



# Meiosis, Karyotypes, Non- disjunction, Fertilization, & Differentiation Test Review



Vocab	Meiosis	Karyotypes & Non- disjunction	Fertilization	Miscellaneous
<u>10</u>	<u>10</u>	<u>10</u>	<u>10</u>	<u>10</u>
<u>20</u>	<u>20</u>	<u>20</u>	<u>20</u>	<u>20</u>
<u>30</u>	<u>30</u>	<u>30</u>	<u>30</u>	<u>30</u>
<u>40</u>	<u>40</u>	<u>40</u>	<u>40</u>	<u>40</u>
<u>50</u>	<u>50</u>	<u>50</u>	<u>50</u>	<u>50</u>

Vocab: 10

What are homologous chromosomes?



ANSWER

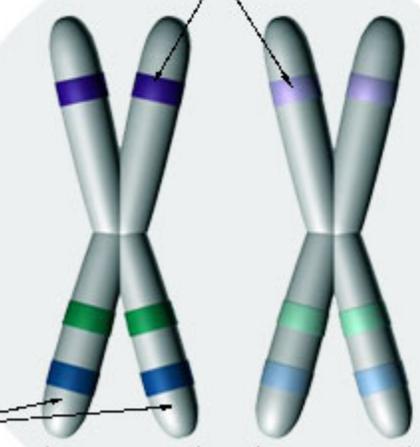
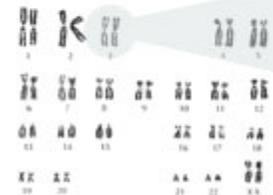
# Vocab: 10 - Answer

Same size and shape, and contain the same genes (may be different versions – thus slightly different DNA)

Figure B-11: Homologous Chromosomes

Homologous chromosomes contain DNA that codes for the same genes. In this example, both chromosomes have all the same genes in the same locations (represented with colored strips), but different 'versions' of those genes (represented by the different shades of each color).

Homologous regions code for the same gene.



Sister chromatids are exact replicas... but homologous chromosomes are not.

Vocab: 20

What is a tetrad?  
(use the correct vocabulary)



ANSWER

## Vocab: 20 - Answer

A tetrad is a pair of homologous chromosomes (these match up during Prophase I of meiosis)

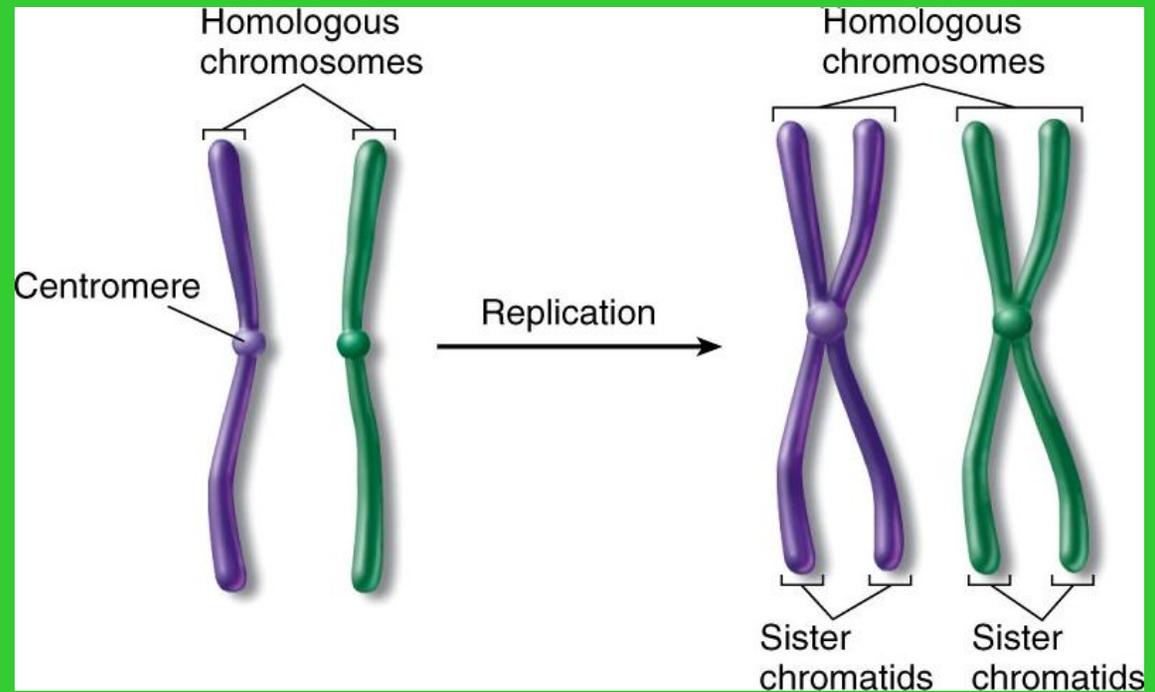
Vocab: 30



ANSWER

# Vocab: 30 - Answer

Homologous chromosomes are not necessarily identical, they carry the same genes – they could be different versions of the gene.



Vocab: 40

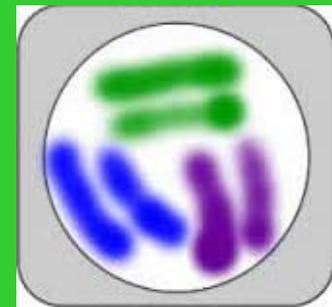
Is this cell haploid  
or diploid?  
Somatic or  
gamete?  $2n$  or  
 $n$ ?



