Full lesson transcript for Mr. Zindi of School A

Lesson 3: Genetics and Inheritance on 6 July 2020

Details

- This lesson transcript represents 35 minutes teaching time.
- A black Zimbabwean male teacher was teaching the topic meiosis 32 male and female learner participants, all in grade 12.
- The lesson took place at a former model C co-educational High School in Johannesburg East district in Gauteng on 6 July 2020.
- When used by the teacher, the learners' names have been changed to protect anonymity.
- The textbooks utilised during the lesson are Exam Fever Life Sciences Grade 12 1st edition published by Exam Fever Publishers and Study and Master Life Sciences Learner's Book Grade 12 Published by Cambridge University Press.
- White board and board markers.

Transcription conventions

Symbol	Signification
T:	A verbal contribution belonging the teacher
L:	A verbal contribution belonging to any individual learner
Ls:	A verbal contribution belonging to two or more learners
…	Noticeable pause of less than 1 second in a turn, which could be due to re-formulation or hesitation
─	Sound abruptly cut off e.g false start Truncated word Formal made shorter e.g S-
/ /	Words between slashes show uncertain transcription (not clearly known or understood.

/ ? /	Inaudible utterances
[ ]	Words in brackets indicate non-linguistic information eg [pause for 1 second] Laughter, throat clearing, smile, applause, sigh happily/ werily/deeply, contently, swallowing, nodding, shaking head dance or movement towards/away
( )	Parenthesis around tone units indicate words spoken in a sotto voice under one's breath (in a very quiet voice)
,	Slight pause
?	High rising intonation
.	Falling intonation at the end of tone unit
:	Colon following a vowel, indicates elongated vowel sound or extending length of sound e.g Die:d
::	Extra colon indicates longer elongation
↑	A step up in pitch/ high pitch (high quality sound)
↓	A shift down in pitch (low quality sound)
^	A caret indicating high pitch level e.g ^weird
-	Low pitch level
— —	Self-interruption or repair
Abc	Best guess transcription
ALL CAPS	Utterance is louder/said with extra stress/emphasised compared with surrounding words
/	Rise tone e.g …saying something, /

\	Fall tone
V	Fall-rise-tone
Λ	Rise-fall-tone
CAPS	Prominent syllable e.g sOn or FAthEr

EPISODE 1: RECAP ON TERMINOLOGY

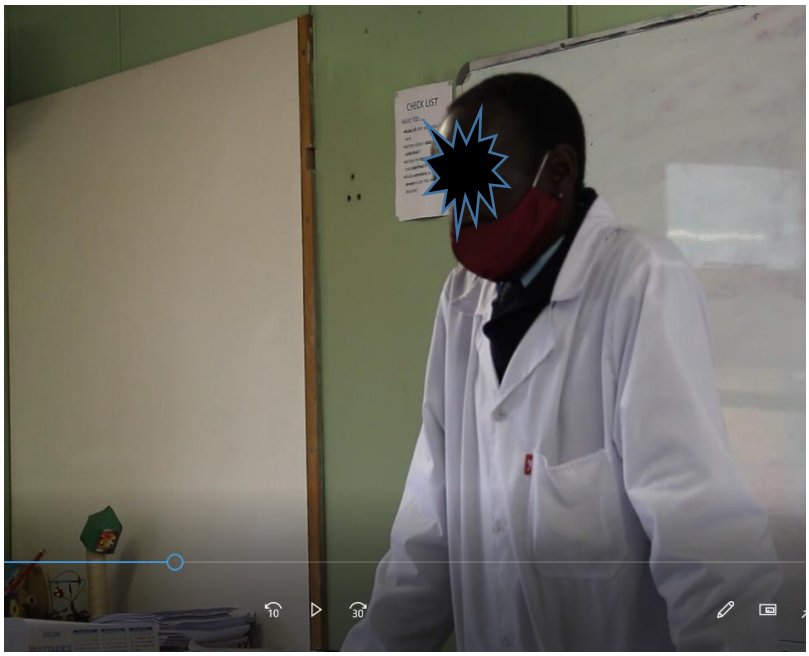
1.	Mr. Zindi:	Right!
2.	Ls:	Shhh…
3.	Mr. Zindi:	Sorry you are now eeh…sitting comfortably.
4.		So ehh … just a remainder to always look at those concepts that you are going to come across are dominant, recessive, phenotype, genotype ehh…[Intercom interruption, learners make noise]
5.		So, we have F_1 generation, F_2 generation and P_1 generation all those concepts, you are going to come across them today when we do the monohybrid crossing.
6.		So, one of these concepts was monohybrid, who can tell us what monohybrid refers too?
7.		What is monohybrid?
8.		Yes, Enhle! [Intercom interruption]
9.	Ls:	[Noise]
10.	Mr. Zindi:	Right!
11.	Ls:	Shhh…
12.	Mr. Zindi:	Let us carry on, Enhle was about to say something [Noise]
13.		Now we all need to listen and avoid wasting time.
14.		Okay, Amahle!
15.	Amahle:	Sir, it is a cross that involves only one characteristic trait [not clear]
16.	Mr. Zindi:	That is correct!
17.		In other words, this is a generic cross whereby we track down a single characteristic or a single trait.

EPISODE 2: GENETIC CROSSES

18.		SO, basically today we are going to do the genetic crosses and we are going to start from ehh…what we discussed about Mendel and remember Gregor Mendel did experiments using pea plants and he crossed pure pea plants and up to F_2 generation.
19.		So, we are going to take that as our example and we are going to learn to do genetic diagrams.
20.		SO, [louder] our genetic diagram will consist of 3 aspects.

21. One, we are going to look at what is co-dominance, we are also going to look at dominance and-- I mean complete dominance.

22. Then co-dominance… [using head]



…and then incomplete dominance, so our crosses will be based on that and find out what is meant by that!

23. So, let us go back to Mendel's crosses where he crossed pure breeding tall plants and pure breeding short plants.

24. Who can remind us again about what pure breeding means?

25. We discussed this at length.

26. So… what is it? We need to start this [inaudible].

27. What is meant by pure breeding? [Silence]

28. Yes, Marlon?

29. Marlon: I think it is when you-- [not clear] when a plant self-pollinates.

30. Mr. Zindi: When a plant self-pollinates… [not clear]

31. What type of plants…

…is it, pure breeding or true breeding plants, of course there is [clearing throat] self-pollination and what happens… [moving towards learners]

…when you start?

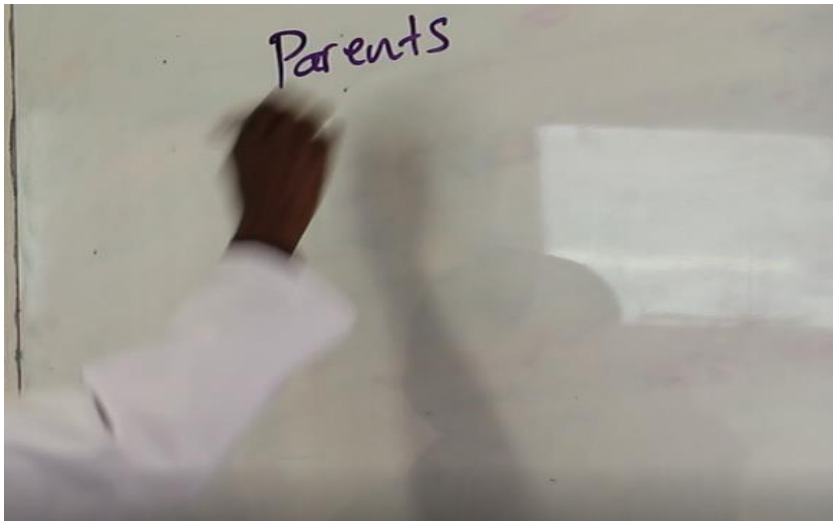
32. When this pure breeding self-pollinates.
33. What is the phenotype of this generation?
34. Christy: Sir, [inaudible]
35. Mr. Zindi: In the [not clear] that is correct.
36. So, if you are breeding.
37. This term means offspring with the same phenotype which is similar to crossed parents.
38. Let us look at the genetic diagram. What is a genetic diagram?
39. [Louder] It is a diagram…

…or format that we are going to be always using when you are doing the monohybrid cross.

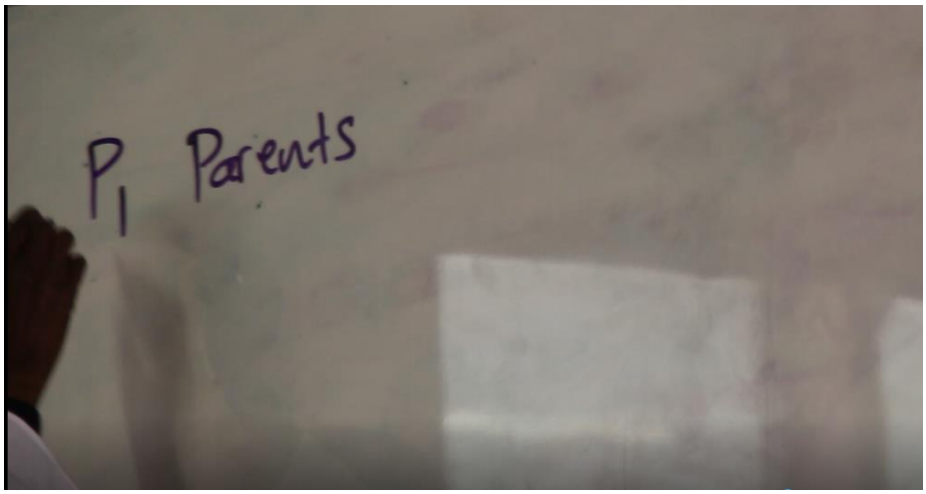
40. So, what are the steps?

41. Step number 1, you must identify the characteristic of the organism in terms of the parents for any breeding to take place there must be parents.

42. So, firstly you look at the parents right [writing].

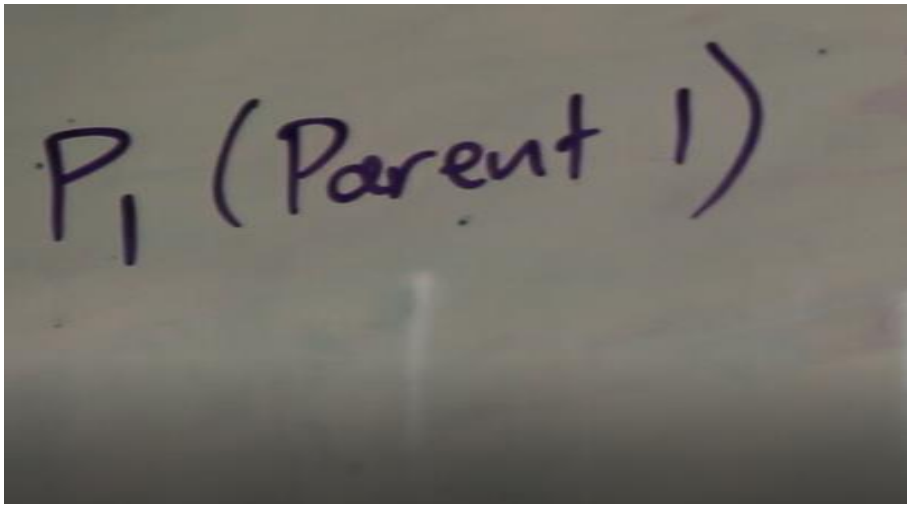


43. You need to write this down.
44. Write the date and the topic ‘Monohybrid Crosses’1.
45. Now what do we call this…?
46. We call this …



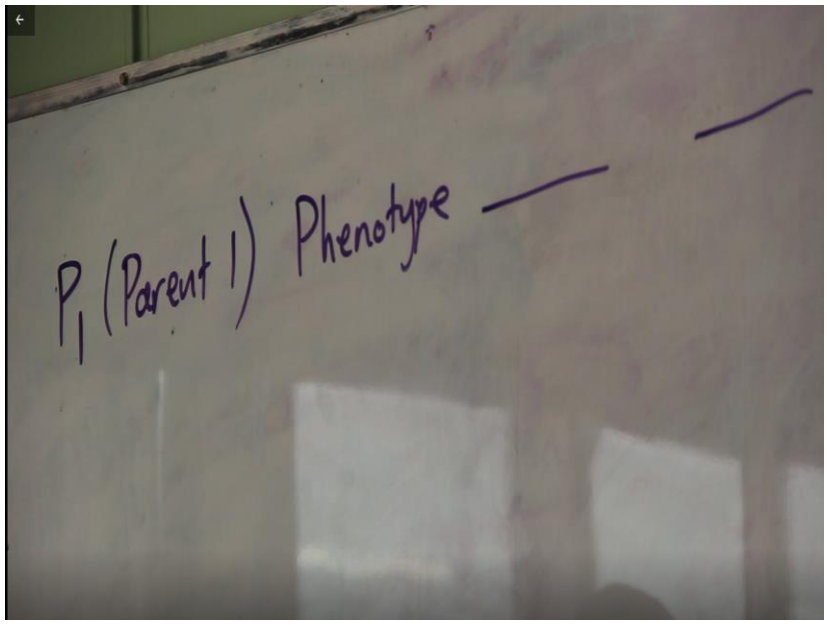
…whenever you see P_1...P stands for parents, right?

47. So, parent 1, what do you look at in parent? [Erases the word parent]
48. First of all, you start with the phenotype.
49. P_1 means parent 1.



…phenotype.

50. Then these parents they have phenotypes.



51. Do you still remember what genotype means?

52 Ls: Yes, sir!

53. Mr. Zindi: What is it?

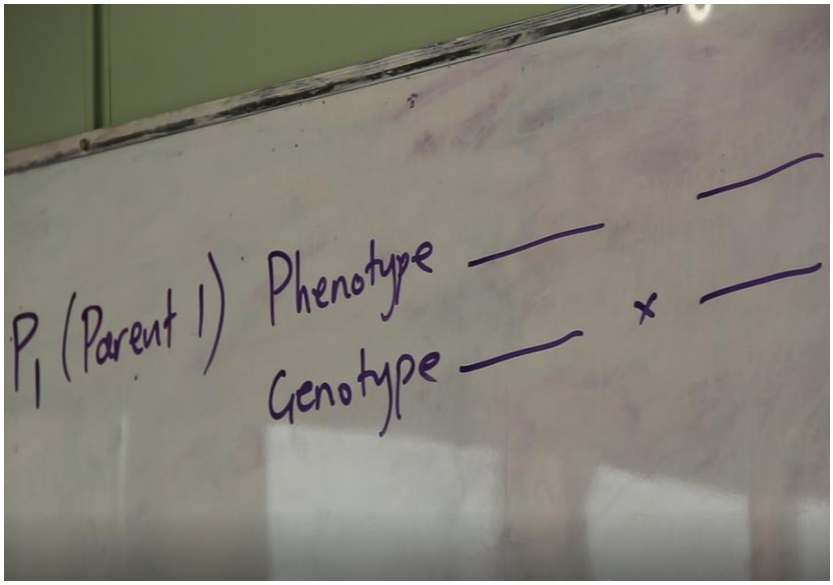
54. Who can quickly tell us, what is genotype?

55. Sibusiso: It is the genetic makeup of an organism.

56. Mr. Zindi: That is correct!

57. The genetic makeup of an organism.

58. So, the next step is … then P_1 genotype…you have this P_1 phenotype…[writing]



59. Now you have your two parents…they are in love and are going to make babies…
60. Ls: [Laughter]
61. …what needs to happen there because they are going to … what happens next?
62. Ls: Fertilization!
63. Mr. Zindi: Fertilization will take place.
64. What is involved with fertilization? Yes!

65. Sipho: The gametes… [unclear]
66. Mr. Zindi: Yes! Pardon!
67. Sipho: The gametes …
68. Mr. Zindi: The gametes, right now these gametes must be formed first.
69. What is the process that is involved in the formation of gametes?
70. Joseph: Gametogenesis!
71. Mr. Zindi: Gametogenesis, it occurs in which process?

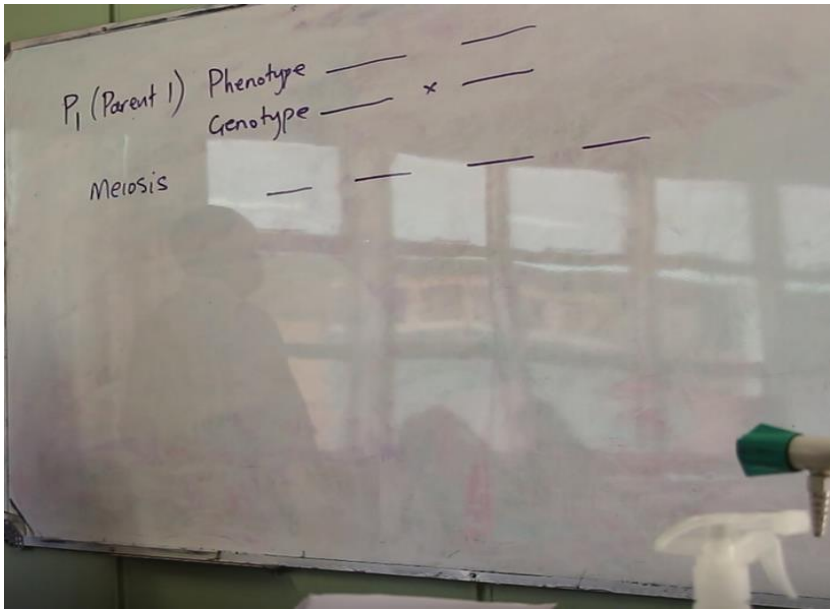
72. Sifiso: Meiosis!

73. Mr. Zindi: In meiosis, the cell chosen occurs first.

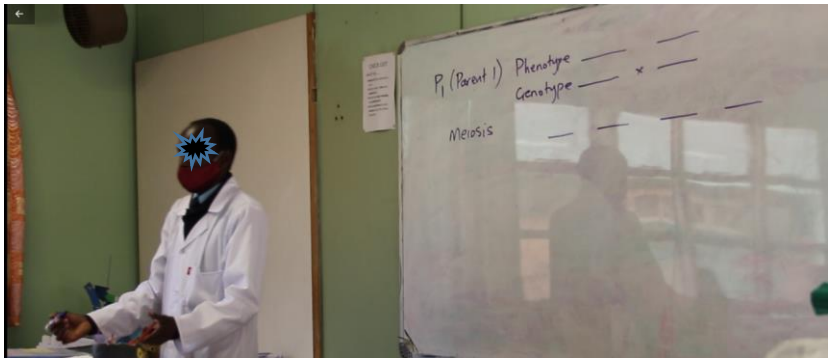
74. [Louder] So this must happen.

