

1. In mice, black fur ( $B$ ) is dominant to brown fur ( $b$ ) and a short tail ( $T$ ) is dominant to a long tail ( $t$ ). Two mice with the genotype  $BbTt$  have two separate litters of offspring together.

Of the data sets shown below, which data set shows the **most likely** outcome for the two litters?

(A) **Phenotypes of Offspring**

Phenotype	Litter 1	Litter 2
Black fur, short tail	5	4
Brown fur, short tail	5	4
Black fur, long tail	5	5
Brown fur, long tail	6	4

(B) **Phenotypes of Offspring**

Phenotype	Litter 1	Litter 2
Black fur, short tail	18	9
Brown fur, short tail	6	3
Black fur, long tail	6	3
Brown fur, long tail	2	1

(C) **Phenotypes of Offspring**

Phenotype	Litter 1	Litter 2
Black fur, short tail	10	9
Brown fur, short tail	3	3
Black fur, long tail	3	4
Brown fur, long tail	1	0

(D) **Phenotypes of Offspring**

Phenotype	Litter 1	Litter 2
Black fur, short tail	9	9
Brown fur, short tail	3	3
Black fur, long tail	3	3
Brown fur, long tail	1	1

2. Leaf color in a particular plant is controlled by the gene locus  $F$ . Plants with at least one  $F$  allele have dark green leaves, and plants with the homozygous recessive genotype have light green leaves. A plant with dark leaves and the  $FF$  genotype is crossed with a plant with light leaves, and the  $F_1$  offspring are allowed to self-pollinate.

Which of these describes the possible allele combinations for the  $F_1$  and  $F_2$  generations and the expected percentages for each?

- (A)  $F_1$  ratio: 50%  $FF$ , 50%  $ff$   
 $F_2$  ratio: 100%  $Ff$
- (B)  $F_1$  ratio: 50%  $FF$ , 50%  $ff$   
 $F_2$  ratio: 25%  $FF$ , 50%  $Ff$ , 25%  $ff$
- (C)  $F_1$  ratio: 100%  $Ff$   
 $F_2$  ratio: 25%  $FF$ , 50%  $Ff$ , 25%  $ff$
- (D)  $F_1$  ratio: 100%  $Ff$   
 $F_2$  ratio: 50%  $FF$ , 50%  $ff$
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3. In cattle, roan coat color (mixed red and white hairs) occurs in heterozygous offspring of a cross between red homozygous and white homozygous parents. The table below describes the phenotypes of the calves (offspring) of a bull (male) and a cow (female) that have been mated several times.

**Coat Color of Offspring  
from Parent Cross**

	Red calves	Roan calves	White calves
F <sub>1</sub>	1	2	1

Which cross describes the **most likely** phenotypes of the bull and the cow?

- (A) red × roan
- (B) red × white
- (C) roan × white
- (D) roan × roan
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4. A couple has three boys and plans to have two more children. Assuming there are no external factors that might influence the gender of future offspring, what is the probability that the two additional children would also be boys?
- (A) 1/32
- (B) 1/8
- (C) 1/4
- (D) 1/2
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5. In radishes, flower color and root shape are determined by single loci alleles that are found on different chromosomes. Radish flowers may be red, purple, or white. A cross between a red-flowered plant ( $RR$ ) and a white-flowered plant ( $WW$ ) yields purple offspring ( $RW$ ). The radish root may be long ( $L$ ) or short ( $l$ ), with long being the dominant phenotype.

The data below show the phenotypes of the offspring produced in the  $F_1$  generation. Which table shows the possible offspring for a cross between  $RRLl$  and  $RWll$  parents?

(A)

Offspring Phenotype	Number
Purple, long	9
Purple, short	2
Red, long	0
Red, short	0
White, long	1
White, short	2

(B)

Offspring Phenotype	Number
Purple, long	6
Purple, short	0
Red, long	3
Red, short	1
White, long	4
White, short	0

(C)

Offspring Phenotype	Number
Purple, long	0
Purple, short	12
Red, long	0
Red, short	0
White, long	0
White, short	0

(D)

Offspring Phenotype	Number
Purple, long	9
Purple, short	0
Red, long	6
Red, short	0
White, long	6
White, short	0