ANSWER

## Vocab: 40 - Answer

The cell is **diploid** (it has pairs of homologous chromosomes), thus it would be a **somatic cell** (such as a skin cell or muscle cell – any body cell), and is **2n**



Vocab: 50

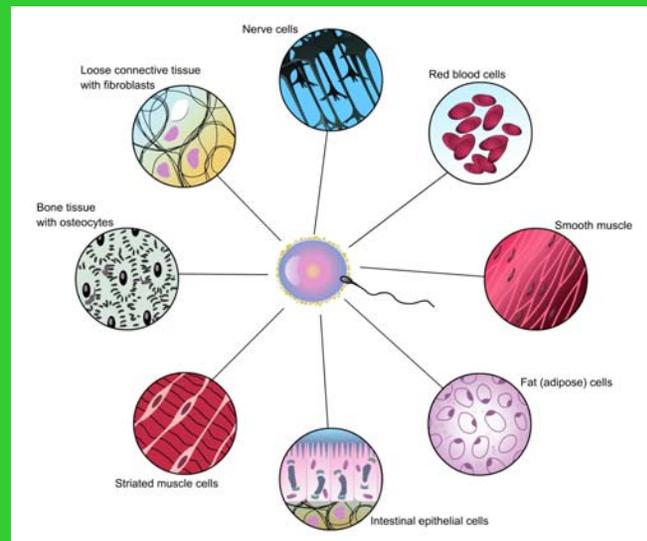
What is cell  
**differentiation?**



ANSWER

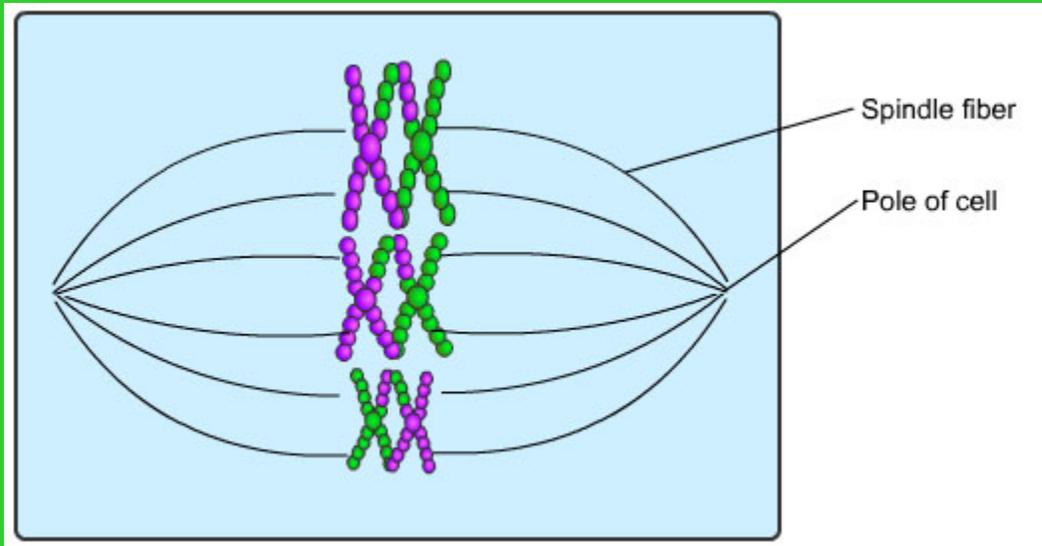
# Vocab: 50 - Answer

The process by which cells are directed to specialize into various different tissues.



# Meiosis : 10

What stage of Meiosis is this?

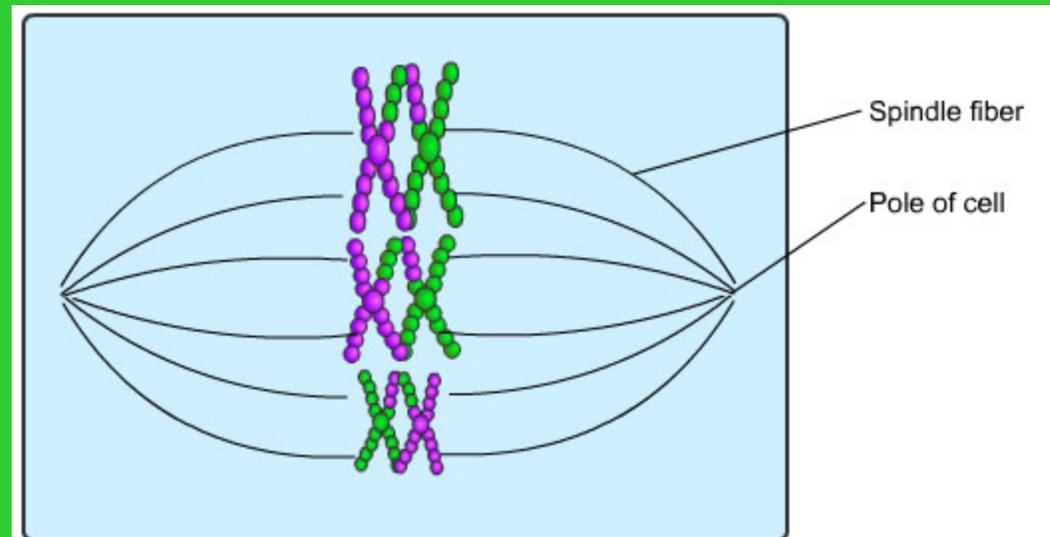


ANSWER

# Meiosis : 10 - Answer

## Metaphase I of Meiosis

(notice the formation of tetrads – pairs of homologous chromosomes)



