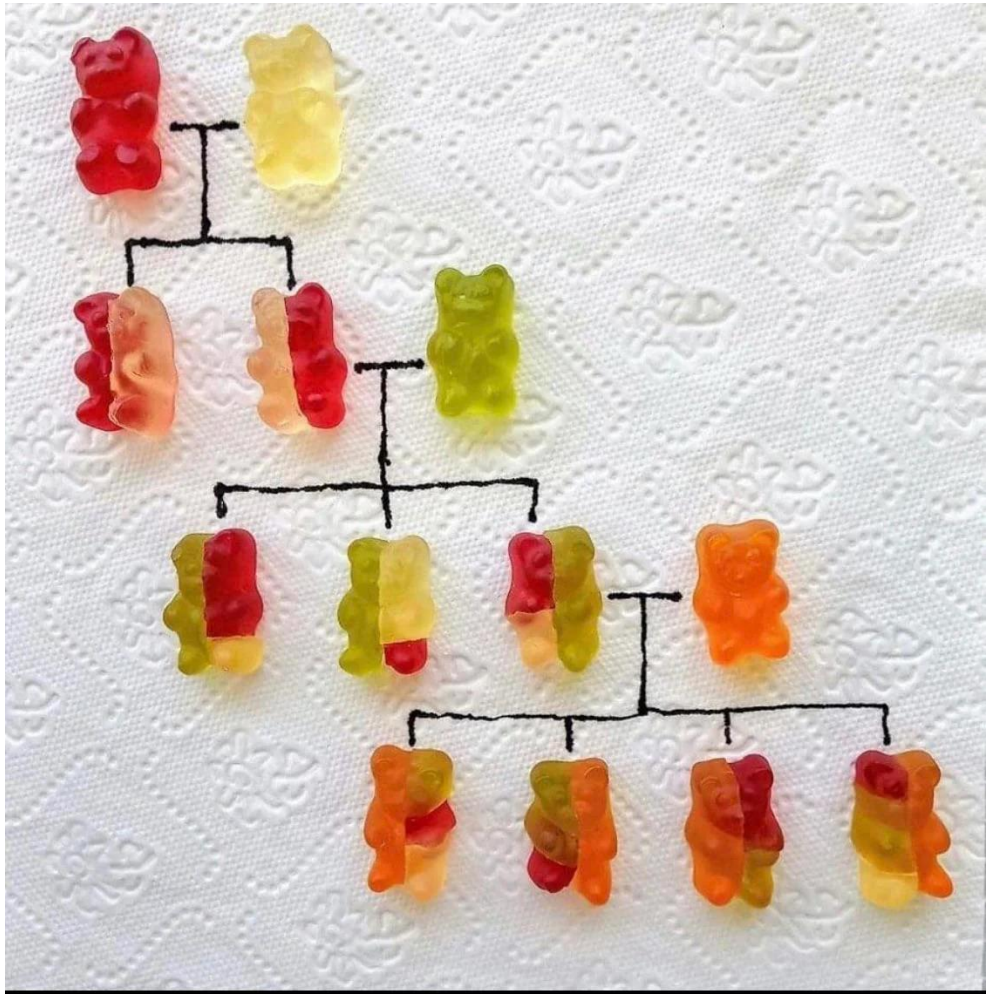
Can you see the snake in this picture?

If you are not familiar with pedigrees, please pick up the small handout – front and back of room

Today's class - Pedigrees

Be able to:

1. Read a pedigree
2. Use a pedigree to determine the most likely most of inheritance for a phenotype in a person.
3. Use a pedigree to calculate the probability of two parents having a child with a certain phenotype
4. List some of the assumptions that are being made when interpreting a pedigree



https://www.reddit.com/r/interestingasfuck/comments/jwburq/explaining_how_genetics_work_through_a_family/

UBC Disabilities United Collective Mentorship Program 2023

The purpose of the UBC Disabilities United Collective Mentorship Program is to provide support, advice, and networking opportunities to aid students who self-identify as having a disability(s) in their professional and personal development during their time at UBC.

Mentees will be matched with a mentor who is at a further stage of their academic or career journey (a senior undergraduate student [year 3+], graduate student, professor/ instructor, or UBC alum) who also identifies as having a disability.

Each mentee is matched to a mentor who will serve as a teacher, role model and resource to the mentee for the duration of the mentorship program.

Apply now to become a mentee until January 29, 2023 at 11:59 PM!

@ubcduc

ubcduc@gmail.com

www.ubcduc.ca

Scan the QR code for a link to the application form!

Next class (Tuesday) – Midterm #1 (20%)

Where: In this room (except students with special accommodation – who I assume are writing at Accessibility).

Exam start time ~11:10 am (-224) or ~5:10 pm (-221) - (this delayed start time only applies to students writing in this room).

Duration: 50 minutes

No lecture after midterm

Currently - 4 major questions, plus bonus question.

- Current total (not finalized) – 35 marks (1.5 minutes per mark)
- Combination of short answer, multiple choice, select all, fill in the blank, explanation, drawing questions
- Testable topics: see learning objectives link on Canvas home page:
  - Genes/Chromosomes
  - Cell Cycle & Mitosis
  - Meiosis
    - If genes are on different chromosomes, linked with and without crossing-over
    - Be able to work forward and backwards in Meiosis
  - Processes that produce variation in gamete genotypes and in offspring phenotypes/genotypes
  - Modes of Inheritance (5)
    - Genetic Crosses
    - Pedigrees
  - Probabilities, e.g. of two parents producing an offspring with certain phenotypes/genotypes, gametes with specific genotypes

Next class (Tuesday) – Midterm #1 (20%)

Bring:

- Pen or pencil
- Calculator (I will bring the few extra calculators that I have).
- Optional: 8.5” x 11” study sheet.
    - ALL content (text, figures, tables) must be in your handwriting.

Common reasons for lost marks

#1 **Misreading questions** – brain does weird things under stress

- not answering the question that was asked
  - so, try to read the question very carefully (consider underlining, highlight content)
  - be very clear on what question is asking you to do
  - identify any information that you may need to help you answer the question.

#2 **Time issues** (e.g. running out of time)

- Do not get bogged down in a question (i.e. book 1.5 marks per question).
- Start with the question that you feel most confident about.
- Do not brain dump (i.e. only include information relevant to answer; and if we ask for one point, do not provide two or more ☺. We won't cherry pick answers).

Common reasons for lost marks

#3 Incomplete explanations:

"I thought that was obvious, so I didn't write it down".

- Markers are not allowed to guess what you mean, or draw the necessary connections to make your answer complete. They are only allowed to mark what is written down by you.
- Perhaps pretend that you are writing answers for a fellow student (not an expert).
- Definitions (include genotypes if referring to individuals, e.g. do not just say heterozygote, homozygote or true-breeding)

"I did not add data from the question to my answer because you can see the data in the table."

- When grading, we only look at your answers (NOT at tables or figures).
  - SO <u>ANSWERS MUST STAND ALONE</u>
- If you are provided with numbers – please use them!
- If we provide you with several generations of data, use all of the evidence = more persuasive argument.
  - **Exception: e.g. disproving a mode of inheritance, e.g. on a pedigree you only need one impossible cross.**

To help you prepare…

Friday – Dr. Brett Couch is having a review session (some activities) in BIOL1000, 5-7 pm (bring questions too)

Saturday - Ruby & Christie will be having a review session (new questions) on Zoom, starting at 11 am.

- Use Office Hours Zoom like (on Canvas home page)
- Slides and link to recording will be posted

Sunday – I will be on Zoom (office hours link) from 4-6 pm

Monday – I will be on Zoom (office hours link) from 6 pm - midnight

Questions?

iClicker Question – related to last class

If a gene was sex-linked, specifically, the gene was located on the X-chromosome, and the male parent (P generation) carries the dominant allele and the female parent carries the recessive allele, in what generation would you see phenotypic differences in male and female offspring?

A. F1 generation
B. F2 generation
C. Neither generation
D. Not sure

Answer

If a gene was sex-linked, specifically, was located on the X-chromosome, and the male parent (P generation) carries the dominant allele and the female parent carries the recessive allele, in what generation would you see phenotypic differences in the phenotype of male and female offspring?

A. F1 generation
B. F2 generation
C. Neither generation
D. Not sure

	X^r
X^R	X^R/X^r
Y	X^rY

iClicker question

In an individual with an X and Y chromosome, do the X- and Y-chromosomes “pair up” during Meiosis I?

A. Yes
B. No
C. Not sure

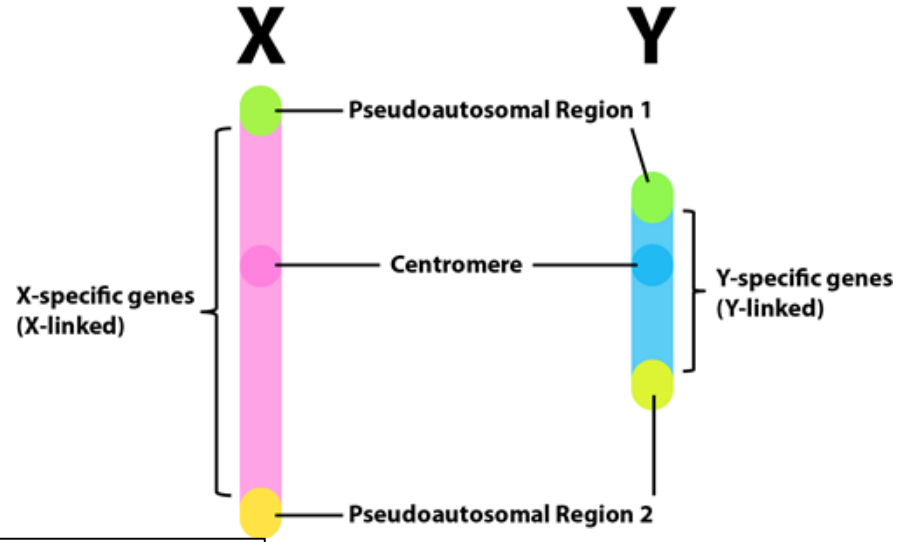
Answer

In an individual with an X and Y chromosome, do the X- and Y-chromosomes “pair up” during Meiosis I?

A. Yes

B. No

C. Not sure



https://opengenetics.pressbooks.tru.ca/chapter/pseudo-autosomal-regions-on-the-x-and-y-chromosomes/

Although the X and Y chromosome are morphologically different (e.g. X-chromosome is larger), they share common regions, called pseudoautosomal regions (not testable) at the tips of the chromosomes.

These common regions allow the X and Y chromosomes to pair up during prophase I.

Not testable – pseudoautosomal regions do contain the same genes; so, crossing-over and recombination of these genes can occur.

To clarify a question from a student

Question: Why do I recommend looking at the F1 females to determine relationship between alleles (if offspring phenotype is broken down by sex)?

Answer: If unsure about whether the gene is autosomal or X-linked, look at the F1 females because a female will carry two homologs regardless of whether the gene is autosomal or X-linked.

To clarify a question from a student…continued

Imagine a situation where long legs was dominant to short legs.

Mode of Inheritance	P generation	F1 genotype(s)	F1 phenotypes
Autosomal	GG x gg	Both sexes: Gg	All offspring (males and females) are hybrids and have long legs; both sexes will have the dominant phenotype
X-linked – male carrying dominant allele	X^g/X^g x X^G/Y	F1 females: X^G/Xg F1 males: X^g/Y	F1 females: hybrids – long legs (dominant phenotype) F1 males: short legs (recessive phenotype)
X-linked – female carrying dominant allele	X^G/X^G x X^g/Y	Females: X^G/X^g Males: X^G/Y	F1 females: hybrids - long legs (dominant phenotype) F1 males: long legs (dominant phenotype)

Hybrid F1 females will exhibit dominant phenotype, whether autosomal or X-linked

If gene is X-linked, F1 males may exhibit dominant or recessive phenotype.
- because they only carry one X-chromosome, they can display the recessive phenotype with only one recessive allele.

iClicker Question – Kiwis - Smooth Skin

Green kiwi fruit has a fuzzy brown skin and green fruit. In contrast, the golden kiwi has smooth brown skin and yellow fruit.

You are studying the mode of inheritance of fruit colour and skin phenotype in kiwis. The parents of the initial cross come from pure-breeding populations (Table 1). You then make a cross using the F1 offspring (Table 2)

Table 1	**Phenotypes**
P	Female: Green Fruit, fuzzy skin Male: Golden Fruit, smooth skin
F1	Females: 100% green fruit, fuzzy skin Males: 100% green fruit, fuzzy skin

Table 2	Green fruit, fuzzy skin	Green fruit, smooth skin	Golden fruit, fuzzy skin	Golden fruit, smooth skin
F2 Females	62	0	22	0
F2 Males	30	31	10	9

What is the most likely mode of inheritance for smooth skin in kiwis:

A. Autosomal dominant
B. Autosomal recessive
C. X-linked dominant
D. X-linked recessive
E. Not sure – please step us through process.

Answer

Green kiwi fruit has a fuzzy brown skin and green fruit. In contrast, the golden kiwi has smooth brown skin and yellow fruit.

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F2 Females	62	0	22	0
F2 Males	30	31	10	9

What evidence did you use to hypothesize that the allele for smooth skin is recessive to the allele for fuzzy skin in kiwis?

A. F1 data

B. F2 data

C. Not sure

Answer

Green kiwi fruit has a fuzzy brown skin and green fruit. In contrast, the golden kiwi has smooth brown skin and yellow fruit.

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F2 Females	62	0	22	0
F2 Males	30	31	10	9

What evidence did you use to hypothesize that the allele for smooth skin is recessive to the allele for fuzzy skin in kiwis?

A. F1 data

(females are heterozygotes – X^S/X^F; and all have fuzzy skin – so smooth skin must be recessive)

A. F2 data

B. Not sure

iClicker Question

Green kiwi fruit has a fuzzy brown skin and green fruit. In contrast, the golden kiwi has smooth brown skin and yellow fruit.

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F2 Females	62	0	22	0
F2 Males	30	31	10	9

What evidence did you use to determine that skin fuzziness is an X-linked trait?

A. F1 data

B. F2 data

C. Not sure

Answer

Green kiwi fruit has a fuzzy brown skin and green fruit. In contrast, the golden kiwi has smooth brown skin and yellow fruit.

