One of these things is not like the other.
One of these things is not like the other

- a. Pons
- b. Abduction of eye
- c. Lateral rectus
- d. Superior orbital fissure
- e. Infracochlear n.
- f. Abduces n.
Match the letter with the number

a.

b.

c.

d.

i.

ii.

iii.

iv.
The oculomotor nerve innervates the superior rectus, levator palpebrae superioris and:

A. Inferior rectus muscle
B. Lateral rectus muscle
C. Orbicularis oculi muscle
D. Pupillary constrictor muscle
E. Superior oblique muscle
The oculomotor nerve innervates the superior rectus, levator palpebrae superioris and:

A. **Inferior rectus muscle**
B. Lateral rectus muscle
C. Orbicularis oculi muscle
D. Pupillary constrictor muscle
E. Superior oblique muscle
A reflex tested during a CN exam is called the corneal reflex. A patient's cornea is touched with a wisp of cotton and the patient blinks. Identify the region of the brain most likely tested by this reflex.

A. Cerebellum  
B. Diencephalon 
C. Medulla 
D. Midbrain  
E. Pons
A reflex tested during a CN exam is called the corneal reflex. A patient's cornea is touched with a wisp of cotton and the patient blinks. Identify the region of the brain most likely tested by this reflex.

A. Cerebellum
B. Diencephalon
C. Medulla
D. Midbrain
E. Pons
Corneal Reflex take home message:

- Sensory. CN V-1
- Brainstem level. Pons
- Motor. CN VII (facial nerve proper)
- Consensual reflex
The pupillary (light) reflex is a consensual reflex because when one eye is stimulated (shine light) both pupils constrict.
The pupillary (light) reflex is a consensual reflex because when one eye is stimulated (shine light) both pupils constrict.
The pupillary (light) reflex is a consensual reflex because when one eye is stimulated (shine light) both pupils constrict.
The pupillary (light) reflex is a consensual reflex because when one eye is stimulated (shine light) both pupils constrict.
Pupillary reflex on patient A reveals the following:

<table>
<thead>
<tr>
<th>Left Pupil</th>
<th>Right Pupil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupil constriction</td>
<td>Pupil constriction</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Left pupil</th>
<th>Right pupil</th>
</tr>
</thead>
<tbody>
<tr>
<td>No pupil constriction</td>
<td>No pupil constriction</td>
</tr>
</tbody>
</table>

A lesion of which of the following nerves would most likely explain this pupillary finding:

A. Left CN II
B. Left CN III
C. Left CN IV
D. Right CN II
E. Right CN III
F. Right CN IV
Pupillary reflex on patient A reveals the following:

<table>
<thead>
<tr>
<th>Left Pupil</th>
<th>Right Pupil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupil constriction</td>
<td>Pupil constriction</td>
</tr>
</tbody>
</table>

A lesion of which of the following nerves would most likely explain this pupillary finding:

A. Left CN II  
B. Left CN III  
C. Left CN IV  
D. **Right CN II**  
E. Right CN III  
F. Right CN IV
Pupillary reflex on patient B reveals the following:

<table>
<thead>
<tr>
<th>Left Pupil</th>
<th>Right Pupil</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Pupil constriction</td>
<td>Pupil constriction</td>
</tr>
</tbody>
</table>

A lesion of which of the following nerves would most likely explain this pupillary finding:

A. Left CN II
B. Left CN III
C. Left CN IV
D. Right CN II
E. Right CN III
F. Right CN IV
Pupillary reflex on patient B reveals the following:

<table>
<thead>
<tr>
<th></th>
<th>Left Pupil</th>
<th>Right Pupil</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Pupil</td>
<td>Pupil constriction</td>
<td></td>
</tr>
</tbody>
</table>

A lesion of which of the following nerves would most likely explain this pupillary finding:

A. Left CN II
B. **Left CN III**
C. Left CN IV
D. Right CN II
E. Right CN III
F. Right CN IV

[Diagram of the nervous system showing connections and lesions.]
Pupillary constrictor (sphincter) m.

Circular muscles contract

Bright light

Parasympathetic
CN III
Day

Normal light
Pupillary dilator m.

