

Purpose of Meiosis

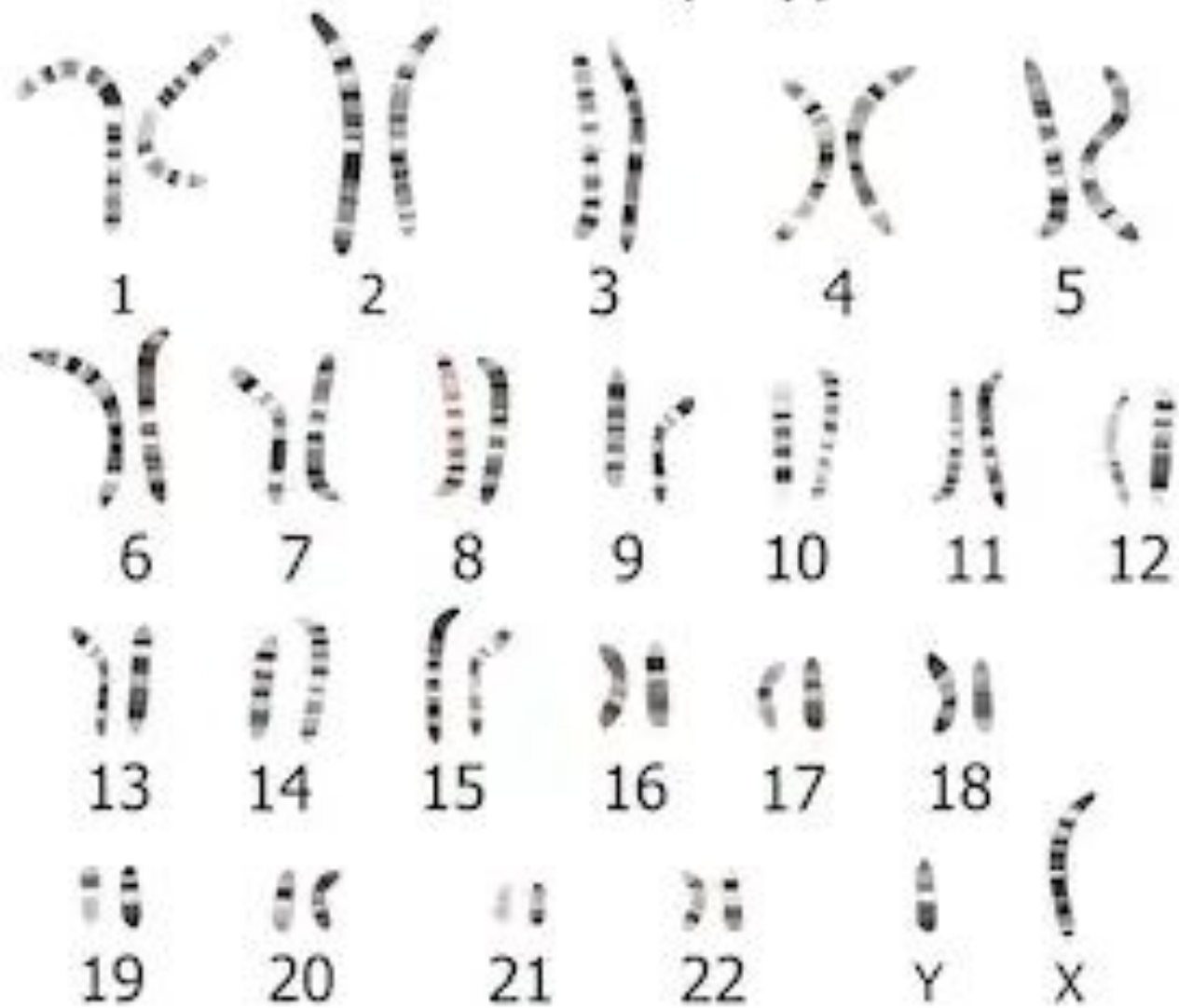
- There is a need to reduce the chromosome number in half prior to sexual reproduction so that the correct number of chromosomes is restored during fertilization.
- **Meiosis** is the process in which the **number of chromosomes** per cell is **cut in half** through the **separation of homologous chromosomes** in a **diploid cell**, forming a **haploid gamete**.

Purpose of Meiosis

Example in Humans:

- **Humans** have **46** chromosomes in all their **body cells**.
- **Meiosis** reduces the chromosome number to **23** in **reproductive cells (gametes)**.
- **Sexual reproduction** restores the chromosome number to **46** when the reproductive cells (egg and sperm) **join**.

