

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: MM genotype = M phenotype; NN 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 plans 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?
- a. $(1/4)^3 (3/4)^2$
 - b. $(1/4)^2 (1/2)$
 - c. $10(1/4)^2 (3/4)^3$
 - d. $10(1/4)^3 (3/4)^2$
 - e. 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
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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 dominate 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 F_1 offspring. The F_2 consisted of 43 black, 14 cream and 22 albinos. Propose a genetic hypothesis for these results in the F_2 , calculate the chi-square, determine the probability of the deviation, and determine whether you would accept or reject your hypothesis.