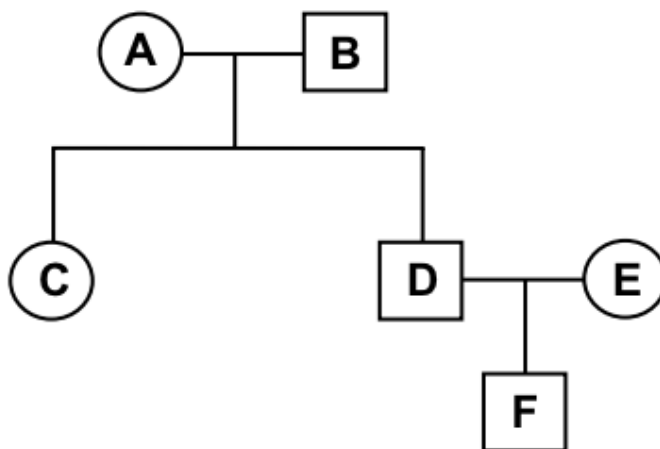




Inheritance

2009

- 1 Individual A in the family pedigree below is homozygous dominant and individual B is homozygous recessive for a particular feature.



What is the percentage probability that individual F is homozygous recessive if:

|   | i) E is homozygous recessive | ii) E is heterozygous |
|---|------------------------------|-----------------------|
| A | 50                           | 0                     |
| B | 25                           | 50                    |
| C | 50                           | 25                    |
| D | 25                           | 0                     |
| E | 0                            | 25                    |



## Inheritance

- 9 The data below considers the risk of having a cancer in the neck region due to drinking alcohol and one genetic factor (presence of a mutant allele for the CYP1A1 gene). A risk value of 1.0 is the mean average risk in the human population.

| Alcohol intake | Number of mutant CYP1A1 alleles present | Risk value |
|----------------|---|------------|
| Light drinker  | 0                                       | 1.0        |
|                | 1                                       | 1.5        |
|                | 2                                       | 1.8        |
| Heavy drinker  | 0                                       | 4.0        |
|                | 1                                       | 4.5        |
|                | 2                                       | 6.0        |

Using only the data from the table, which of the following tentative conclusions about the risk of having a cancer of the neck, is **not** correct?

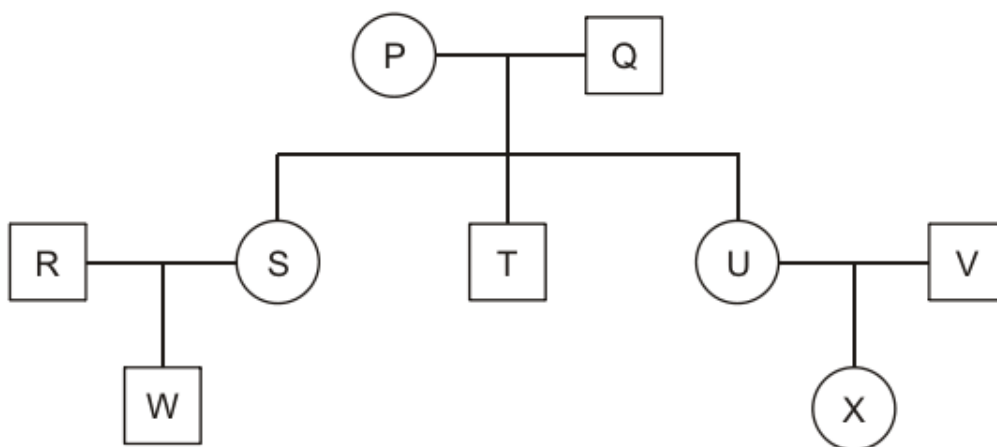
- A Overall, the presence of at least one mutant allele increases the risk.
- B Overall, there is a positive correlation between the risk and alcohol intake.
- C Heavy drinking is the main factor in increasing the risk.
- D The presence of at least one mutant allele is the main factor for increasing risk.
- E The presence of two mutant alleles increases the risk more for heavy drinkers than light drinkers.



Inheritance

2010

- 17 In the family tree shown below, both P and Q are carriers of a recessive allele which causes a condition. Only individuals R and X have the condition.



What is the percentage likelihood of S, T and U each being a carrier?

