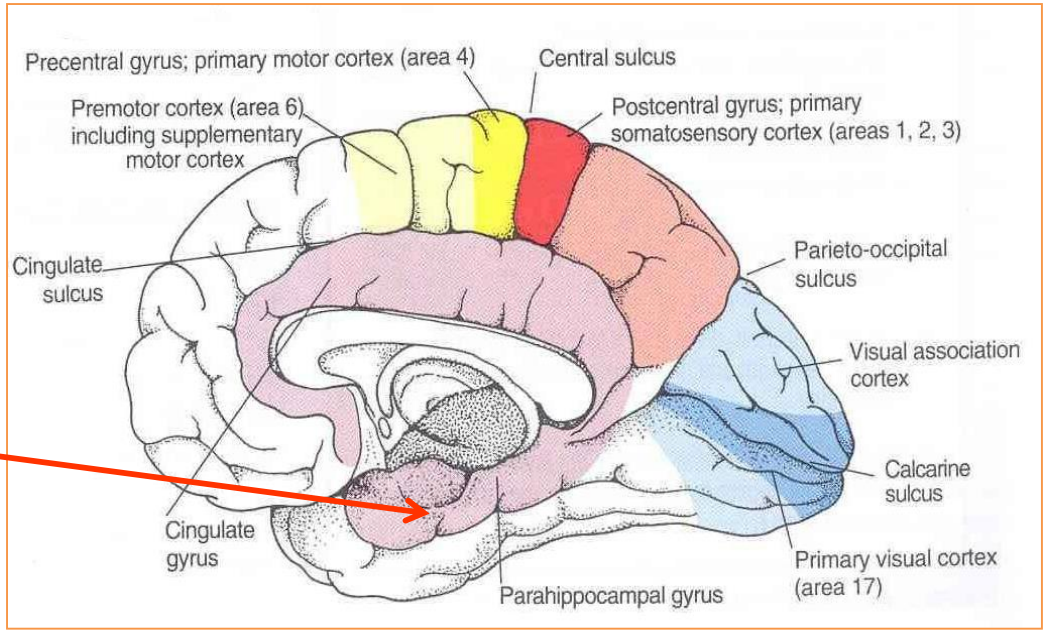
# TEMPORAL LOBE

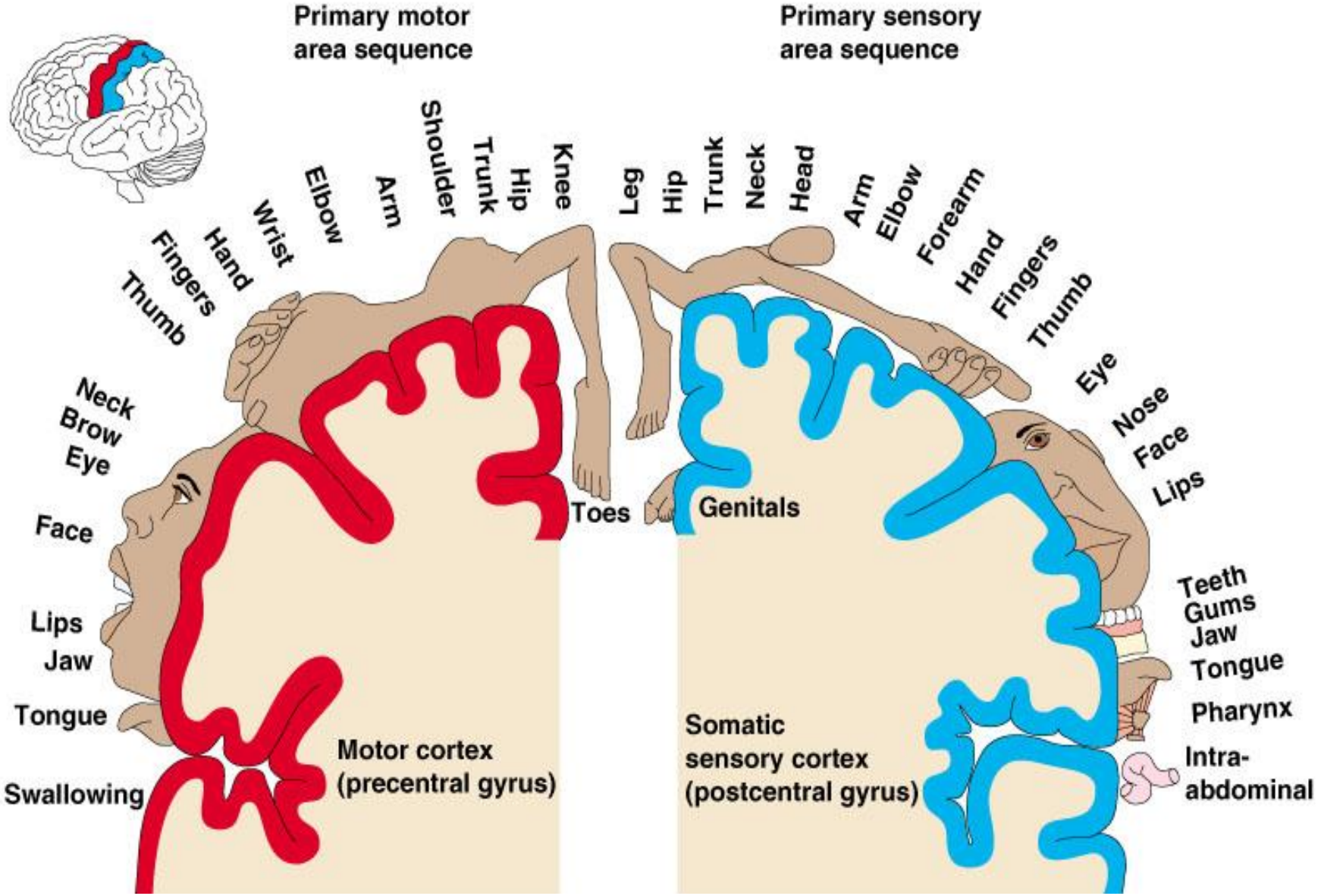



**<u>Primary auditory cortex</u>**: located in the superior surface of the superior temporal gyrus (**Brodmann's area 41, 42)**

**<u>Auditory association cortex</u>**: located immediately around the primary auditory cortex (also includes **Wernick's area)**

**<u>Parahippocampal gyrus:</u>** located in the inferomedial part of temporal lobe. Deep to this gyrus lies the **hippocampus** and the **amygdala**, which are parts of **limbic system**




Primary motor area sequence
Primary sensory area sequence
Thumb
Fingers
Hand
Wrist
Elbow
Arm
Shoulder
Trunk
Hip
Knee
Leg
Hip
Trunk
Neck
Head
Arm
Elbow
Forearm
Hand
Fingers
