

01 / LEARN THE METHOD

Chromosome and DNA Counting

Mitosis and meiosis worked practice

For introductory biology. Count the requested cell or nucleus at the stated stage before doing any arithmetic. This independent worksheet is not an official school handout.

Keep these distinctions clear

1. Count chromosomes by centromeres. Before sister separation, a replicated chromosome still counts as one chromosome but contains two DNA molecules.
2. One round of DNA replication precedes meiosis. Homologs separate in meiosis I; sister chromatids separate in meiosis II.
3. State the counting boundary: whole cell, one pole, or one completed daughter cell. At mitotic anaphase the whole-cell chromosome count rises temporarily when sisters separate.
4. Here, one chromatid corresponds to one double-stranded DNA molecule. Ignore organelle DNA. Counts refer to a typical diploid organism without segregation errors.

Worked example: an organism with $2n = 10$

G1: 10 chromosomes and 10 DNA molecules per cell.

After S phase / G2: 10 chromosomes and 20 DNA molecules. DNA doubled; chromosome count did not.

After meiosis I and cytokinesis: each daughter has 5 chromosomes and 10 DNA molecules.

After meiosis II and cytokinesis: each daughter has 5 chromosomes and 5 DNA molecules.

02 / TRY IT WITHOUT THE KEY

Practice set

Write the reasoning, not only the answer.

1. A diploid organism has $2n = 6$. How many chromosomes and DNA molecules are present in one G1 cell?
2. For the same organism, count chromosomes, DNA molecules, and homologous pairs at metaphase I.
3. For $2n = 6$, count chromosomes and DNA molecules in one completed meiosis-I daughter cell.
4. For $2n = 6$, count chromosomes and DNA molecules in one completed meiosis-II daughter cell.
5. A $2n = 8$ cell reaches mitotic anaphase, before cytokinesis. Count chromosomes in the whole cell and at one pole.
6. A $2n = 6$ meiosis-II cell reaches anaphase II. Count chromosomes in that whole dividing cell and in one eventual daughter.
7. A learner says a $2n = 12$ cell becomes $4n$ after S phase because it has 24 DNA molecules. Explain the error.
8. An organism has $n = 7$. Give chromosome and DNA-molecule counts for a G2 somatic cell and a mature meiotic product.

03 / CHECK AND CORRECT

Answers with reasoning

1. 6 chromosomes; 6 DNA molecules. No replication has occurred in this G1 cell.
2. 6 chromosomes; 12 DNA molecules; 3 homologous pairs. Sister chromatids do not count as separate chromosomes yet.
3. 3 chromosomes; 6 DNA molecules per daughter. Homologs separated, but sisters remain paired.
4. 3 chromosomes; 3 DNA molecules per daughter. Sister separation completed the second division.
5. 16 chromosomes in the whole anaphase cell; 8 at each pole. After cytokinesis each daughter has 8.
6. 6 chromosomes in that anaphase-II cell; 3 in each eventual daughter. Count separated sisters individually.
7. Ploidy counts chromosome sets, not DNA amount. The cell remains diploid: 12 replicated chromosomes with 24 DNA molecules.
8. G2 somatic cell: 14 chromosomes and 28 DNA molecules. Meiotic product: 7 chromosomes and 7 DNA molecules.

Reference reading

[OpenStax Biology 2e, The Cell Cycle](#)

[OpenStax Biology 2e, The Process of Meiosis](#)

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