

Punnett Squares Enrichment

- 1) Complete the Punnett Squares with the following crosses. Make sure to write in the parent genotype on the top and left side of the boxes.

a. aa x aa

| | |
|----|----|
| aa | aa |
| aa | aa |

b. TT x TT

| | |
|----|----|
| TT | TT |
| TT | TT |

c. Tt x tt

| | |
|----|----|
| Tt | Tt |
| Tt | Tt |

d. Rr x rr

| | |
|----|----|
| Rr | Rr |
| rr | rr |

e. Bb x Bb

| | |
|----|----|
| BB | Bb |
| Bb | bb |

- 2) List all of the genotypes of the offspring from the above crosses? (Hint: List only the letters. Example: Rr, rr, RR, etc... There should be four answers for each cross.)

a. aa, aa, aa, aa

b. TT, TT, TT, TT

c. Tt, Tt, Tt, Tt

d. Rr, Rr, rr, rr

e. BB, Bb, Bb, bb

- 3) Describe the genotypes above by using the words: Pure Dominant, Pure Recessive or Heterozygous. Also, indicate how many of each kind of genotype there are in the cross. (Example: 2 Pure Dominant and 2 Pure Recessive.)

a. 4 (100%) Homozygous Recessive

b. 4 (100%) Homozygous Dominant

c. 4 (100%) Heterozygous

d. 2 (50%) Heterozygous, 2 (50%) Homozygous Recessive

e. 1 (25%) Homozygous Dominant, 2 (50%) Heterozygous, 1 (25%) Homozygous Recessive

Answer the following questions and make sure to read the directions.

- 4) When crossing two parents that are pure homozygous, what are the genotypes of the offspring? Explain by using complete sentences.

All offspring would have the same genotype as the parents because both parents can only give one type of allele. If homozygous dominant, they can give only the dominant allele. If homozygous recessive, they can give only the recessive allele.

- 5) When crossing one heterozygous parent with a pure recessive parent, what are the chances of having an offspring that is pure recessive? Answer the question with a complete sentence and show the Punnett Square.

50% chance of having an offspring that is homozygous recessive. See example D above.

- 6) When crossing two heterozygous parents, how many different genotypes are possible for the offspring? Answer the question with a complete sentence and show the Punnett Square.

All 3 different genotypes are possible for the offspring. Homozygous Dominant, Heterozygous, Homozygous Recessive. See example E from the front page.

- 7) From the question above, what are the chances of getting an offspring that is:
(Write the percentage. Example: 25%.)
- a. Pure Dominant: 25%
 - b. Heterozygous: 50%
 - c. Pure Recessive: 25%
- 8) You are a botanist working with rose bushes. Recently you crossed two red rose bushes to try to determine their genotype. Upon examining the 26 offspring, you observe the following: 19 plants have red roses and 7 have white roses. What are the genotypes of the parents? Explain your answer using a complete sentence and show the Punnett Square.

19 out of 26 is 73% which is closer to 75% than 50%. This cross appears to be a heterozygous cross based on the actual or observed results. See example E from the front page.

- 9) What are the dominant and recessive phenotypes of the cross above?

Dominant: Red Roses

Recessive: White Roses

- 10) What are the genotypes of the red roses?

Red: Homozygous Dominant and Heterozygous

- 11) What are the genotypes of the white roses?

White: Homozygous Recessive

- 12) Pure red rose bushes are very valuable because their offspring are always red. If you had only these 28 plants (26 offspring and 2 parents), how could you isolate the plants that were pure dominant for red roses? (Hint: You have to cross one of the offspring that has red roses with a plant that has a known genotype, then analyze the new offspring from that cross. Do you have any plants that you know the genotype?)

The only known genotype of the roses would be the white flowered plants because the only way to show the recessive phenotype is to be homozygous recessive. With this in mind, cross a white rose bush by a red rose bush and analyze the results. If 50% of the offspring come out white, then you have a heterozygous red plant (see example D above). If you get all red offspring, then the original red parent plant must be homozygous dominant (see example C above).