Meiosis : 20

**How** are homologous chromosomes matched up and in **what phase** of meiosis do they pair up?

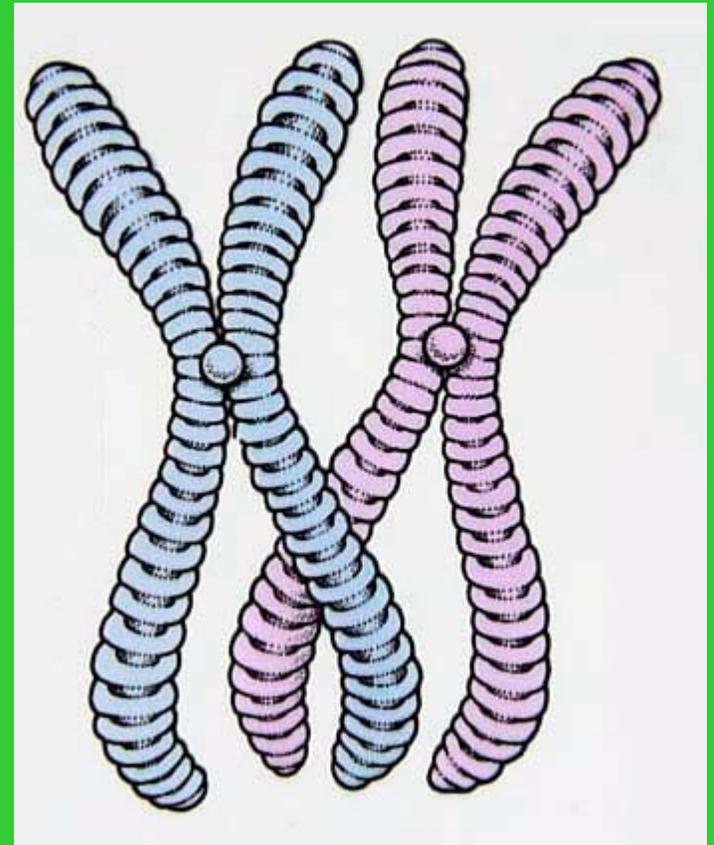


ANSWER

# Meiosis : 20 - Answer

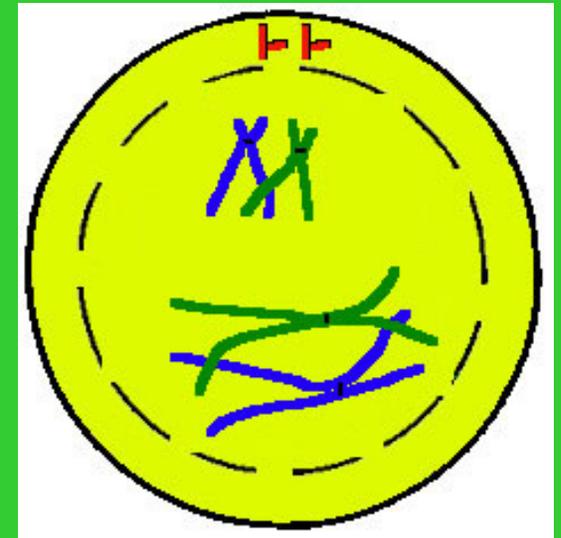
They pair up by same size (and they contain the same type of genes).

During **Prophase I** they pair up.



# Meiosis : 30

What stage of meiosis is this in? What event is happening which increases variation in offspring?