75. You have the parents' genotype there.

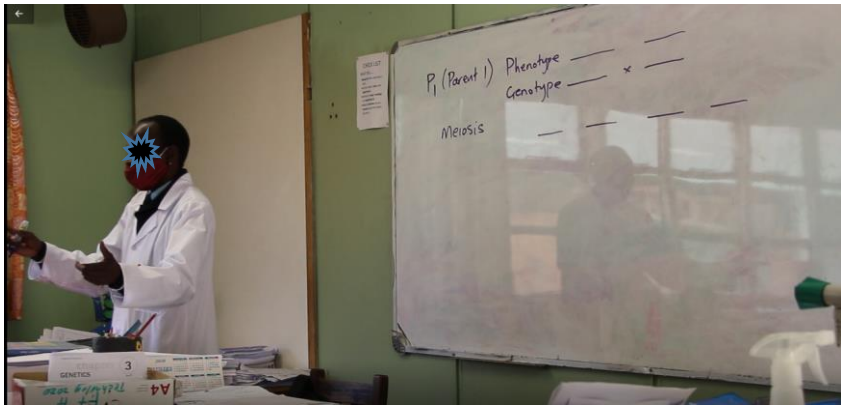
76. Then the next stage must be meiosis that takes place [writing on board].



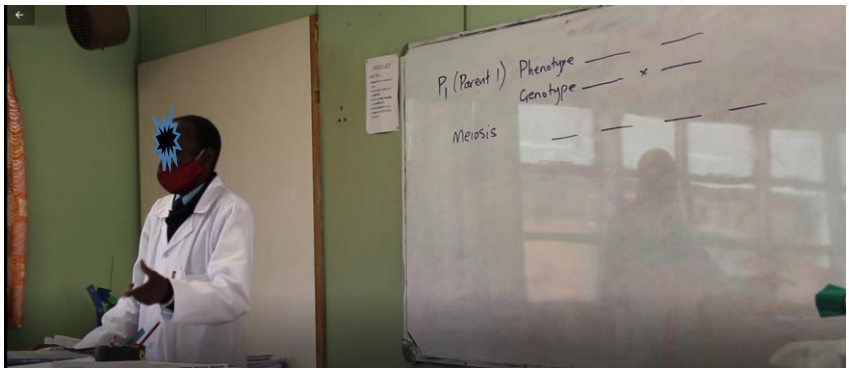
77. Now meiosis has taken place…



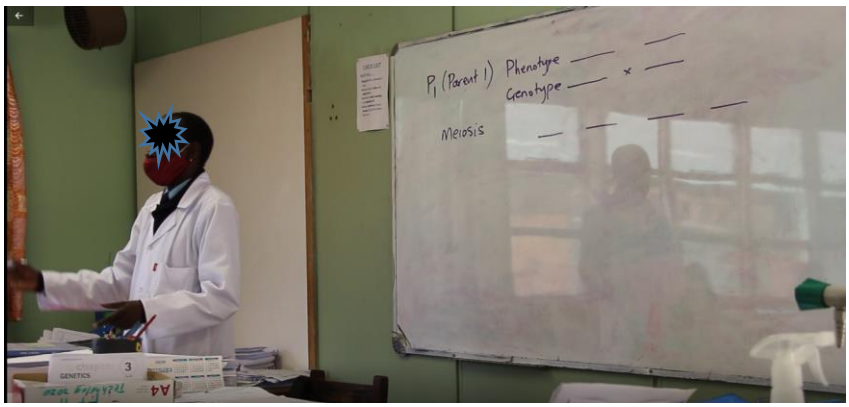
…we have the sperm cells…



…and the eggs in the case of ehh… mammals, in the case of plants we have ovules…

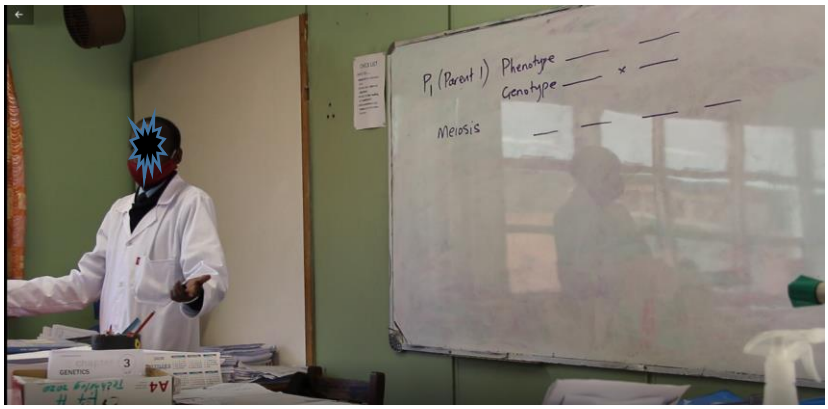


…then we have pollen grains.



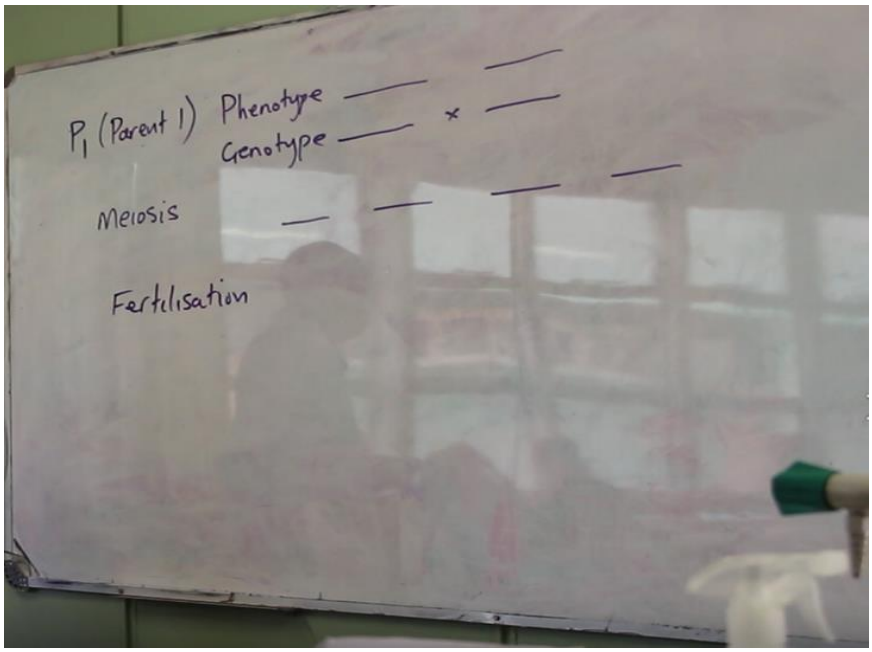
Then what happens next?

78. When we have gametes…



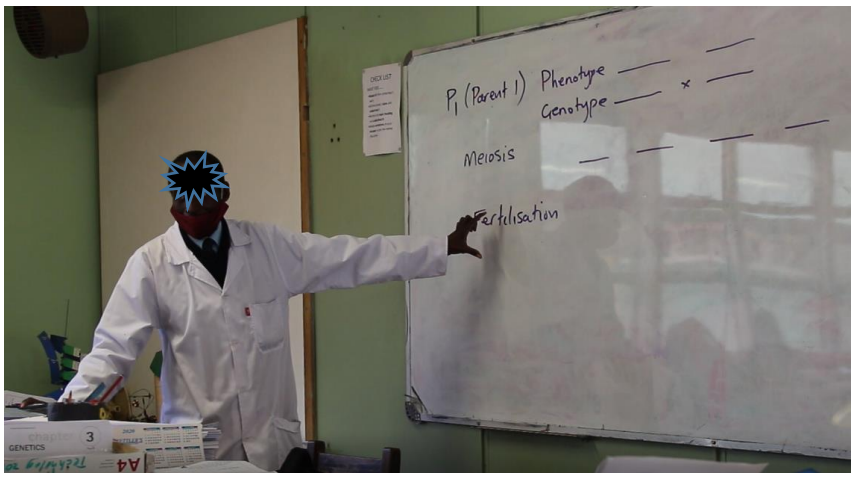
…what is the next thing to happen in reproduction?

79. Fertilization …[writing]



…fertilization takes place.

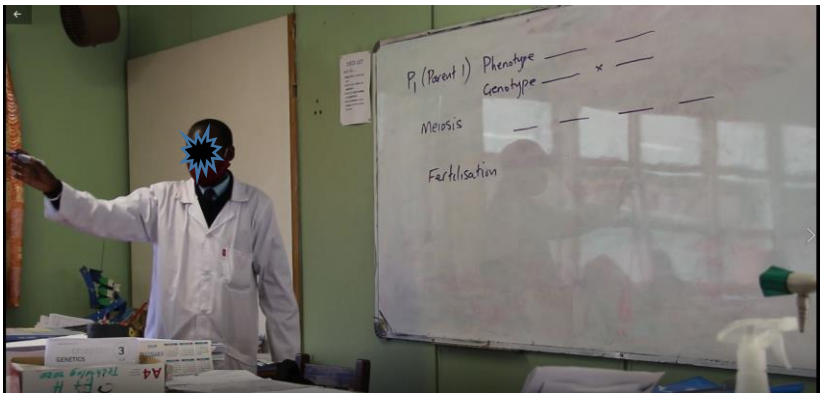
80. Right, [clearing throat] I am going to end here…



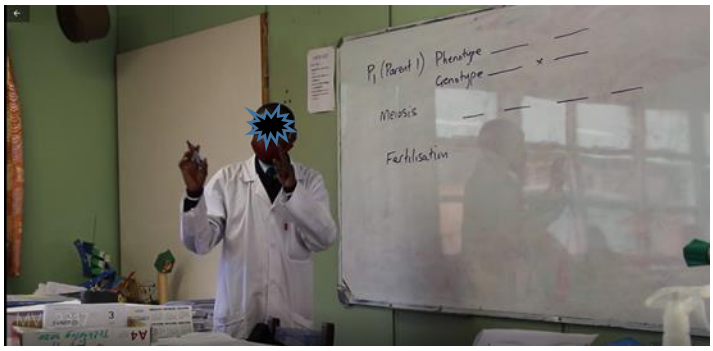
…for now, and then explain the rest okay.

EPISODE 3: GENETIC CROSS USING MENDEL'S EXEPERIMENTS

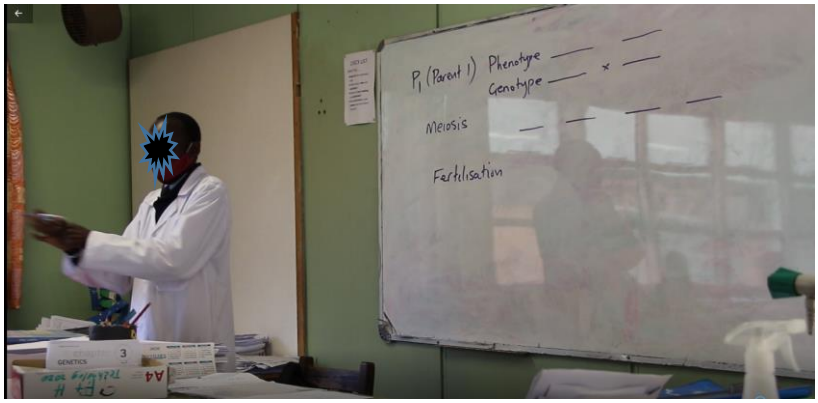
81. So, let us go back to Mendel.



82. Mendel used two…

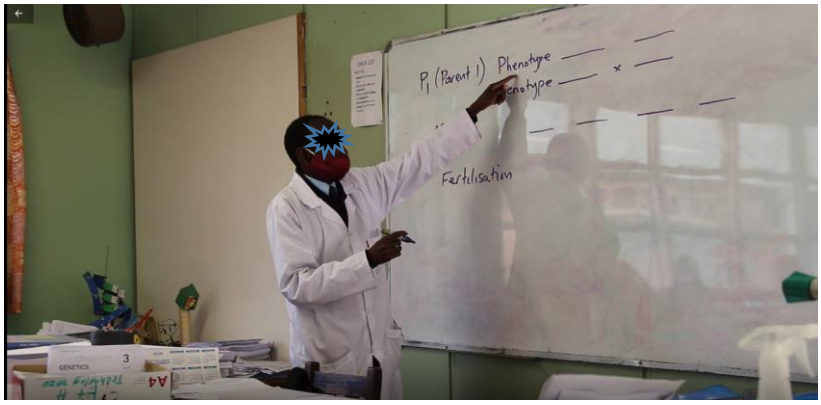


…pure breeding plants, tall plants…

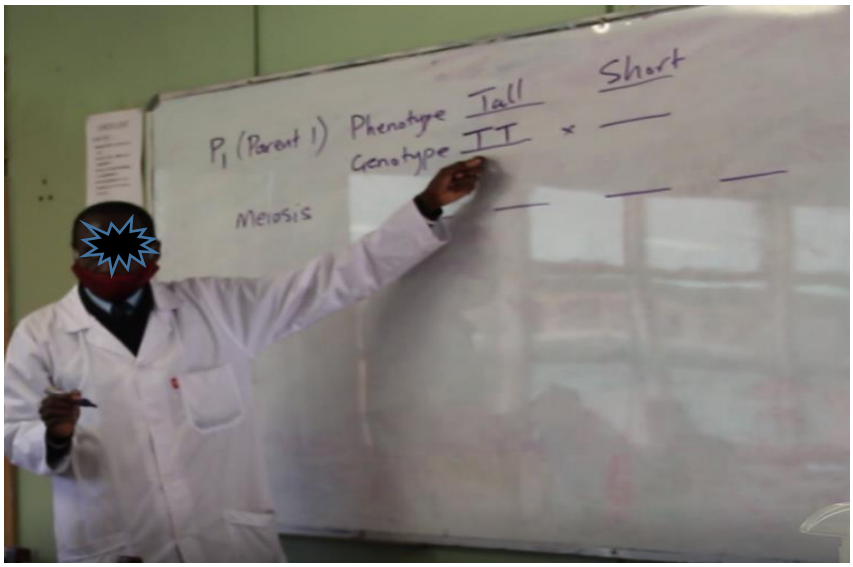


…and short plants.

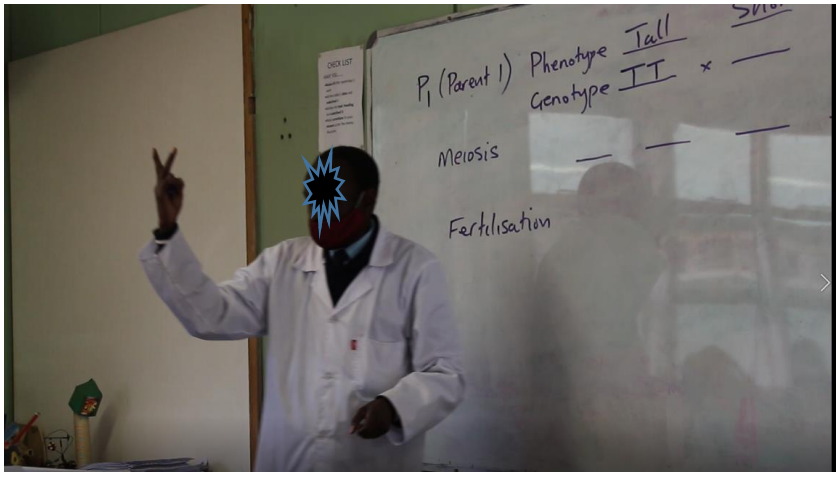
83. Right, how do we represent the phenotype? [Pointing]



84. One parent is a tall plant and the other is … short.
85. Now genotype!
86. They are pure breeding; how do we represent genotypes?
87. By …
88. Ls: Letters! Sir.
89. Mr. Zindi: Letter, right [clearing throat] we discovered that the tall plants … the tall plants were dominant over.
90. I mean the … the genes or alleles for tall plants were dominant over short plants.
91. So, how do we represent the dominant tall … capital letter T. [writing]

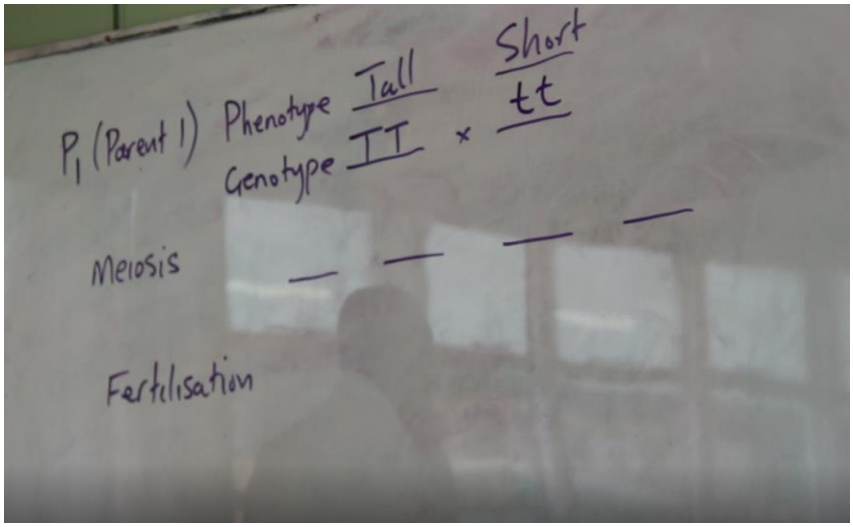


92. Why do we have two?
93. The genes are always in pairs…

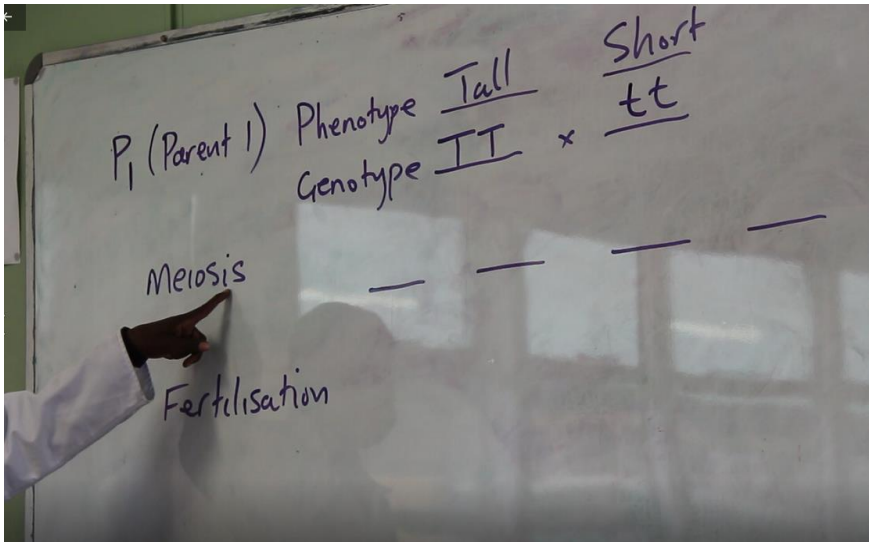


…and we call them alleles.