You are studying the mode of inheritance of fruit colour and skin phenotype in kiwis. The parents of the initial cross come from pure-breeding populations (Table 1). You then make a cross using the F1 offspring (Table 2)

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F2 Females	62	0	22	0
F2 Males	30	31	10	9

What evidence did you use to determine that skin fuzziness is an X-linked trait?

A. F1 data

B. F2 data

- *Sex difference*
- *Males 1:1 fuzzy (40) to smooth (40)*
- *Females – all (84) fuzzy skin (0 smooth skin)*

A. Not sure

Kiwi Fruit – Fruit Colour

Green kiwi fruit has a fuzzy brown skin and green fruit. In contrast, the golden kiwi has smooth brown skin and yellow fruit.

You are studying the mode of inheritance of fruit colour and skin phenotype in kiwis. The parents of the initial cross come from pure-breeding populations (Table 1). You then make a cross using the F1 offspring (Table 2)

Table 1	**Phenotypes**
P	Female: Green Fruit, fuzzy skin Male: Golden Fruit, smooth skin
F1	Females: 100% green fruit, fuzzy skin Males: 100% green fruit, fuzzy skin

Using the information provided in the tables, assess the hypothesis that green fruit colour in kiwis is inherited through autosomal dominance.

Table 2	Green fruit, fuzzy skin	Green fruit, smooth skin	Golden fruit, fuzzy skin	Golden fruit, smooth skin
F2 Females	62	0	22	0
F2 Males	30	31	10	9

Define alleles and genotypes based on the assumption that the hypothesized mode of inheritance is true (green is autosomal dominant phenotype)

G - Green fruit
.g - Golden fruit

GG – Green fruit
Gg – Green fruit
.gg – Golden fruit

- No need to mentioned sex in definition of genotypes for an autosomal gene.

Predictions for genotype and phenotype frequencies of F1 & F2 generation, if hypothesis is true (green fruit colour is autosomal dominant)

Parents: Green kiwi fruit (GG) x Golden Kiwi Fruit (gg)

	G
g	Gg

Predict for F1 generation (if hypothesis is true) - All F1s are heterozygous (Gg) and have green fruit

Observed – As predicted, all F1 offspring have green fruit (can't quantify)

Table 1	Phenotypes
P	Female: Green Fruit, fuzzy skin Male: Golden Fruit, smooth skin
F1	Females: 100% green fruit, fuzzy skin Males: 100% green fruit, fuzzy skin

Prediction: F2 generation (if cross F1 plants - Gg x Gg)

	G	g
G	GG	Gg
g	Gg	gg

Predict - 3:1 phenotypic ratio of green fruit to golden fruit

Observed - As predicted – observed a 3:1 phenotypic ratio of green to golden fruit

Quantify:

All – Green: 62+ 30 + 31 = 123, Golden: 22 + 10 + 9 = 41 (~3:1)

Females only: 62 green, 22 golden (~3:1)

Males only: 61 green, 19 golden (~3:1)

Table 2	Green fruit, fuzzy skin	Green fruit, smooth skin	Golden fruit, fuzzy skin	Golden fruit, smooth skin
F2 Females	62	0	22	0
F2 Males	30	31	10	9

Conclusion

The observed phenotype frequencies in the F1 and F2 generation are consistent with the predicted phenotype frequencies for an autosomal dominant mode of inheritance for green fruit colour in Kiwis.

Questions?

Pedigrees

- Genetic Crosses - works with fruit flies, tomatoes, pea plants, etc.
  - can have hundreds or thousands of offspring
    - so, a very large sample size (increasing confidence in claim)

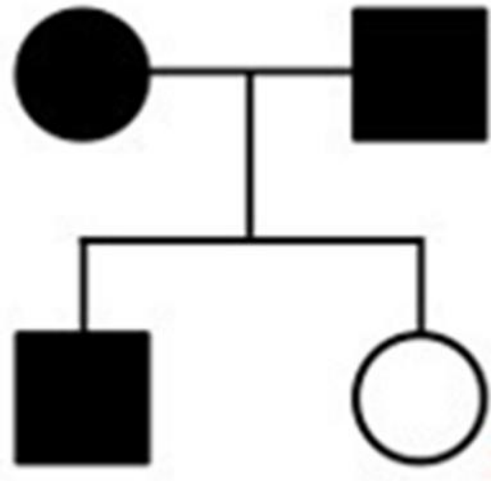
- It would highly unethical to use this approach to study mode of inheritance in humans.

- Determining mode of inheritance in humans – use pedigrees

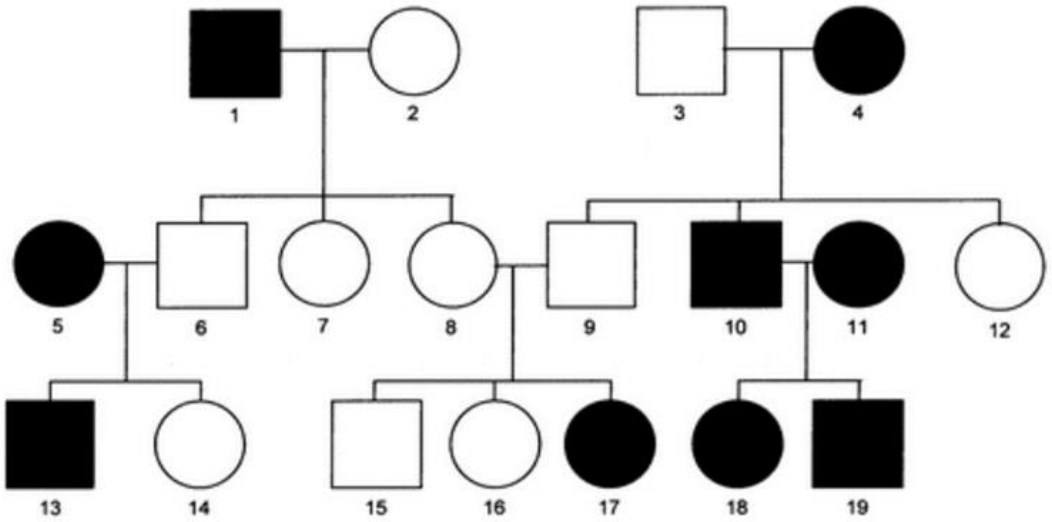
iClicker Question

Have you used pedigrees to determine mode of inheritance in the past?

A. Yes, recently
B. Yes, but more than a year ago
C. No
D. What is a pedigree?
E. EEEEEEE



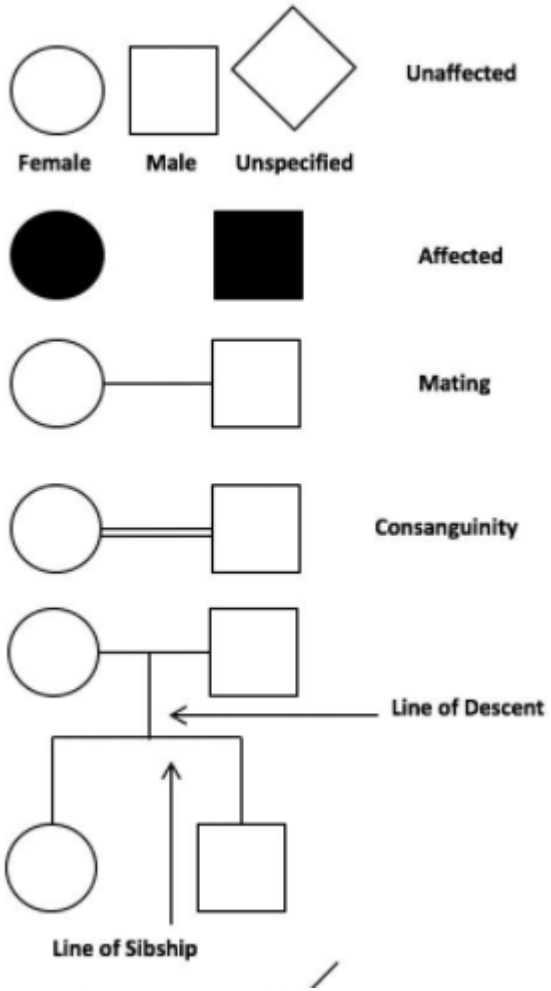
What is a pedigree?

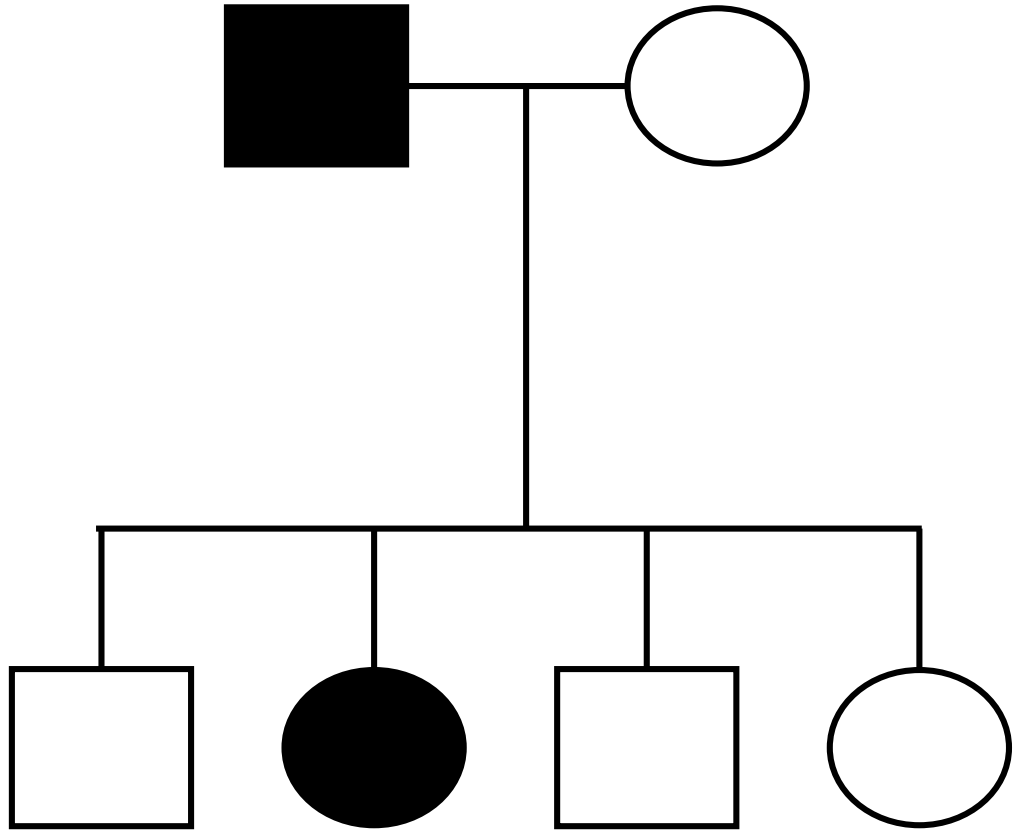


- A pedigree is a family tree
- Shows which members of the family are affected by a genetic trait of interest.
- Allows researchers to determine pattern of inheritance in humans.
- And predict characteristics of future offspring.

Pedigrees: Learning Goal #1 of 3

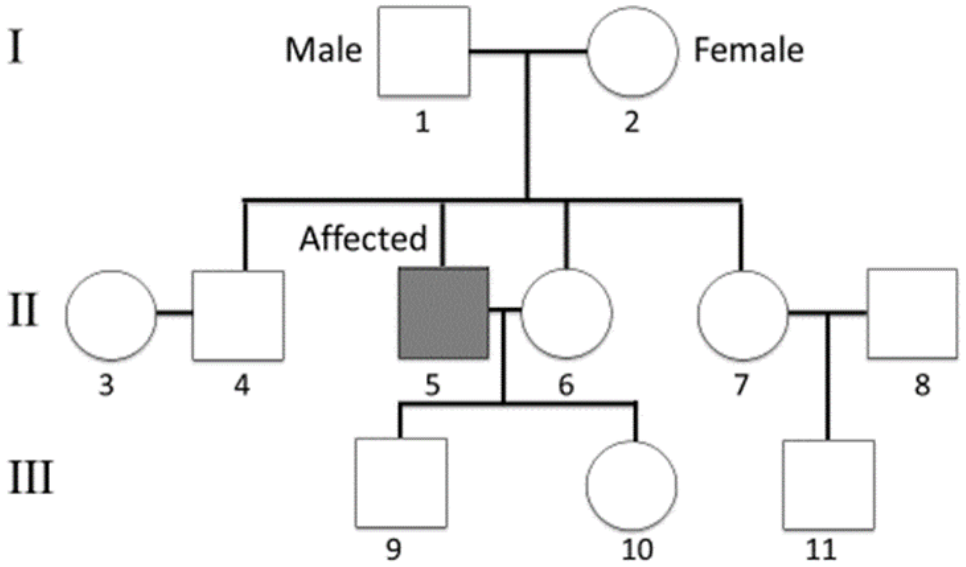
Understand/know how to properly read/interpret pedigree.





https://step1.medbullets.com/biochemistry/102036/modes-of-inheritance

Reading a Pedigree



Every individual represented by a digit (1, 2)

Sometimes roman numerals (I, II) are included to indicate generation.

If you are asked to explain a possible (or impossible) mode of inheritance, you should refer to specific individuals in the pedigree (e.g. individual 5 or individual II-5)

Pedigrees: Learning Goal #2 of 3

Understand/know how to:

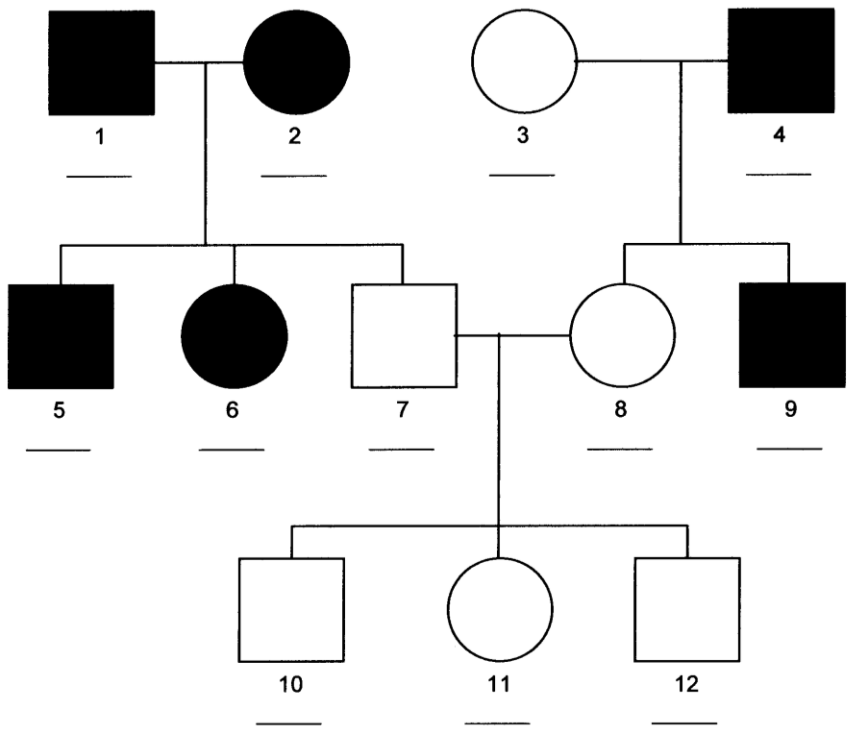
- Test hypotheses concerning different modes of inheritance
  - Autosomal dominant
  - Autosomal recessive
  - X-linked dominant
  - X-linked recessive
- Infer possible genotypes from phenotype, based on hypothesized mode of inheritance.