Thumb
Eye
Nose
Face
Lips
Neck
Brow
Eye
Face
Lips
Jaw
Tongue
Swallowing
Toes
Genitals
Teeth
Gums
Jaw
Tongue
Pharynx
Intra-abdominal
Motor cortex (precentral gyrus)
Somatic sensory cortex (postcentral gyrus)

# LANGUAGE AREAS

- Organized around the lateral Sulcus.
- **Broca's area**: concerned with expressive aspects of language.
- **Wernick's area:** responsible for comprehension of the spoken words.
- **Angular gyrus & Supramarginal gyrus:** nearby regions of temporal lobe and parietal lobe o fthe inferior parietal lobule) are important in naming, reading, writing, and calculation.
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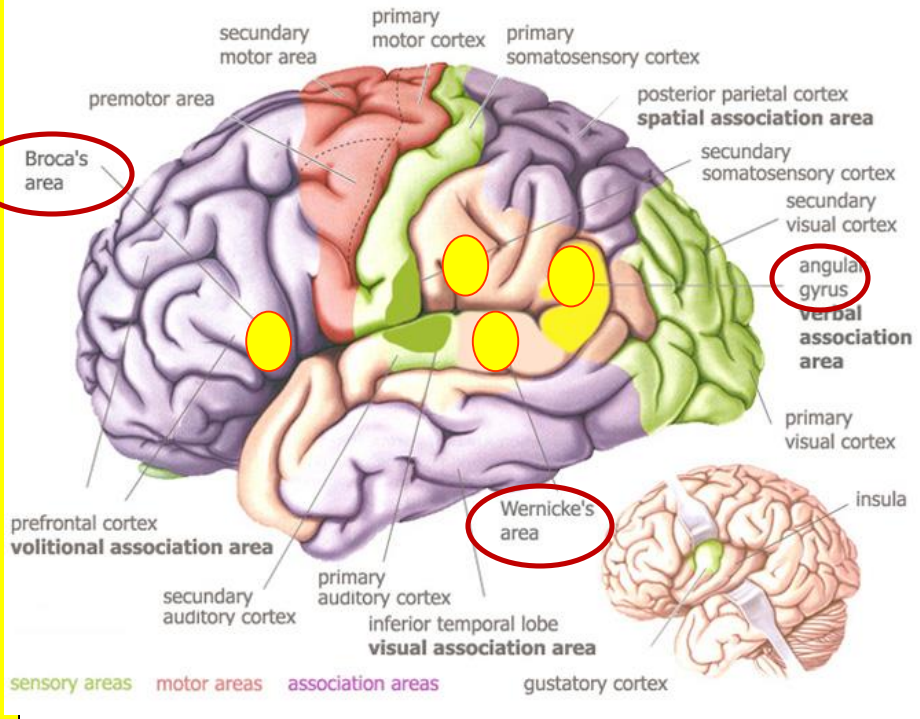
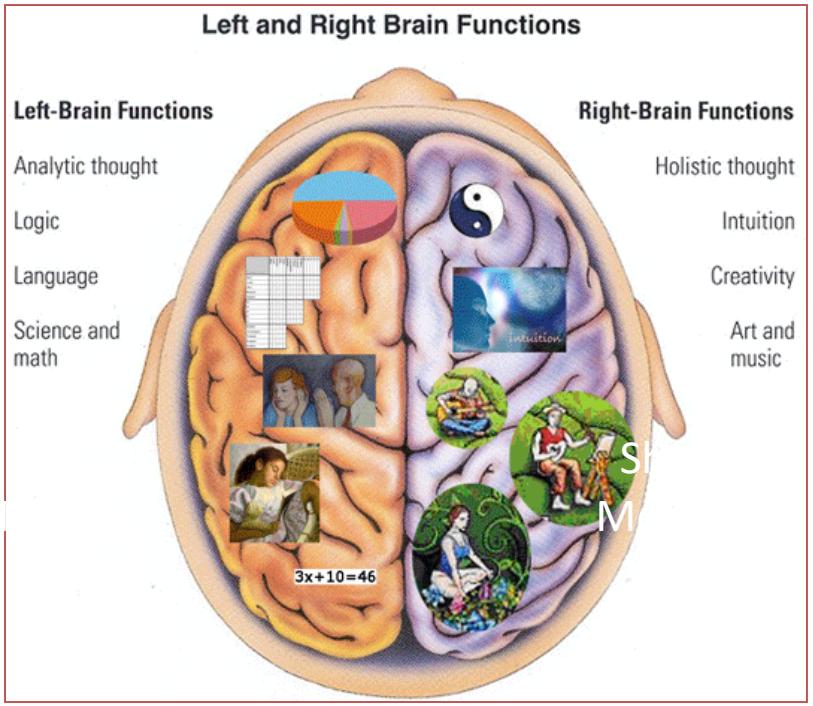