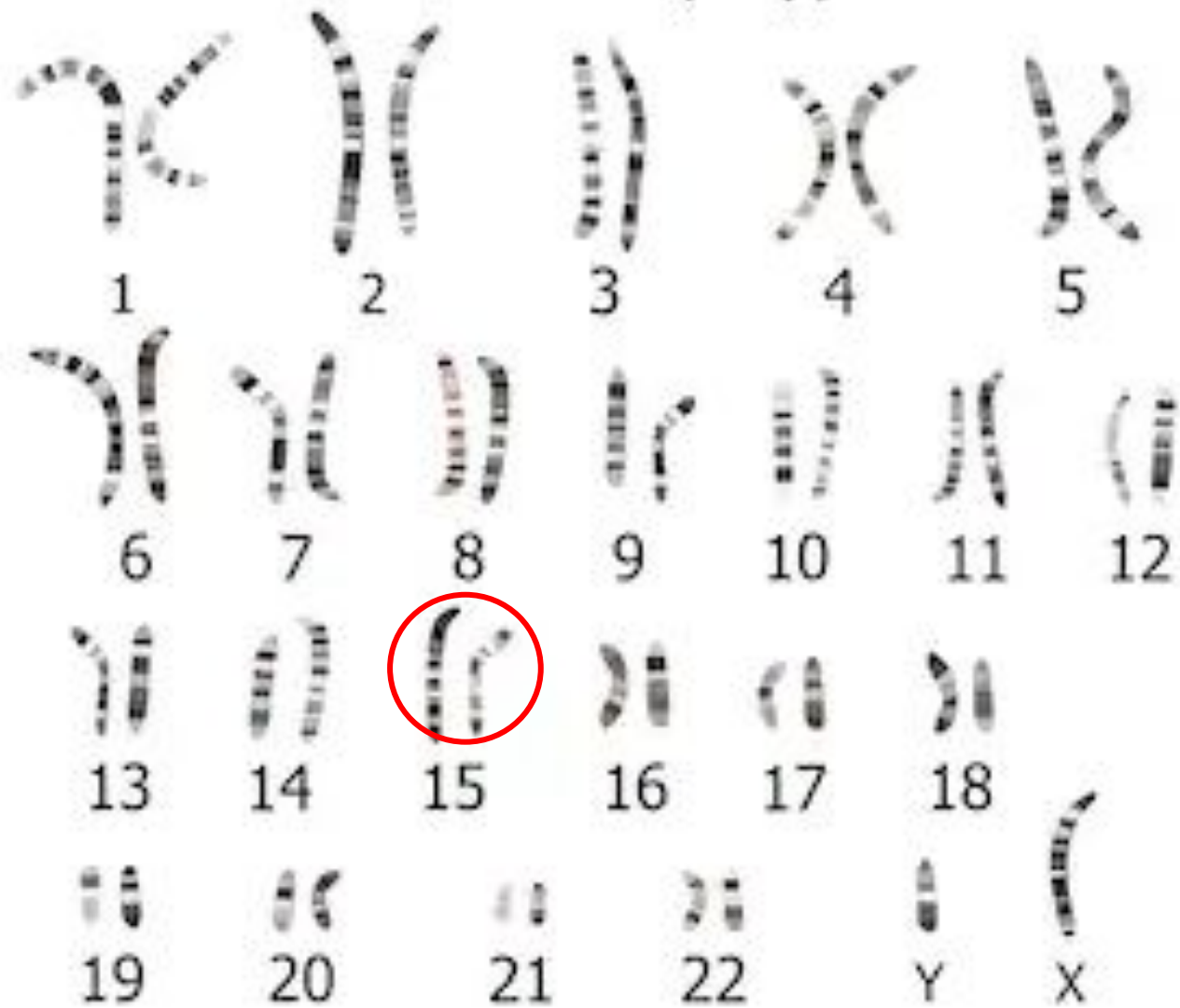
Human karyotype



Chromosome Number

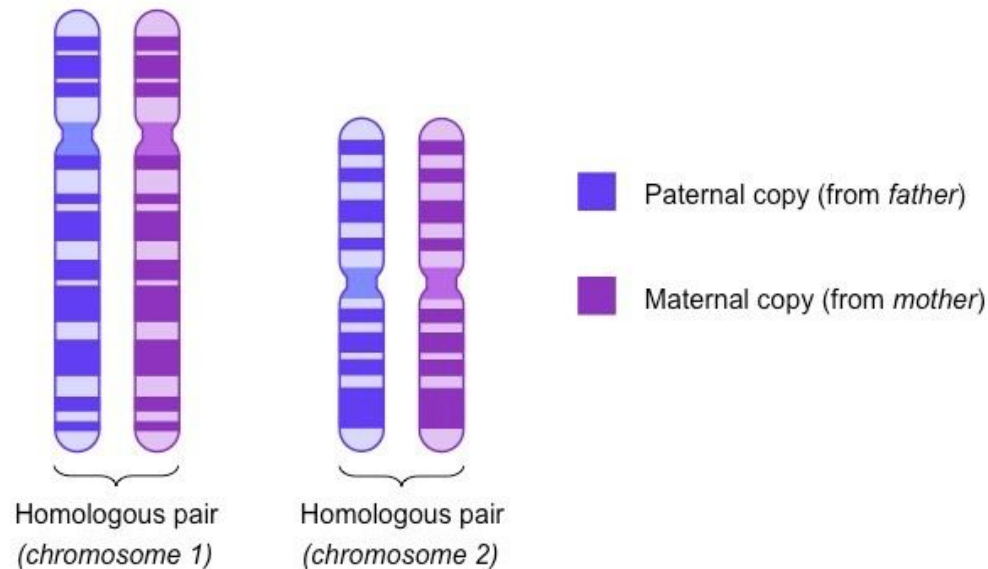
- **Chromosomes**—those strands of DNA and protein inside the cell nucleus—**are the carriers of genes.**
- Genes are **segments of DNA that contain instructions** for individual characteristics.
- The genes are **located in specific positions** on chromosomes.
- For example, the gene that determines your eye color is located on a section of chromosome 15.