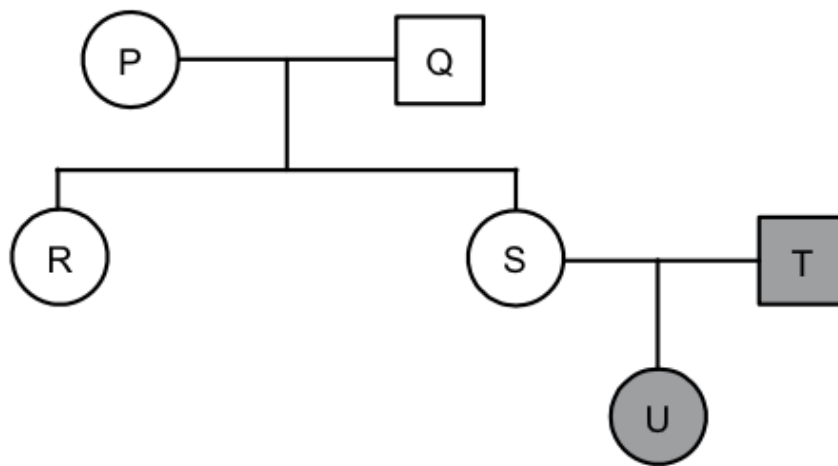
|   | Percentage likelihood of being a carrier |     |     |
|---|--|-----|-----|
|   | S  | T   | U   |
| A | 25                                       | 25  | 50  |
| B | 25                                       | 25  | 100 |
| C | 25                                       | 50  | 100 |
| D | 50                                       | 50  | 50  |
| E | 50                                       | 50  | 100 |
| F | 100                                      | 50  | 50  |
| G | 100                                      | 100 | 50  |



Inheritance

2011

- 17 The genetic condition represented by the shading is caused by the presence of at least one allele for the condition.



Which of the following are possible reasons why **U** has the condition?

- 1 The condition is dominant.
  - 2 The sperm from **T** carried the allele for the condition.
  - 3 A mutation present in a egg of **S**.
- A** 1 and 2 only
- B** 1 and 3 only
- C** 2 and 3 only
- D** 1, 2 and 3
- E** None of the above



## Inheritance

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# 2012

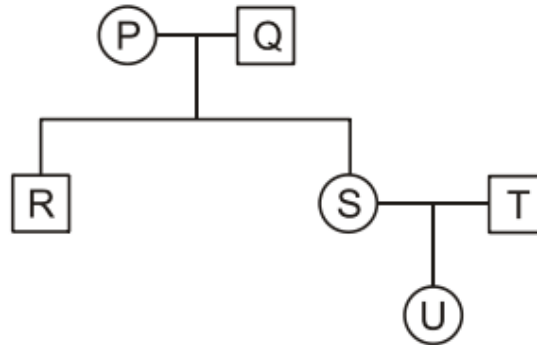
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- 21 In a monohybrid genetic cross a ratio of phenotypes of 3:0 rather than the usual 3:1 ratio was seen. This could be due to:
- 1 offspring with both dominant alleles not surviving.
  - 2 only a small number of offspring being produced.
  - 3 chance.
- A 1 only
- B 2 only
- C 1 and 2 only
- D 2 and 3 only
- E 1, 2 and 3



Inheritance

- 25 What is the minimum number of people shown in the family pedigree who **must** be heterozygous for the two situations described in the table in the absence of any new mutations?



|   | Only U shows a recessive condition | Only R and U show a recessive condition |
|---|------------------------------------|---|
| A | 1                                  | 1                                       |
| B | 1                                  | 2                                       |
| C | 2                                  | 3                                       |
| D | 2                                  | 4                                       |
| E | 3                                  | 4                                       |
| F | 3                                  | 5                                       |
| G | 4                                  | 5                                       |



## Inheritance

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 2013
 

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- 25 Manx cats with two recessive alleles have a tail. Heterozygous Manx cats lack a tail. Individuals with both dominant alleles die before birth.

Which answer shows the percentage of Manx cats without tails in a population for the two crosses given in the table?

|          | Manx cat with a tail<br>crossed with a<br>Manx cat without a tail | Manx cat without a tail<br>crossed with a<br>Manx cat without a tail |
|----------|---|--|
| <b>A</b> | 25  | 0  |
| <b>B</b> | 50  | 75   |
| <b>C</b> | 50  | 67   |
| <b>D</b> | 50  | 50   |
| <b>E</b> | 67  | 25   |
| <b>F</b> | 67  | 33   |
| <b>G</b> | 0   | 75   |



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## Inheritance

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# 2014

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- 25 A woman has a recessive genetic condition but neither of her parents has the condition. Which one of the following could **not** be true?
- A Both her parents are heterozygous for this gene.
  - B One maternal grandparent and one paternal grandparent have the condition.
  - C One maternal grandparent and one paternal grandparent are heterozygous for this gene.
  - D All her grandparents were carriers of the recessive allele.
  - E Both parents are homozygous and a mutation occurred in the DNA of a gamete from one of her parents.

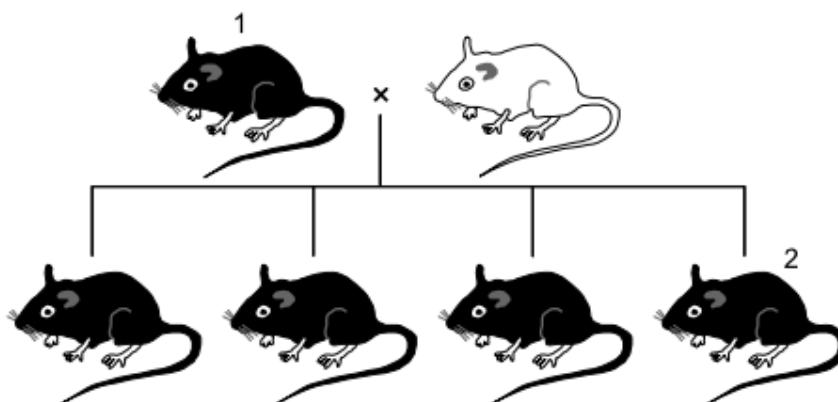




Inheritance

2015

- 9 The diagram shows the results of a breeding experiment using a homozygous black mouse and a white mouse.