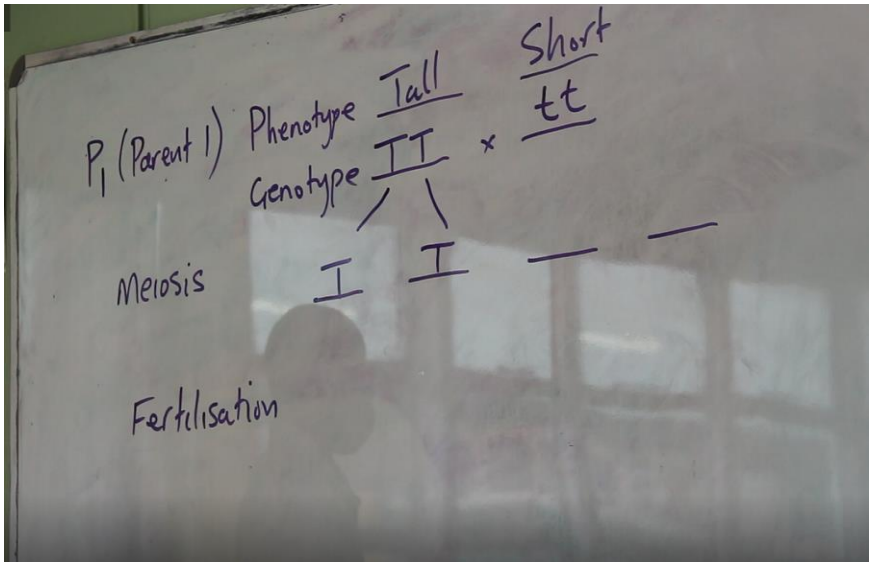
94. Then the short ones are small letter … T… [writing]



…now meiosis must take place… [pointing].

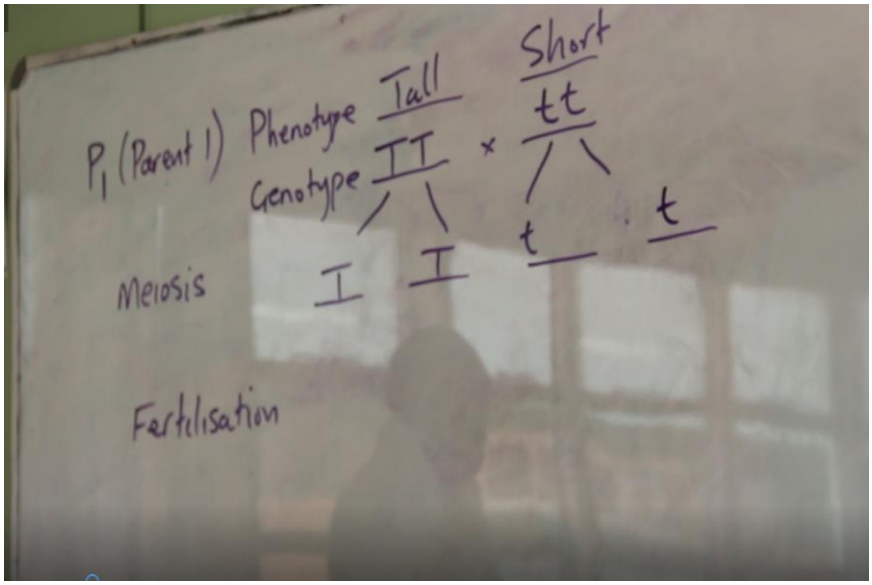


95. This is where the two alleles are going to be separated… [writing]



…we have T: there and another T there.

96. Same applies here meiosis o-- occurs… [writing]

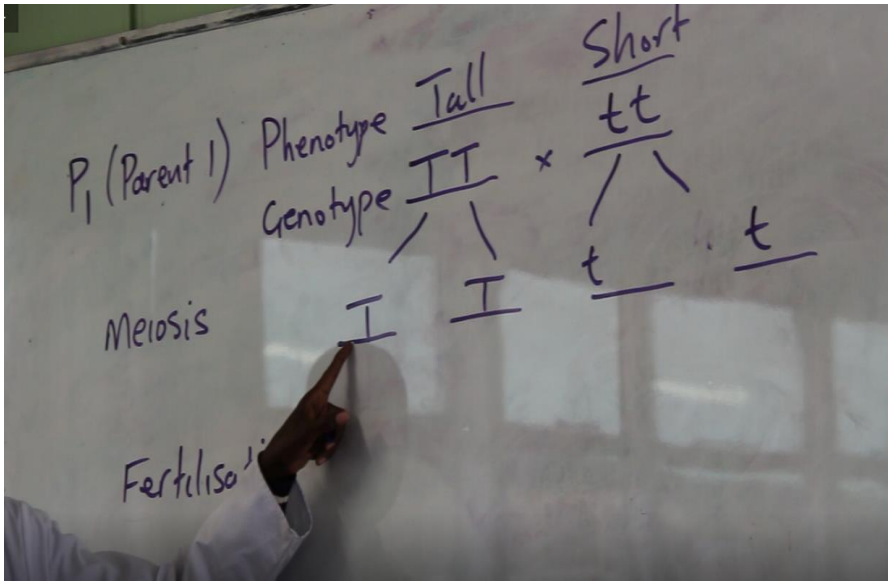


…segregation of gametes …

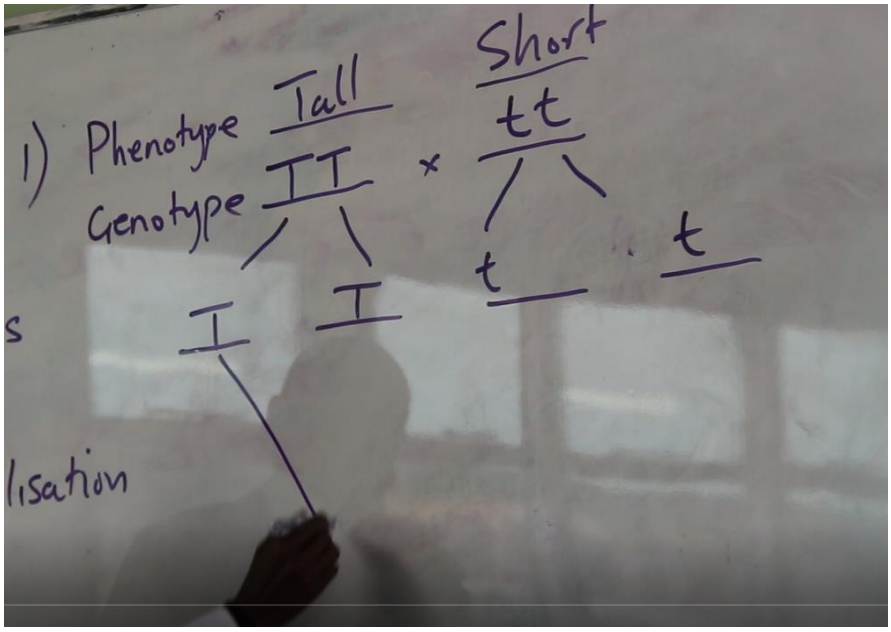
97. Right, you can use what we call ehh…genetic cross diagram and you can also use what is known as the punnet square to do your calculation.

98. But first, let us use this ehh…other method to get to F_1 generation now this a sperm-- I mean this is a pollen grain.

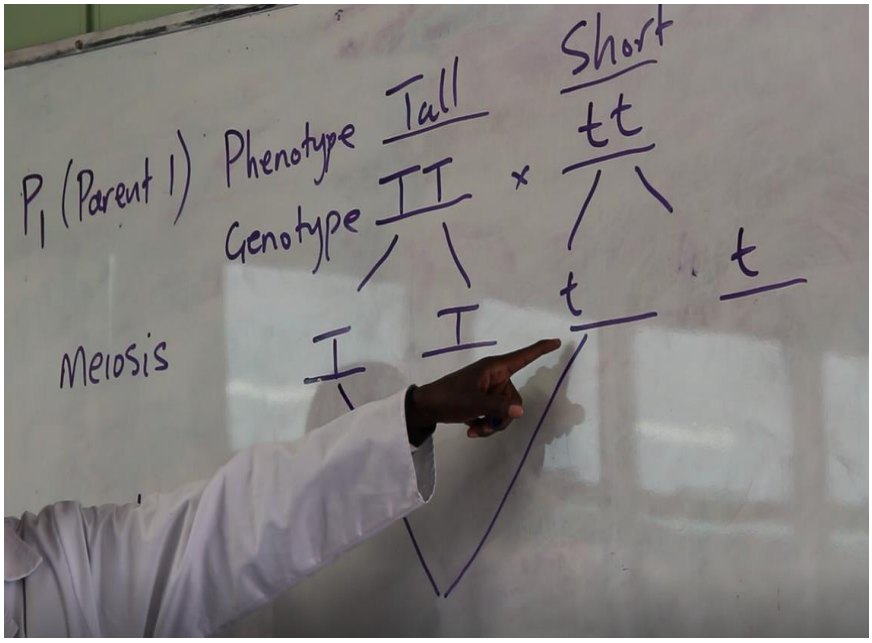
99. Let us assume it is a pollen grain… [pointing]



…and this has a chance of… [drawing line]



…fertilizing this ovule… [drawing line and pointing]

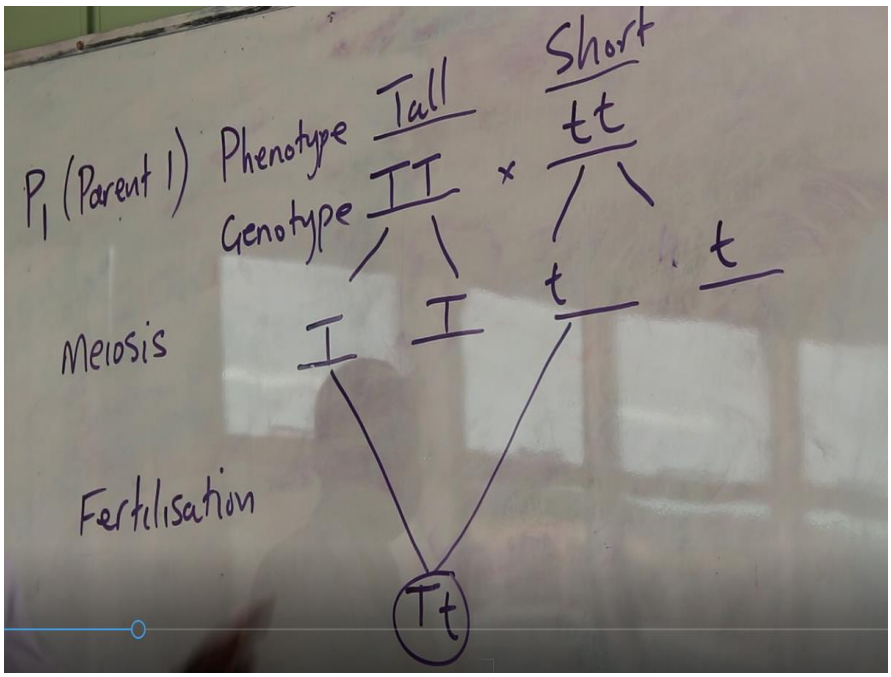


…are you following?

100. Ls: Yes!

101. [Cleaning throat] What is the result when these two are combined?

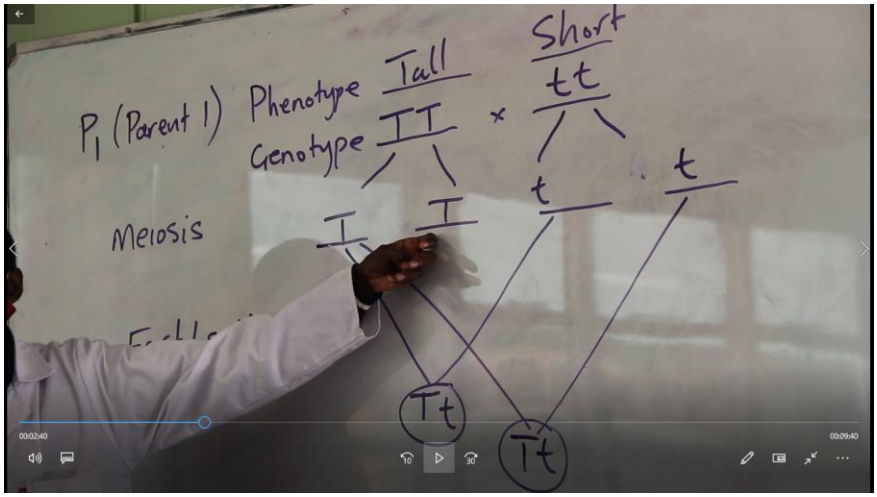
102. We have … [writing]



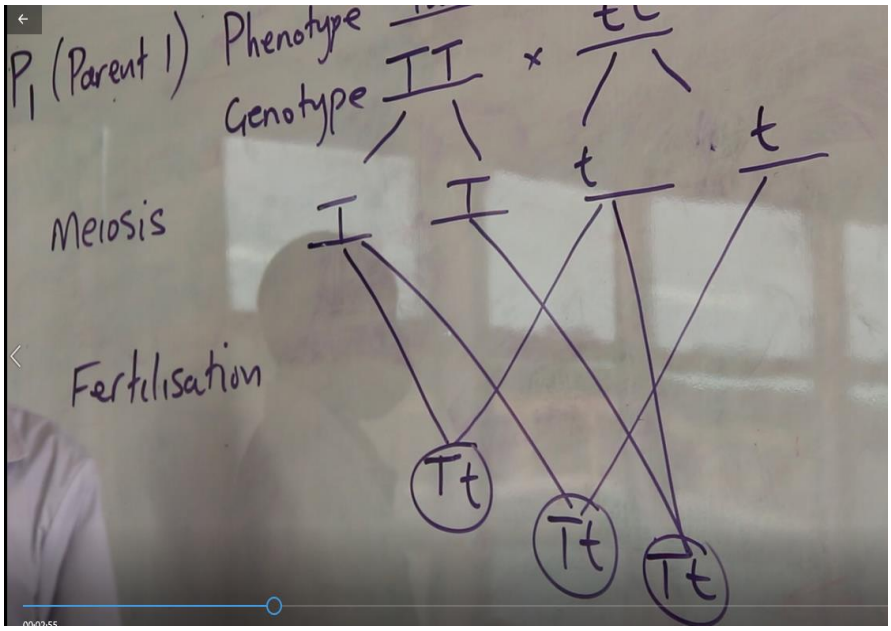
103. Big T: and small t right?

104. Also, the same Capital letter T means the same ehh…allele represented by the capital letter has a chance of fertilizing with
that, what is the result?

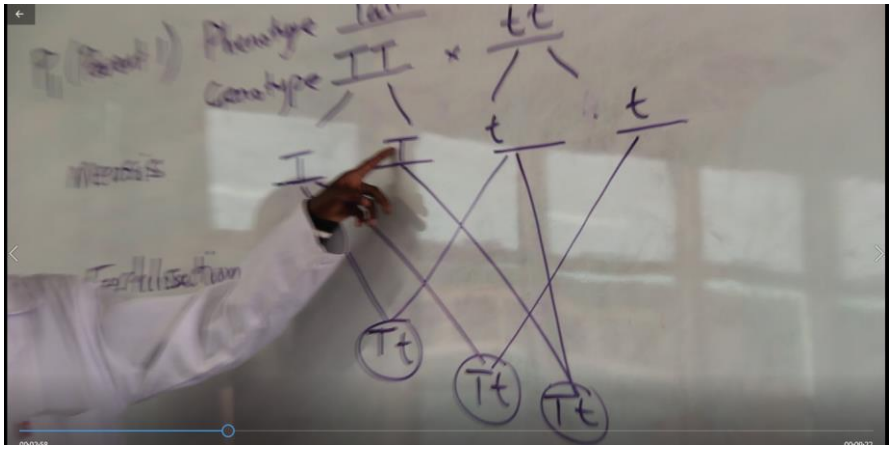
105. Right you look at this, you go to the second one.



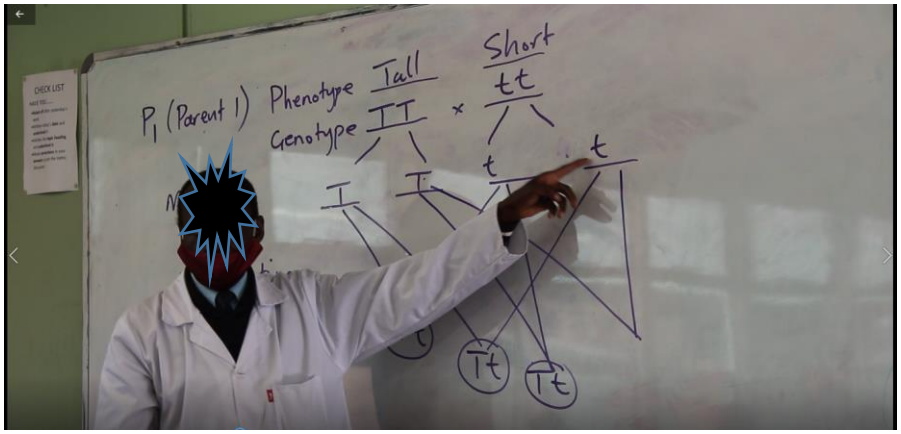
106. This can fertilize the ovum… [clearing throat] right…[writing]



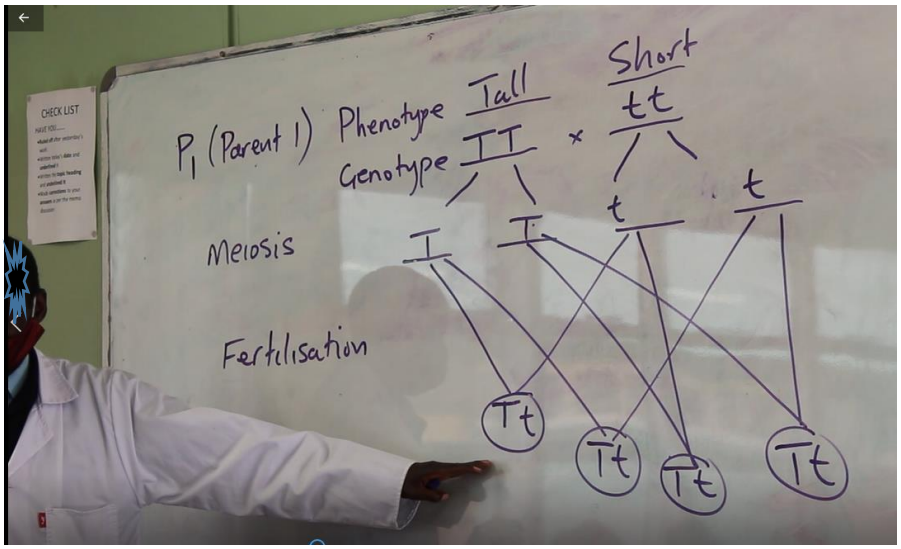
… [clearing throat] and the same ehh pollen grain…



…can fertilize this ovum.



