

Stats and Probability

1. There are 200 students in a class with 75 of them being girls. Fifty of all students are blonde and the rest red haired or brunettes. What is the chance that you will meet at random a non-blond student in this class?
 - a. 0.250
 - b. 0.375
 - c. 0.600
 - d. 0.750
 - e. None of the alternatives A-D is correct

2. Assuming a 1:1 sex ratio, what is the probability that a family will have a boy after they have had four girls?
 - a. $1/32$
 - b. $1/16$
 - c. $3/16$
 - d. $1/4$
 - e. $1/2$

3. Purple anthocyanin pigment in tomato stems is governed by a dominant allele, A , and its recessive allele, a , produces green stem. Hairy stem is governed by a dominant allele, H , and a hairless stem by its recessive allele, h . A double heterozygous plant $AaHh$ is self-fertilized:

What is the probability of obtaining a green, hairy stemmed plant?

 - a. $1/16$
 - b. $3/16$
 - c. $4/16$
 - d. $8/16$
 - e. $9/16$

4. Roger has blood type AB. His genotype is AB. His girlfriend, Mary, has blood type A. Her genotype is AI. They plan to marry and have at least four children. (Note: AO or AA has a phenotype A; BO or BB has a phenotype B; AB has a phenotype AB). What is the probability that their child will be either a boy with "A" blood or a girl with "B" blood?
 - a. 0.50
 - b. 0.25
 - c. 0.375
 - d. 0.125
 - e. None of the alternatives A-D is correct.

5. In humans, there are blood types M, MN, and N. In a series of matings of MN types together there were 51 M, 47 N, and 102 MN blood types found. (Note: *M* genotype = M phenotype; *N* genotype = N phenotype.)

If a 1:2:1 ratio is assumed, what is the probability of a couple with MN genotypes obtaining either an M or an N child?

- a. $1/8$
 - b. $1/4$
 - c. $1/2$
 - d. $3/4$
 - e. 1
6. Suppose there are six individuals seated in a row. In how many ways would these individuals be arranged in the row?
- a. 6
 - b. 36
 - c. 216
 - d. 720
 - e. 45,656
7. A couple plan to have 8 children. How many permutations are there in a combination of five girls and three boys?

The following refers to the next two questions.

Two parents are each heterozygous for a recessive allele which when homozygous causes feeble-mindedness.

8. What is the probability that, if they have four children, three will be normal and one feeble-minded?
- a. $3(3/4)^3 (1/4)$
 - b. $3(3/4) (1/4)^3$
 - c. $4(3/4)^3 (1/4)$
 - d. $4(3/4) (1/4)$
 - e. None of the alternatives A-D is correct
9. What is the probability that in four children, two will be feeble-minded girls?
- a. $1/32$
 - b. $4/64$
 - c. $8/64$
 - d. $294/4096$
 - e. $1/4$

10. It is assumed that coat colors in cattle are the result of a gene whose alleles are *R* red, *r* white, and *Rr* roan. A roan bull is mated with several roan cows. What is the probability that of five calves, three will be red?
- $(1/4)^3 (3/4)^2$
 - $(1/4)^2 (1/2)$
 - $10(1/4)^2 (3/4)^3$
 - $10(1/4)^3 (3/4)^2$
 - None of the alternatives A-D is correct

The diagram below refers to the next question.

	O	E	O-E	(O-E) ²	(O-E) ² /E
Brown	21	25	-4	16	0.64
Spotted	48	50	-2	4	0.08
Tan	31	25	6	36	1.44

11. Choose the probability for the calculated chi-square.
- Between 0.30 and 0.50.
 - Between 0.50 and 0.70
 - Between 0.20 and 0.30
 - Less than 0.05
 - More than 0.95
12. In humans there are blood types M, MN, and N. In a series of matings of MN types together there were 51 M, 47 N and 102 MN blood types found in the children. (Note: MM genotype = M phenotype, NN genotype = N phenotype.)

What is the probability of the data as interpreted from the chi-square analysis?

- Between 0.30 and 0.50
 - Between 0.50 and 0.70
 - Between 0.80 and 0.90
 - Between 0.90 and 0.95
 - More than 0.95
13. In matings of roan cattle, there are 200 roan, 90 red, and 110 white progeny. These results are to be tested by a chi-square analysis. Choose the hypothesis from which we deduce phenotypes and ratios that conform most closely to those implied in this problem.
- Red is dominant to white
 - Roan is dominant to both white and red
 - White is recessive to both red and roan
 - Red and white are incompletely dominant
 - White is dominant to red

14. Determine the degrees of freedom when testing the ratios 9:3:4. _____
15. In the garden pea, yellow cotyledon color is dominant to green, and inflated pod shape is dominant to constricted form. When both traits were involved in self-fertilized hybrids the progeny were: 193 green inflated; 184 yellow, constricted; 556 yellow, inflated; 61 green constricted. Test the data for two independent pairs of alleles giving the probability of the chi-square result and determine whether you would accept or reject the hypothesis.
16. Pure black rats, when test crossed to albinos, produced black F1 offspring. The F2 consisted of 43 black, 14 cream and 22 albinos. Propose a genetic hypothesis for these results in the F2, calculate the chi-square, determine the probability of the deviation, and determine whether you would accept or reject your hypothesis.