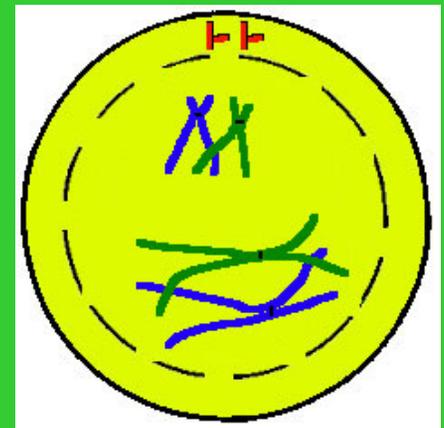


ANSWER

# Meiosis : 30 - Answer

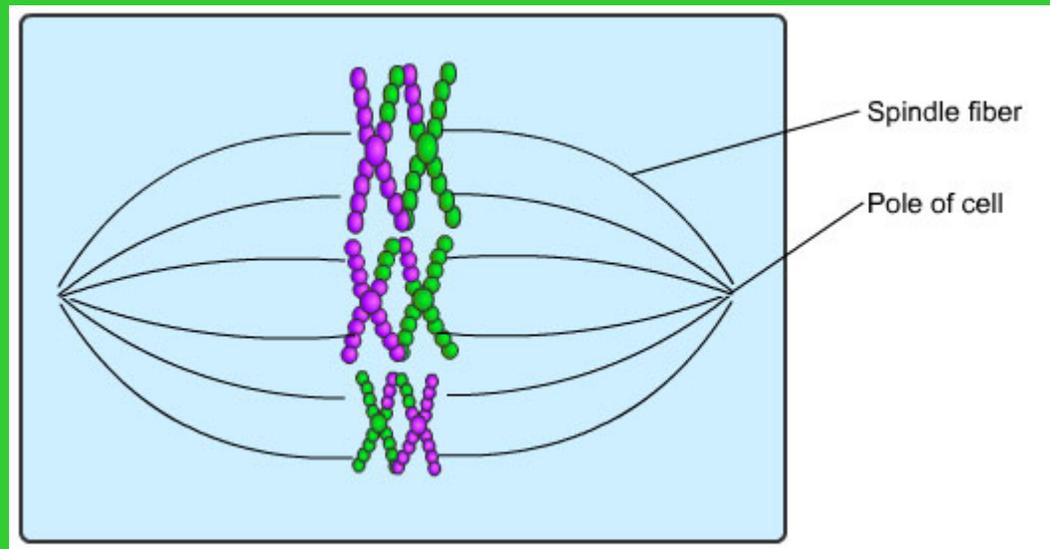
## Prophase I

Crossing over occurs and increases genetic variation in the daughter cells



# Meiosis : 40

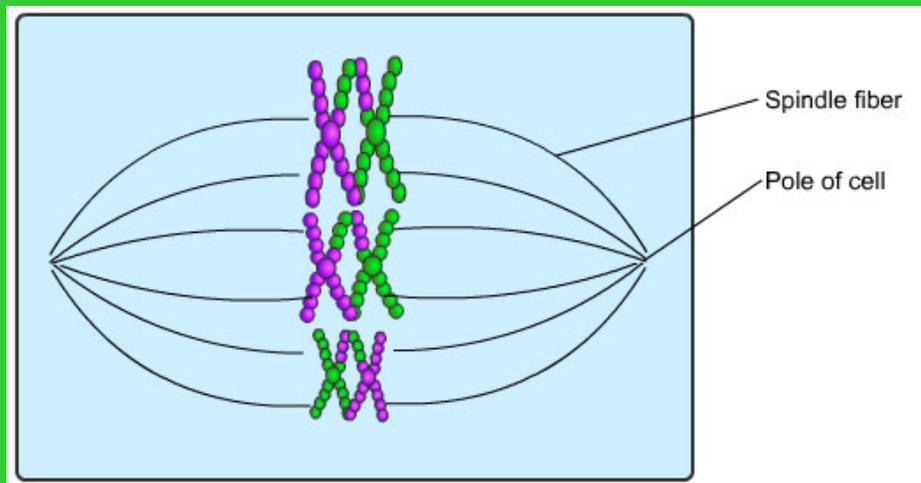
What event in this stage leads to variation?



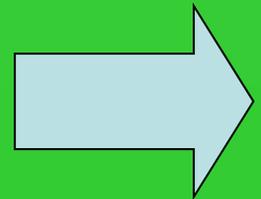
ANSWER

# Meiosis : 40 - Answer

**Independent Assortment**  
(during Metaphase I) leads to  
genetic variation in the  
daughter cells.



**Double  
Jeopardy!!!**



# Meiosis : 50

If a cell starts with 20 **chromatids** at the beginning of Meiosis, how many chromosomes will be in one of the haploid cells at the end of Meiosis?

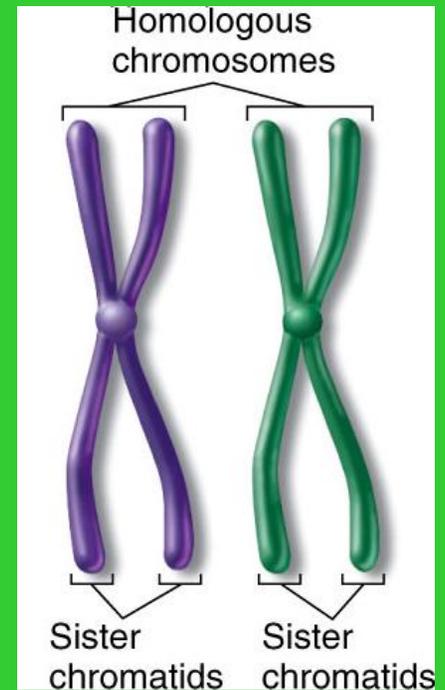


ANSWER

# Meiosis : 50 - Answer

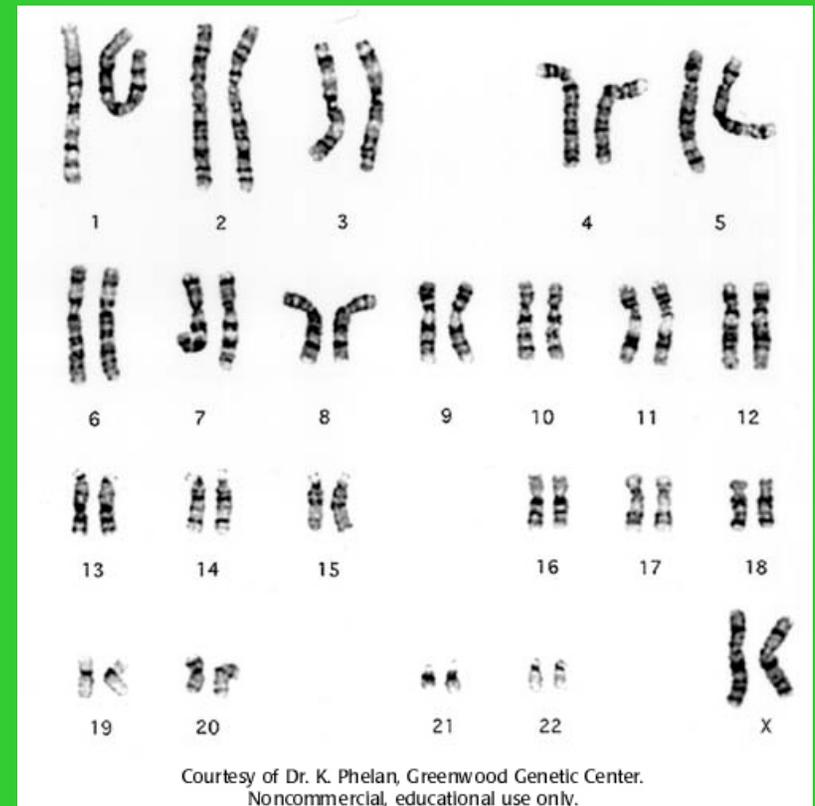
If there are 20 chromatids then the cell is starting with 10 chromosomes.