You can look for clues

In pedigree analysis you can look for clues that will indicate whether the mode of inheritance for the trait is:

- autosomal dominant
- autosomal recessive
- X-linked dominant
- X-linked recessive

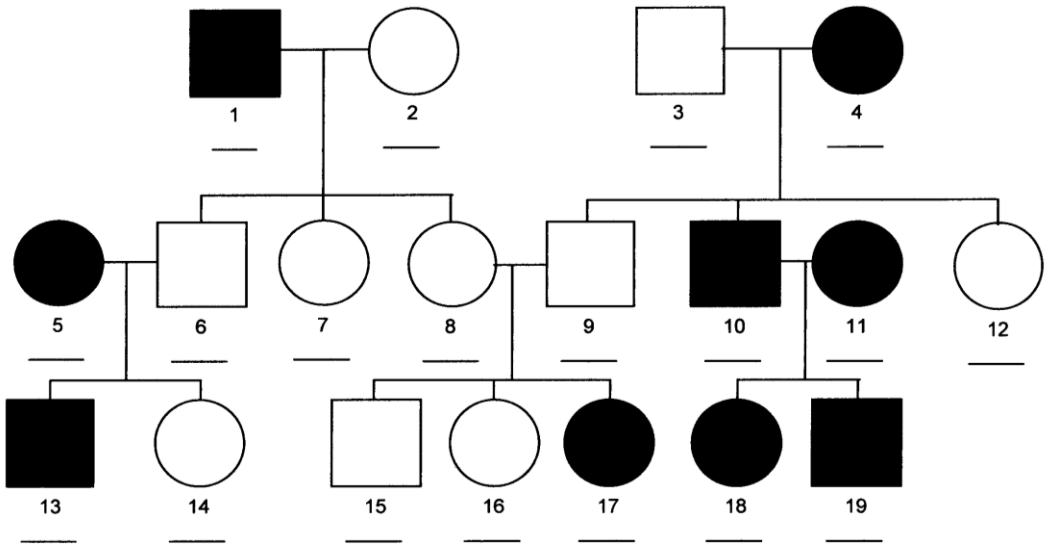
Autosomal Dominant - clues



https://migrc.org/Library/AutosomalDominant.html

- An affected person (e.g. 9) must have at least one affected parent (4).
- Two unaffected parents (7, 8) can only have unaffected offspring (10, 11, 12).
- Males and females have the same chance to be affected.
- Typically occurs in every generation.

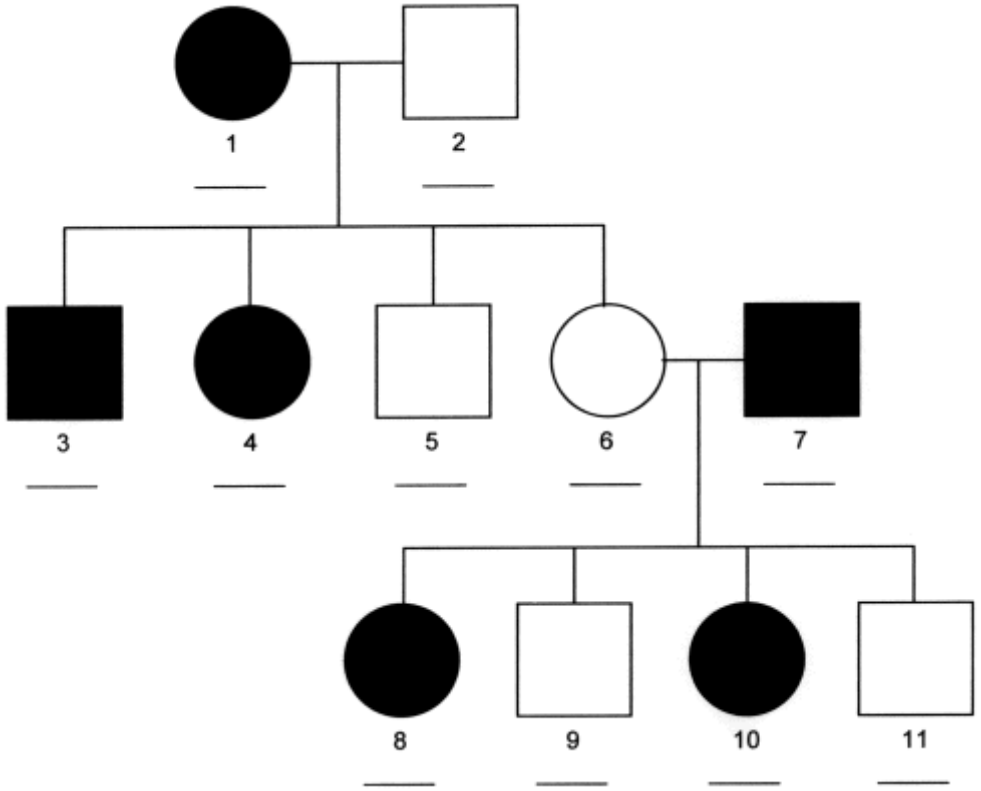
Autosomal Recessive - clues



https://migrc.org/Library/AutosomalRecessive.html

- If both parents are affected (e.g. 10 & 11) they are homozygous recessive and all of the offspring (18, 19) must be affected.
- Unaffected parents (8-9) can have affected offspring (17), if parents are heterozygotes
- Males and females have the same chance of being affected.
- Can skip generations

X-linked Dominant - clues

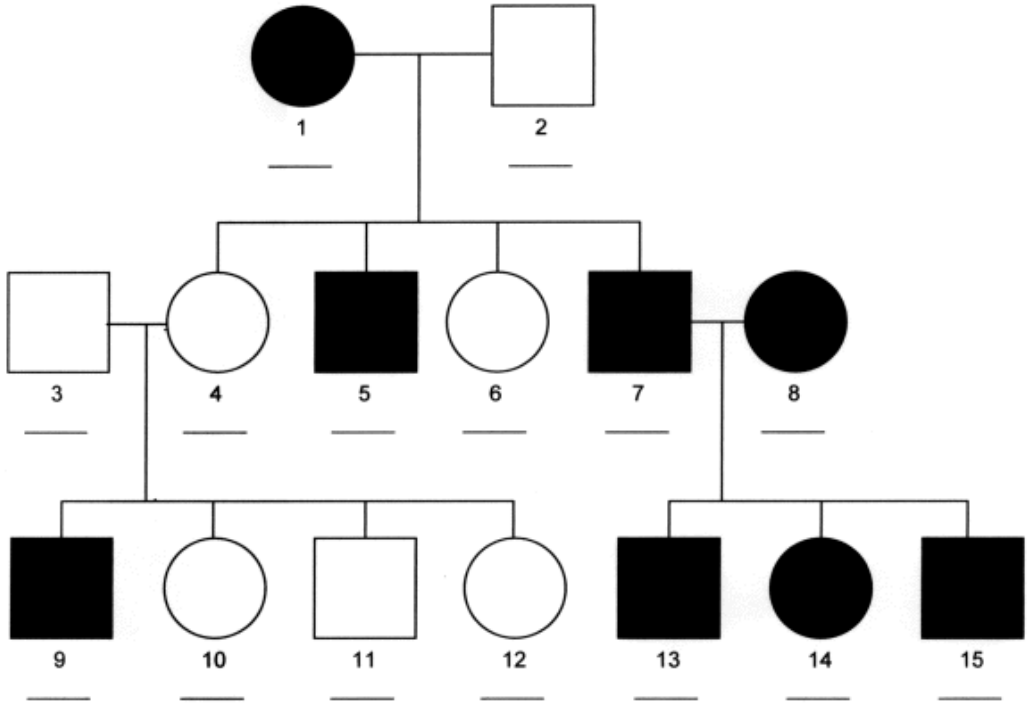


- If a father is affected (e.g., 7), it means he is carrying dominant allele on his X chromosome; so, his daughters (8 or 10) must also have this trait

- Sons (e.g. 3) can only have trait if mother has the trait (1) (son receive X from mother)

https://migrc.org/Library/SexlinkedDominant.html

X-linked Recessive - clues



- Affected daughters (e.g. 14) are homozygous recessive; so, they must have an affected father (7) to be affected.
- Mother of an affected daughter may be affected (X^rX^r) or unaffected (X^RX^r)
- Males are more likely than females to exhibit this trait (only need 1 recessive allele from mother)

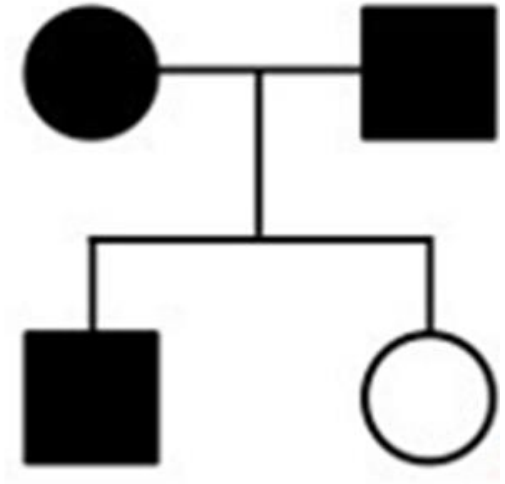
https://migrc.org/library/sexlinkedrecessive.html

My approach

- Rather than memorizing clues……

- I assign genotypes based on hypothesized mode of inheritance

- I keep going until I either fill out the entire pedigree (=possible mode of inheritance) or until I encounter one impossible situation (=impossible mode of inheritance).

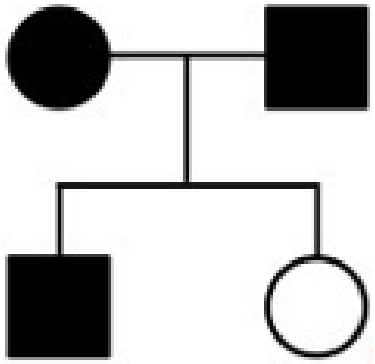


4-minute break

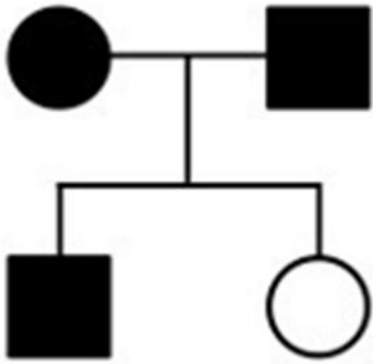
Can you see snow leopard in photo?

Mode of inheritance

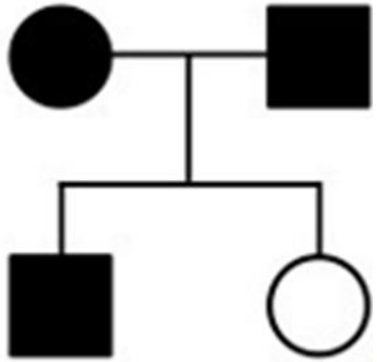
Autosomal Dominant?



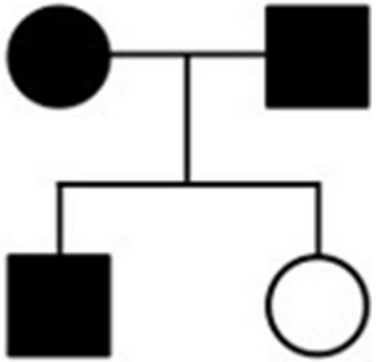
Autosomal Recessive?



X-linked dominant?

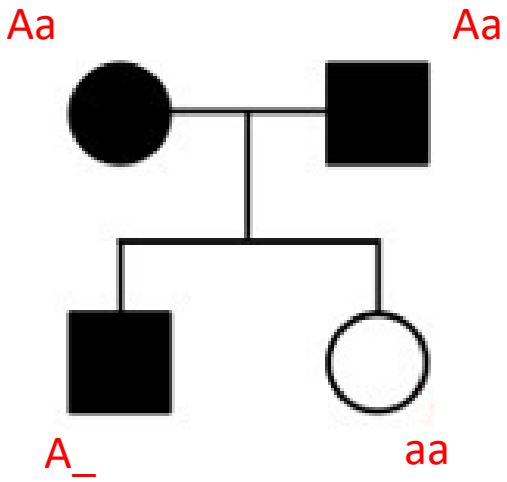


X-linked recessive?



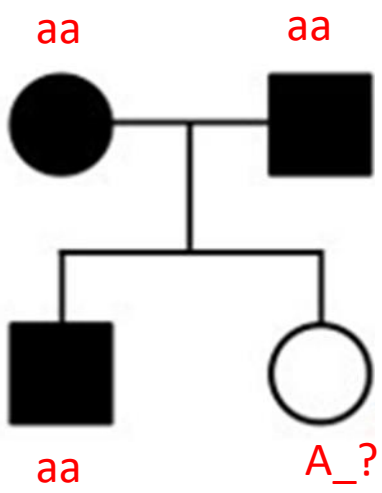
Mode of inheritance

Autosomal Dominant?