...then we get our ehh…results right?

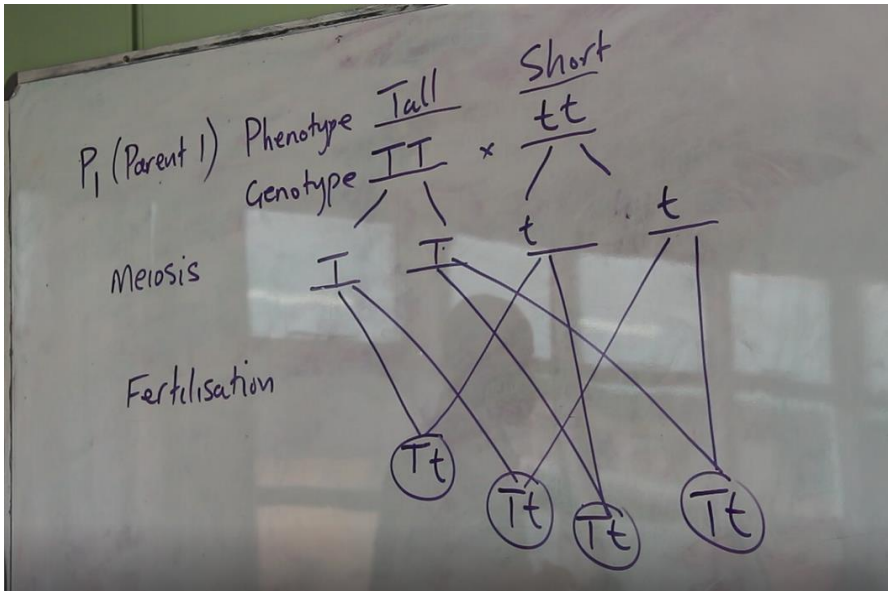


107. This is our first generation, F_2 generation…F standing for filial generation.

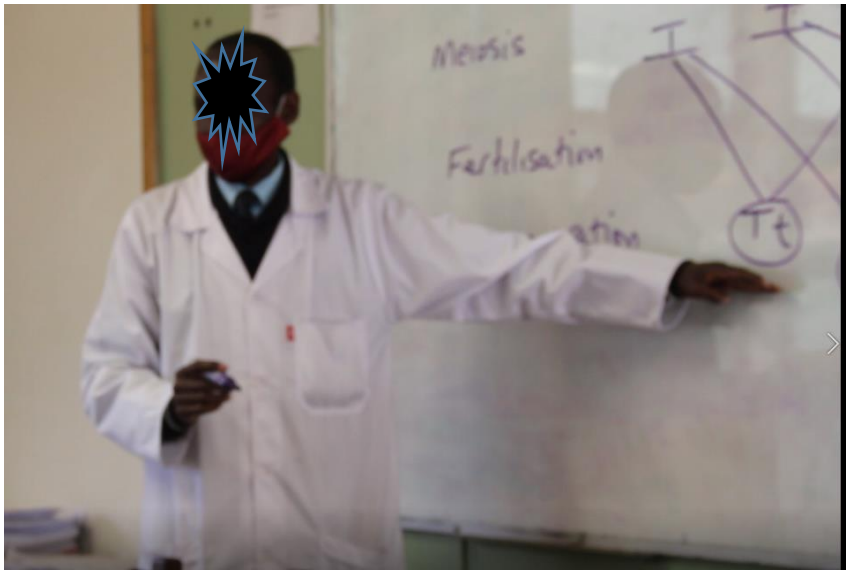
108. This generation, where is it coming from?

109. It is a result of breeding of P_1 or parents 1 right.

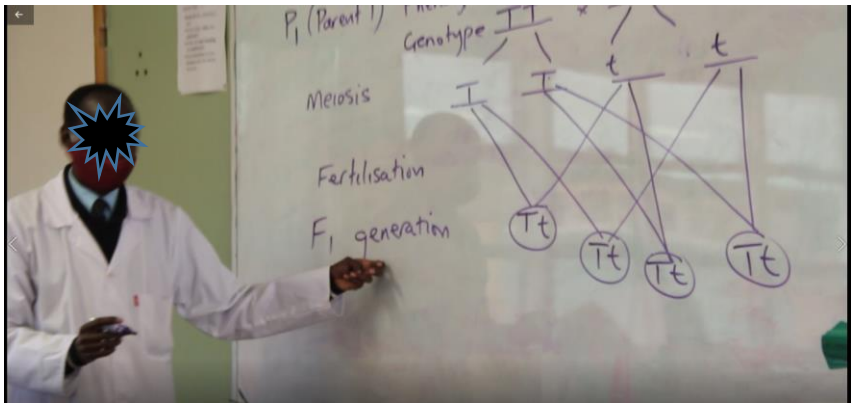
110. So, [writing] this is F_1 … offspring of P_1 generation.



111. What do we call these?



112. Are these phenotypes or genotypes of F_1? [Pointing]

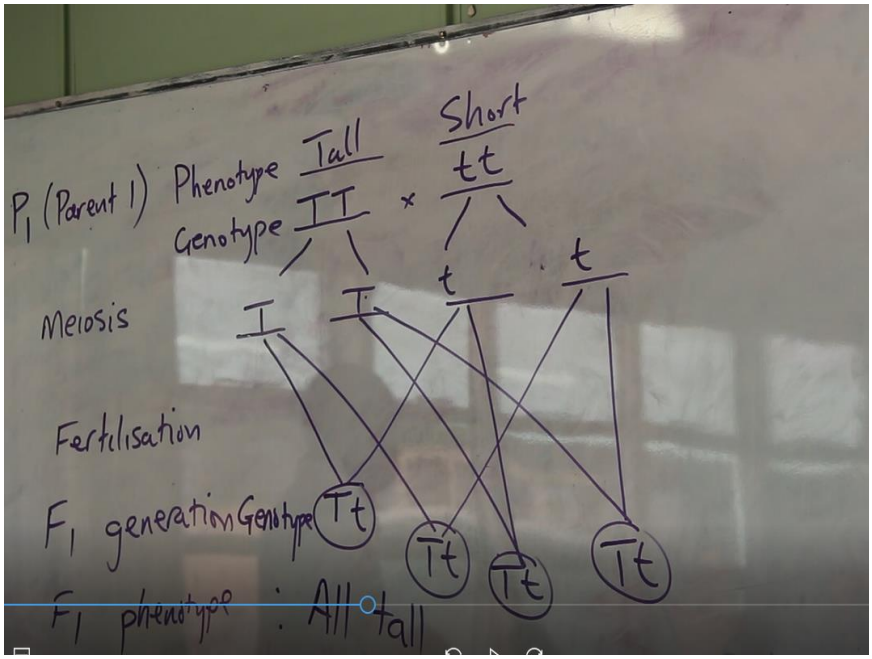


113. Ls: Genotype

114. So, this F_1 …genotype.

115. So, this F_1 each genotype.

116. Then the next stage let us identify F_1… [writing]



…phenotype, right, what is the phenotype for F_1 generation?

117. They are all …they are all … tall right?

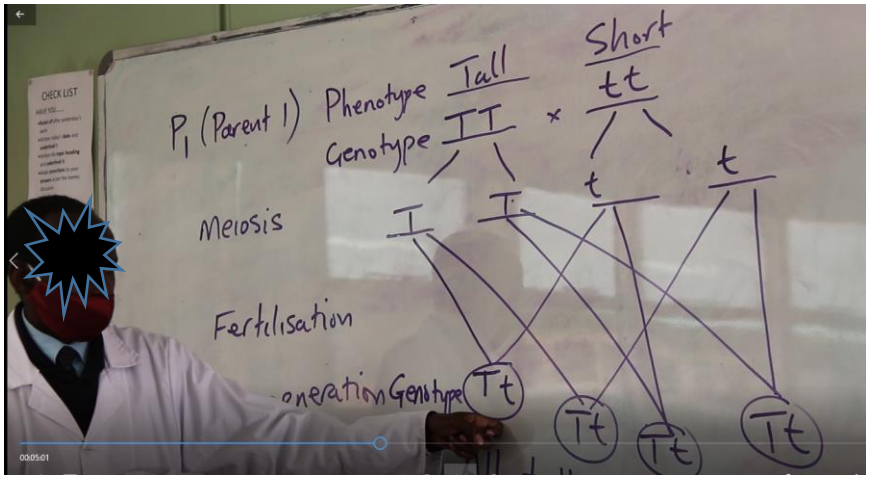
118. Then [clearing throat] if you are required to calculate the percentage.

119. What is the percentage there?

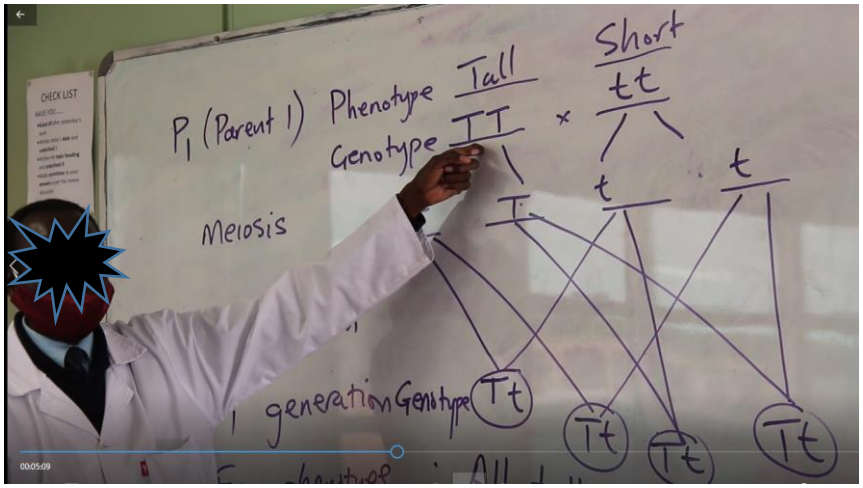
120. Ls: 100% tall!

121. Mr. Zindi: 100% tall Percent [writing] phenotype 100% tall…and how?

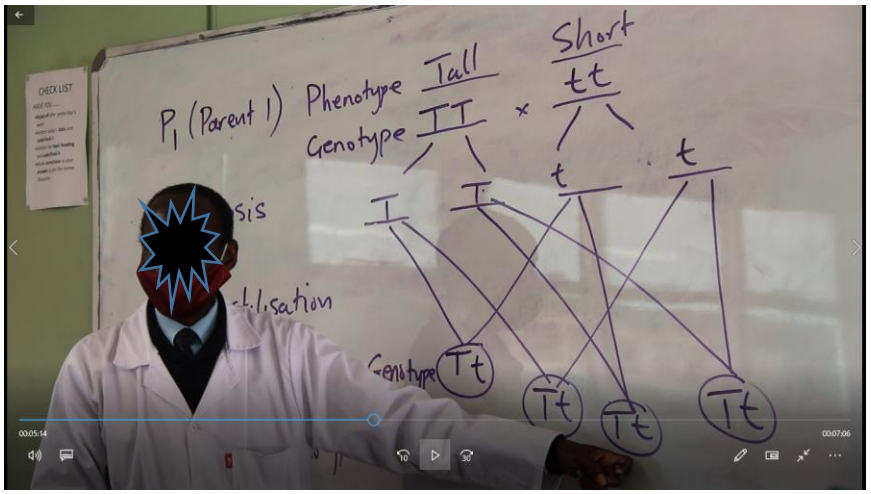
122. Now look at the offspring,



…their genotypes look different from their parents' genotype …



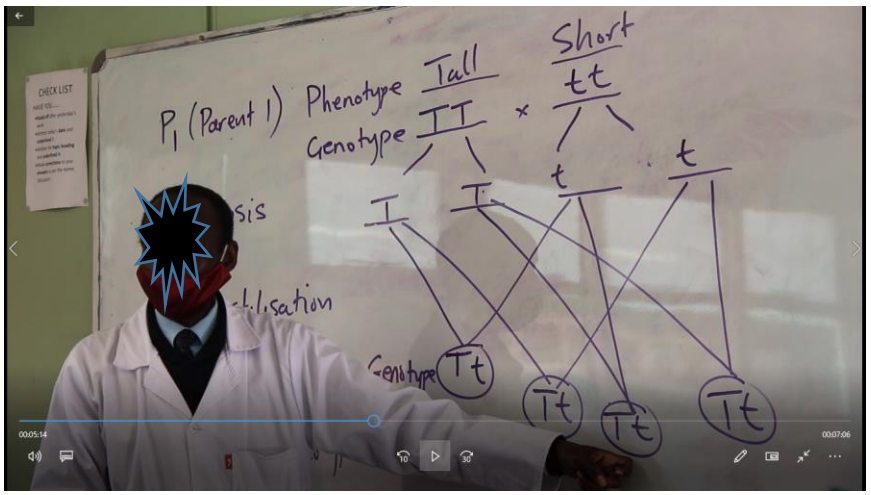
… and this we said-- we refer to this as pure breeding, what … term do we use to refer to describe this?



123. The genotype of the F_1 generation?

124. Are they homozygous or heterozygous?

125. Remember, we said the parents …



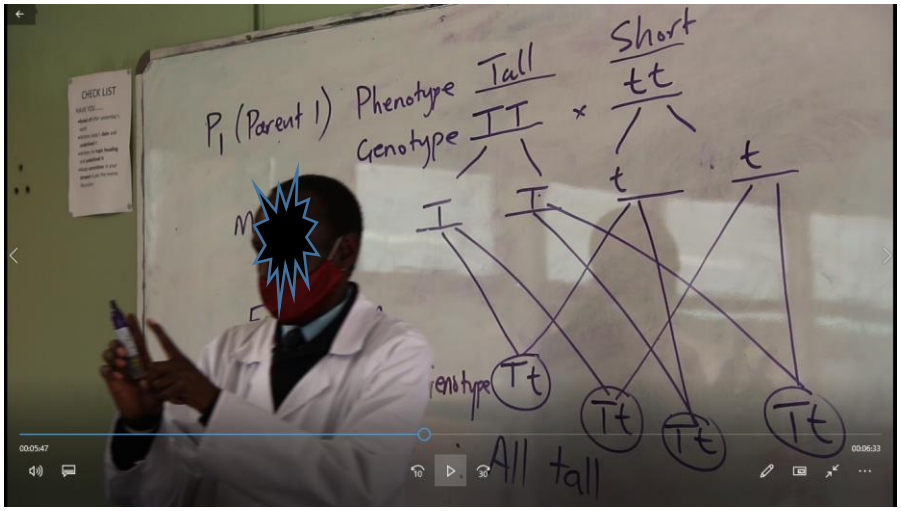
…pure breeding parents are homozygous.

126. Homo— means the same right?

127. So, this one is …

128. Ls: ((Heterozygous))

129. Mr. Zindi: …because the alleles are…



…different, right?

130. Now … imagine having or probably doing four or five of these examples and doing the crisscrossing.

131. Most of you will end up being confused.

132. You end up confusing the lines.

133. You end up repeating this twice.

EPISODE 4: USING A PUNNET SQUARE

134. So, there is another way which is very simple, which is known as the punnet square.

135. So, let us represent what we represented there using the punnet square.

136. Are you done copying this?

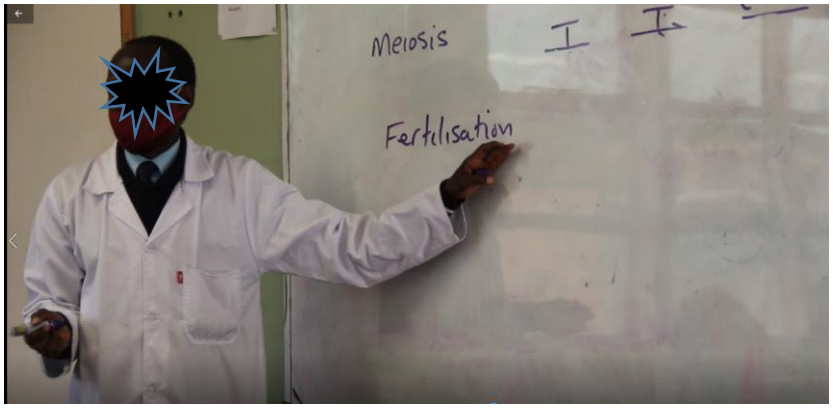
[Erases genetic cross from the board]

137. Ls: [Noise]

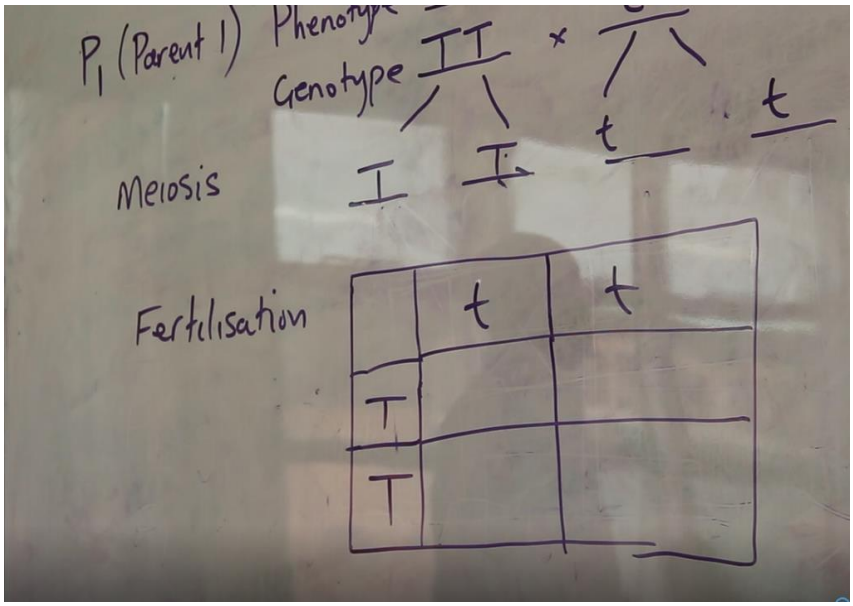
138. Mr. Zindi: Right!