Human karyotype



Homologous Chromosomes

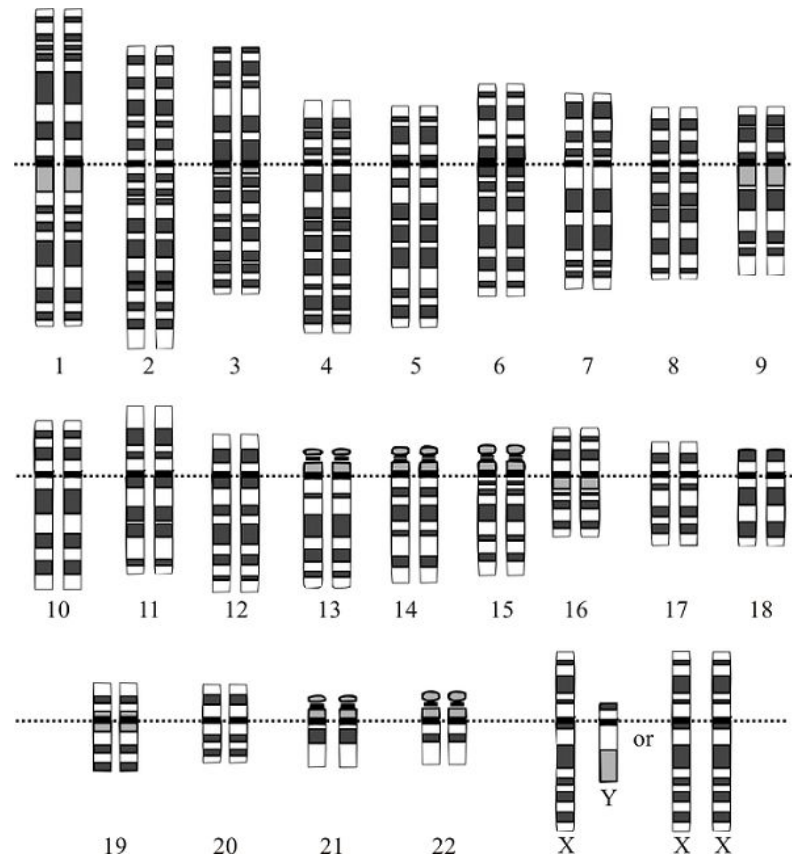
- **Chromosome pairs** that are similar in length, gene locations, and centromere location are **homologous chromosomes**.



- **One chromosome from each pair of homologous chromosomes comes from each parent.**

Homologous Chromosomes

- Humans have **23 pairs of homologous chromosomes**.
 - Each of the 23 chromosomes inherited from the male parent has a homologous chromosome from the female parent.

