1. CNS tissue is enclosed within the vertebral column from the foramen magnum to L1
2. Provides two-way communication to and from the brain
3. Protected by bone, meninges, and CSF
4. Spidural Space – space between the vertebrae and the dural sheath (dura mater) filled with fat and a network of veins
1. 42-45 cm in length; 2.5 cm wide
2. Cervical enlargement – C4:T1 supply upper limbs
3. Lumbar enlargement – T9:T12 supply lower limbs
4. Conus medullaris – tapers off to end at L1/L2
5. Cauda Equina – (horse tail) nerves below L2
6. Filum Terminale – pia mater anchors cord to coccyx

Things to remember:
The cord itself ends at L1/L2 vertebrae
Lower nerves dangle down in the cauda equina
There are 31 pairs of spinal nerves
Spinal segment – gives rise to one spinal nerve
C1-C7 spinal nerves project above C1-C7 vertebra (this means that there are 8 cervical nerves and only 7 cervical bones)
C8 projects below C7 and above T1
T1-S5 spinal nerves project below T1-S5 vertebrae
Most of the slide is to understand location and the progression from the vertebrae to the grey matter itself.

1. First image is to illustrate its relationship to the surrounding vertebral column.
2. Second breaks down into just the spinal cord and its meningeal coverings. (the meningeal coverings are easy to identify once you relate them to other things, the outer most layer is called dura mater, medial arachnoid mater, and inner most is pia mater)
   1) **Dura mater**- dura is just another word for tough and mater sounds like mother, so if you think about it something hard is a tough mother....
   2) **Arachnoid mater**- easier to learn since arachnoid sounds like arachnid (spider), the structure looks clear white as a spider web.
   3) **Pia mater**- doesn’t really have a way to compare but all you got left is pia, pia mater.

Last image shows how the grey matter of the spinal cord is divided into a sensory half and a motor half ventrally. Understand that the dorsal and ventral roots are part of the PNS, not the spinal cord.
There is both grey and white matter (grey matter is due to the nerve cell bodies motor & interneurons and the white is the mylenated axons of motor & sensory).
The grey matter has an H shape the H is composed of various regions:
1. Grey commissure is the cross bar of the H that surrounds the central canal
2. Central canal – is the hole in the center
3. Anterior (ventral) horns – motor
4. Posterior (dorsal) horns – sensory
5. Lateral (intermediate) horns which are present in thoracic and superior lumbar segments of the cord
This image is perfect to understand how the ANS works within the grey matter.

• Dorsal half – sensory and ganglia  (Doral = sensory)
• Ventral half – motor root  (Ventral = motor)
• Dorsal and ventral roots fuse laterally to form spinal nerves
• There are four zone within the grey matter – somatic sensory (SS), visceral sensory (VS), visceral motor (VM), and somatic motor (SM).  (Autonomic)
Each spinal nerve connects to the spinal cord via two medial roots. Each root forms a series of rootlets that attach to the spinal cord. Ventral roots arise from the anterior horn and contain motor (efferent) fibers. Dorsal roots arise from sensory neurons in the dorsal root ganglion and contain sensory (afferent) fibers.
Spinal Nerve Innervation: Back, Anterolateral Thorax, and Abdominal Wall

• The back is innervated by dorsal rami via several branches
• The thorax innervated by ventral rami T1-T12 as intercostal nerves
• Intercostal nerves supply muscles of the ribs, anterolateral thorax, and abdominal wall
There are 31 pairs of mixed nerves that arise from the spinal cord and supply all parts of the body except the head, all named according to their point of issue.

8 cervical nerves (C1-C8) 12 thoracic (T1-T12) 5 Lumbar (L1-L5) 5 Sacral (S1-S5) 1 Coccygeal (C0)

All ventral rami except T2-T12 form interlacing nerve networks called plexuses. Plexuses are found in the cervical, brachial, lumbar, and sacral regions. Each resulting branch of a plexus contains fibers from several spinal nerves. Fibers travel to the periphery via several different routes. Each muscle receives a nerve supply from more than one spinal nerve. Damage to one spinal segment cannot completely paralyze a muscle.
The cervical plexus is formed by ventral rami of C1-C4. Most branches are cutaneous nerves of the neck, ear, back of head, and shoulders. The most important nerve of this plexus is the phrenic nerve – the major and sensory nerve of the diaphragm.
The brachial plexus is formed by C5-C8 and T1 (C4 and T2 may also contribute to this plexus in some people)
It gives rise to the nerves that innervate the upper limb.

There are 4 major branches of this plexus (See chart for branches)
1. Root – 5 ventral rami (C5 and C6 form the upper trunk) (C7 forms the middle trunk) (C8 and T1 form the lower trunk)
2. Trunks – upper, middle, and lower (form divisions)
3. Divisions – anterior and posterior serve the front and back of the limb
4. Cords – lateral, medial, and posterior fiber

The cords then form 5 of the major peripheral nerves
1. Musculocutaneous – sends fibers to the biceps brachii and brachialis (from Lateral Cord)
2. Median – branches to most of the flexor muscle of arm (from Medial Cord and Lateral Cord)
3. Ulnar – supplies the flexor carpi ulnaris and part of the flexor digitorum profundus (from Medial Cord)
4. Radial – innervates essentially all extensor muscle (from Posterior Cord)
5. Axillary – innervates the deltoid and teres minor (from Posterior Cord)
Lumbar Plexus
Arises from L1-L4 and innervates the thigh, abdominal wall, and related muscles
Major nerves are the Femoral and Obturator

<table>
<thead>
<tr>
<th>NERVES</th>
<th>SPINAL ROOTS</th>
<th>STRUCTURES SERVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femoral</td>
<td>L2-L4</td>
<td>Skin of anterior and medial thigh via anterior femoral cutaneous branch; skin of medial leg and foot, hip and knee joints via saphenous branch; motor to anterior muscles (quadriceps and sartorius) of thigh and to pectineus, iliacus</td>
</tr>
<tr>
<td>Obturator</td>
<td>L2-L4</td>
<td>Motor to adductor magnus (psoas), longus, and brevis muscles, gracilis muscle of medial thigh, obturator externus; sensory for skin of medial thigh and for hip and knee joints</td>
</tr>
<tr>
<td>Lateral femoral cutaneous</td>
<td>L1, L2</td>
<td>Skin of lateral thigh; some sensory branches to peritoneum</td>
</tr>
<tr>
<td>Iliohypogastric</td>
<td>L1</td>
<td>Skin of lower abdomen and hip; muscles of anterolateral abdominal wall (internal obliques and transversus abdominis)</td>
</tr>
<tr>
<td>Ilioinguinal</td>
<td>L1</td>
<td>Skin of external genitalia and proximal medial aspect of the thigh; inferior abdominal muscles</td>
</tr>
<tr>
<td>Genitofemoral</td>
<td>L1, L2</td>
<td>Skin of scrotum in males, of labia majora in females, and of anterior thigh inferior to middle portion of inguinal region; cremaster muscle in males</td>
</tr>
</tbody>
</table>
Sacral Plexus

Arises from L4- S4 and serves the buttock, lower limb, pelvic structure, and the related sacral areas

The major nerve is the sciatic, the longest and thickest nerve of the body

The sciatic is actually composed of two nerves: the tibial and the common fibular nerves
Dermatomes
Is the area of skin innervated by the cutaneous branches of a single spinal nerve
All spinal nerves except C1 participate in dermatomes