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

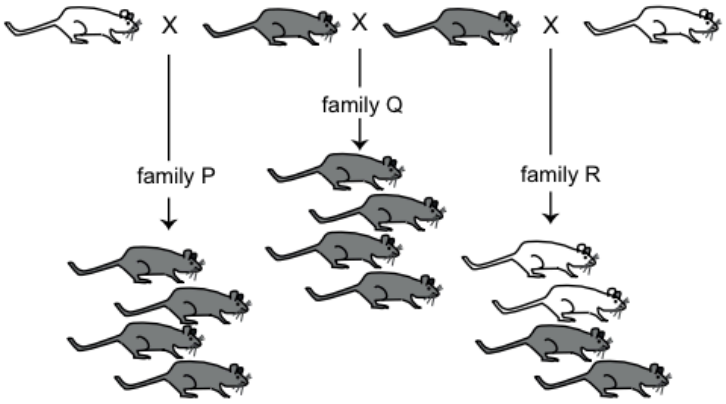
F 1, 2 and 4 only

G 1, 2, 3 and 4

2016

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

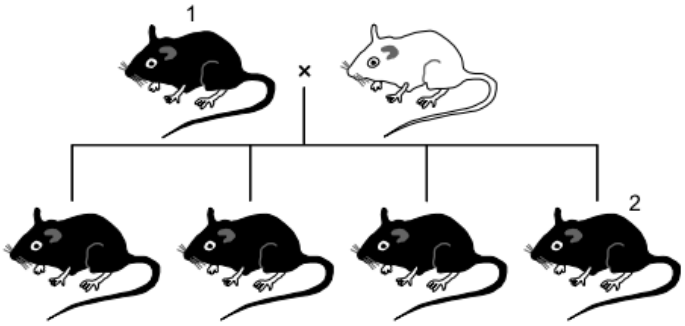
F 7

G 8

H 12

2016

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?

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

2015

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*
A	female	female	female	male	male
B	female	female	male	male	male
C	female	male	female	male	female
D	female	male	female	male	male
E	male	female	male	female	female
F	male	female	male	female	male
G	male	male	female	female	female
H	male	male	female	female	male

2015

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.

2014

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 crossed with a Manx cat without a tail	**Manx cat without a tail crossed with a Manx cat without a tail**
A	25	0
B	50	75
C	50	67
D	50	50
E	67	25
F	67	33
G	0	75

2013

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

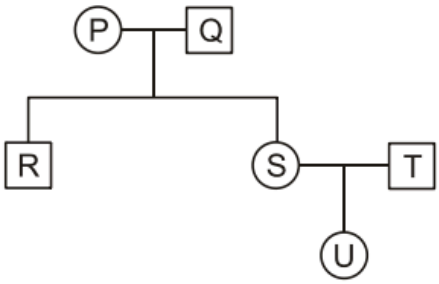
C 1 and 2 only

D 2 and 3 only

E 1, 2 and 3

2012

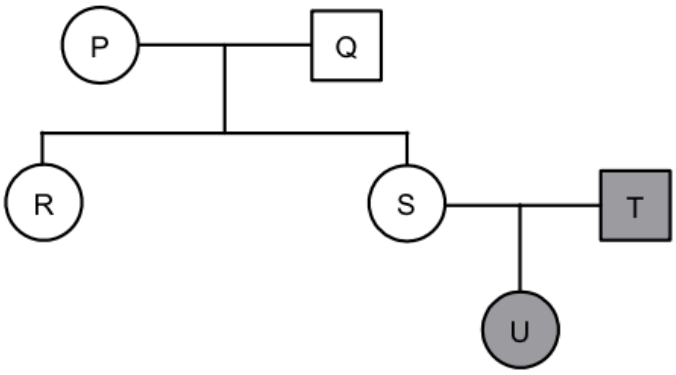
25 What is the minimum number of people shown in the family pedigree who **must** be heterozygous for the two situations described in the table in the absence of any new mutations?



	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

2012

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

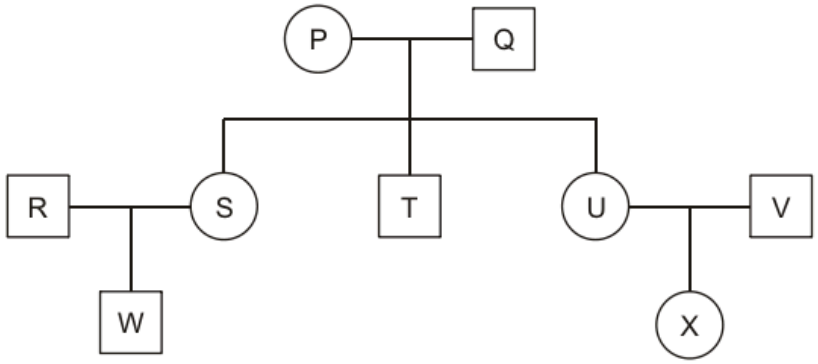
C 2 and 3 only

D 1, 2 and 3

E None of the above

2011

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.

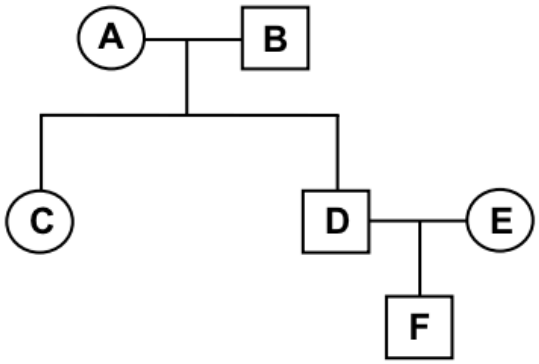


What is the percentage likelihood of S, T and U each being a carrier?

	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

2010

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

2009

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.

2009