139. Ls: Shhh…

140. Mr. Zindi: Now we are on fertilization…



…and we want to draw a punnet square. … [drawing a punnet square on the board]



141. Ls: [Talking]

142. Mr. Zindi: Right!

143. Ls: Shhh…

144. Mr. Zindi: Can we continue?

145. Ls: [Noise]

146. Mr. Zindi: Now!

147. Ls: Shhh…

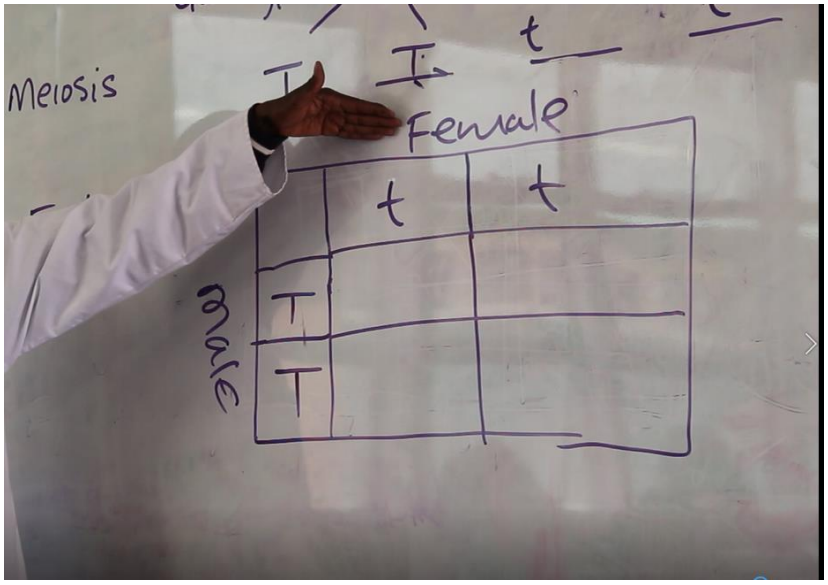
149. Mr. Zindi: We are going to use the punnet square.

150. So, we have our gametes represented here.

We have the female gametes.

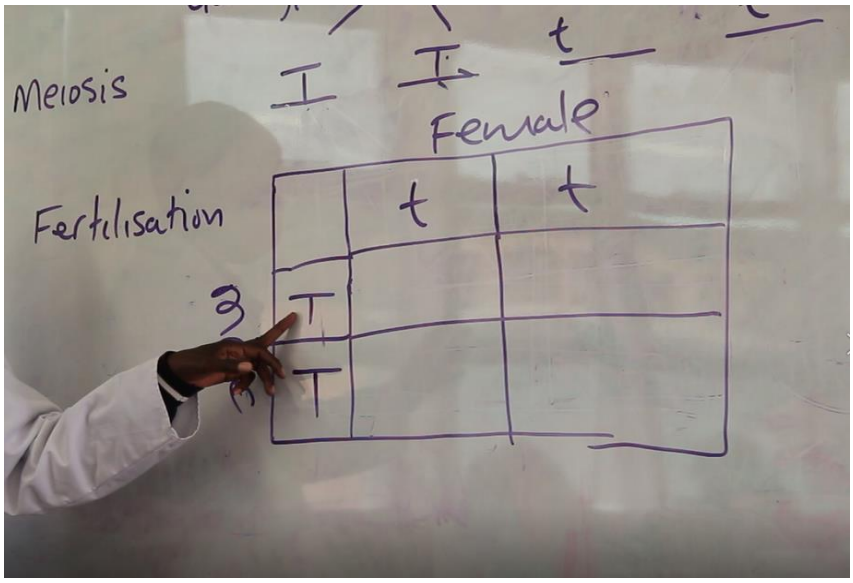
151. So, what you must do is just cross them and you get your genotype.

152. So, this side let us assume that this is the male, and this is a female… [showing]

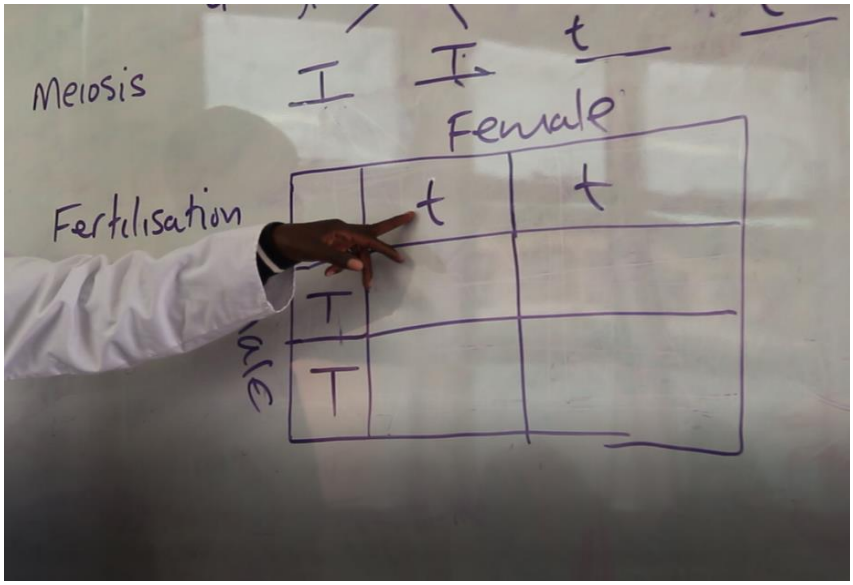


153. So … the punnet square comes in different forms, sometimes it will be just be four squares and you have to write just gametes ehh… that side.

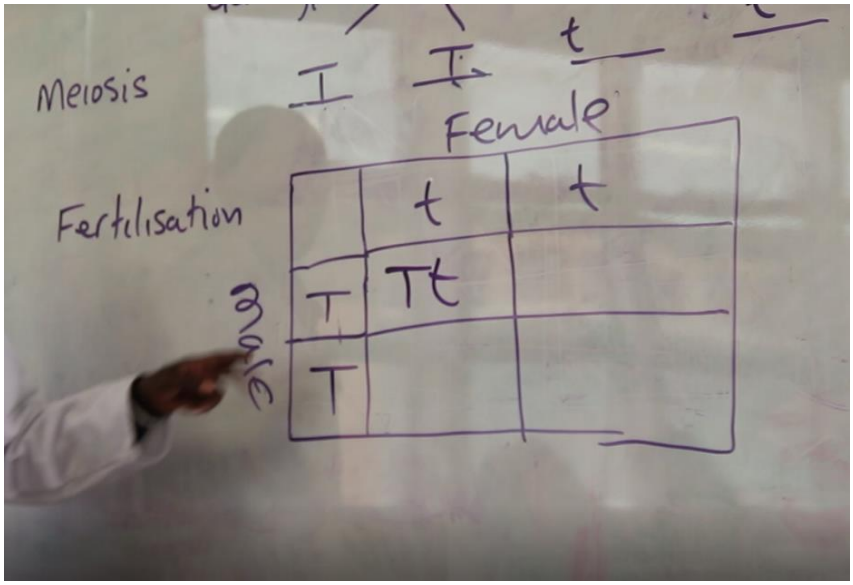
154. Right so, this … it is like you are multiplying this [showing]



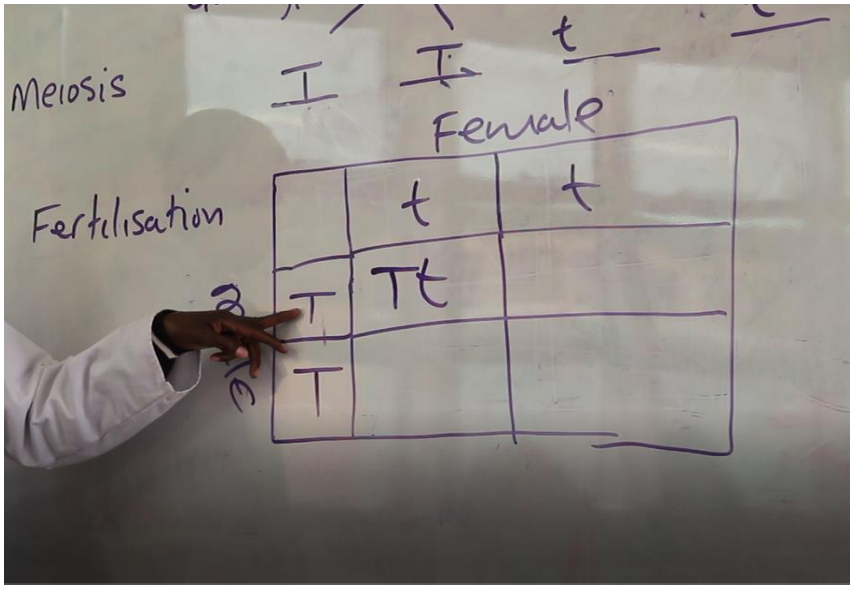
…and this…



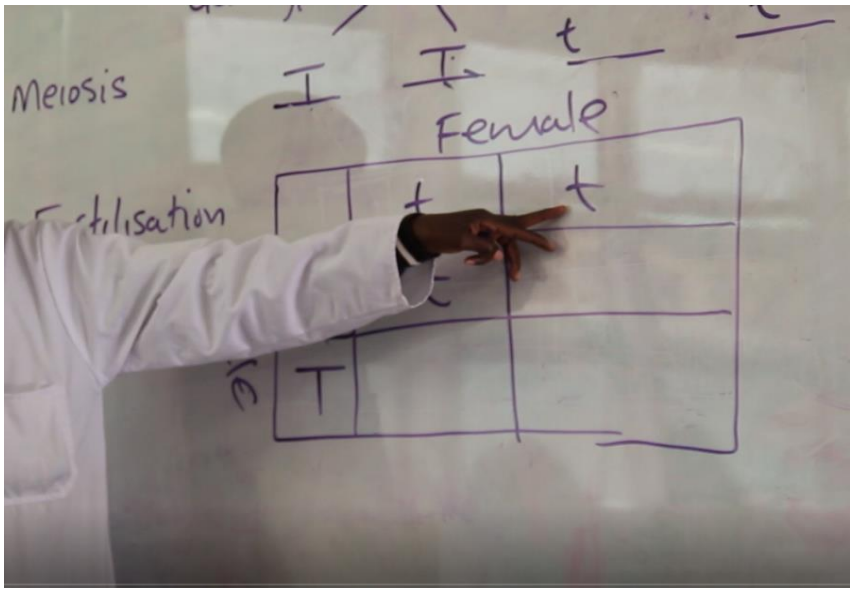
…what do you get?



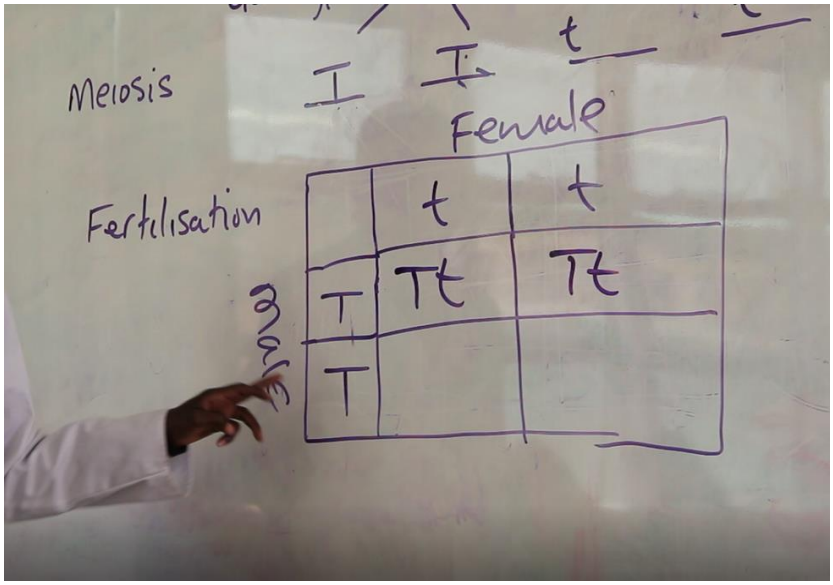
155. Right the same allele…[pointing]



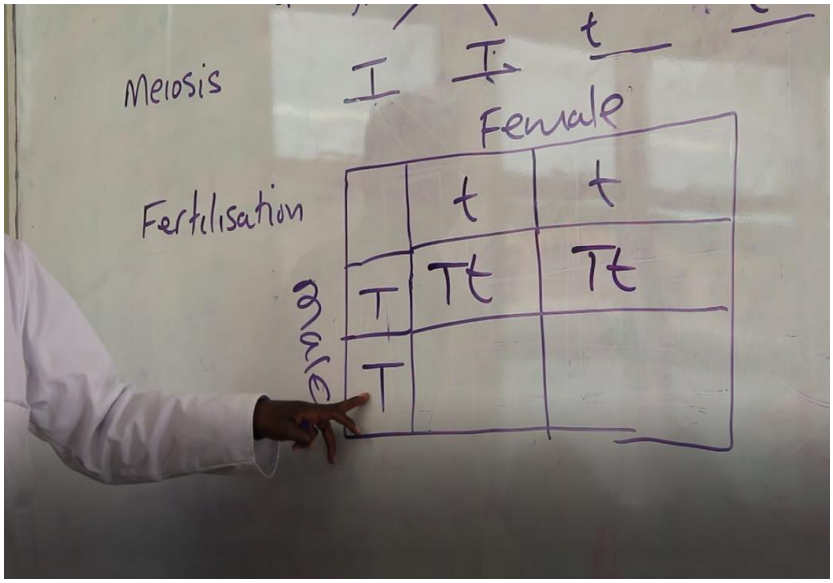
…crossing with this one…



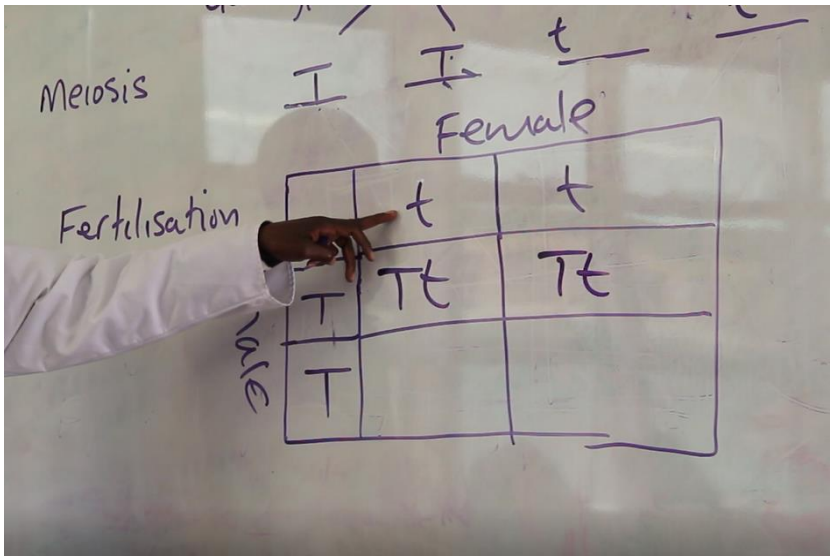
156. What do you get?



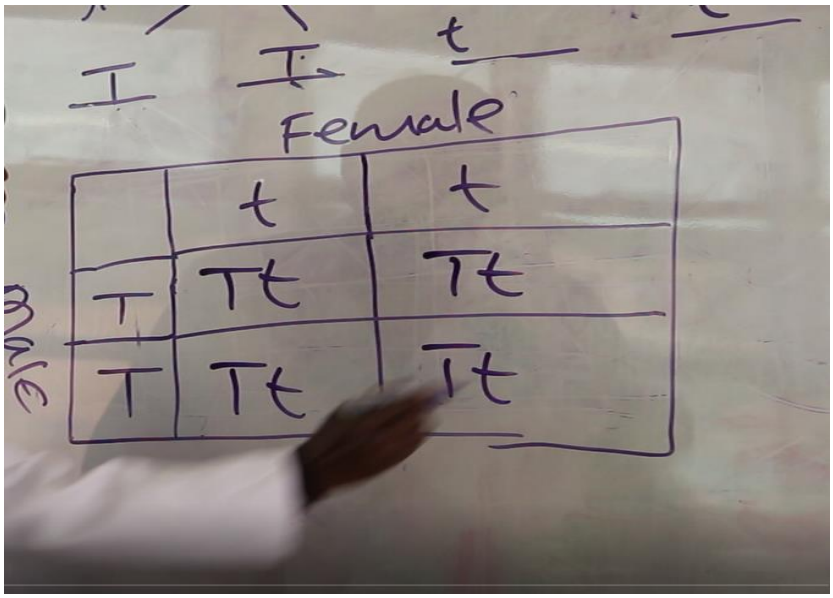
157. This one Right, this one and this one.