After meiosis is complete, each haploid daughter cell will have **5 chromosomes** each



# Karyotypes & Non-disjunction : 10

How are the  
chromosomes  
arranged in a  
karyotype?  
(be specific!)

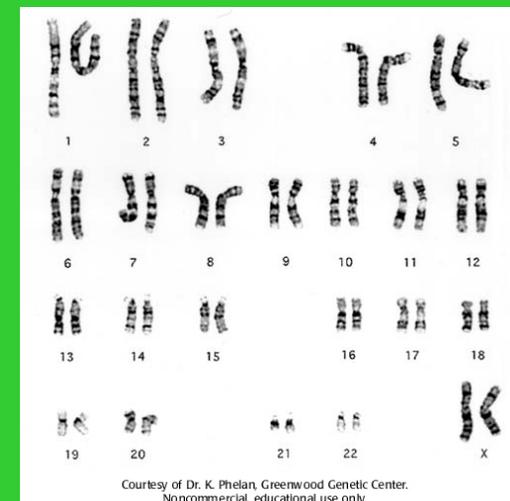


ANSWER

# Karyotypes & Non-disjunction :

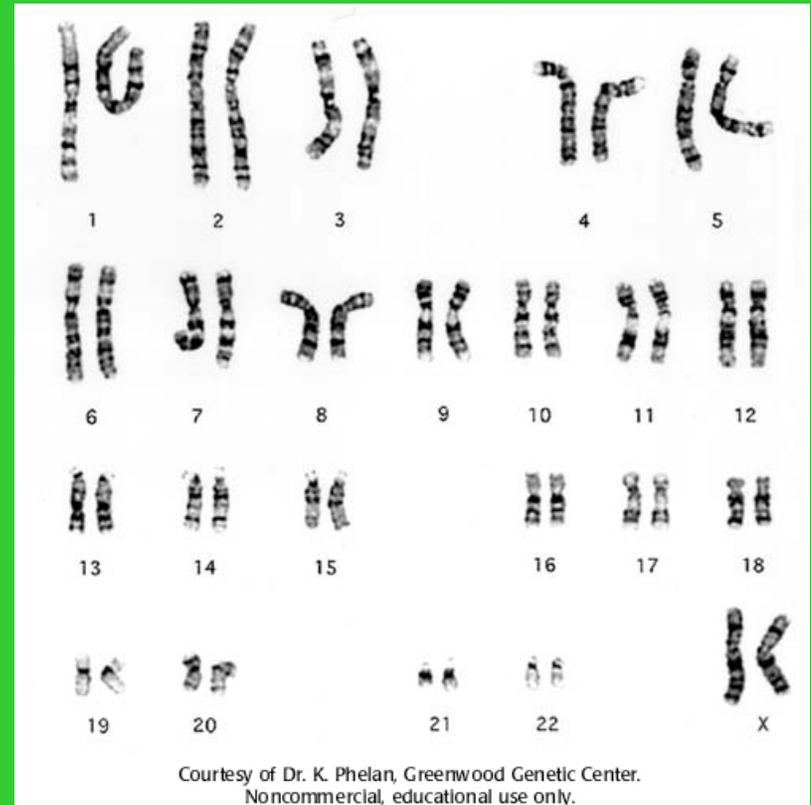
## 10 - Answer

Chromosomes are arranged in homologous pairs from **BIGGEST TO SMALLEST** with the sex chromosomes at the very end.



# Karyotypes & Non-disjunction : 20

Is this from a  $2n$   
or  $n$  cell? How  
can you tell?