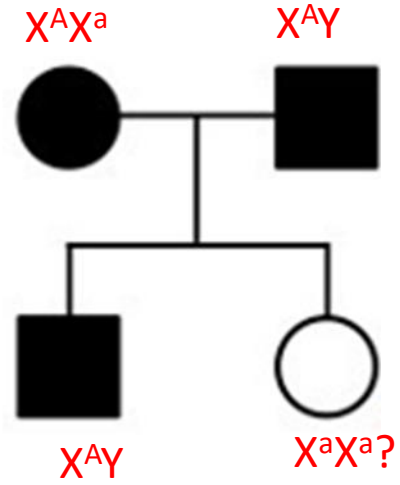
Possible – if affected parents are heterozygotes, can have unaffected daughter

Autosomal Recessive?



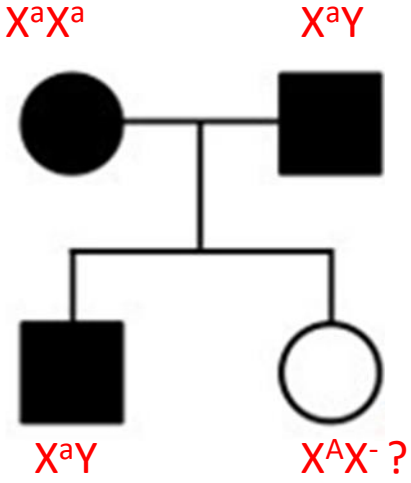
Not Possible
- Daughter would need to carry a dominant allele to be unaffected, but affected parents homozygous recessive

X-linked dominant?



Not Possible
- Daughter would need to be homozygous recessive; but affected father carrying dominant allele

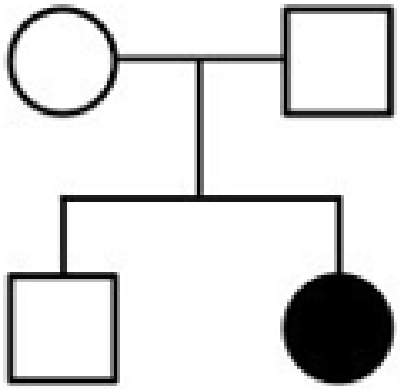
X-linked recessive?



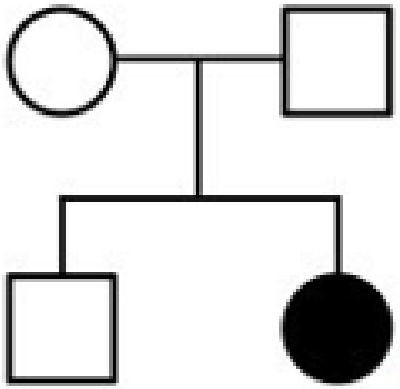
Not Possible
- Daughter would need to carry a dominant allele to be unaffected but affected parents only carry recessive alleles

Your turn… (possible or impossible)?

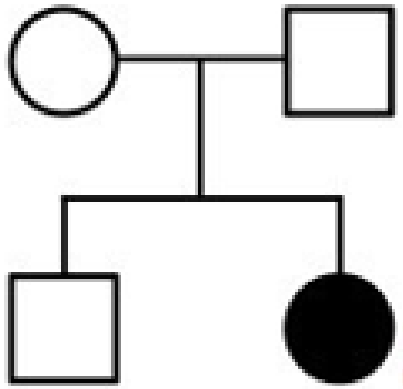
Autosomal Dominant?



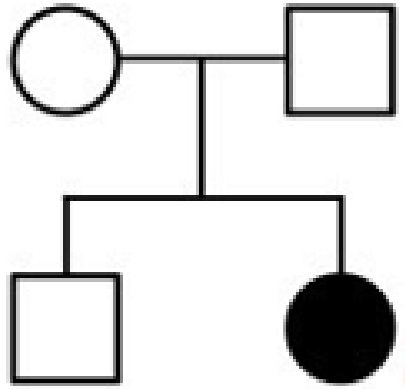
Autosomal Recessive?



X-linked dominant?

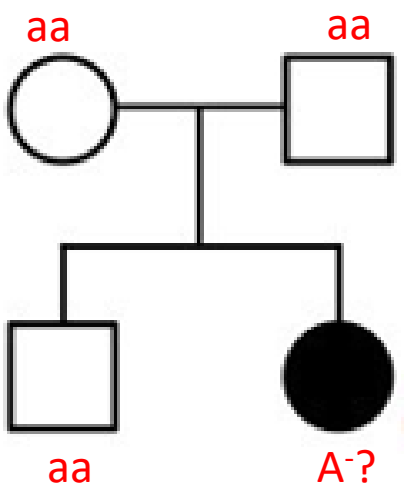


X-linked recessive?



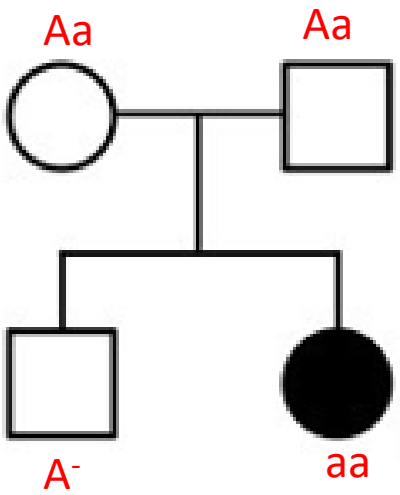
Your turn… (possible or impossible)?

Autosomal Dominant?



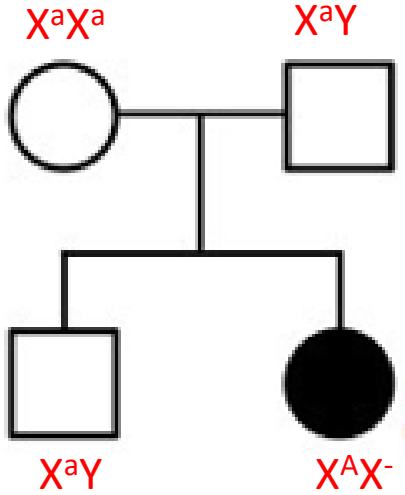
Not Possible
- Daughter would need to carry a dominant allele to be affected, but unaffected parents homozygous recessive

Autosomal Recessive?



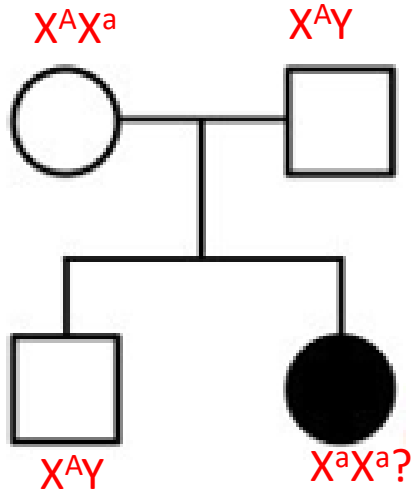
Possible – if parents heterozygotes, can have affected daughter

X-linked dominant?



Not Possible
- Daughter would need to carry a dominant allele to be affected, but unaffected parents only carry recessive

X-linked recessive?

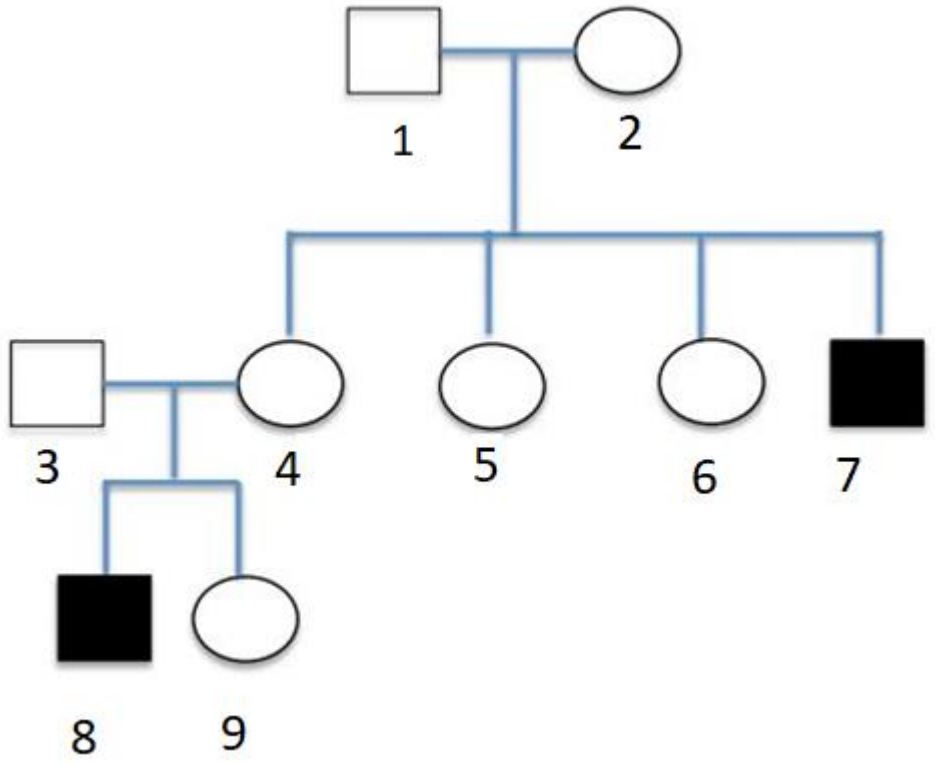


Not Possible
- Daughter would need to carry two recessive alleles, but unaffected father must carry dominant allele.

Question

What is/are the possible mode(s) of inheritance?

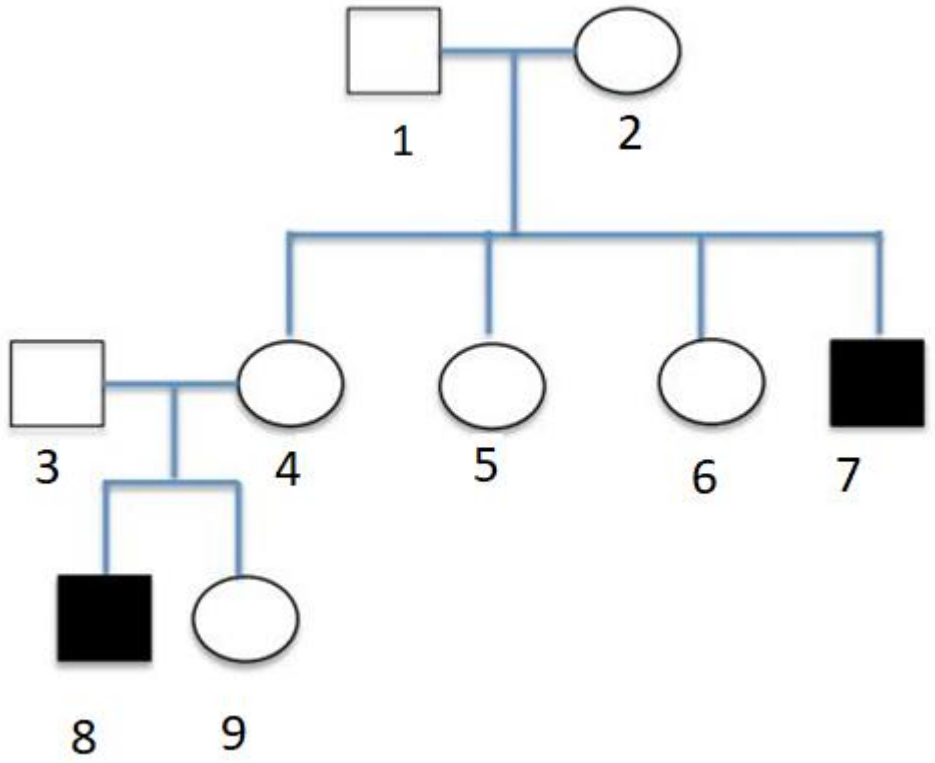
A. Autosomal dominant
B. Autosomal recessive
C. X-linked dominant
D. X-linked recessive
E. B or D



Answer

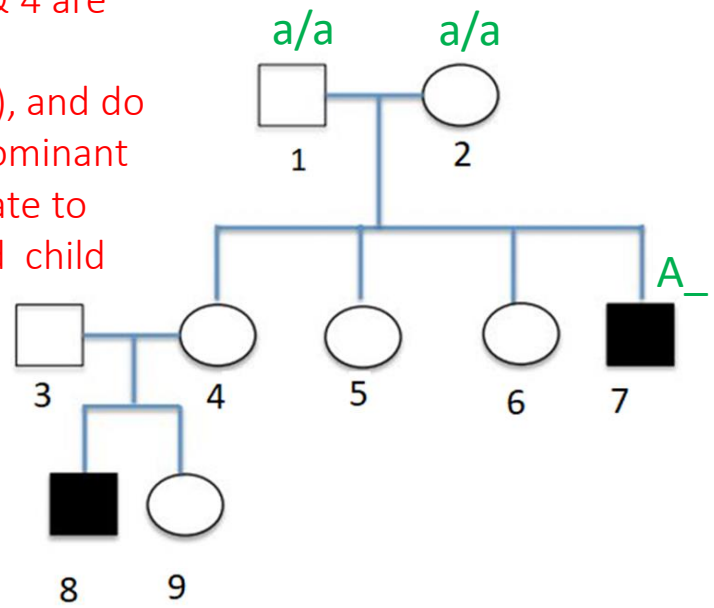
What is/are the possible mode(s) of inheritance?