158. This one and this one.



159. This one and this one…



160. So, with that crisscrossing of the lines you are going to get your results.

161. Now it does not end there.

162. Ls: [Noise]

EPISODE 5: ANALYSIS OF RESULTS

163. Mr. Zindi: Now can we— [Learner enters]

164. Ls: Shhh…

165. Mr. Zindi: You must be glad he is back

166. Ls: [Laughter]

167. Mr. Zindi: So, let us continue Right.

168. Ls: Shhh…

169. Mr. Zindi: What is the next step?

170. That we need to do there.

171. Now that you have offspring.

172. What must be done?

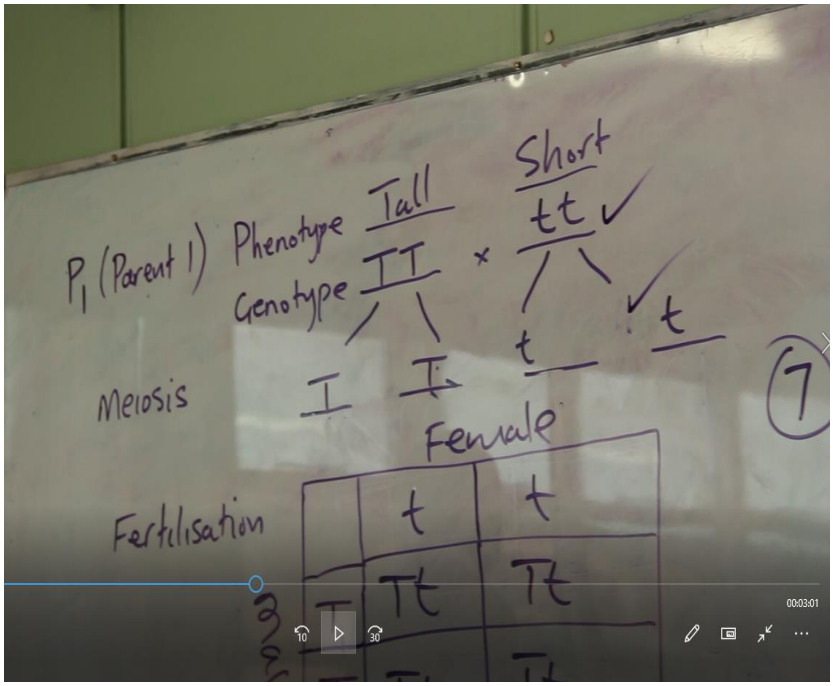
173 Because the question is saying use a genetic diagram or use a punnet square to determine … genotypes, phenotypes of F_1 generation probably up to F_2 right.

174. So, what do you write next, suppose?

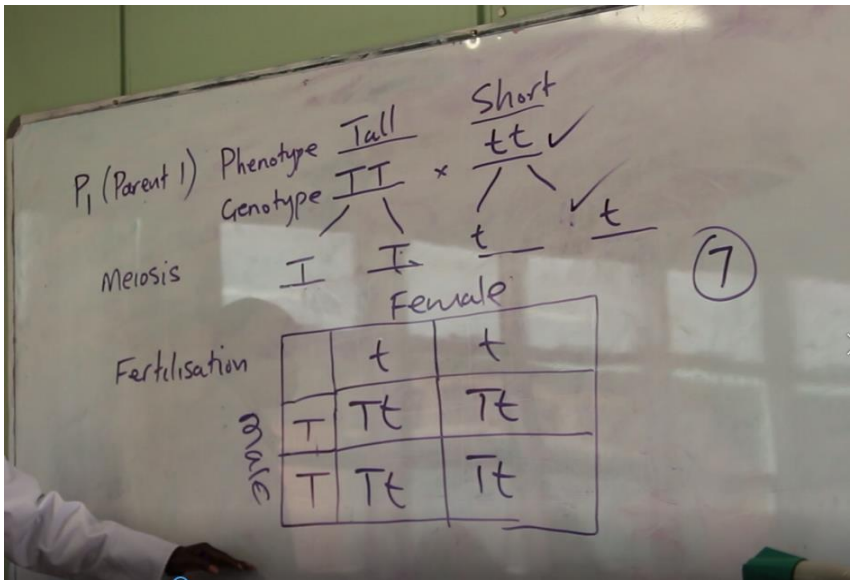
175. Let is suppose this is seven marks…

176. Ls: [Noise]

177. Mr. Zindi: Right, then most of the marks will come from this section and here probably it can be— let us assume you get two marks from the total…



…where do you go from here according to the previous ehh…diagram? Maria!

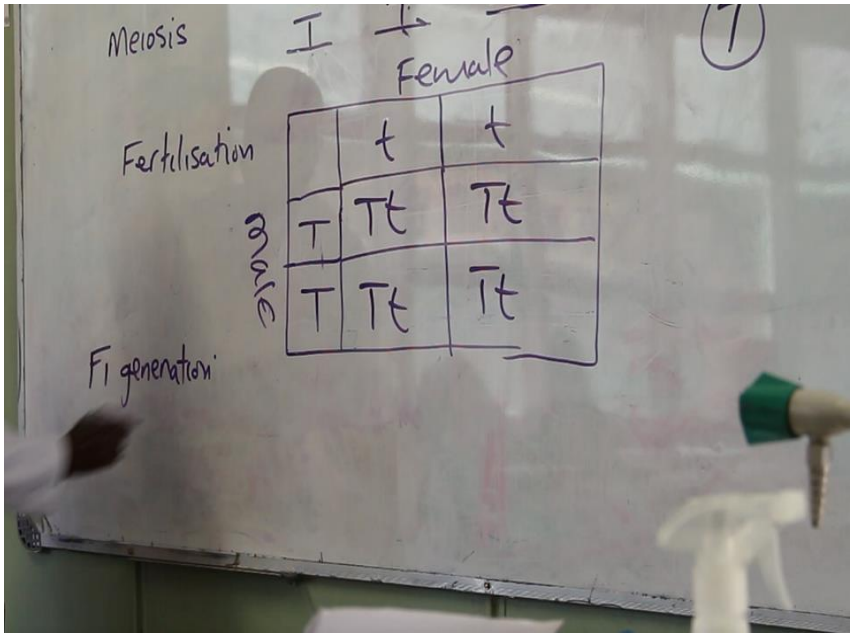


178. Maria: [Unclear]

179. Mr. Zindi: I cannot hear anything.

180. Maria: F_1 generation.

181. Mr. Zindi: F_1 generation… [writing]



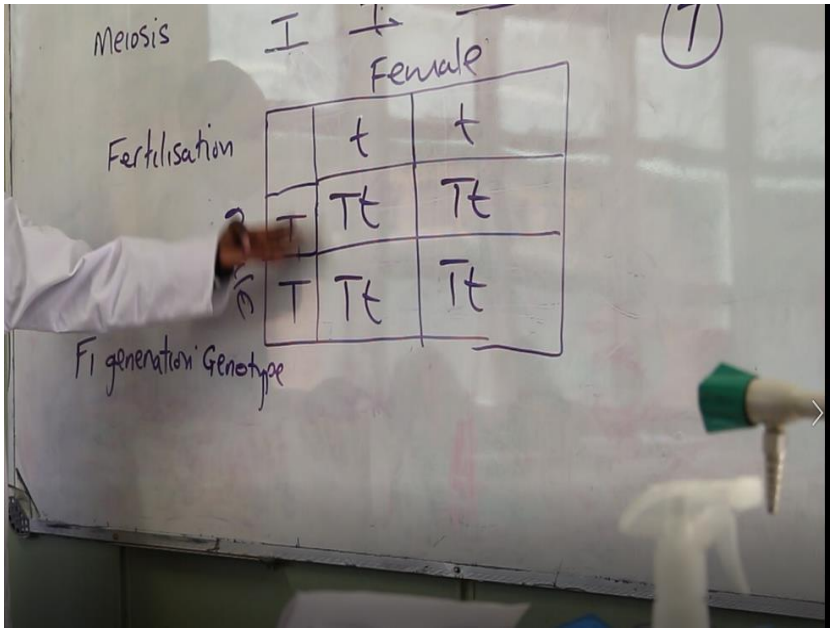
182. What is it that we need to write about it?

183. F_1 generation.

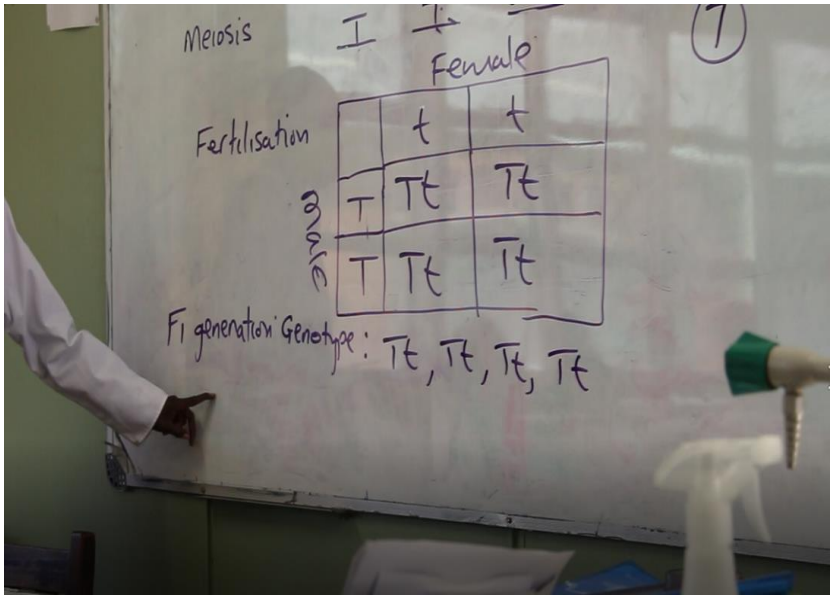
184. Ls: Genotype!

185. Mr. Zindi: Genotypes, where is the genotype?

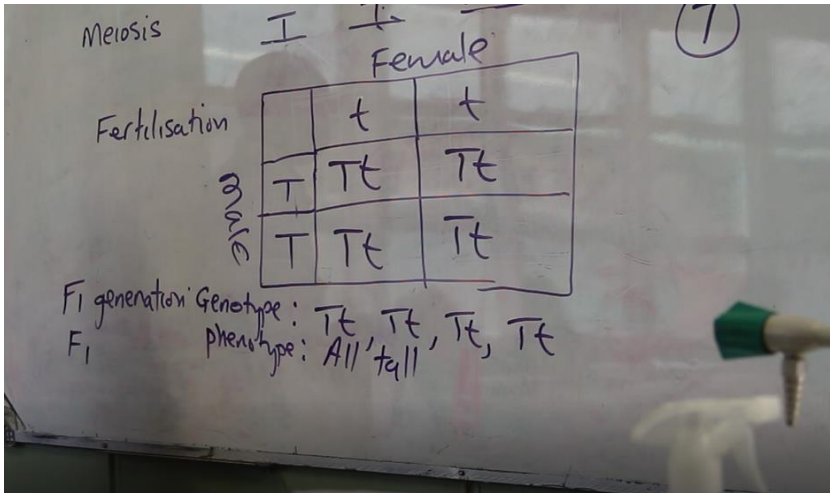
186. The genotype is there…



…but probably you can just list it down… [writing]



187. Right then next is F_1 phenotype all tall.

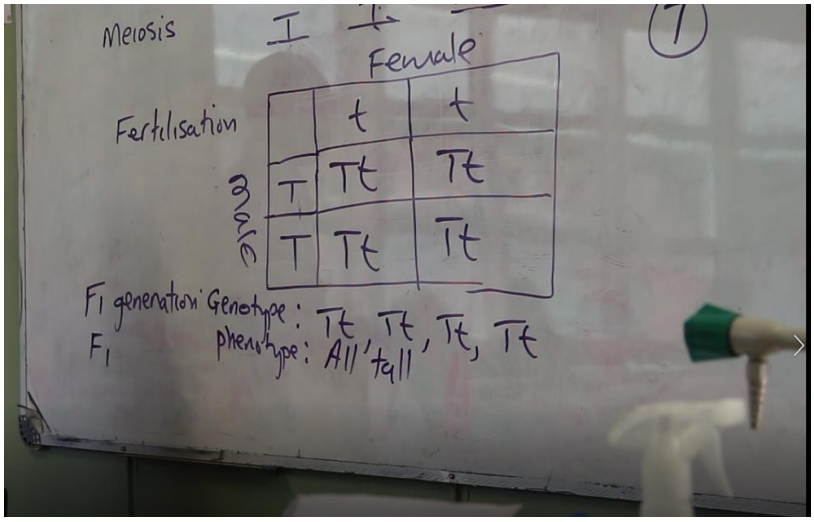


188. Percentage phenotype 100% right.

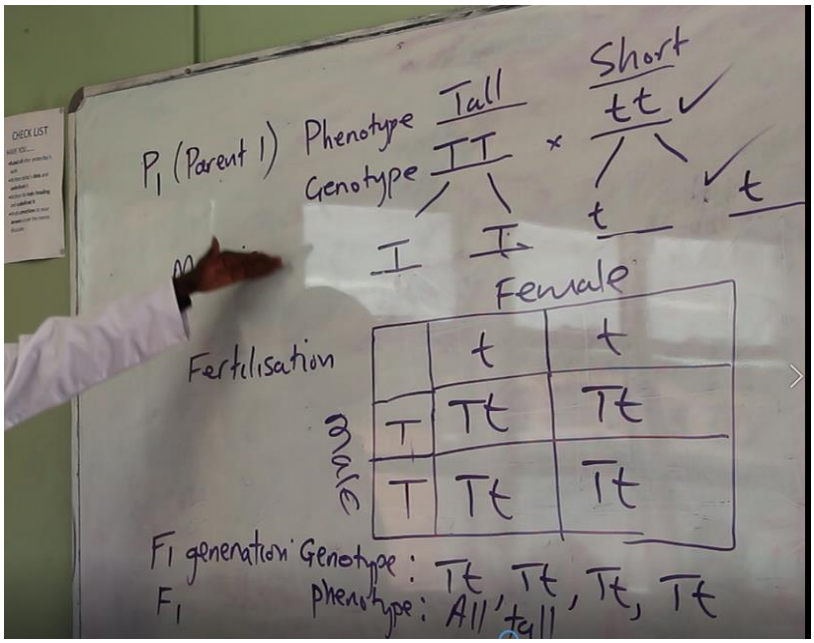
189. Now [erasing board] the question goes on to say … determine genotype …the genotypes of F_2 of a cross between the offspring of F_2 generation.

190. What do we do?

191. We start…these are now going to be the parents… [showing].



192. So, you start your diagram all over again right. [Showing]

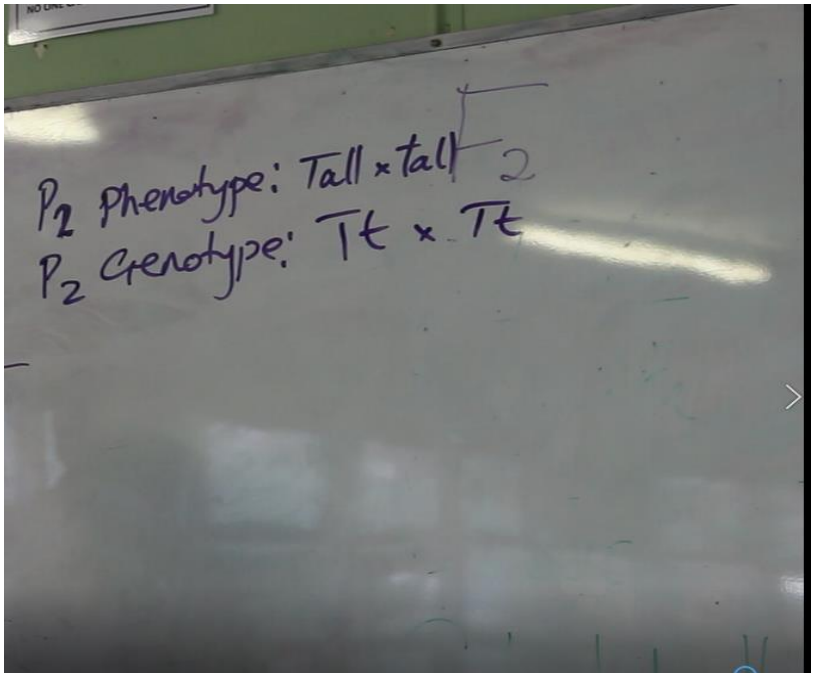


193. So, the parent how P_1 will be [writing] Tall and Tall.

EPISODE 6: SECOND GENERATION/ F_2

194. Now second stage.

195. This is now P_2.



196. Right find the offspring genotype work out in the diagram individually, work it out.

197. Use the punnet square to determine the genotypes.

198. Ls: [Learners work out the problem]

199. Mr. Zindi: Remember [softly] what we are looking for [unclear] that is the generation that came from breed amongst F_1 offspring.

200. Ls: [Continue to write]

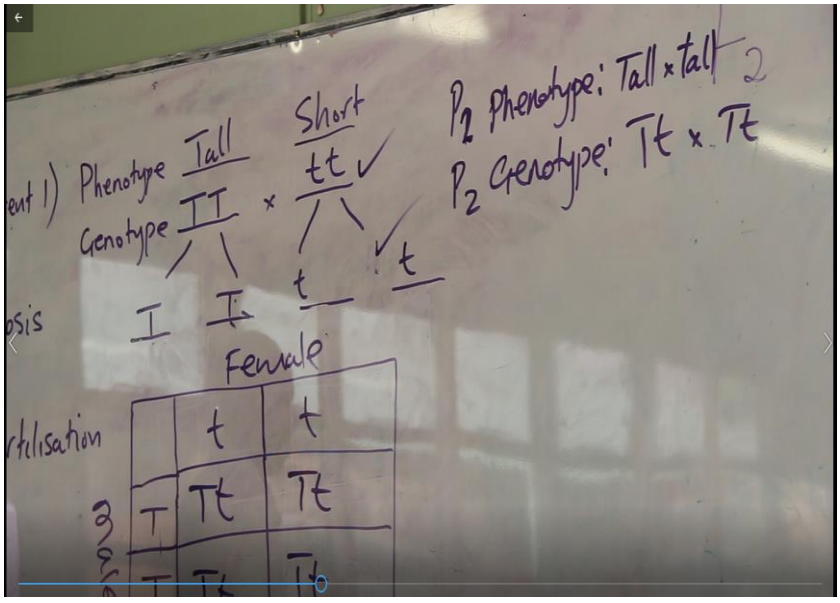
201. Mr. Zindi: Let us close the textbooks [unclear]

202. Ls: [Talking]

203. Mr. Zindi: Right! Right, think most of you have the … you have the answer.

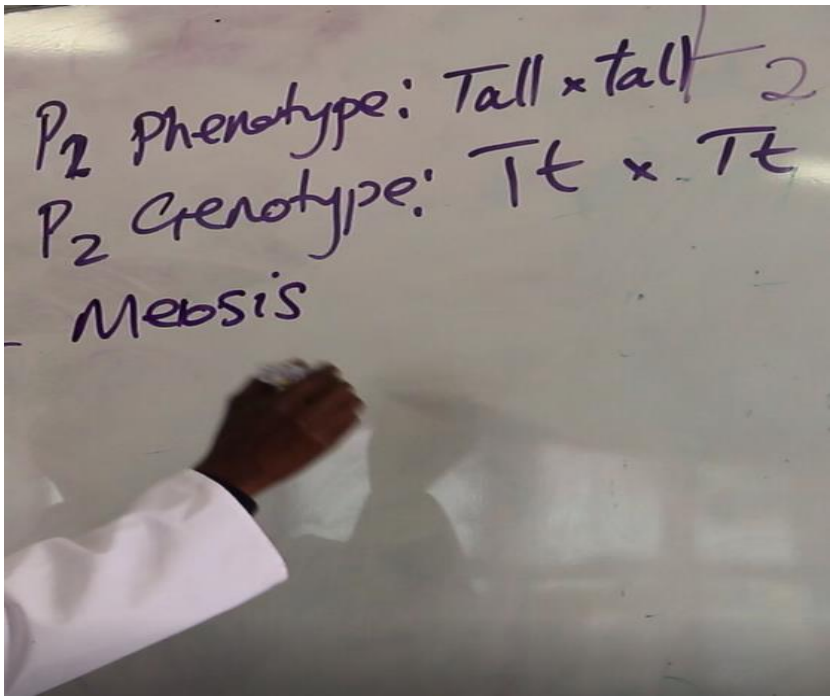
204. So, let us how we proceed.

