Quiz 4: Probabilities, Pedigrees

Due Feb 5 at 11:59pm **Points** 11 **Questions** 11
Available until Feb 6 at 2pm **Time Limit** 60 Minutes
Allowed Attempts 2

Instructions

This quiz on probabilities and pedigrees.

You have 2 attempts for this quiz, and 60 minutes to complete the quiz.

This quiz is based on the **Targeted Readings for Unit 1 (Chapter 14 ($CANVAS_COURSE_REFERENCE$/file_ref/g2f41d56bbfe4a3624fce3a6461b46af8?wrap=1)**  **($CANVAS_COURSE_REFERENCE$/file_ref/g2f41d56bbfe4a3624fce3a6461b46af8?wrap=1)**).

This quiz is due on Sunday, February 5 at 11:59 pm

($CANVAS_COURSE_REFERENCE$/file_ref/g1eac163bbc53837d8e007155fac36c21/download?wrap=1)

Take the Quiz Again

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	41 minutes	11 out of 11

Score for this attempt: **11** out of 11
Submitted Feb 2 at 5:06pm
This attempt took 41 minutes.

Question 1 — 1 / 1 pts

A male and female decide they will have children. The female finds out that she is a carrier for an X-linked recessive condition. The father does not display the phenotype of the condition, but he has not been genotyped. Assuming the couple has a daughter, what are the odds she will be affected?

Correct!

- (●) It is impossible.
- ( ) 50% chance of having an affected daughter.
- ( ) 25% chance of having an affected daughter.
- ( ) 100% chance of having an affected daughter.

Correct! The father only has one X chromosome, which means that if he had the affected allele (i.e., on his X chromosome) he would have been affected. Therefore, the father must instead have one *unaffected* (i.e., dominant) allele on his X chromosome. All of his daughters need to have inherited this unaffected allele from him when they inherited his X chromosome (that's why they are female!). The condition is a recessive condition, which means an individual needs two copies of the affected allele in order to have the condition. Because all of the man's daughters can only possibly inherit a maximum of one affected allele (i.e., from their mother), all of them will be unaffected.

Question 2

1 / 1 pts

A male and female decide they will have children. The female finds out that she is a carrier for an X-linked recessive condition. The father does not display the phenotype of the condition, but he has not been genotyped. Assuming the couple has a son, what are the odds he will be affected?

- ( ) it is impossible

Correct!

- (●) 50% chance of having an affected son.
- ( ) 25% chance of having an affected son.

100% chance of having an affected son.

Correct! The father will give all of his sons his Y chromosome (which doesn't have the affected allele, because the affected allele is on the X chromosome). The mother has one affected allele and one unaffected allele on her two X chromosomes (one of which she will give to her son).There is a 50% chance she gives her offspring (both sons and daughters) the affected allele, and 50% she gives them an unaffected allele.
Therefore, there is a 50% chance that any son she has will be affected.

Question 3

1 / 1 pts

What is the best way to approach solving a pedigree problem?

Look for patterns and assign a mode of inheritance based on the pattern.

Correct!

Form hypotheses and test them to see if the data in the pedigree supports your hypotheses (rule out modes of inheritance).

Guess.

Ask a friend.

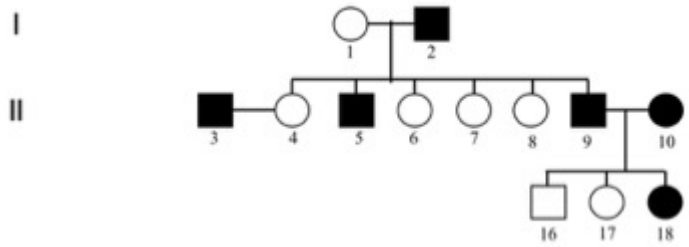
Look for patterns and assign genotypes.

Correct! The most efficient way to make sure your solution is correct is to FIRST start with a hypothesis (Note: this hypothesis could be based on a guess, or patterns you think you might see), and THEN test your hypothesis. If your hypothesis is correct, what would you expect? Does the information you are given match your predictions? No? Then go back and start with a new hypothesis.If you just answer a pedigree problem based on a pattern you think you see and don't double check that your answer makes sense, chances are you are making a mistake.