Night

Sympathetic
T1; sup cerv ganglion

Dim light

Radial muscles contract
Pupillary constrictor (sphincter) m.

Parasympathetic
CN III

Pupil

Bright light

Normal light

Dim light

Radial muscles contract

Sympathetic
T1; sup cerv ganglion
A 64-year-old man suffers a lesion to his left CN VI. Identify the symptom this patient would most likely present with.

A. Double vision when looking left
B. Double vision when looking right
C. Eye is positioned down and to the right
D. Eye is position down and to the left
E. Miosis (pin point pupil)
F. Mydriasis (blown/large pupil)
A 64-year-old man suffers a lesion to his left CN VI. Identify the symptom this patient would most likely present with.

A. **Double vision when looking left**
B. Double vision when looking right
C. Eye is positioned down and to the right
D. Eye is position down and to the left
E. Miosis (pin point pupil)
F. Mydriasis (blown/large pupil)
Lateral rectus muscle

Superior view of left orbit
Lateral rectus muscle

Superior view of left orbit

Lat

Med
Double vision when looking laterally on side of the lesion
A 64-year-old man suffers a lesion to his left CN VI. Identify the symptom this patient would most likely present with.

A. **Double vision when looking left**
B. Double vision when looking right
C. Eye is positioned down and to the right
D. Eye is position down and to the left
E. Miosis (pin point pupil)
F. Mydriasis (blown/large pupil)

*L. Abducens n. (CN VI)*
A 71-year-old man complains of a headache, double vision and right droopy eyelid. Figure A is the man's eye at rest. Figure B shows the results of testing his extraocular muscles.

Identify the nerve most likely injured.

A. CN III (left)
B. CN III (right)
C. CN IV (left)
D. CN IV (right)
E. CN V (left)
F. CN V (right)
G. CN VI (left)
H. CN VI (right)
A 71-year-old man complains of a headache, double vision and right droopy eyelid. Figure A is the man's eye at rest. Figure B shows the results of testing his extraocular muscles.

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A. CN III (left)
B. CN III (right)
C. CN IV (left)
D. CN IV (right)
E. CN V (left)
F. CN V (right)
G. CN VI (left)
H. CN VI (right)
Jack and Mary present with the following symptoms:

- Jack’s left eye: Ptosis and a mydriasis (excessive dilation)
- Mary’s left eye: Ptosis and a miosis (excessive constriction)

Explain how both patients have ptosis but Jack has a dilated pupil and Mary a constricted pupil.
Jack and Mary present with the following symptoms:

- Jack’s left eye: Ptosis and a mydriasis (excessive dilation)
- Mary’s left eye: Ptosis and a miosis (excessive constriction)

Explain how both patients have ptosis but Jack has a dilated pupil and Mary a constricted pupil.

Jack has a CN III injury; CN III innervates the levator palpebrae superioris muscle and the dilator constrictor muscles. Therefore, a lesion to this nerve would result in ptosis and the pupil dilating.

Mary has sympathetic injury; the sympathetics innervate the superior tarsal muscle and dilates the pupil.
So …

- The “Juice-Squeeze” ration for the next concept is low.. So if you memorize the following image you don’t have to understand it in its entirety.
Clinical Testing

LR<sub>6</sub>SO<sub>4</sub> R<sub>3</sub>

Lateral Rectus CN 6, Superior Oblique CN 4, Rest CN 3
Figure III–7  Right eye movements around the “X,” “Y,” and “Z” axes (movements driven by cranial nerve III are highlighted in pink).
Clinically testing Orbital CN’s

The Medial Rectus and Lateral Rectus muscles are the only 2 extraocular muscles that act in the X-axis.

How would you clinically test these 2 muscles and their CN’s?

Anatomical Actions
Clinically testing Orbital CN’s

Lateral rectus muscle

Superior view of right orbit
Clinically testing Orbital CN’s

Lateral rectus muscle

Superior view of right orbit
Clinically testing Orbital CN’s

Medial rectus muscle

Superior view of right orbit
Clinically testing Orbital CN’s

Medial rectus muscle

Superior view of right orbit

Med  Lat
Clinically testing Orbital CN’s

- **Clinically actions**: Movements patient is instructed to make with eyes in order to clinically test each extraculcular muscle and associated CN.
  - SR
  - ID
  - MI
  - LI
  - RI
  - SO

**Clinical Testing**
Clinically testing Orbital CN’s

The Superior Rectus and Inferior oblique muscles are the only 2 extraocular muscles that act in the Y-axis to elevate the eye (look up). Therefore, to test the SR muscle it must be isolated from the IO (and vice versa). How is this done?

