

Solutions

2.1 A Distinguish homologous chromosomes from sister chromatids, and chromosome number from DNA quantity. Replication before meiosis copies DNA without doubling the number of chromosome sets. Crossing over and independent assortment contribute to genetic variation, while random fertilization further changes combinations. These processes do not make every offspring genetically distinct under every conceivable condition.

2.2 Gametes are haploid: $n=20/2=10$ chromosomes.

2.3 False. A gamete is not made by halving the size of an ordinary cell. Independent assortment counts assume distinct homologous alternatives and do not include crossing-over outcomes. Human and plant reproduction cannot be fully replaced by a monohybrid Punnett grid.

2.4 haploid. haploid means Having one chromosome set in the stated life cycle.

3.1 Four pairs give $2^4=16$ combinations under independent assortment. Phenotype probabilities also need loci, dominance and linkage information; combinations are not phenotype categories.