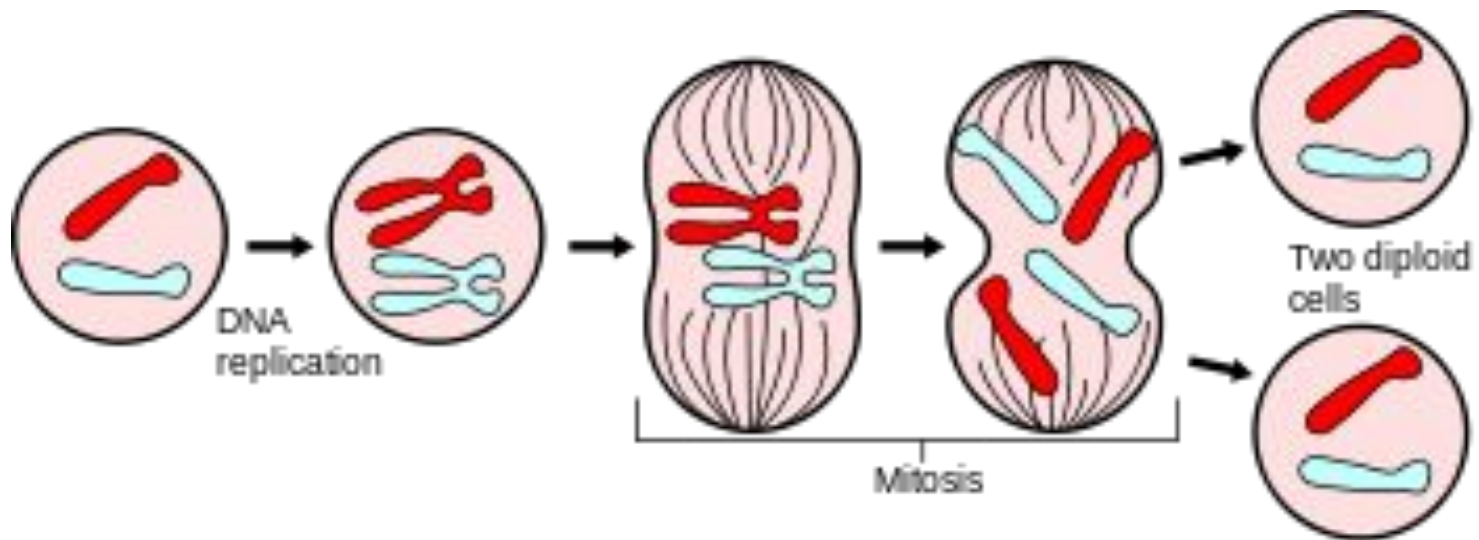


Diploid Cells

- A cell that contains **both sets of homologous chromosomes** is **diploid**, meaning “**two sets.**”
- The diploid number of chromosomes is sometimes represented by the symbol **2n**.
- For humans, the diploid number is 46, which can be written as $2n = 46$
 - **n = the number of unique chromosomes in a set**

Diploid Cells

- Mitosis produces diploid cells that are identical to the parent cell.