# HEMISPHERIC DOMINANCE

- The localization of **Speech centers & Mathematical ability** is the criterion for defining the dominant cerebral hemisphere.
- In 96% of normal **right-handed** individuals and 70% of normal **left-handed** individuals, the Left hemisphere contains the language centers. These are Left Hemisphere Dominant.
- Cerebral dominance becomes established during the **first few years after birth.**




**Hemispheres communicate via the corpus callosum**

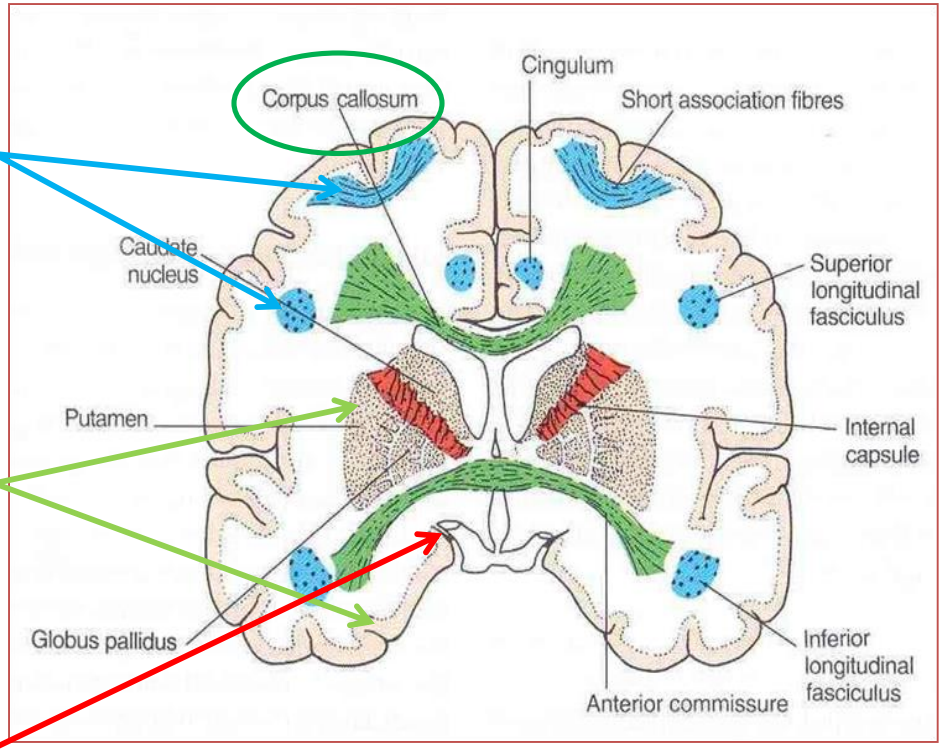
# WHITE MATTER

- Underlies the cortex, contains nerve fibers, neuroglia cells and blood vessels.
- The nerve fibers originate, terminate or sometimes both, within the cortex.
- Depending on their origin & termination, these nerve fibers are classified into three types: **Association**, **Projection** & **Commissural**

**Association fibers:** Unite different parts of the same hemisphere, are of two types: long & short

**Commissural fibers:** Connect the corresponding regions of the two hemispheres

**Projection fibers:** Consist of afferent and efferent fibers of the cerebral cortex




THANK U & GOOD LUCK