Mouse 1 was then allowed to mate with mouse 2. Using C for the dominant allele for coat colour and c for the recessive allele, which answer below correctly identifies the details of their offspring?

|          | <i>Details of offspring when mouse 1 and mouse 2 are mated</i> |                     |                             |
|----------|--|---------------------|-----------------------------|
|          | <i>Percentage heterozygous (%)</i>                             | <i>Phenotype(s)</i> | <i>Genotype(s)</i>          |
| <b>A</b> | 100  | black only          | all Cc                      |
| <b>B</b> | 100  | black and white     | all heterozygous            |
| <b>C</b> | 75   | black only          | Cc and CC                   |
| <b>D</b> | 50   | black only          | homozygous and heterozygous |
| <b>E</b> | 50   | black and white     | CC, Cc and cc               |
| <b>F</b> | 50   | black and white     | homozygous and heterozygous |
| <b>G</b> | 0  | black only          | all homozygous              |



## Inheritance

- 25** The sex of a species of fruit fly is determined by the number of X chromosomes relative to the number of non-sex chromosomes (A) in a cell. This is called the X:A ratio.

A fruit fly will be male if X:A = 0.5:1 and female if X:A = 1:1.

The Y chromosome contains genes necessary for making sperm.

Which row of the table correctly shows the sex of the five fruit flies with different numbers of these chromosomes?

|          | XAA    | XYAA   | XXAA   | XXYAA  | XXYYAA |
|----------|--------|--------|--------|--------|--------|
| <b>A</b> | female | female | female | male   | male   |
| <b>B</b> | female | female | male   | male   | male   |
| <b>C</b> | female | male   | female | male   | female |
| <b>D</b> | female | male   | female | male   | male   |
| <b>E</b> | male   | female | male   | female | female |
| <b>F</b> | male   | female | male   | female | male   |
| <b>G</b> | male   | male   | female | female | female |
| <b>H</b> | male   | male   | female | female | male   |



## Inheritance

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# 2016

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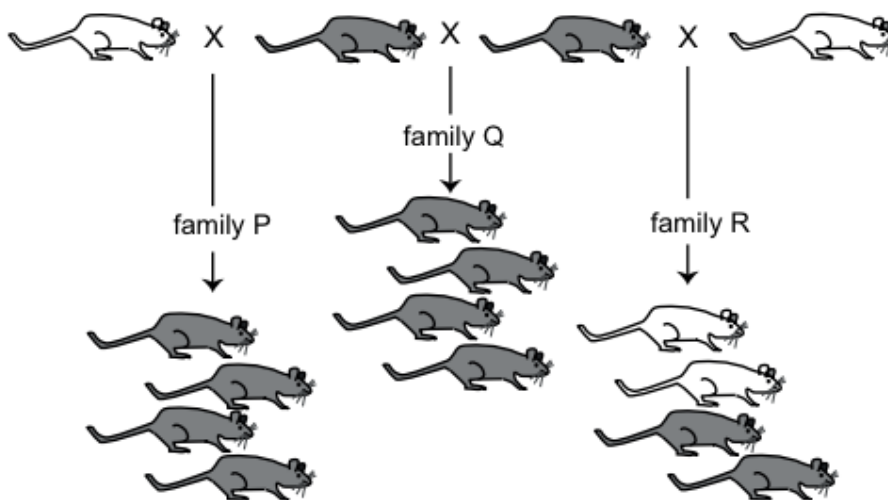
- 17 Which of the following statements could describe the result of a single mutation of a gene coding for a protease enzyme in a fertilised human egg cell?
- 1 A new allele is formed coding for a protease enzyme that works more efficiently.
  - 2 A new allele is formed coding for a protease enzyme that works less efficiently.
  - 3 A new allele is formed coding for a non-functional protein that has no effect on the cell.
  - 4 A new allele is formed coding for a non-functional protein that has a negative effect on the cell.
- A 1 only
- B 2 only
- C 1 and 2 only
- D 3 and 4 only
- E 1, 2 and 3 only
- F 1, 2 and 4 only
- G 1, 2, 3 and 4



Inheritance

25 An experiment was carried out to investigate a gene for coat colour in mice.

The diagram shows the results of **three** crosses between different mice, producing three different families, P, Q and R.



What is the maximum possible number of heterozygous mice shown in the diagram?

- A 2
- B 3
- C 4
- D 5
- E 6
- F 7
- G 8
- H 12