205. We have our … eh parents' phenotype and genotype… [showing]

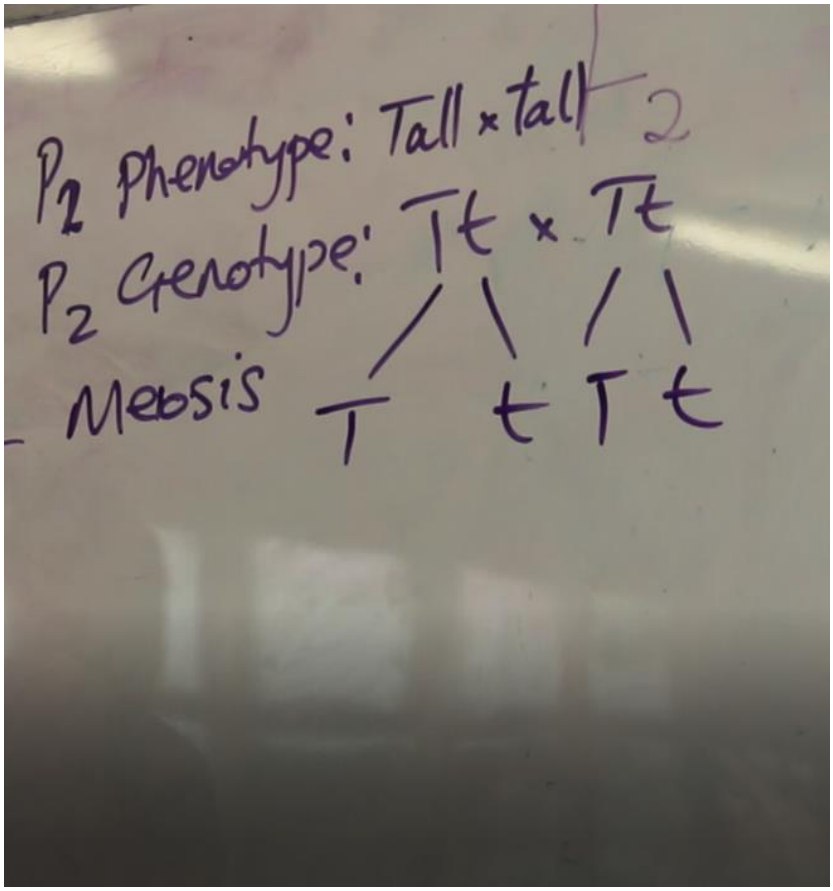


206. What is the next stage?

207. From there is meiosis…



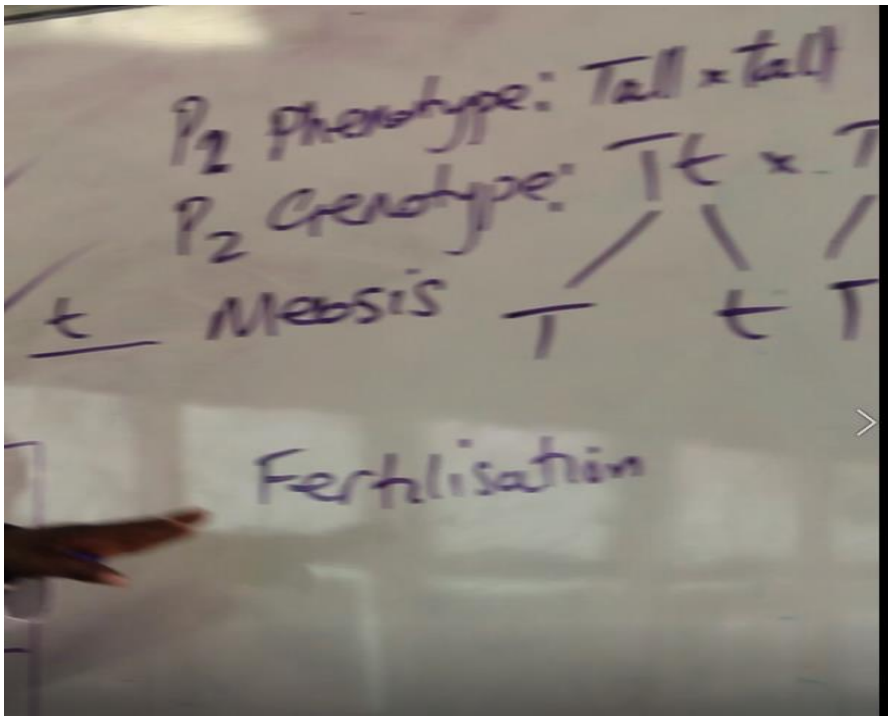
208. Big T, small t.



209. Right the next stage is … what is the next stage?

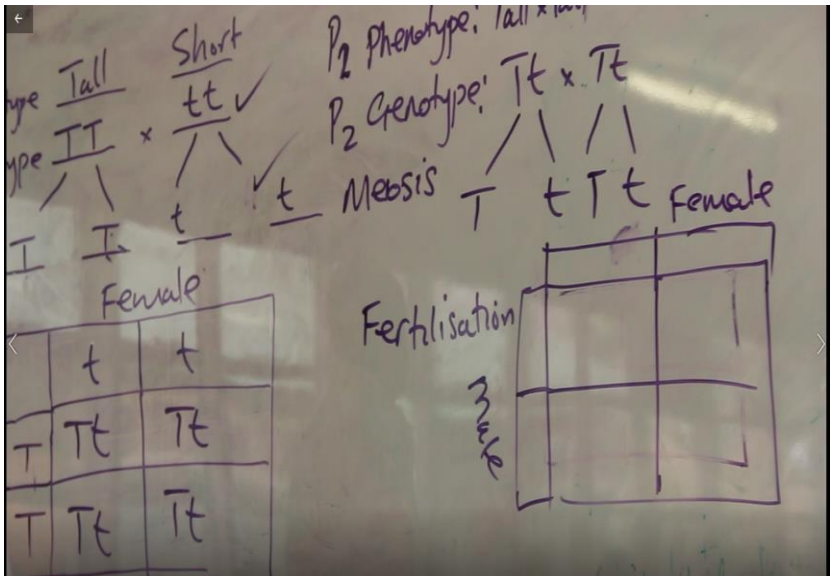
210. Ls: Fertilization!

211. Mr. Zindi: Fertilization! [Writing]

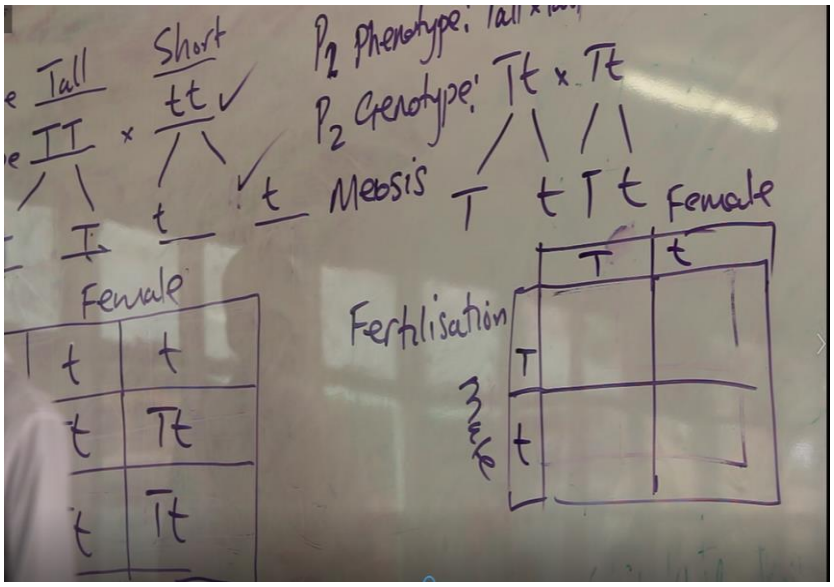


212. Right you have to write it down, you do not have to assume.

213. F_2 must be written down, then you draw your punnet square… [drawing]

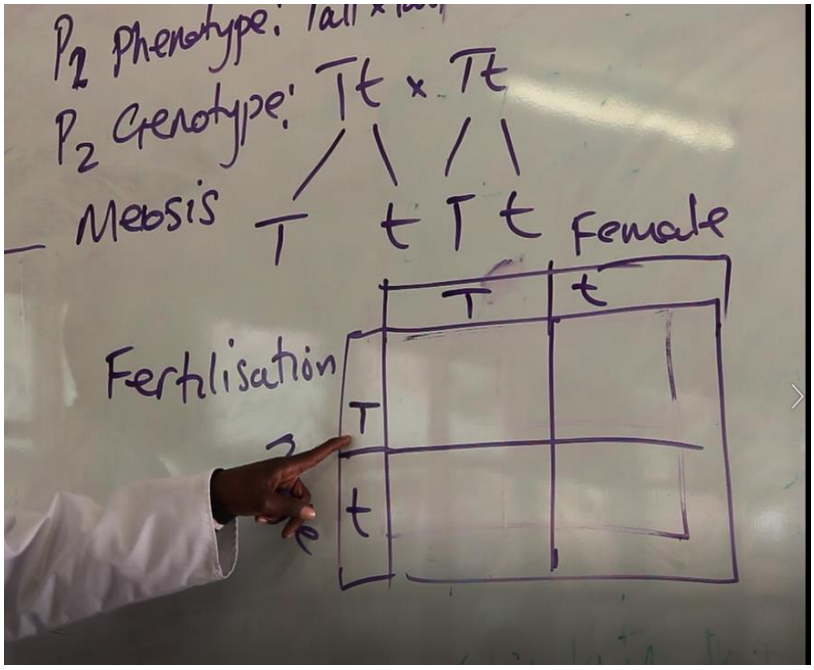


214. Right, you write your gametes [writing]

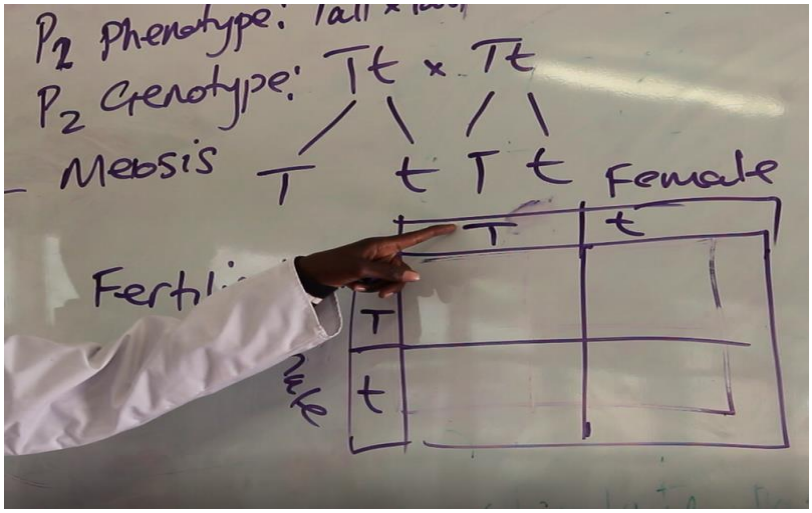


…for this parent and you do your crosses.

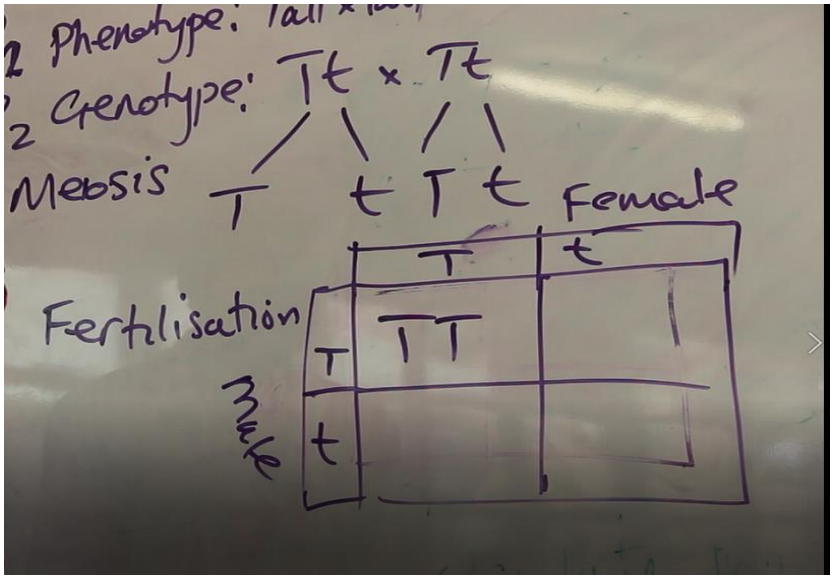
215. Right, this… [pointing]



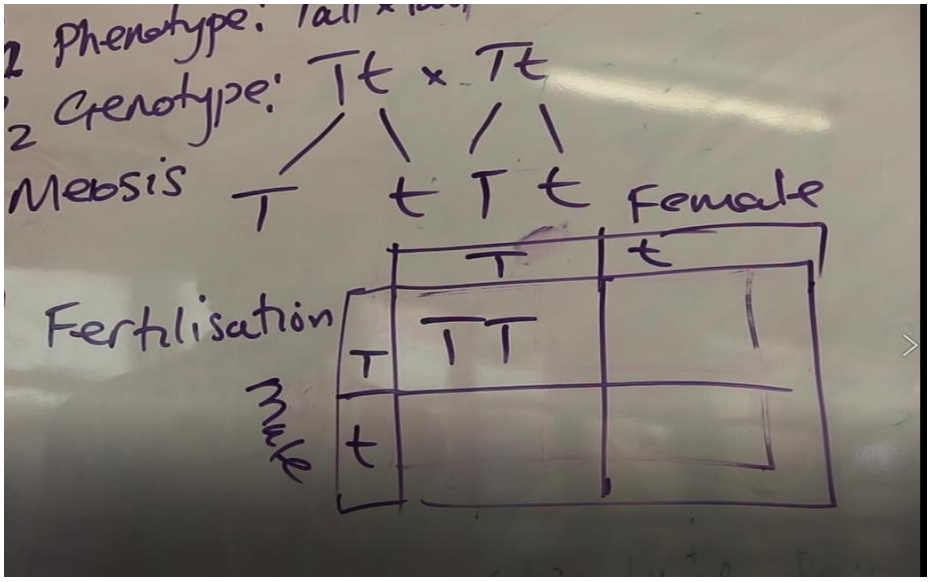
…this



216. Big T…



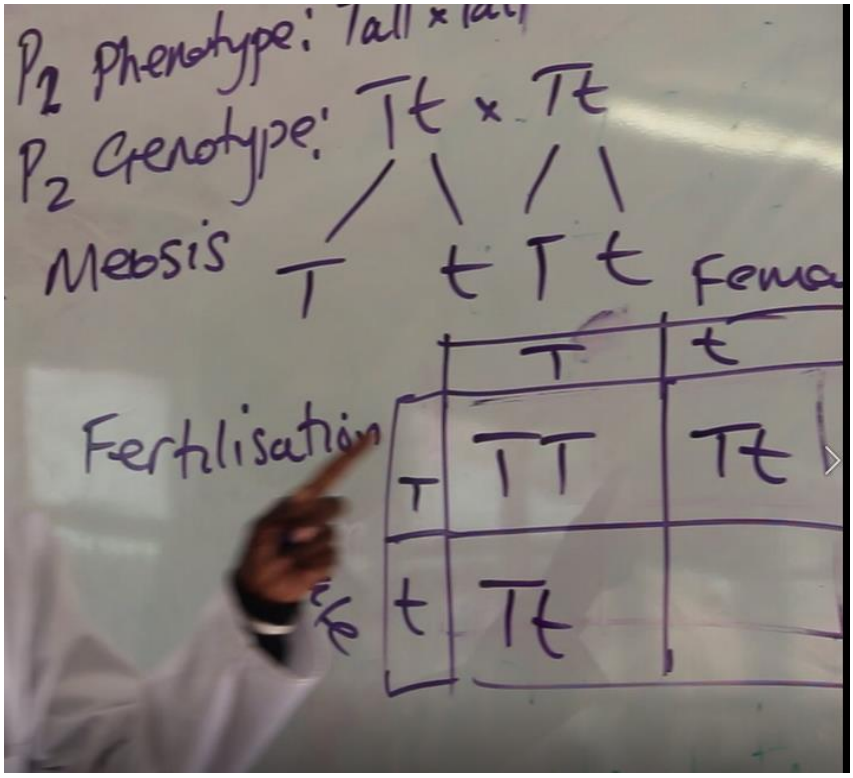
…this one and this one…



…right now.