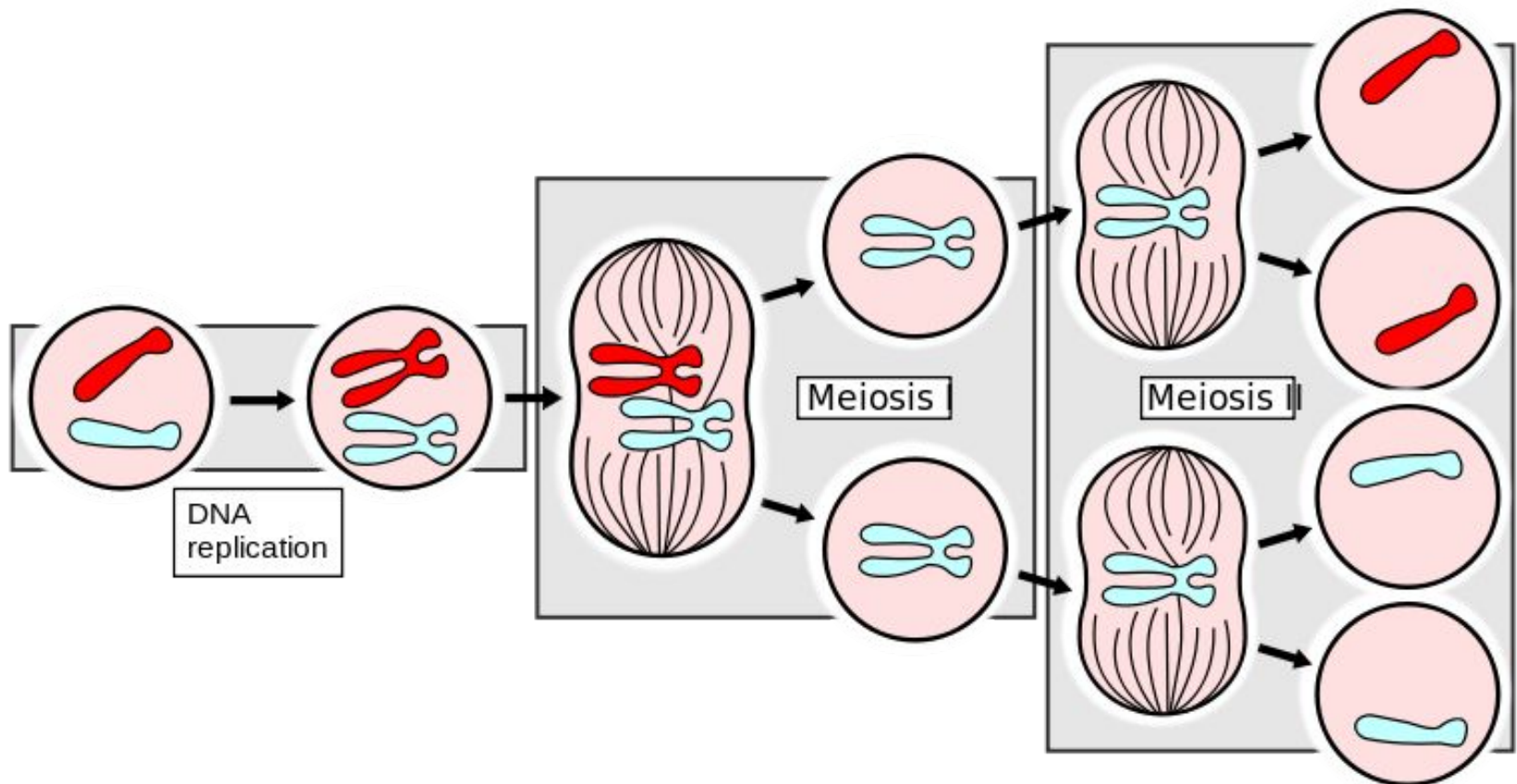


Haploid Cells

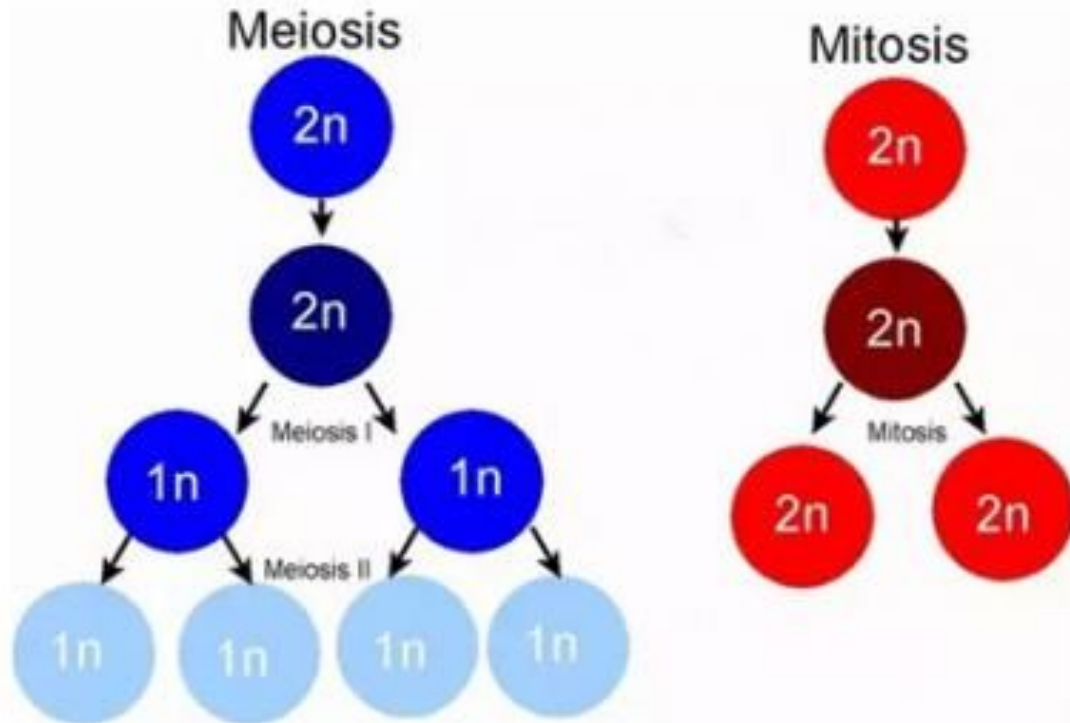
- A cell that contains only a **single set of chromosomes**, and therefore a **single set of genes**, is **haploid**, meaning “**one set.**”
- The reproductive sex cells, **gametes**, of sexually reproducing organisms are **haploid**.
- For human gametes, the haploid number is 23, which can be written as $n = 23$.