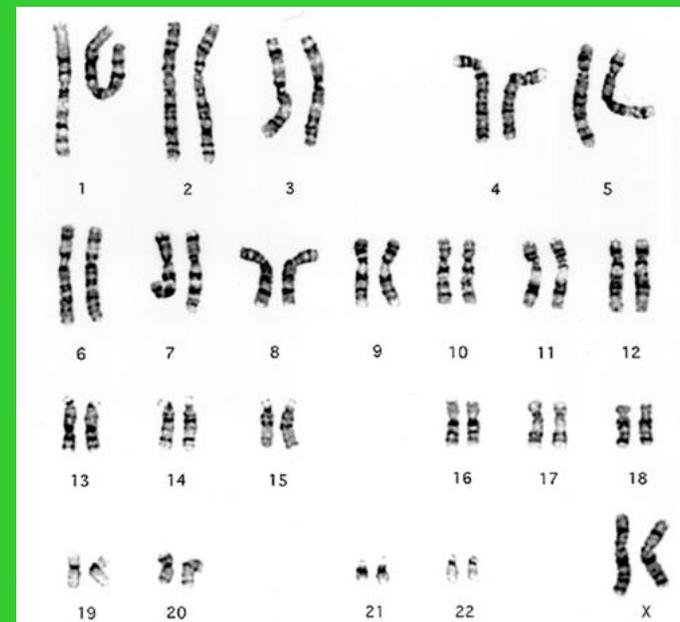


ANSWER

# Karyotypes & Non-disjunction : 20 - Answer

This karyotype come  
from a cell that is  
**2n.**

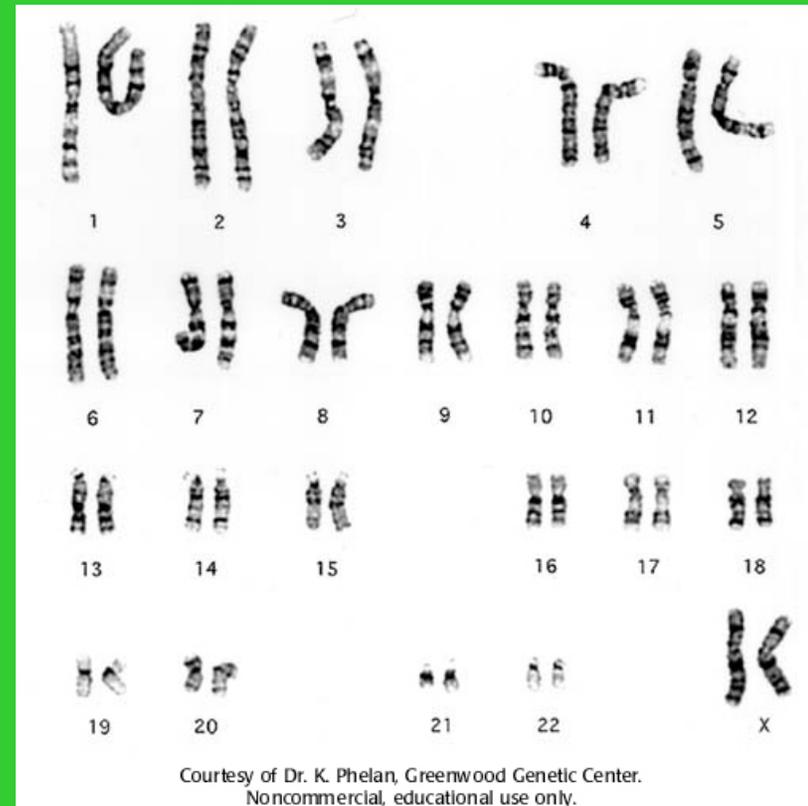
You can tell it is a diploid  
(2n) cell because the  
chromosomes are in  
their homologous pairs.



Courtesy of Dr. K. Phelan, Greenwood Genetic Center.  
Noncommercial, educational use only.

# Karyotypes & Non-disjunction : 30

In a human,  
how many  
autosomes are  
there? How  
many sex  
chromosomes?



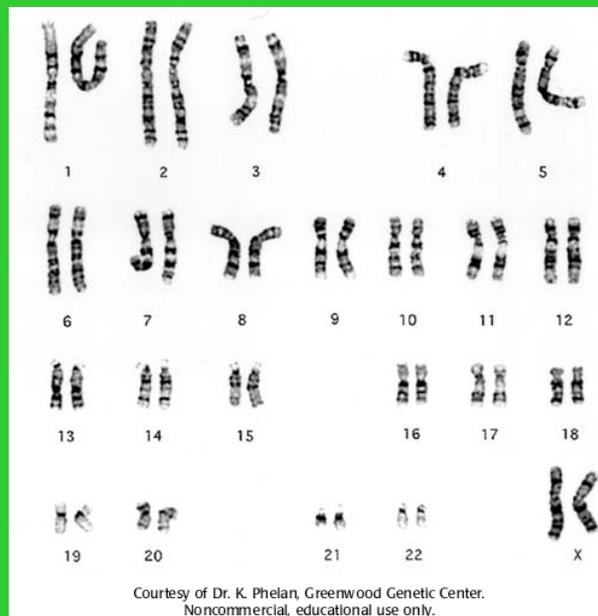
ANSWER

# Karyotypes & Non-disjunction :

## 30 - Answer

44 autosomes (or 22 pairs)