Question 4

1 / 1 pts

In the pedigree below, how is individual #1 related to individual #18?



- #1 is the maternal grandmother
- They are not related.

Correct!

- #1 is the paternal grandmother
- #1 is the paternal grandfather.

Correct! Squares = malesCircles = femalesPaternal = on the father's (male) side of the familyMaternal = on the mother's (female) side of the family

Question 5

1 / 1 pts

True or false: Individual #18 from Question 4's pedigree MUST be homozygous for the "affected" allele.

- True

Correct!

- False

Correct!

If individual 18 *is* homozygous for the affected allele, that means she had to have gotten one copy from each of her parents (i.e., both of her parents – individuals 9 and 10 – must each have at least one copy of the affected allele).

Now, if both of her parents were homozygous themselves, individual 18 would *have* to be homozygous herself (both of her parents had two copies of the infected allele --> they have to each pass an affected allele on to their daughter because there are no other options).

However, if both of her parents were homozygous, they would have each had to pass on an affected to all of their other children (individuals 16 and 17 as well). This would make all of their other children homozygous for the affected allele... which means all of their children would be affected (note: it doesn't matter whether an allele is recessive or dominant – in both cases, a homozyous individual would be affected by the trait associated with that allele).

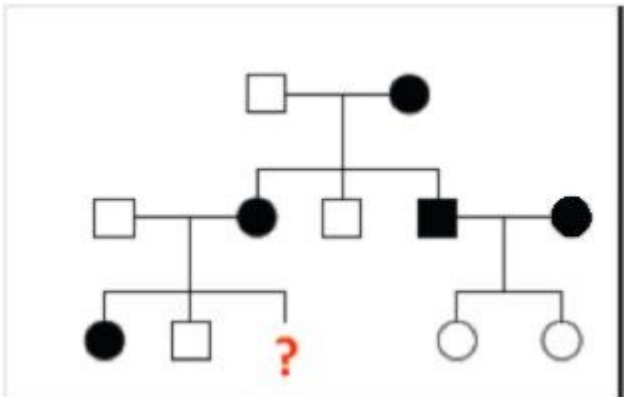
However, that is not the case: individuals 16 and 17 are not affected = they are not homozygous for the affected allele. They could be 1) heterozygous, or 2) homozygous for the non-affected allele... But it is not possible for them to be homozygous for the affected allele and not show the trait. That means that individuals 16 and 17 must each have inherited at least one non-affected allele. Both of them could have gotten a non-affected allele from their mom, or from their dad (or maybe individual 16 got it from his dad, and individual 17 got it from her mom...or vice versa) – we don't know for sure. We just know that at least one of their parents (again this is individual 9 and 10 we are talking about) must have at least one unaffected allele between the two of them. Therefore, we can not assume that both parents are homozygous.

Because we cannot assume that both parents (individuals 9 and 10) are homozygous, we also can't assume that their affected daughter, individual 18, is homozygous. She might be homozygous... But it is also possible that she only has one copy of the affected allele and her other allele is unaffected (given that at least one of her parents had an unaffected allele to give her). (Note: We *can* say for sure that the affected allele is not recessive... How do we know that?)

Question 6

1 / 1 pts

Examine the pedigree below. Determine the mode of inheritance and the probability that the child (?) will be affected. **Select the two correct answers.**



Correct!

- [x] Mode of inheritance: Dominant autosomal
- [ ] Mode of inheritance: Recessive autosomal
- [ ] Mode of inheritance: Dominant X-linked
- [ ] Mode of inheritance: Recessive X-linked
- [ ] Probability: 25%
- [ ] Probability: 100%

Correct!

- [x] Probability: 50%
- [ ] Probability: 0%
- [ ] We need more information to determine the probability

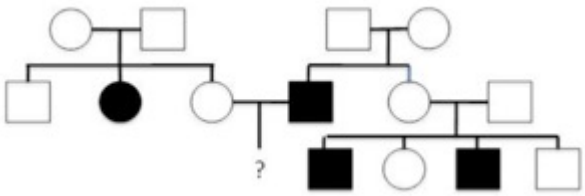
correct!