A. Autosomal dominant
B. Autosomal recessive
C. X-linked dominant
D. X-linked recessive
E. B or D



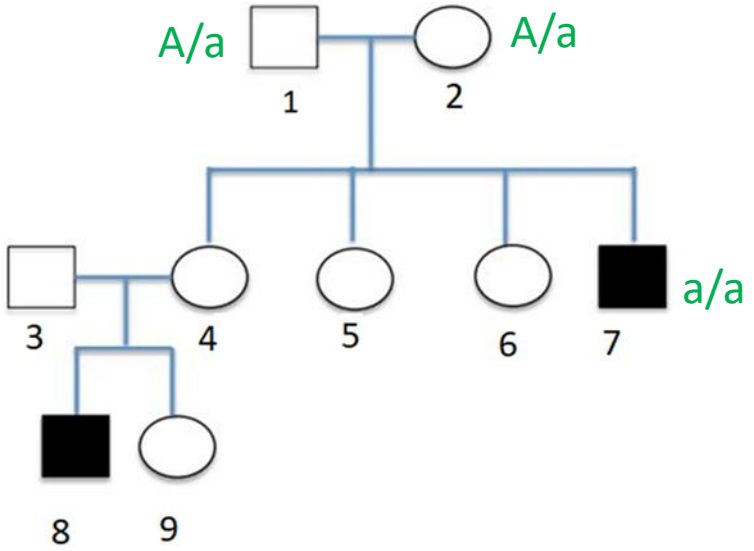
Autosomal dominant

Not possible
Unaffected parents – 1 & 2 and 3 & 4 are homozygous recessive (aa), and do not have a dominant allele to donate to their affected child (A_) – 7, 8



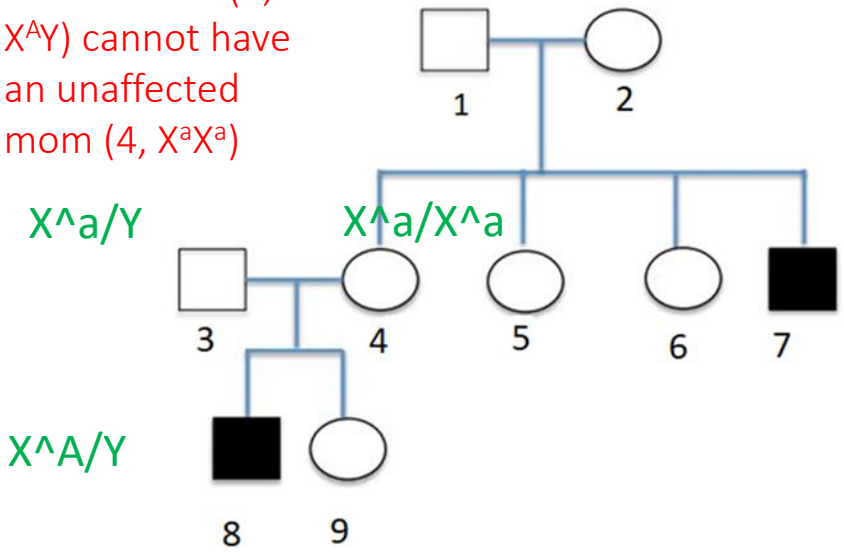
Autosomal recessive

Possible, if individuals 1 & 2 and 3 & 4 are heterozygotes (Aa x Aa), they can have an affected son (aa, 7, 8) and unaffected daughters (A_ 4, 5, 6, 9)



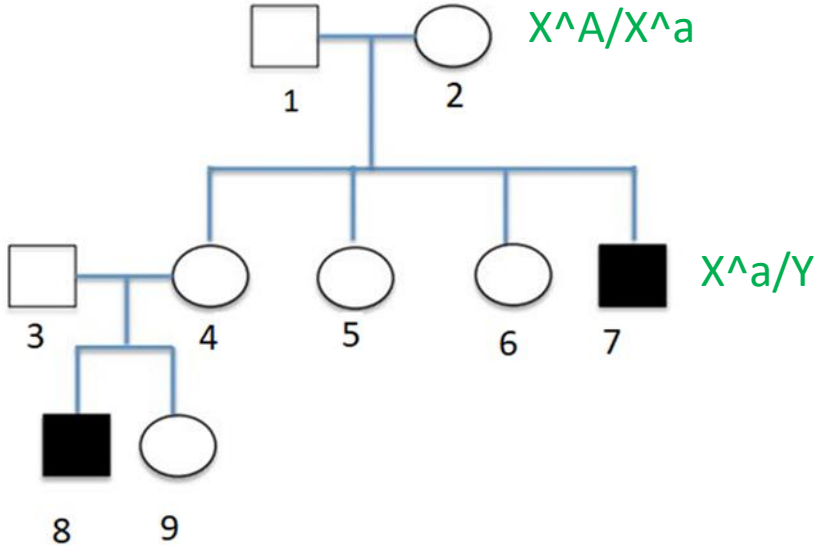
X-linked dominant

Impossible - Affected son (8, X^AY) cannot have an unaffected mom (4, X^aX^a)



Possible
Affected individual 7 (X^aY) is possible if his unaffected mother (2) is heterozygous (X^AX^a) and passes her recessive allele to her son.
Unaffected daughters 4-6 are also possible because the unaffected father will pass his dominant allele to his daughters (X^AY)
Explanation for the offspring (8, 9) of individual 3 and 4 is the same logic.

X-linked recessive



Case study – Blue people of Kentucky

Martin Fugate & family

Case study – Blue Fugates of Troublesome Creek, Hazard County, Kentucky

In the 1800's a very isolated place (no roads, no railroad).

Not uncommon for people to marry cousins, or other family members.

Fugate Family (partial pedigree)

In 1820, French orphan, Martin Fugate moved to Troublesome Creek.

He married Elizabeth Smith.

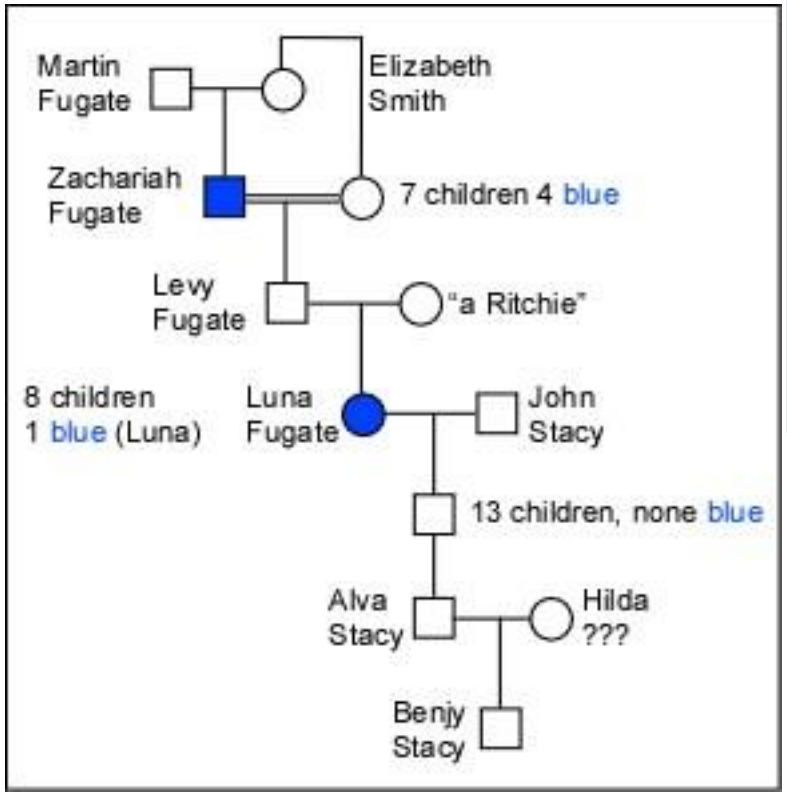
Both Martin & Elizabeth were unaffected. They had 7 children, 4 of these children had blue skin

Their son, Zachariah (blue), married his Aunt (Mary). They had 12 children, two of whom had blue skin skin.

Levy (Zachariah & Mary's son) married a distant relative (both unaffected).

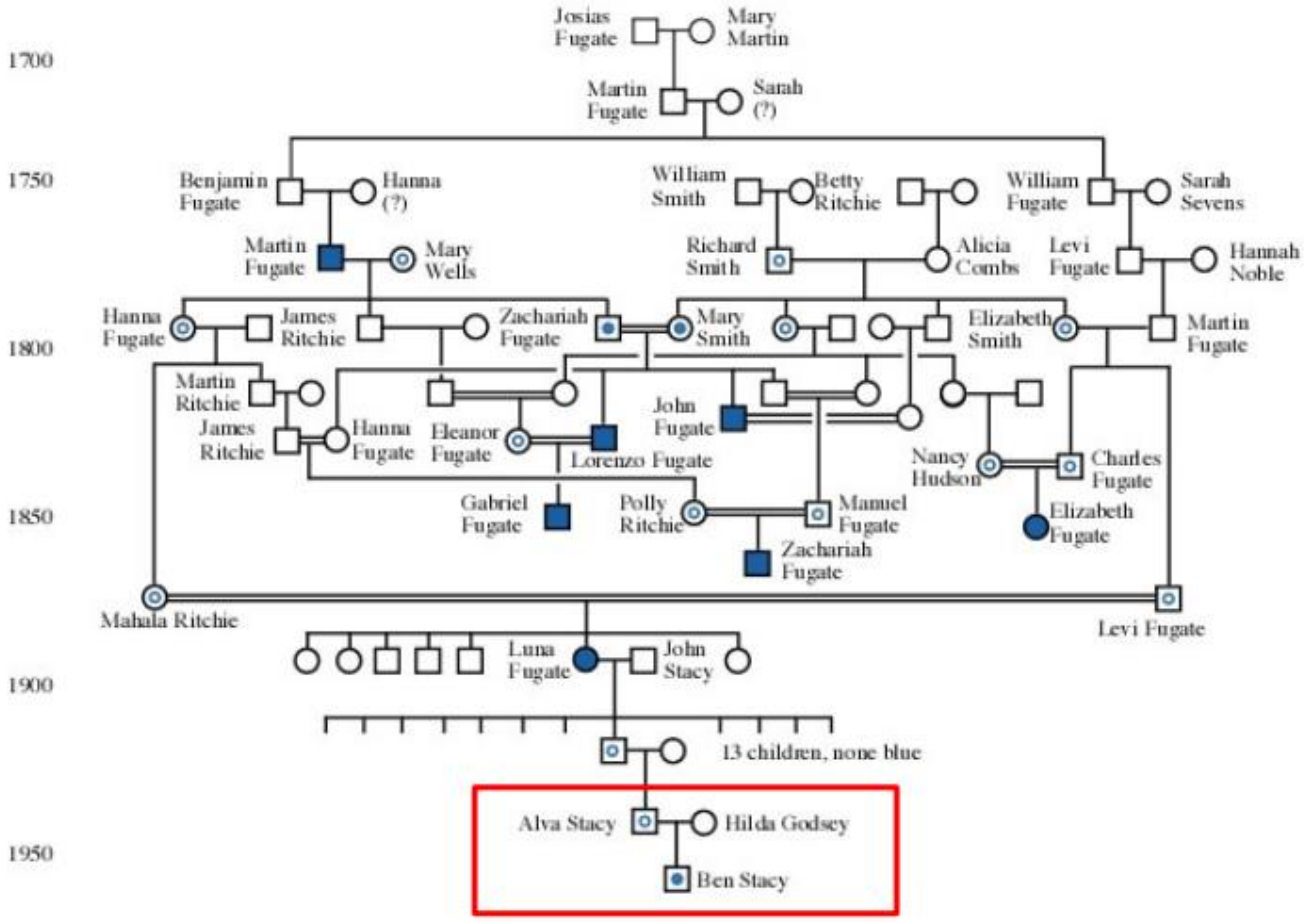
Their daughter, Luna, had blue skin.

Two generations late, Benjy Stacy was born. If Benjy gets cold or angry his skin would have a blue tinge



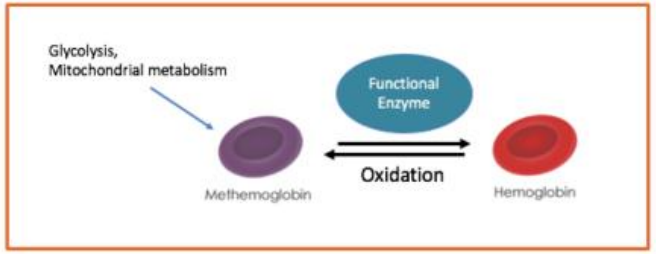
Martin Fugate & family

Last child born with blue skin – Ben (Benjy) Stacy



Methemoglobinemia

- The Fugates have a hereditary disorder that causes excessive levels of methemoglobin in the blood (due to an impaired enzyme).



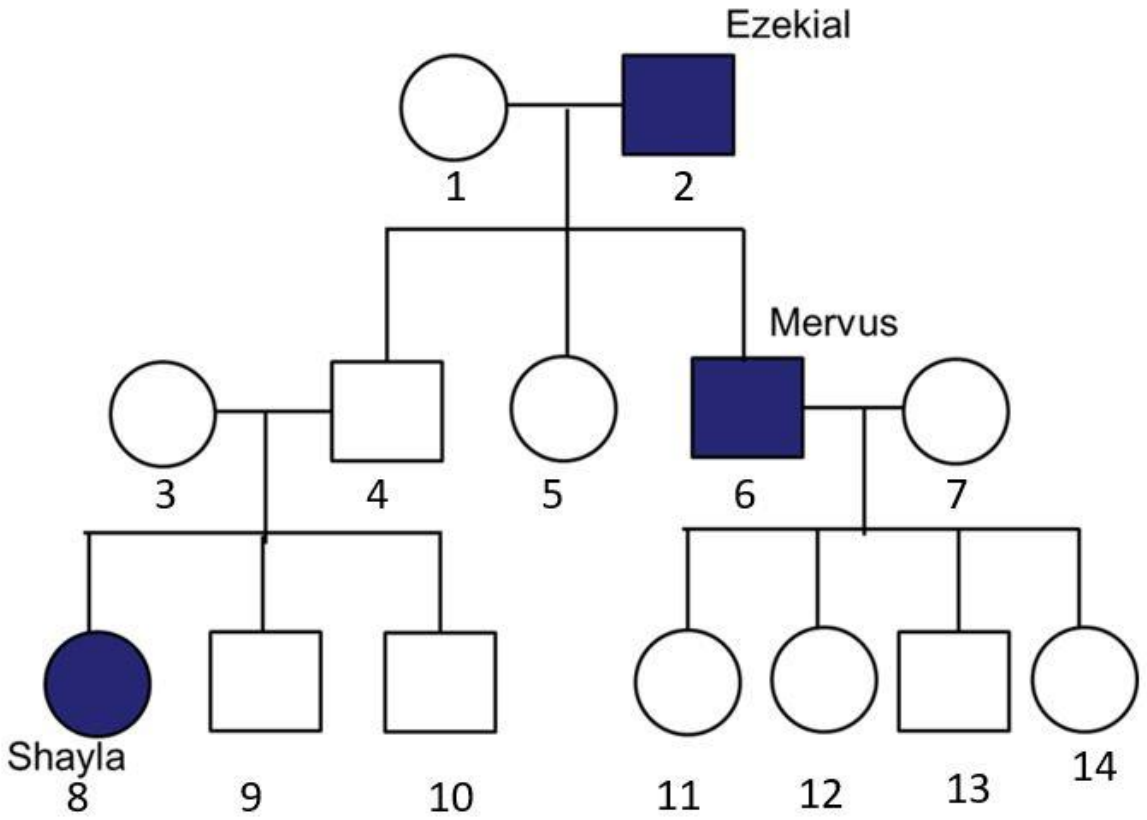
- Methemoglobin is a non-functional blue version of hemoglobin, which carries 0_2 to cells in our body. It is converted to hemoglobin by an enzyme.