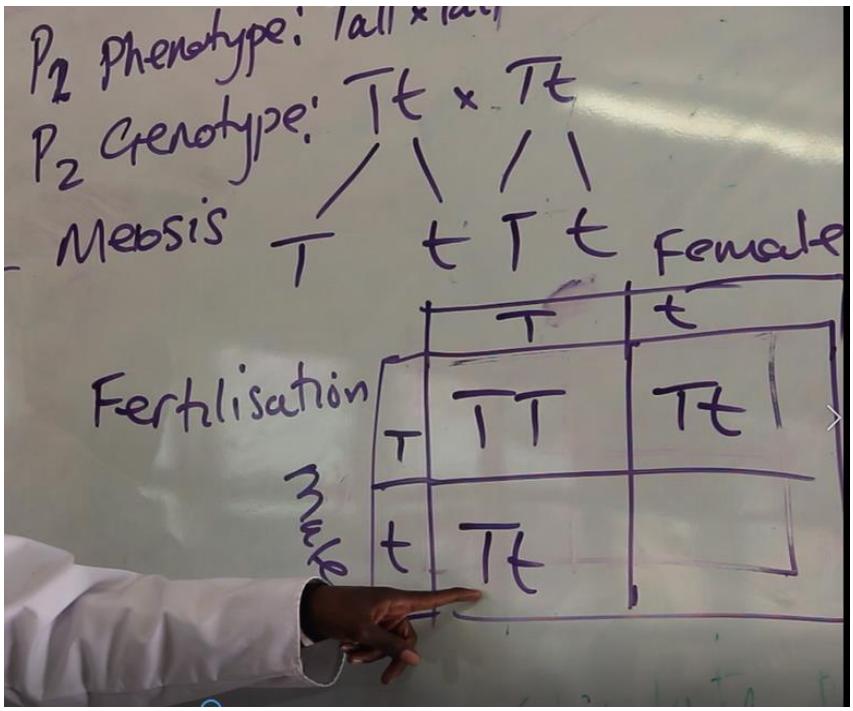
217. Let us use the term homozygous, heterozygous instead of using big T: and small t.

218. Right this one and this one.



…and always start with the dominant allele.

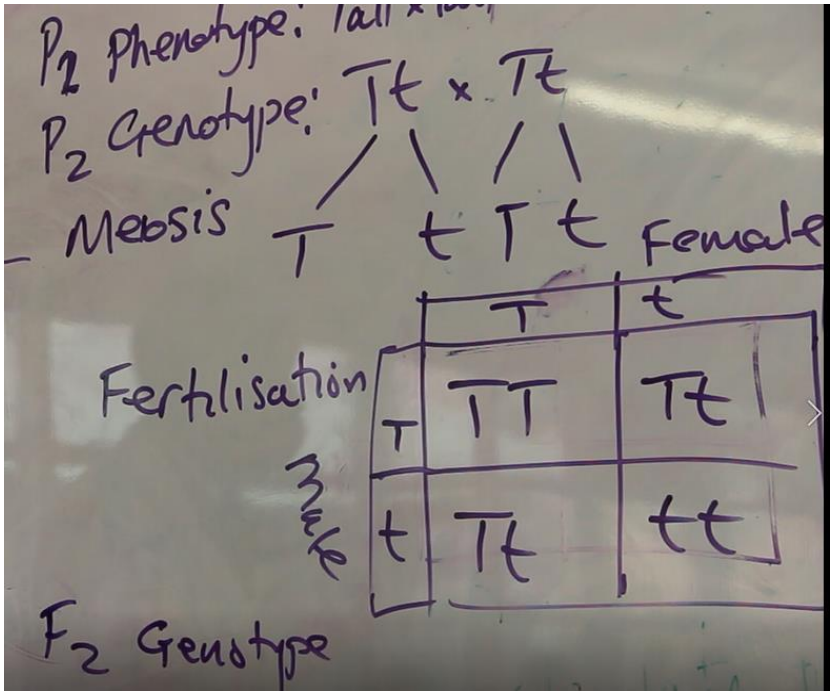
219. You always start with the dominant allele…[showing]



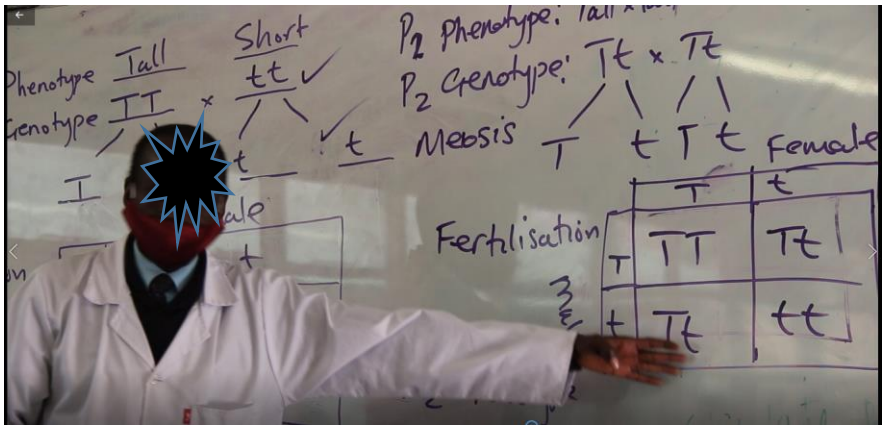
220. Right, that gives us our results!

221. Those are our offspring.

222. So, let us determine F_2 … eeh…F_2 genotype… [writing].



223. These are the genotypes …

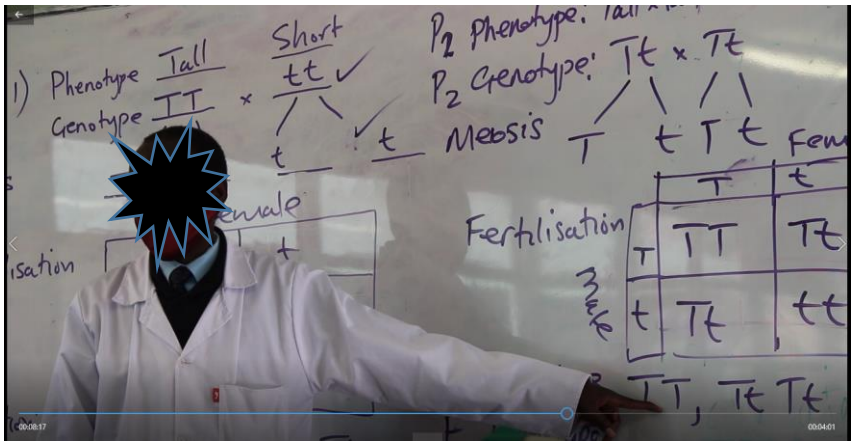


224. Right, then

225. Ls: Shh…

226. Mr. Zindi: F_2 phenotype … [writing] phenoty-- or phenotypic ratio.

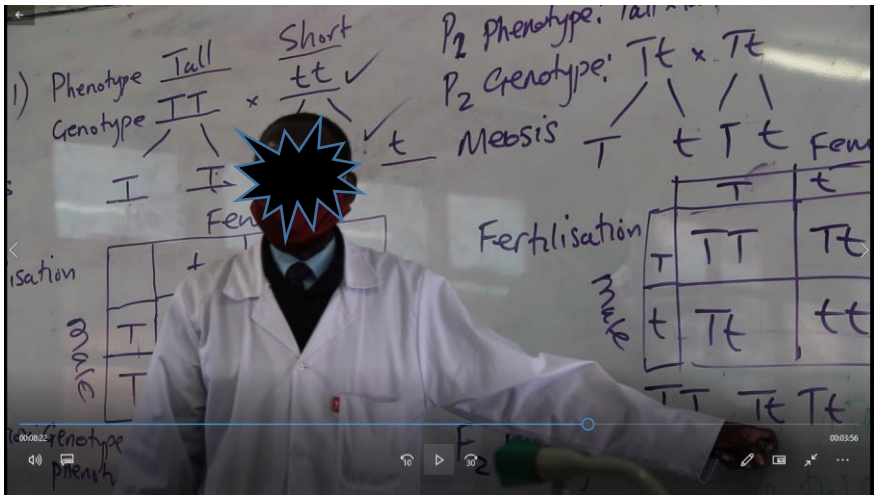
227. Right, this one!



228. Is it tall or short?

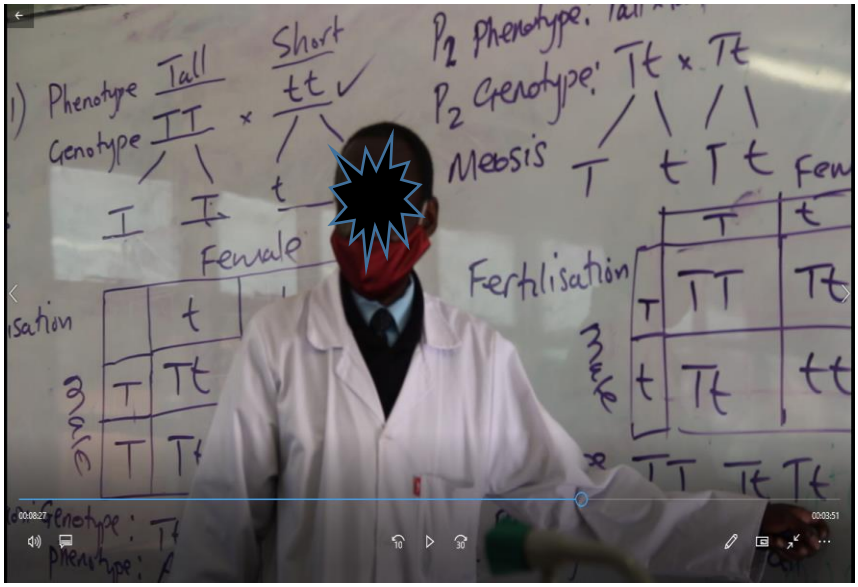
229. Ls: Tall!

230. Mr. Zindi: The second one?



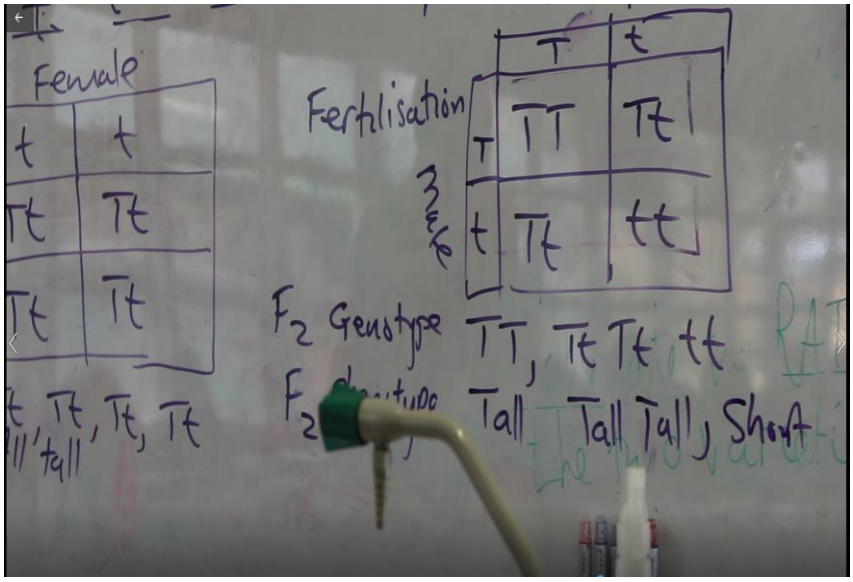
231. Ls: Tall!

232. Mr. Zindi: the third one …



233. Ls: Tall!

234. Mr. Zindi …and the … last one? [Writing]



235. Ls: Short! [Noise]

236. Mr. Zindi: Right!

237. Ls: Shh…

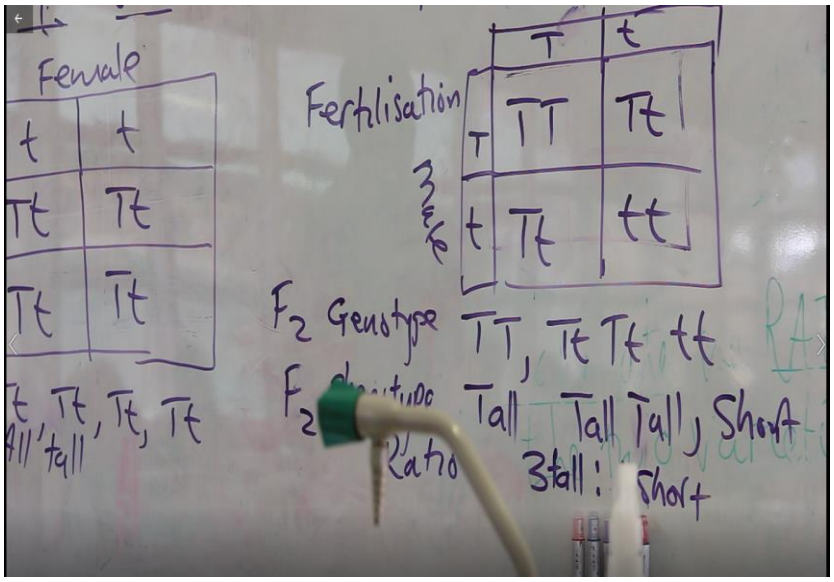
238. Mr. Zindi: Now …

239. Ls: [Noise]
Shh…

240. Mr. Zindi: What is the ratio of tall to short plants?

241. Ls: [Chorus]

242. Mr. Zindi: Ratio 3 is to 1 [writing] 3 tall and 1 short, which is 3 is to one.



243. Now, you also need to analyse the genotype ratio in terms of how many homozygous recessive how many heterozygous.

244. So, if you look at the offspring.

245. How many ehh…homozygous dominant?

246. Ls: One!

247. Mr. Zindi: One, 1 [writing] homozygous dominant and has how many heterozygous?

248. Ls: Two!

249. Mr. Zindi: Two and this one call it homozygous recessive, how many do we have?

250. Ls: One!

251. Mr. Zindi: One! So, what is the ratio?

252. 1 is to 2 is to 1.

253. Right, and let us calculate percentage… [erasing board] because the question may also require you to calculate percentage of homozygous for each homozygous dominant… [writing] what is the percentage age of the homozygous dominant?

254. Collins: 25.

255. Mr. Zindi: 25. How do you get 25?

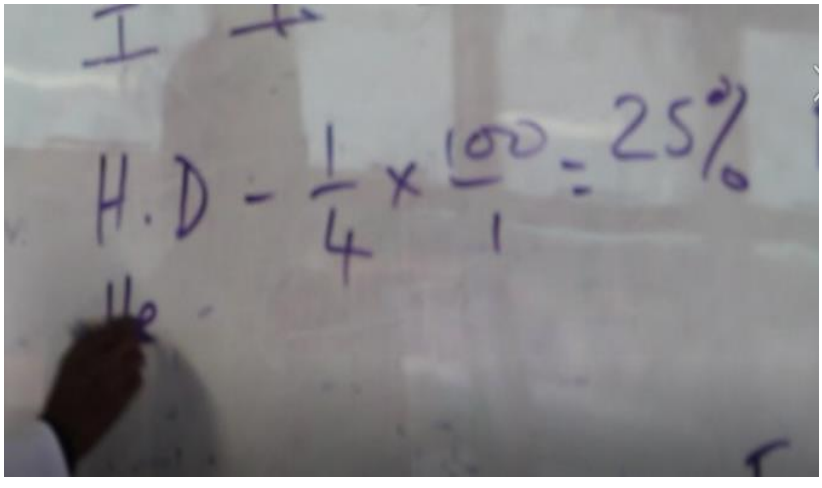
256. Collins: 1 over 4!

257. Mr. Zindi: We have 4 individuals there.

258. So homozygous 1 over 4 times x 100 which is 25%.

259. How about heterozygous?

260. How many? [Writing]



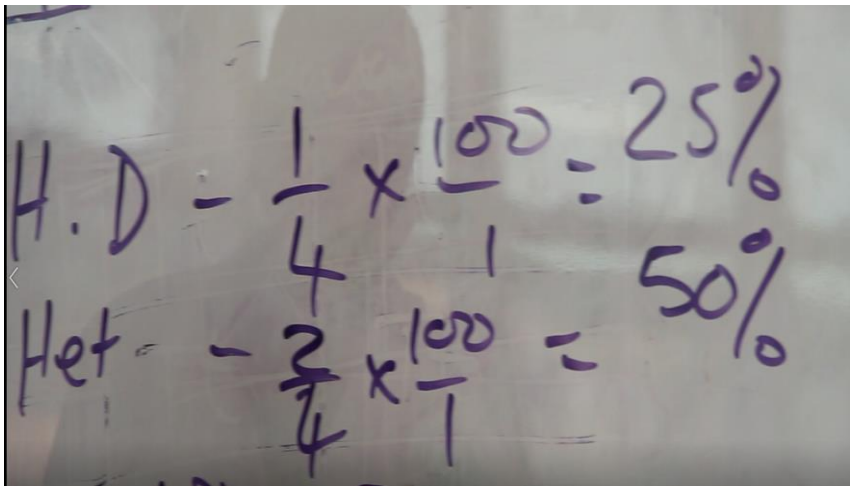
261. Richmond: 2 over 4 times 100.

262. Mr. Zindi: Which is?

263. What is the answer?

264. Ls: Fifty percent!

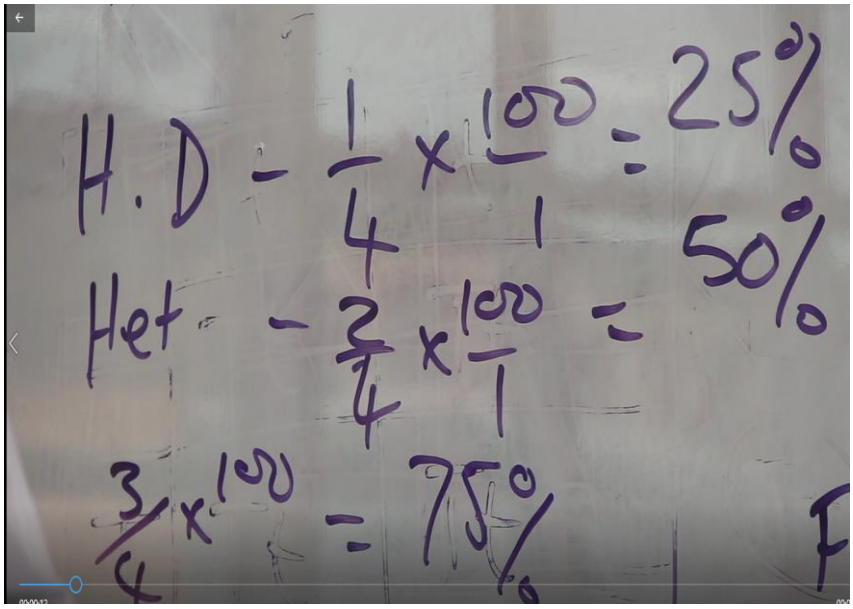
265. Mr. Zindi: Fifty percent! [writing]



266. And you do the same with the recessive individual that is 35%.

267. Now, what is the percentage of tall plants?

268. That will be 1, 2, 3 over 4 … that will give you 75% tall plants, this other 25% is short pants.



269. So, this is our first example and now … [erasing board].

270. Ls: [Noise]

[Bells, rings]

271. Mr. Zindi: Fifty percent!

Right, let us go.

END