

1 Chance variation

Purpose

To model the variation in potential offspring.

Materials

- die
- 20 cards about the size of playing cards
- marker pen
- the information in Table 1.3.1

Table 1.3.1

Each gene is on a different chromosome.		
Gene	Allele 1	Allele 2
1	Can roll tongue (T)	Cannot roll tongue (t)
2	Freckles (F)	No freckles (f)
3	Bent little finger (B)	Straight little finger (b)
4	Broad lips (L)	Thin lips (l)
5	Dimples (D)	No dimples (d)
	Evens	Odds

Procedure

- 1 Use the information in Table 1.3.1 to make two identical sets of cards. Each card represents an allele on one of the five pairs of homologous chromosomes. For example, there should be two cards saying 'Can roll tongue (T)', two saying 'Cannot roll tongue (t)'. Follow this model until there are two cards for every allele. You will have 20 cards.
- 2 The 20 cards represent five pairs of chromosomes from two individuals. Each pair of cards represents a gene for a characteristic and there are two alleles for each gene. Divide the cards into two sets of five pairs. These are the parents— P_1 and P_2 . They are both heterozygous for each of the alleles.
- 3 Copy Table 1.3.2 into your workbook and record the genotype and phenotype for each parent. Look carefully at the symbols used for the alleles to identify the type of inheritance.

Table 1.3.2

Gene	Parent 1		Parent 2	
	Genotype	Phenotype	Genotype	Phenotype
1				
2				
3				
4				
5				

- 4 Now create the gametes. Start with gene 1 for parent 1. Toss the die. If an even number is tossed, then select the 'Can roll tongue' card from the evens list in Table 1.3.1. If an odd number is tossed, then select the 'Cannot roll tongue' card from the odds list in Table 1.3.1. Continue in this way until one allele for each gene has been selected for the P_1 gamete. Place the cards for the gamete to one side. They will be used in step 6.
- 5 Create the P_2 gamete by repeating step 4 with the other set of cards.
- 6 Take the two gametes you have created and arrange the cards into the pairs. They represent the genotype of the first zygote. Copy Table 1.3.3 into your notebook and record the genotype and phenotype of this zygote.
- 7 Sort the cards back into the original piles for P_1 and P_2 and repeat the process of creating gametes and a zygote four more times.

Results

Copy and complete Table 1.3.3 by recording the genotype and phenotype of the zygote.

Table 1.3.3

Gene	Zygote 1		Zygote 2		Zygote 3		Zygote 4		Zygote 5	
	Genotype	Phenotype	Genotype	Phenotype	Genotype	Phenotype	Genotype	Phenotype	Genotype	Phenotype
1										
2										
3										
4										
5										

Discussion

- 1 **Compare** the zygotes you created.
- 2 **Explain** why the zygotes were different when the genotypes of the parents were identical.
- 3 In this model, you were looking at only five genes. **Predict** the amount of variation that would result if twice as many genes were modelled.
- 4 Each chromosome in your body carries more than one gene. **Deduce** how that would affect variability in offspring.