Phenotype	Homozygous wild type (C^N/C^N)	Heterozygote (C^N/C^B)	Homozygous mutant (C^B/C^B)
Enzyme activity	100%	50%	10%
Skin colour	Normal	Normal	**Blue**

Treatment – ingest methylene blue

What mode(s) of inheritance is/are possible for blue skin?

A. Autosomal dominant
B. Autosomal recessive
C. X-Linked dominant
D. X-Linked recessive
E. More than one are possible



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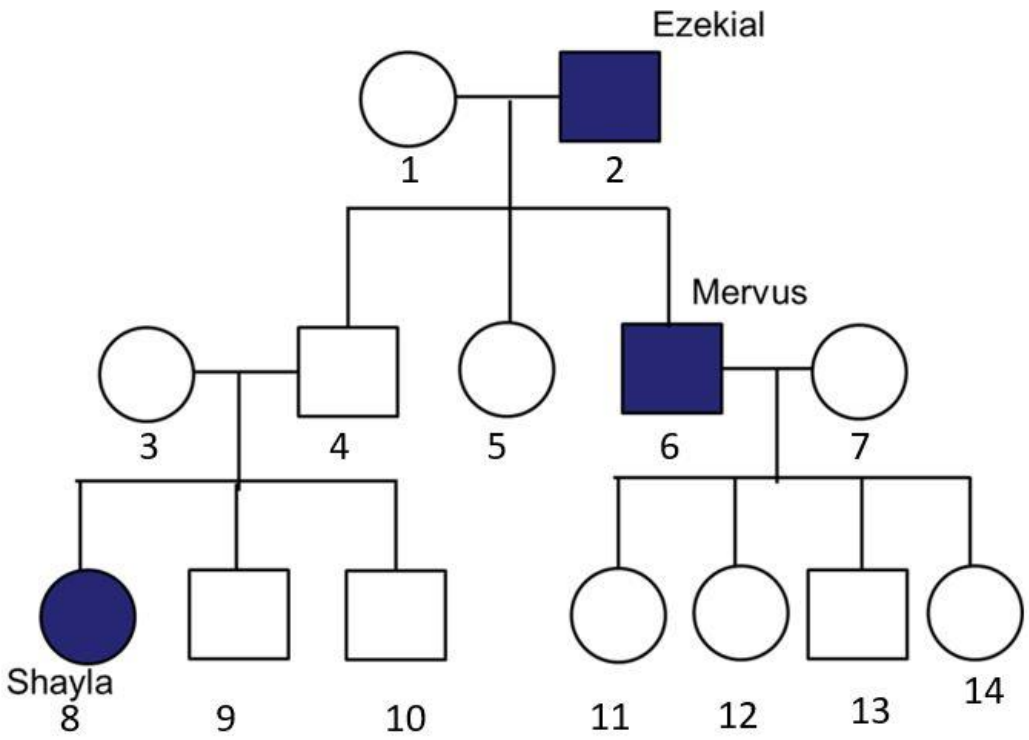


Question

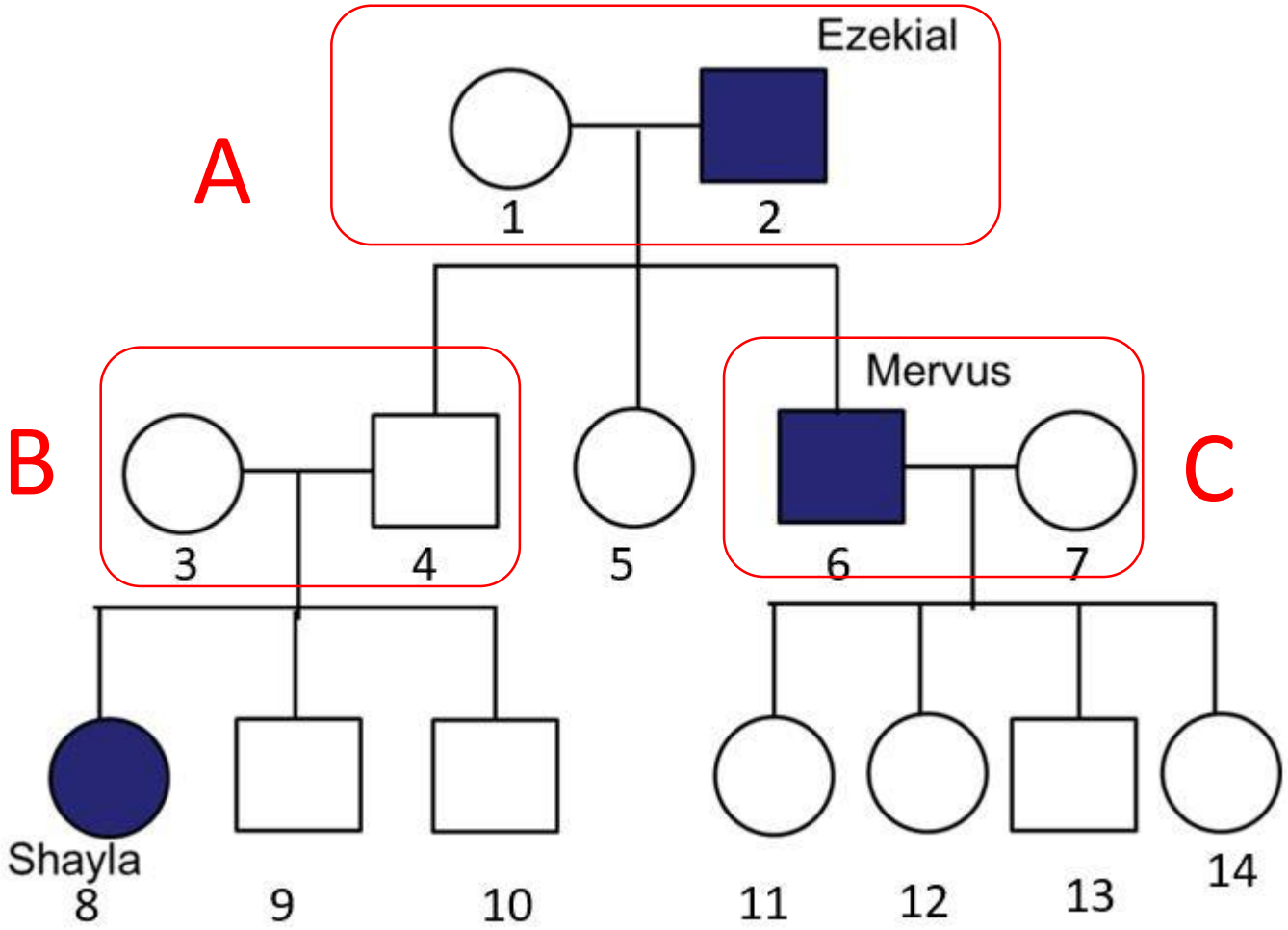
Which parental cross allows you to rule out autosomal dominant as a mode of inheritance for this trait?

A.

B.

C.

D. All of the above



Answer

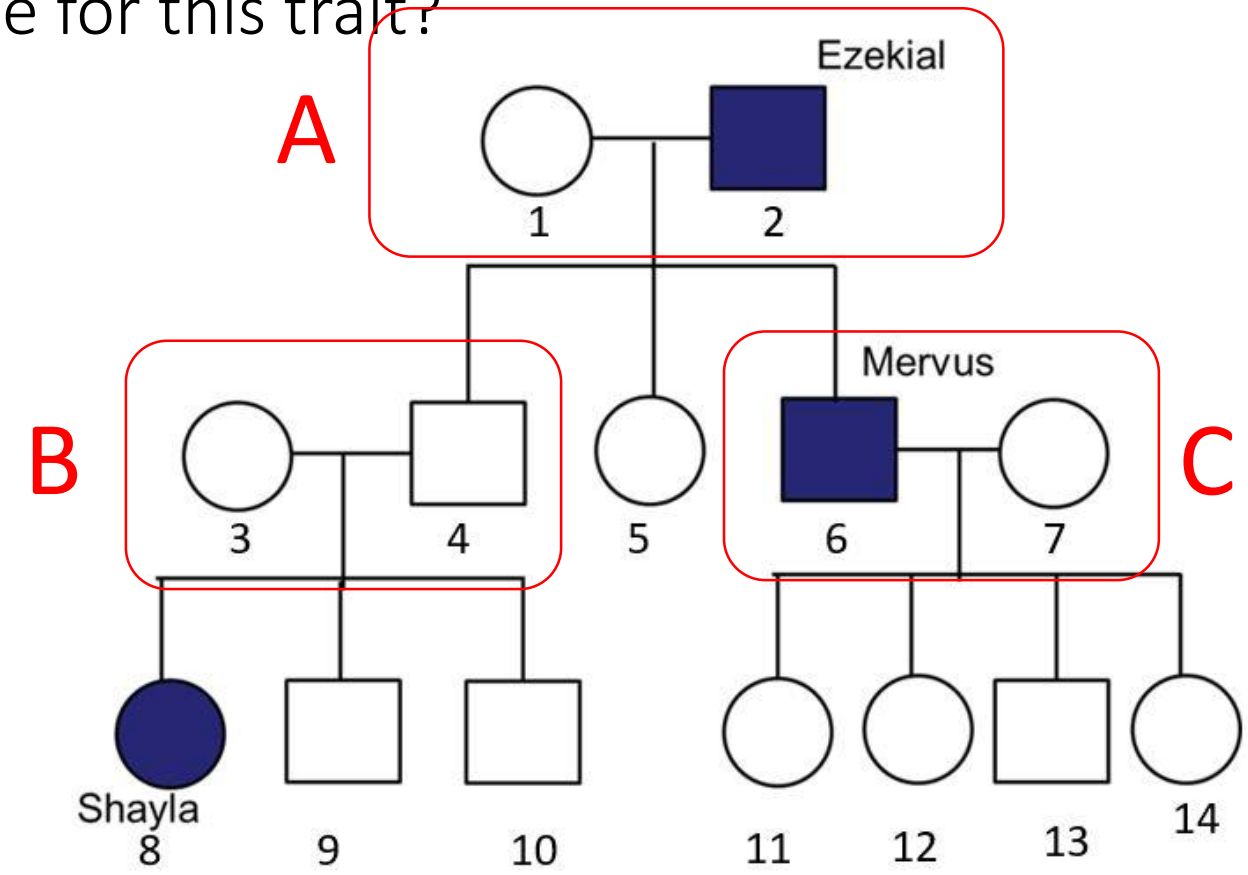
Which parental cross allows you to rule out autosomal dominant as a mode of inheritance for this trait?

A.

B.

C.

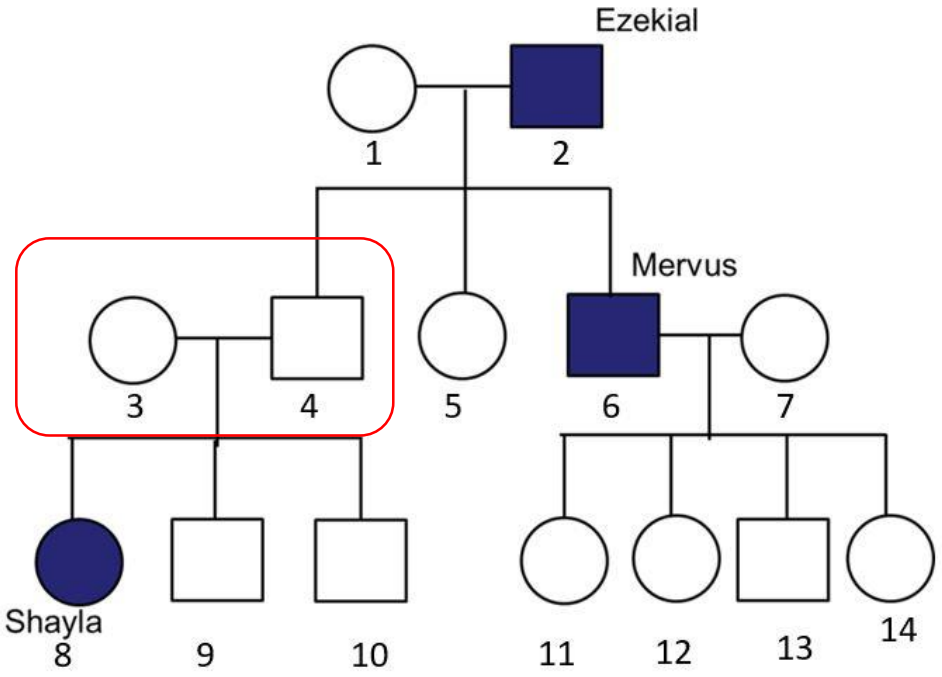
D. All of the above



How to explain that a mode of inheritance is not possible

Refer to specific individuals by:

- number
- phenotype (affected or not, sex)
- genotypes



e.g. If autosomal dominant was a possible mode of inheritance for blue skin, Shayla (8) would need to carry at least one dominant allele (A_) to be affected. However, neither parent (3, 4) is affected, which means that they must both be homozygous recessive (aa) and would not have a dominant allele to pass to Shayla. Therefore, autosomal dominant is not a possible mode of inheritance.