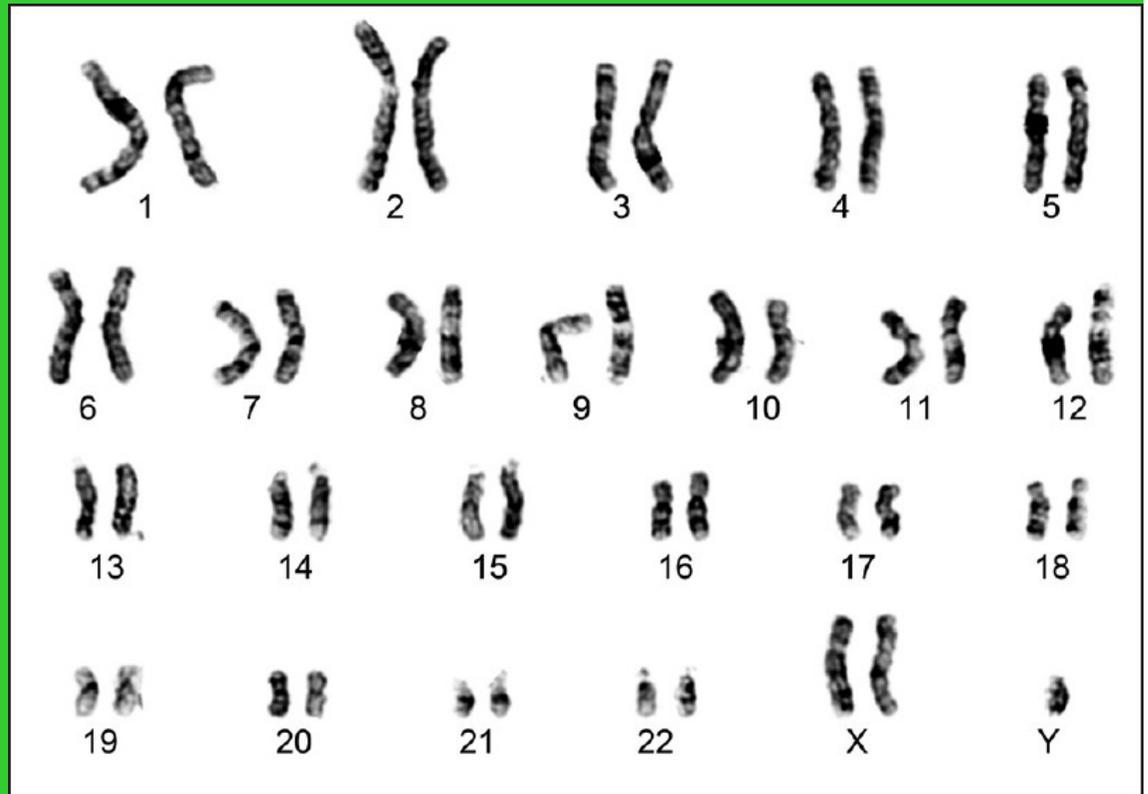
2 sex chromosomes (or 1 pair)



# Karyotypes & Non-disjunction : 40

What  
aneuploidy  
would this  
individual  
have?

What  
disorder is  
this called?

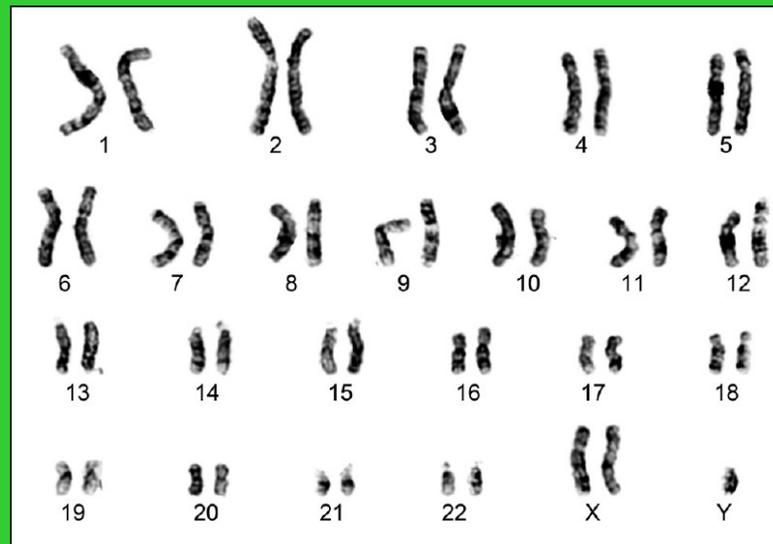


ANSWER

# Karyotypes & Non-disjunction : 40 - Answer

Aneuploidy – XXY (has an extra  
X chromosome)

Klinefelter's Syndrome



# Karyotypes & Non-disjunction : 50

How does a non-disjunction in  
Anaphase I compare to Anaphase  
II?



ANSWER

# Karyotypes & Non-disjunction :

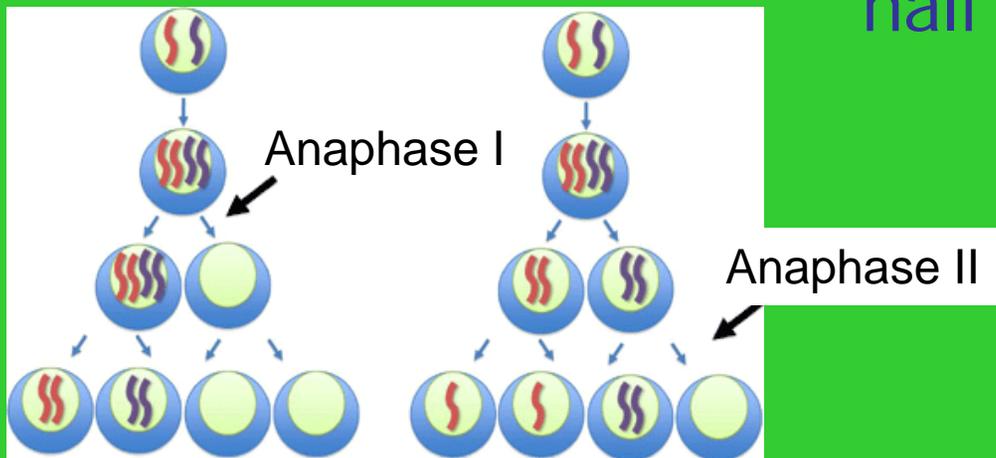
## 50 - Answer

### Anaphase I

- Homologous chromosomes (tetrads) fail to separate
- Results in aneuploidy in all daughter cells

### Anaphase II

- Double stranded chromosome (sister chromatids) fail to separate
- Results in aneuploidy in half of the daughter cells



# Fertilization : 10

What is a fertilized egg called?