Anatomical Actions
Clinically testing Orbital CN’s

Superior rectus muscle

In order to isolate the SR from the IO muscle the vector pull of the muscle (solid arrow) must be placed in parallel with the gaze of the orbit (dotted arrow).

What action would be necessary in order to accomplish this?
Clinically testing Orbital CN’s

Superior rectus muscle

Now the vector pull of the SR (solid arrow) is in parallel with the gaze of the orbit (dotted arrow).

Now the patient is instructor to look up.

What axis would the IO muscle now act if contracted with the eye abducted?
In order to isolate the IO from the SR muscle the vector pull of the muscle (solid arrow) must be placed in parallel with the gaze of the orbit (dotted arrow).

What action would be necessary in order to accomplish this?
Clinically testing Orbital CN’s

Inferior oblique muscle

Now the vector pull of the IO (solid arrow) is in parallel with the gaze of the orbit (dotted arrow).

Now the patient is instructor to look up.

What axis would the SR muscle now act if contracted with the eye abducted?
Clinically testing Orbital CN’s

- **Clinical actions**: Movements patient is instructed to make with eyes in order to clinically test each extracocular muscle and associated CN.

  - SR
  - IO
  - NR
  - LR
  - HR
  - SQ

Right eye; anterior view

Draw the lines on this eye to demonstrate clinical movements of eye

---

**Clinical Testing**
Anatomical Actions

The **Superior Oblique** and **Inferior Rectus muscles** are the only 2 extraocular muscles that act in the Y-axis to depress the eye (look down). Therefore, to test the SO muscle it must be isolated from the IR (and vice versa). How is this done?

Clinically testing Orbital CN’s

Right eye; anterior view
Clinically testing Orbital CN’s

Superior oblique muscle

What action is necessary in order to put the vector of the SO muscle (solid arrow) parallel with the gaze of the orbit (dotted arrow)?

Superior view of right orbit
Clinically testing Orbital CN’s

Superior oblique muscle

Superior view of right orbit
Clinically testing Orbital CN’s

Inferior rectus muscle

Superior view of right orbit
Clinically testing Orbital CN’s

Inferior rectus muscle

Superior view of right orbit
Clinically testing Orbital CN’s

- Clinically actions: Movements patient is instructed to make with eyes in order to clinically test each extracocular muscle and associated CN.
  - SR
  - IO
  - MM
  - LR
  - IR
  - SO

Right eye; anterior view

Draw the lines on this eye to demonstrate clinical movements of eye
This is what you need to memorize

Anterior view of right eye - Clinical testing of eye muscles

Clinical Testing

LR_{6SO_4 R_3}

Lateral Rectus CN 6, Superior Oblique CN 4, Rest CN 3
Anatomical Actions

Clinical Testing
Anatomical Actions

Clinical Testing

- Circular muscles contract
- Pupil
- Radial muscles contract

Right eye (frontal view) Left eye (frontal view)

- Superior oblique
- Superior rectus
- Lateral rectus
- Medial rectus
- Inferior rectus
- Inferior oblique

Action of the oculomotor muscles when the eye is at rest

Primary action ➔ Secondary action ➔ Tertiary action
A 67-year-old woman suffers an injury to her right trochlear nerve. The movement she will most likely have difficulty doing is looking:

A. Abduction
B. Abduction and depression
C. Abduction and elevation
D. Adduction
E. Adduction and depression
F. Adduction and elevation
A 67-year-old woman suffers an injury to her right trochlear nerve. The movement she will most likely have difficulty doing is looking:

A. Abduction
B. Abduction and depression
C. Abduction and elevation
D. Adduction
E. **Adduction and depression**
F. Adduction and elevation
http://cim.ucdavis.edu/eyes/version15/eyesim.html
Some additional tutorials
A patient presents with paralysis of the extraocular eye muscles. There is an abolition of the corneal reflex but there is preservation of vision.