The mother of "?" is a heterozygote (...We know this, because she has a son that isn't affected. Because we've determined that the trait is autosomal dominant, her son must be homozygous for the non-affected allele, which means that the mother must have one non-affected allele and one non-affected allele = she is a heterozygote).That means that there is a 50:50 chance that the mother will pass on an affected allele to her unborn child (the other half of the time, she will pass on an unaffected allele).Try watching this helpful video on solving pedigrees: https://www.youtube.com/watch?v=HblHjsn5cHo (https://www.youtube.com/watch?v=HblHjsn5cHo)

Question 7

1 / 1 pts

Examine the pedigree below. The "?" represents a child that is yet to be born, and their phenotype is unknown.Determine the most likely mode of inheritance.



- Dominant autosomal
- **Correct!** Recessive autosomal
- Dominant X-linked
- Recessive X-linked

correct!

Watch this helpful video for tips on how to solve pedigrees: https://www.youtube.com/watch?v=HblHjsn5cHo (https://www.youtube.com/watch?v=HblHjsn5cHo)

Question 8

1 / 1 pts

Phenylketonuria is an inherited disease caused by a recessive autosomal allele. If a woman and her husband are both carriers, what is the probability that their first child will be a phenotypically normal girl?

- 1.0
- 1/16

Correct!

- 3/8

Probability of being "normal", i.e. not affected = 3/4

Probability of being a girl = 1/2

3/4*1/2 = 3/8

- 3/16
- 1/4

Question 9

1 / 1 pts

Red-green colour blindness is a sex-linked recessive trait. A colour blind woman gives birth to a normal daughter. The

paternity of this child is in question and the phenotypes of the two possible fathers are: Male A is colour blind. Male B is not. Who is likely the father of the child?

- Male A
- Male B

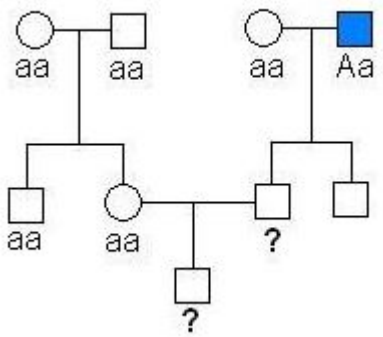
Correct!

- Impossible to say
- No answer text provided.

Question 10

1 / 1 pts

Huntington's disease is a late onset, lethal disease caused by a dominant allele. By the time the disease is evident (around 35-45), the affected individual may have passed on the allele to a child. A young couple (early 20s) has just had a baby boy, and finds out that one of child's grandfathers has developed Huntington's disease.
Given the pedigree below, what is the probability that the child's father has inherited the mutant allele?



rrect Answer

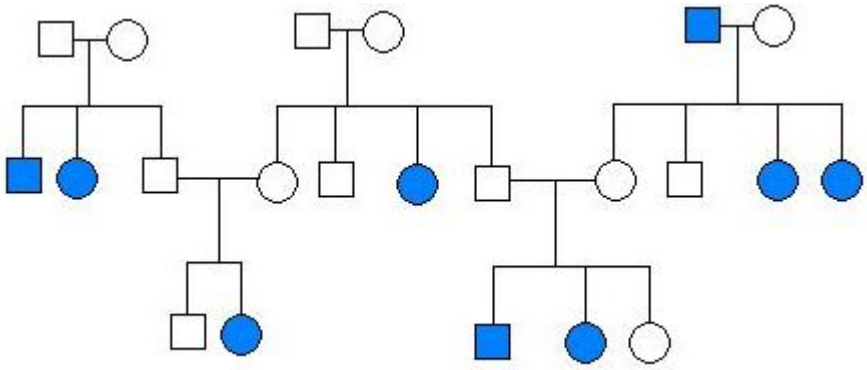
Correct!

- (●) 1/2
- ( ) 1/3
- ( ) 1/4
- ( ) 1/8

Question 11

1 / 1 pts

Given the following pedigree, would you say this inherited trait is caused by a recessive or dominant allele?



Correct!

- (●) Recessive
- ( ) Dominant
- ( ) No answer text provided.
- ( ) No answer text provided.

Quiz Score: **11** out of 11