Question

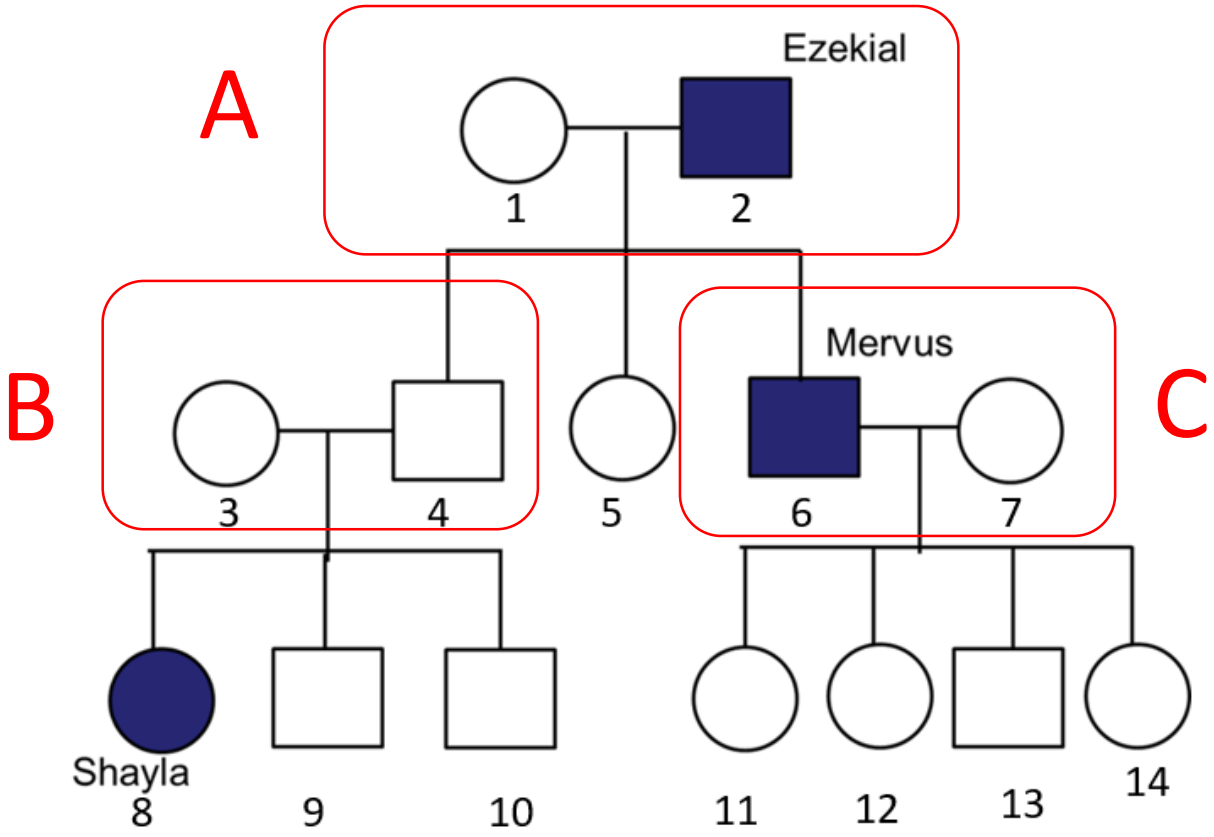
Which parental cross allows you to rule out X-linked recessive as a mode of inheritance for blue skin?

A.

B.

C.

D. All of the above.



Answer

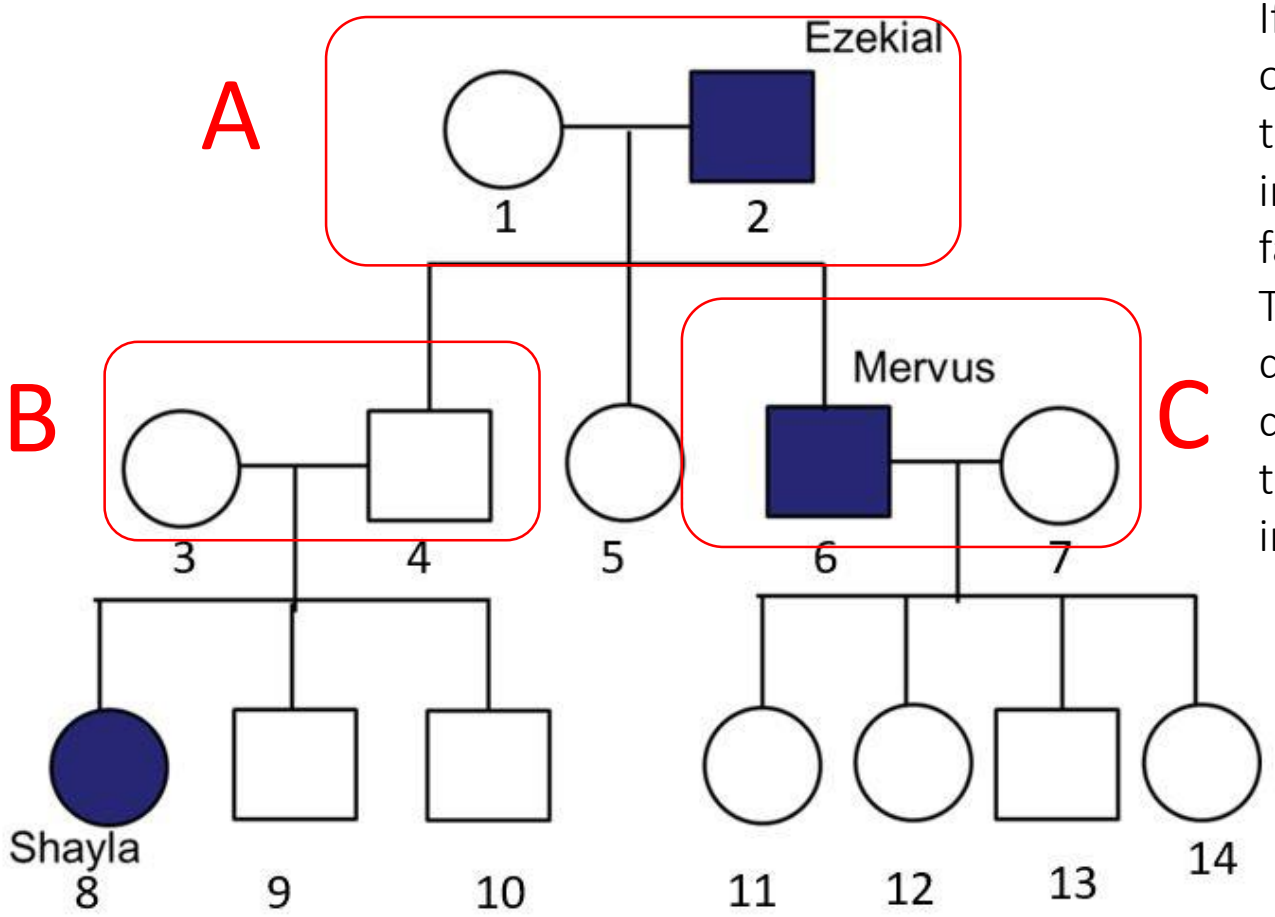
Which parental cross allows you to rule out X-linked recessive as a mode of inheritance for blue skin?

A.

B.

C.

D. All



If X-linked recessive was a possible mode of inheritance for blue skin, for Shayla (8) to be affected (X^aX^a), she must have inherited a recessive allele (X^a) from her father (4); however, he is unaffected (X^AY). Therefore, he must be carrying the dominant allele on his X-chromosome and does not have a recessive allele to donate to Shayla. Hence, X-linked recessive is impossible.

Question

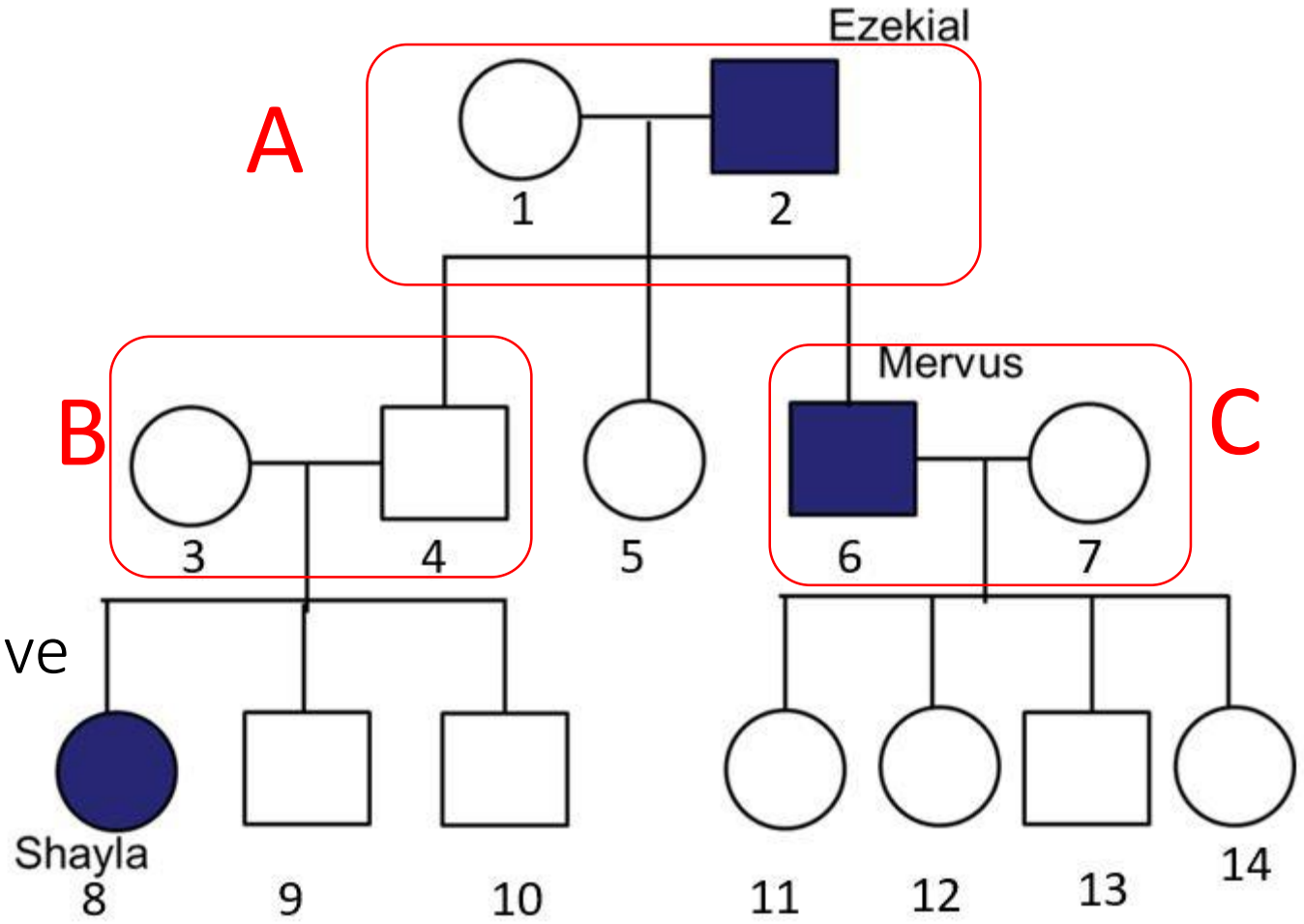
Which parental cross allows you to rule out X-linked dominant as a mode of inheritance for blue skin?

A.

B.

C.

D. All of the above



Answer

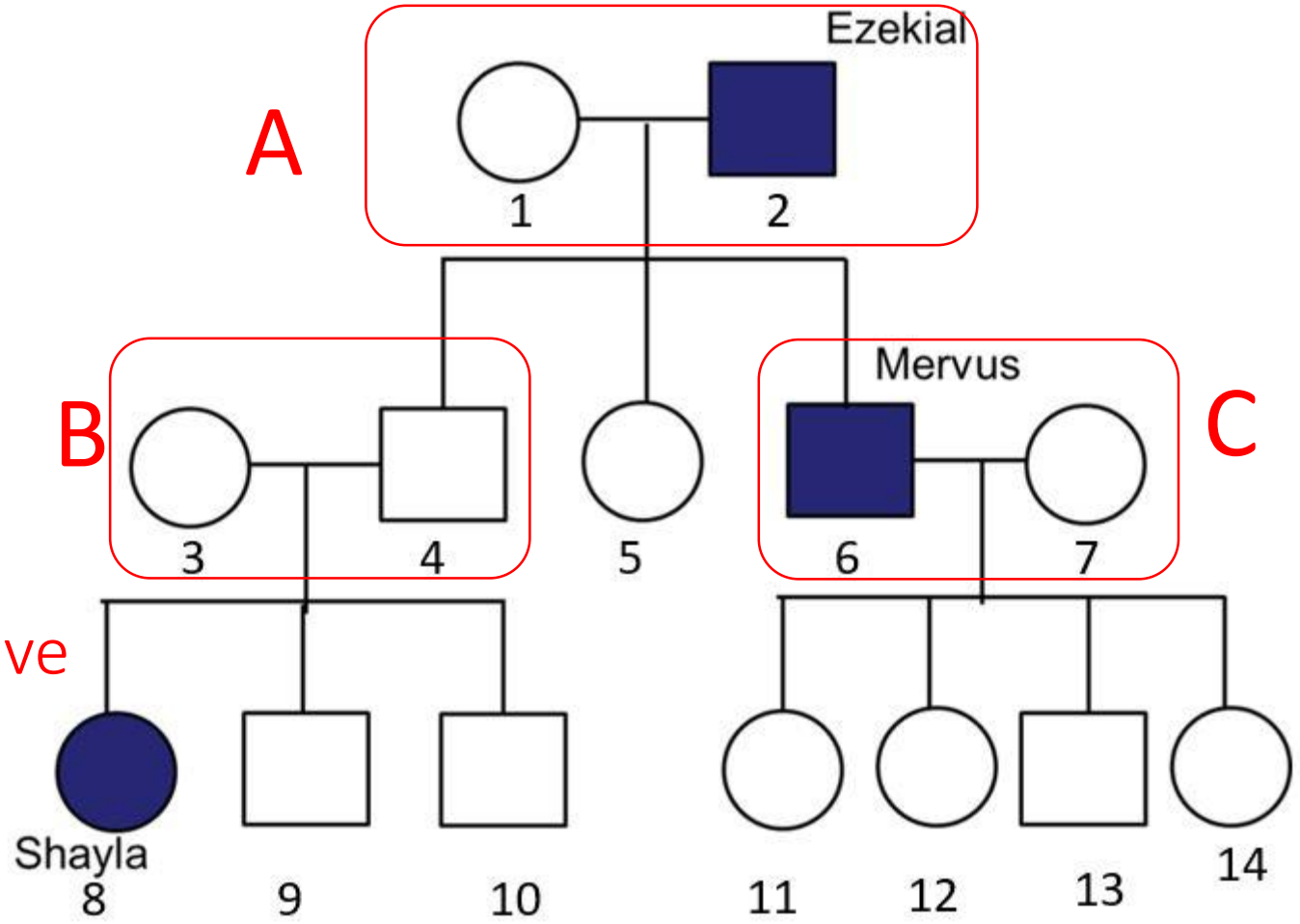
Which parental cross allows you to rule out X-linked dominant as a mode of inheritance for blue skin?

A.

B.