The most likely cause of this condition would be fracture of the:

A. foramen rotundum
B. petrous part of temporal bone (internal acoustic meatus)
C. superior orbital fissure (Rochon-Duvigneaud’s syndrome)
D. pterygopalatine fossa (Sluder’s syndrome)
E. maxillary sinus
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C. superior orbital fissure (Rochon-Duvigneaud’s syndrome)
D. pterygopalatine fossa (Sluder’s syndrome)
E. maxillary sinus
What other symptoms would this patient most likely present with?

A. Anesthesia of the root of the nose and forehead
B. Anesthesia of the upper lip and side of the nostrils
C. Anesthesia of the lower lip and cheek
D. Weakness in closing eye against resistance (facial paralysis)
E. Weakness in clenching jaw
F. Difficulty in saying “Ma-Ma-Ma-Ma-Ma-Ma”
What other symptoms would this patient most likely present with?

A. Anesthesia of the root of the nose and forehead
B. Anesthesia of the upper lip and side of the nostrils
C. Anesthesia of the lower lip and cheek
D. Weakness in closing eye against resistance (facial paralysis)
E. Weakness in clenching jaw
F. Difficulty in saying “Ma-Ma-Ma-Ma-Ma-Ma”

Ophthalmic branch of trigeminal n. (CN V-1)
A 52-year-old woman suffers a lesion to her left oculomotor nerve. Identify symptom(s) this patient would most likely present with.

A. Anesthesia of forehead
B. Anesthesia of lower lip
C. Anesthesia of mandibular teeth
D. Anesthesia maxillary teeth
E. Anesthesia of upper lip
F. Anosmia
G. Double vision when looking left
H. Double vision when looking right
I. Eye is positioned down and out
J. Miosis (pin point pupil)
K. Mydriasis (blown/large pupil)
L. Ptosis
M. Vision problems
N. Weakness in clenching jaw
A 52-year-old woman suffers a lesion to her left oculomotor nerve. Identify symptom(s) this patient would most likely present with.

A. Anesthesia of forehead
B. Anesthesia of lower lip
C. Anesthesia of mandibular teeth
D. Anesthesia maxillary teeth
E. Anesthesia of upper lip
F. Anosmia
G. Double vision when looking left
H. Double vision when looking right
I. **Eye is positioned down and out**
J. Miosis (pin point pupil)
K. **Mydriasis (blown/large pupil)**
L. Ptosis
M. Vision problems
N. Weakness in clenching jaw

**CN III. Oculomotor nerve**

Function
- Visceral motor to *pupillary constrictor* and ciliary muscles
A 45-year-old woman complains of double vision when looking to the right but not to the left.

Identify the side of the brainstem that is most likely injured.

A. Medulla – left side
B. Medulla – right side
C. Midbrain – left side
D. Midbrain – right side
E. Pons – left side
F. Pons – right side
A 45-year-old woman complains of double vision when looking to the right but not to the left.

Identify the side of the brainstem that is most likely injured.

A. Medulla – left side
B. Medulla – right side
C. Midbrain – left side
D. Midbrain – right side
E. Pons – left side
F. **Pons – right side**
Patients with multiple sclerosis (MS) often experience numbness, tingling, pain, weakness, and balance problems. In addition, MS targets CN II up to 50% of the time. **Identify an additional symptom a patient with CN II involvement of MS would most likely experience.**

A. Anesthesia of upper lip  
B. Anosmia  
C. Eye is positioned down and out  
D. Ptosis  
E. Vision loss  
F. Weakness in clenching jaw
Patients with multiple sclerosis (MS) often experience numbness, tingling, pain, weakness, and balance problems. In addition, MS targets CN II up to 50% of the time. Identify an additional symptom a patient with CN II involvement of MS would most likely experience.

A. Anesthesia of upper lip
B. Anosmia
C. Eye is positioned down and out
D. Ptosis
E. **Vision loss**
F. Weakness in clenching jaw
The following list demonstrates symptoms associated with CN injury. Identify the CN most likely associated with each injury.