(a fertilized egg results from an egg and sperm fusing together...what is this new cell called?)



ANSWER

# Fertilization : 10 - Answer

A zygote!



# Fertilization : 20

What are sex cells called?  
And where are they made?



ANSWER

# Fertilization : 20 - Answer

Sex cells (egg and sperm cells) are called **gametes**.

Egg cells made in ovaries,  
sperm cells made in testes

# Fertilization : 30

What is the correct sequence that describes the development of a baby?

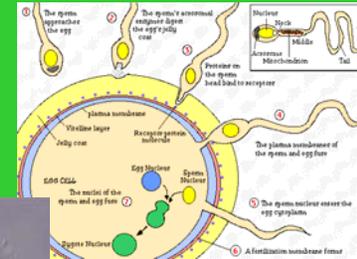
**Baby, Embryo, Fertilization, Fetus, Zygote**



ANSWER

# Fertilization : 30 - Answer

**Fertilization,  
Zygote,  
Embryo,  
Fetus,  
Baby**



Fertilization : 40

How many chromosomes are in  
a human gamete?

How many chromosomes are  
there in a human zygote?



ANSWER

Fertilization : 40 - Answer

23 chromosomes are in a  
human gamete

46 chromosomes are in a  
human zygote

# Fertilization : 50

Why is it important that both gametes are haploid?



ANSWER

Fertilization : 50 - Answer

Both gametes are haploid because when they come together they will make a fertilized diploid cell

(thus **RESTORING** the original amount of chromosomes)

Miscellaneous: 10

True or False:

Homologous chromosomes are exactly identical.



ANSWER

Miscellaneous: 10 - Answer

**False**, homologous chromosomes contain the same types of genes, but they may be different versions. Thus the sequence of DNA nucleotides could be different!

Miscellaneous: 20

What kind of aneuploidy does a person that have Turner's syndrome have?

$2n-1$  or  $2n+1$

How do you know?



ANSWER

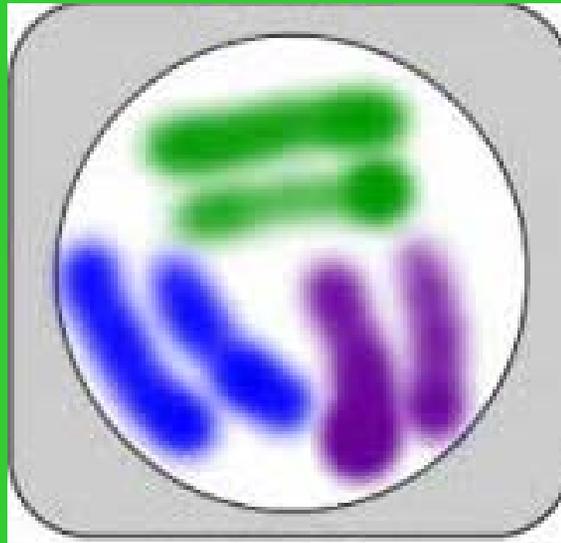
Miscellaneous: 20 - Answer

$$2n-1$$

They are missing one of their X  
chromosomes  
(in every single cell)

Miscellaneous: 30

Would this cell be considered  $n$   
or  $2n$ ?

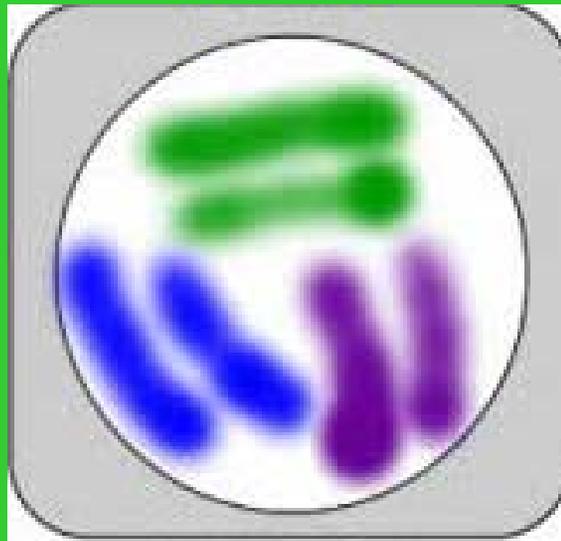


ANSWER

Miscellaneous: 30 - Answer

$2n$

It has homologous **pairs** of  
chromosomes



Miscellaneous: 40

If the cell starts with 40 chromosomes at the beginning of Meiosis, how many chromosomes will be in one of the haploid cells at the end of Meiosis?



ANSWER

Miscellaneous: 40 - Answer

20 chromosomes

(the number is halved in  
meiosis)

# Miscellaneous: 50

How is spermatogenesis  
different from oogenesis?  
(definition + difference in the  
END RESULT)



ANSWER

## Miscellaneous: 50 - Answer

Spermatogenesis (production of sperm) produces 4 functional haploid sperm cells at the end of meiosis,

Oogenesis (production of eggs) produces 1 functional haploid egg cell and 3 haploid polar bodies that later disintegrate.