Haploid Cells

- Meiosis produces haploid cells that contain half the genetic material as the parent cell.



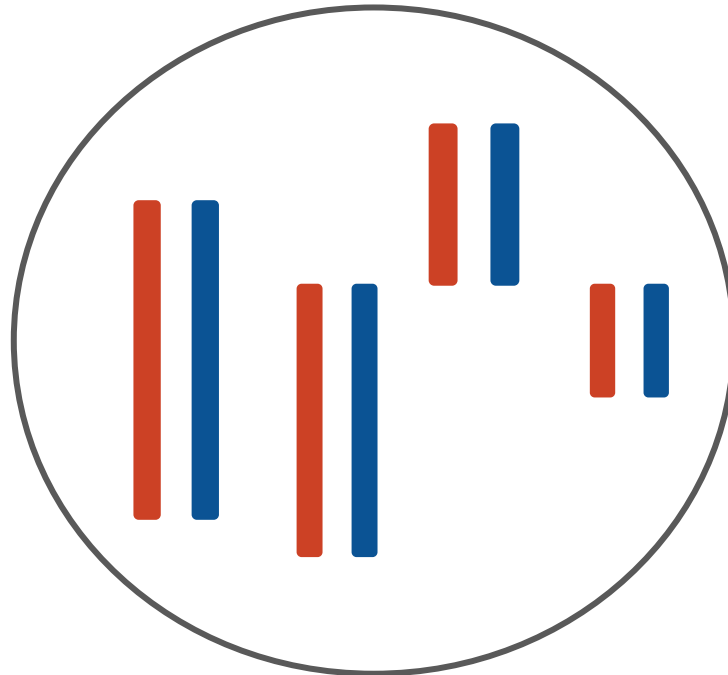
Diploid vs Haploid



Numbered Heads Together Review

In the following cell:

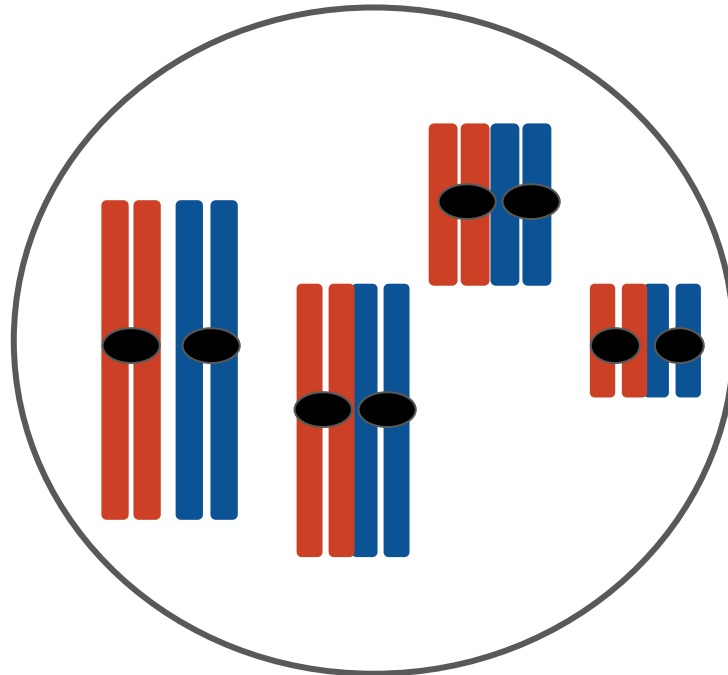
1. How many homologous chromosome pairs are there?
2. What is the diploid number?
3. What is the haploid number?