- Anesthesia of forehead
- Anesthesia of mandibular teeth and lower lip
- Anesthesia of maxillary teeth and upper lip
- Anosmia
- Mydriasis (blown/large pupil)
- Ptosis
- Vision problems
- Weakness in clenching jaw
The following list demonstrates symptoms associated with CN injury. Identify the CN most likely associated with each injury.

- Anesthesia of forehead (CN V-1)
- Anesthesia of mandibular teeth and lower lip (CN V-3)
- Anesthesia of maxillary teeth and upper lip (CN V-2)
- Anosmia (CN I)
- Mydriasis (blown/large pupil) (CN III)
- Ptosis (CN III and sympathetics)
- Vision problems (CN II)
- Weakness in clenching jaw (CN V-3)
The following list demonstrates symptoms associated with CN injury. Identify the CN most likely associated with each injury.

- Anesthesia of forehead
- Anesthesia of lower lip
- Anesthesia of mandibular teeth
- Anesthesia maxillary teeth
- Anesthesia of upper lip
- Anosmia
- Double vision when looking left
- Double vision when looking right
- Eye is positioned down and out
- Miosis (pin point pupil)
- Mydriasis (blown/large pupil)
- Ptosis
- Vision problems
- Weakness in clenching jaw
The following list demonstrates symptoms associated with CN injury. Identify the CN most likely associated with each injury.

- Anesthesia of forehead (CN V-1)
- Anesthesia of lower lip (CN V-3)
- Anesthesia of mandibular teeth (CN V-3)
- Anesthesia maxillary teeth (CN V-2)
- Anesthesia of upper lip (CN V-2)
- Anosmia (CN I)
- Double vision when looking left (left CN VI)
- Double vision when looking right (right CN VI)
- Eye is positioned down and out (CN III)
- Miosis (pin point pupil) (sympathetics)
- Mydriasis (blown/large pupil) (CN III)
- Ptosis (CN III and sympathetics)
- Vision problems (CN II)
- Weakness in clenching jaw (CN V-3)
A 20-year-old man is brought to the ED following a motorcycle collision. PE shows clear fluid dripping from the nose. Radiographs confirm a fracture of the cribriform plate of the ethmoid bone. **Identify symptom(s) this patient would most likely present with as a result of this fracture.**

A. Anesthesia of forehead  
B. Anesthesia of lower lip  
C. Anesthesia of mandibular teeth  
D. Anesthesia maxillary teeth  
E. Anesthesia of upper lip  
F. Anosmia  
G. Double vision when looking left  
H. Double vision when looking right  
I. Eye is positioned down and out  
J. Miosis (pin point pupil)  
K. Mydriasis (blown/large pupil)  
L. Ptosis  
M. Vision problems  
N. Weakness in clenching jaw
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A. Anesthesia of forehead  
B. Anesthesia of lower lip  
C. Anesthesia of mandibular teeth  
D. Anesthesia maxillary teeth  
E. Anesthesia of upper lip  

**F. Anosmia**

G. Double vision when looking left  
H. Double vision when looking right  
I. Eye is positioned down and out  
J. Miosis (pin point pupil)  
K. Mydriasis (blown/large pupil)  
L. Ptosis  
M. Vision problems  
N. Weakness in clenching jaw
Tic-Douloureux is a neuropathic disorder characterized by sudden attacks of excruciating, lightening-like jabs of facial pain (paroxysm). This sudden stabbing pain is often set off by touching the face, brushing the teeth, shaving, and/or chewing.

The cause of this condition is unknown, but the nerve causing this condition is not. Identify the most likely nerve associated with this condition.

A. Oculomotor nerve
B. Facial nerve
C. Glossopharyngeal nerve
D. Trigeminal nerve
E. Vagus nerve
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The cause of this condition is unknown, but the nerve causing this condition is not. Identify the most likely nerve associated with this condition.

A. Oculomotor nerve
B. Facial nerve
C. Glossopharyngeal nerve
D. **Trigeminal nerve**
E. Vagus nerve
One of these things is not like the other

a. 

b. 

c. 

d. 

e.
One of these things is not like the other