C.

D. All of the above



Question

Which parental cross allows you to rule out X-linked dominant as a mode of inheritance for blue skin?

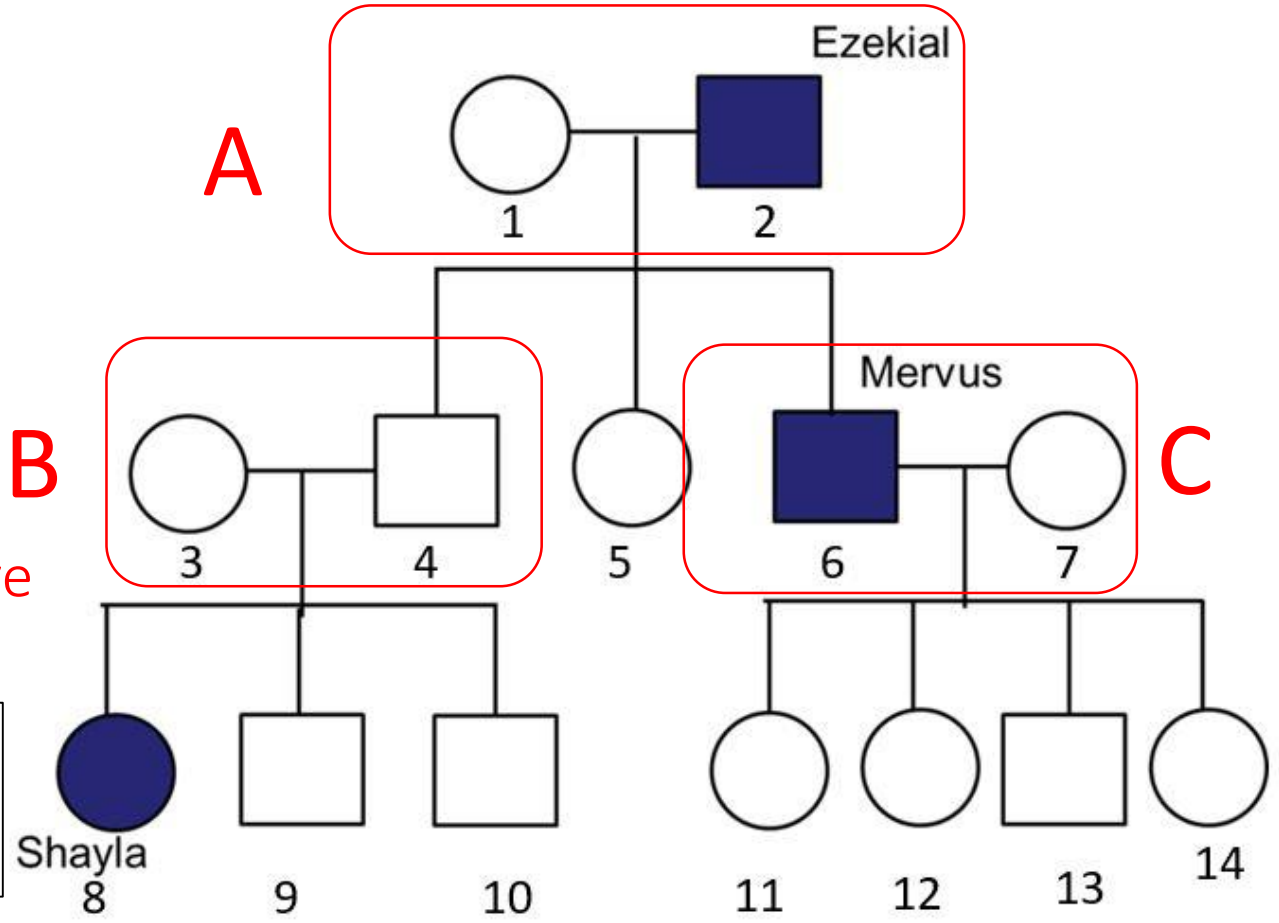
A.

B.

C.

D. All of the above

you only need to refer to one cross that is impossible



A. If the mode of inheritance for blue skin is X-linked dominant, then an affected father (2) (X^BY) cannot have an unaffected daughter (5) because she will inherit her father's X-chromosome with the dominant allele; but she is unaffected. So, X-linked dominant is not possible

OR

A. If the mode of inheritance for blue skin is X-linked dominant, Mervus (6) could also not be affected (X^BY) if his mother (1) was unaffected (X^bX^b) because she would not have a dominant allele to pass to her son. Therefore, X-linked dominant is not possible.

Answer

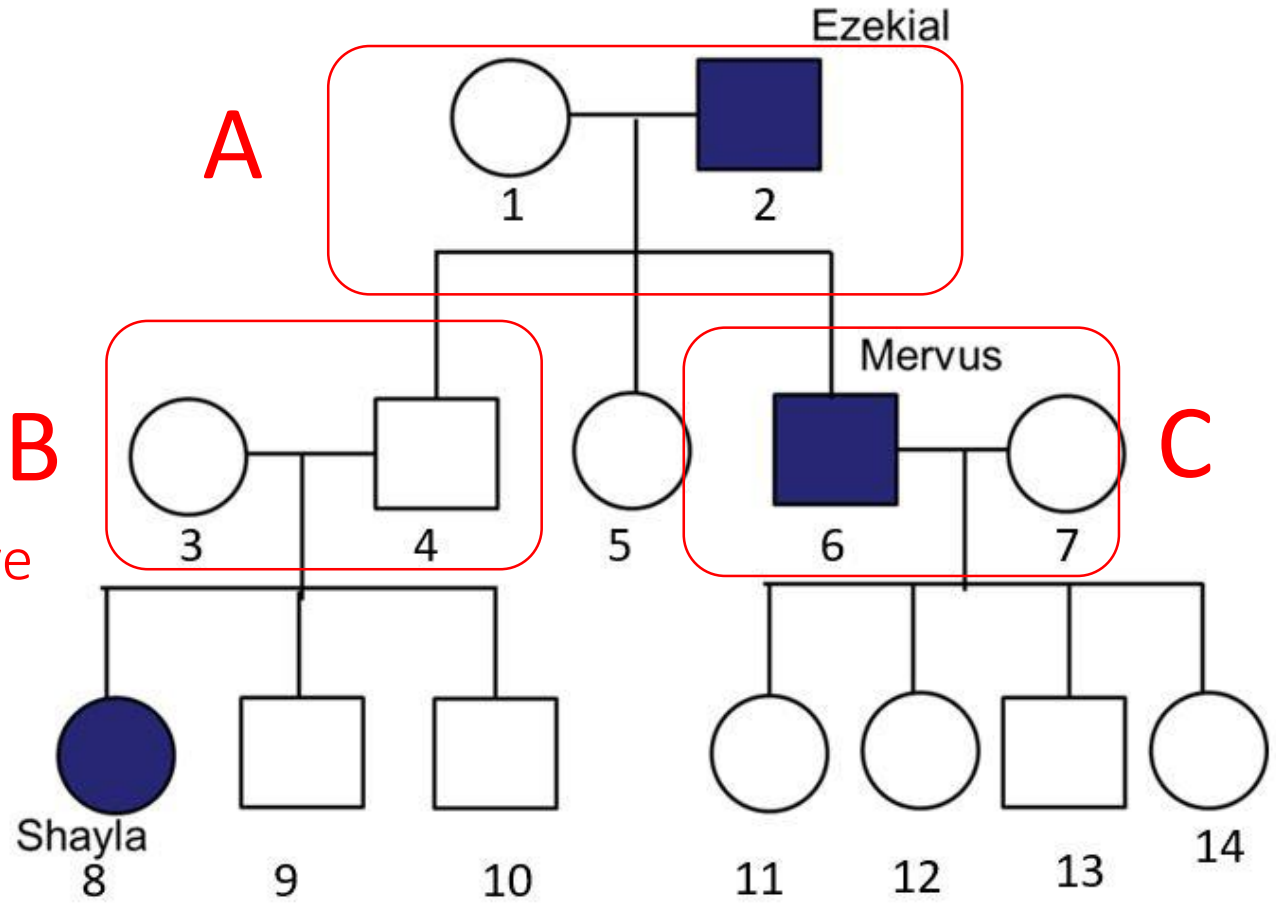
Which parental cross allows you to rule out X-linked dominant as a mode of inheritance for blue skin?

A.

B.

C.

D. All of the above



you only need to refer to one cross that is impossible

C. If the mode of inheritance for blue skin is X-linked dominant, Mervus (6), who is affected (X^BY) cannot have unaffected daughters (X^bX^b) as they would inherit his X-chromosome with the dominant allele, and therefore would be affected. So, X-linked dominant is not possible.

B. If the mode of inheritance is X-linked dominant, Shayla (8) cannot be affected (X^BX^-) because both parents (3, 4) are unaffected (X^bX^b and X^bY), which means they only carry recessive alleles and they do not have a dominant allele to donate to Shayla. So, X-linked dominant is not possible.

An environmental explanation for some blue people

Example of how phenotype = genotype + environment

- Mr. Paul Karason
- drank a silver chloride colloid
- also rubbed a silver salve on his skin
- to treat a skin condition
- resulted in his skin turning a blue colour (Argyria).

- The silver particles were deposited in his skin, organs, etc.

Pedigrees: Learning Goal #3 - Assumptions

Understand/know -

- What assumption you are making when interpreting a pedigree

Pedigrees: Learning Goal #3

Three examples of assumptions (that may not be true):

- Males are XY and females are XX
- There are only two phenotypes (affected and unaffected), and the phenotypes are distinct and unmistakable.
- Phenotype is determined by one gene two alleles (there may be multiple alleles influencing phenotype or different alleles influencing phenotype in different people; environment may also play a role.)

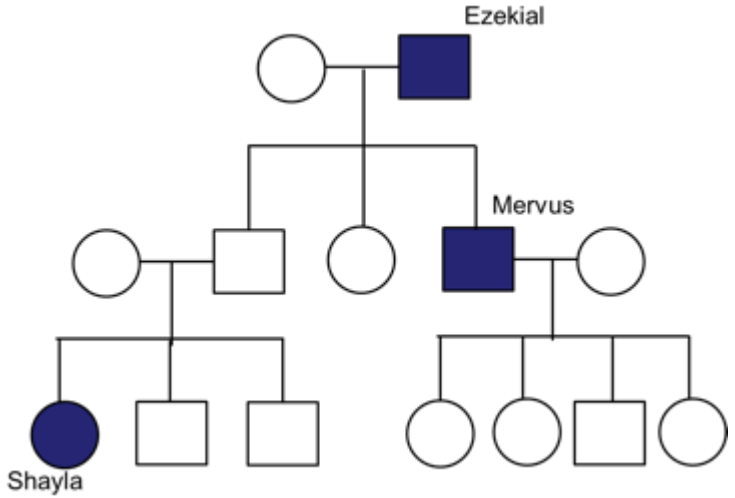
Pedigrees: Learning Goal #4

Understand/know -

- Which offspring genotypes/phenotypes two parents are capable of producing, and with what probabilities

Question

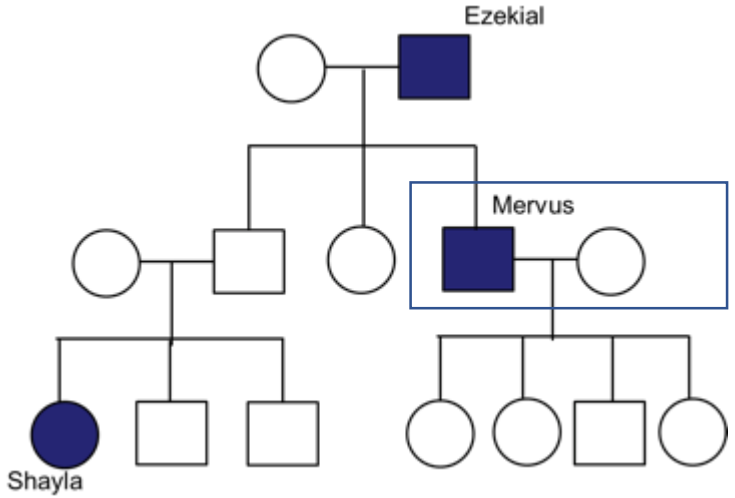
If Mervus and his wife have a fifth child, what is the probability that this child will be a boy with blue skin? Assume Mervus' wife is a heterozygote. Phenotype is autosomal recessive.



A. 0%
B. 25%
C. 50%
D. 75%
E. 100%

Question

If Mervus and his wife have a fifth child, what is the probability that this child will be a boy with blue skin? Assume Mervus' wife is a heterozygote. Phenotype is autosomal recessive.



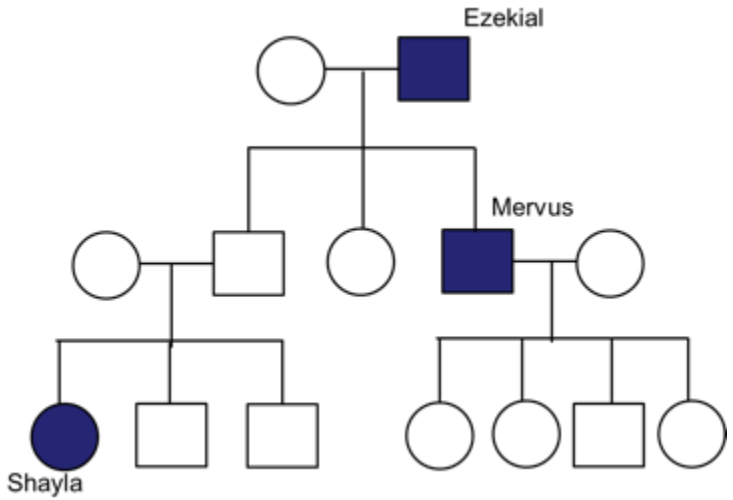
A. 0%
B. 25%
C. 50%
D. 75%
E. 100%

50% chance of having a boy

	X	X
X	XX	XX
Y	XY	XY

50% chance of the child having blue skin (aa)

	A	a
a	Aa	aa
a	Aa	aa



Answer B = .5 x .5 = 25% chance

Pedigrees – You-tube video

- Two link to you-tube video on pedigrees

  https://www.youtube.com/watch?v=HbIHjsn5cHo

  https://www.youtube.com/watch?v=ej2hFc8u_zQ

- I will be posting on Canvas > Genetics – Additional Materials
- Recommend watching if you do not feel confident about pedigrees.