Numbered Heads Together Review

In the following cell:

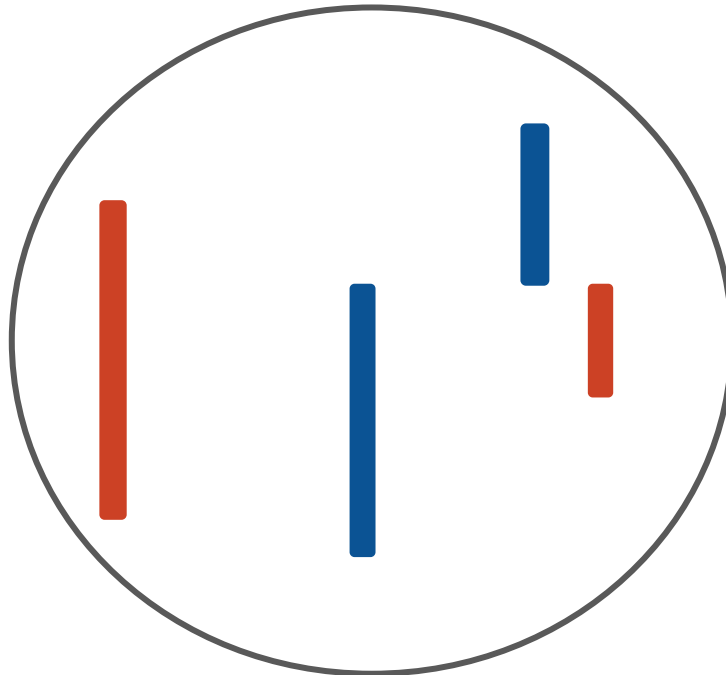
1. How many homologous chromosome pairs are there?
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Numbered Heads Together Review

In the following cell:

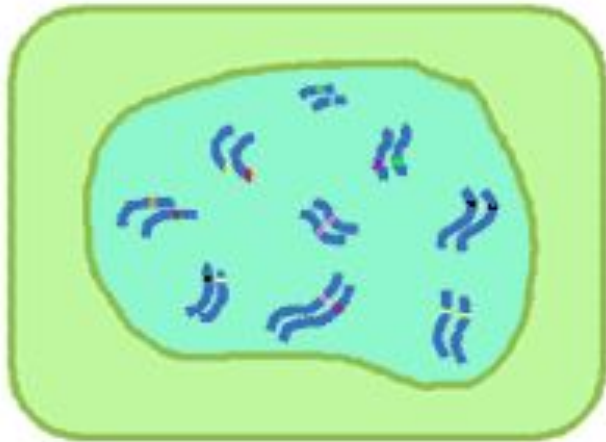
1. How many homologous chromosome pairs are there?
2. What is the diploid number?
3. What is the haploid number?



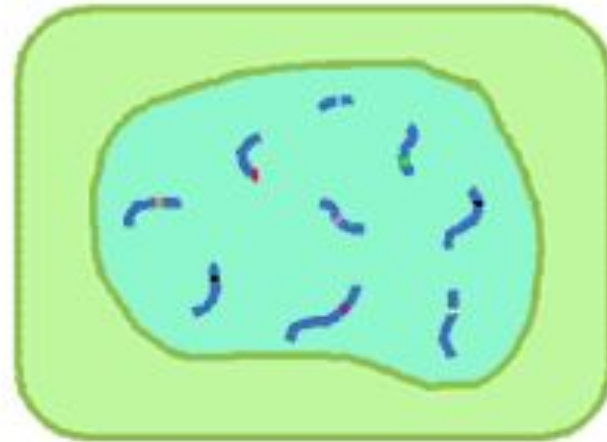
Numbered Heads Together Review

In the following somatic (body) cell:

1. How many homologous chromosome pairs are there?
2. What is the diploid number?
3. What is the haploid number?



Somatic Cell

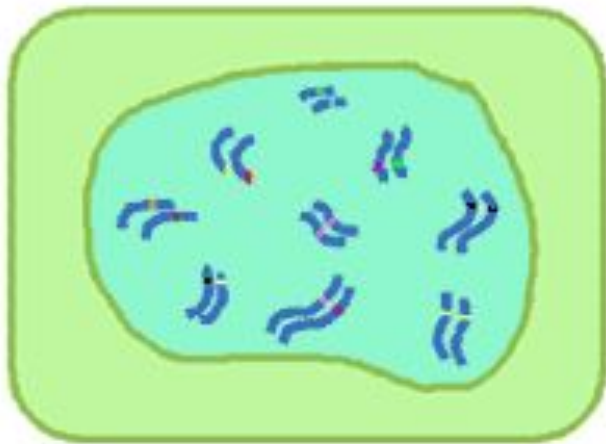


Gamete Cell

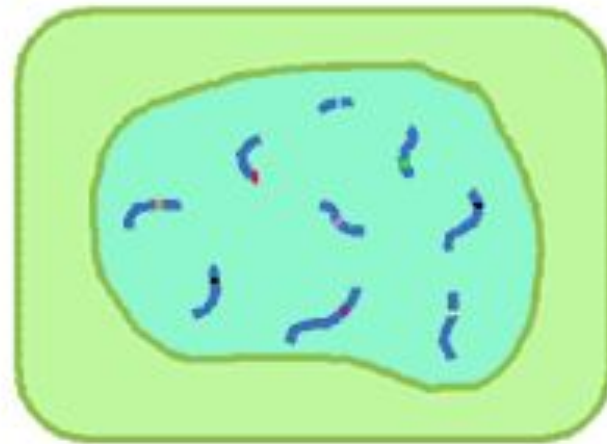
Numbered Heads Together Review

In the following gamete (sex) cell:

1. How many homologous chromosome pairs are there?
2. What is the diploid number?
3. What is the haploid number?



Somatic Cell



Gamete Cell

Numbered Heads Together Review

1. Draw a cell with 3 homologous chromosome pairs.
2. What is the diploid number?
3. What is the haploid number?

Numbered Heads Together Review

1. Draw a cell with a diploid number of 10.

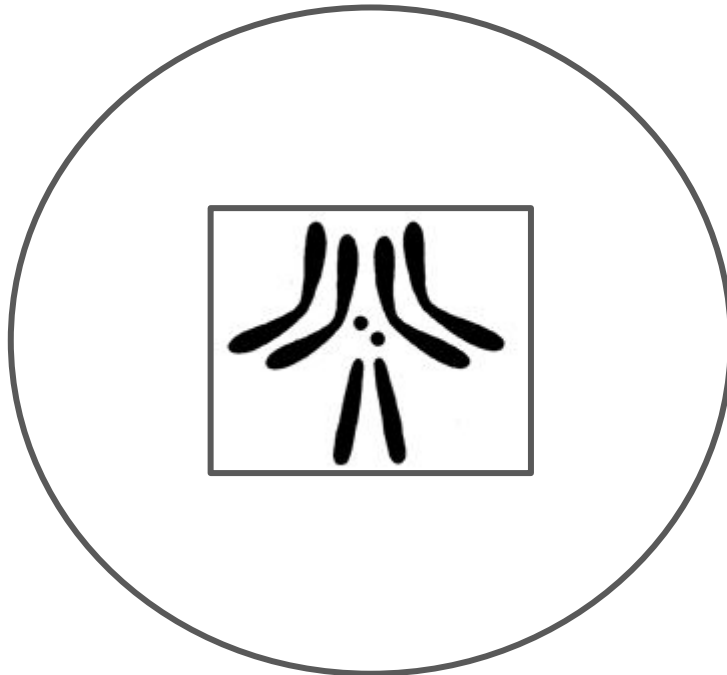
Numbered Heads Together Review

1. Draw a cell with a haploid number of 7.

Numbered Heads Together Review

In the following fruit fly cell:

1. How many homologous chromosome pairs are there?
2. What is the diploid number?
3. What is the haploid number?



Somatic chromosome number of some common plants and animals

Sr. no	Scientific name	Common name	Chromosome number	
			Somatic	Gametic
1	<i>Homo sapiens</i>	Human	46	23
2	<i>Oryza sativa</i>	Rice	24	12
3	<i>Rattus norvegicus</i>	rat	42	21
4	<i>Pisum sativum</i>	Pea	14	7
5	<i>Daucus carota</i>	Carrot	20	10
6	<i>Allium cepa</i>	Onion	16	8
7	<i>Zea mays</i>	Maize	20	10
8	<i>Apis mellifera</i>	Honey bee	32	16
9	<i>Musca domestica</i>	House fly	12	6
10	<i>Felis domesticum</i>	Cat	38	19
11	<i>Drosophila melanogaster</i>	Fruit fly	8	4
12	<i>Neurospora Crassa</i>	Bread mold	14	7