QTL “training wheels” example

The population on the close side of the island has only tall dragons. The population on the far side has only short dragons. Tall dragons are about 6 meters tall, while short dragons are only about 2 meters tall. When dragons breed, their offspring can be anywhere in this range of heights when fully grown.

The Problem: Alchemists of old know that the gene that controls a dragon's height is somewhere on the first dragon chromosome, but they don't know where on that chromosome it appears.

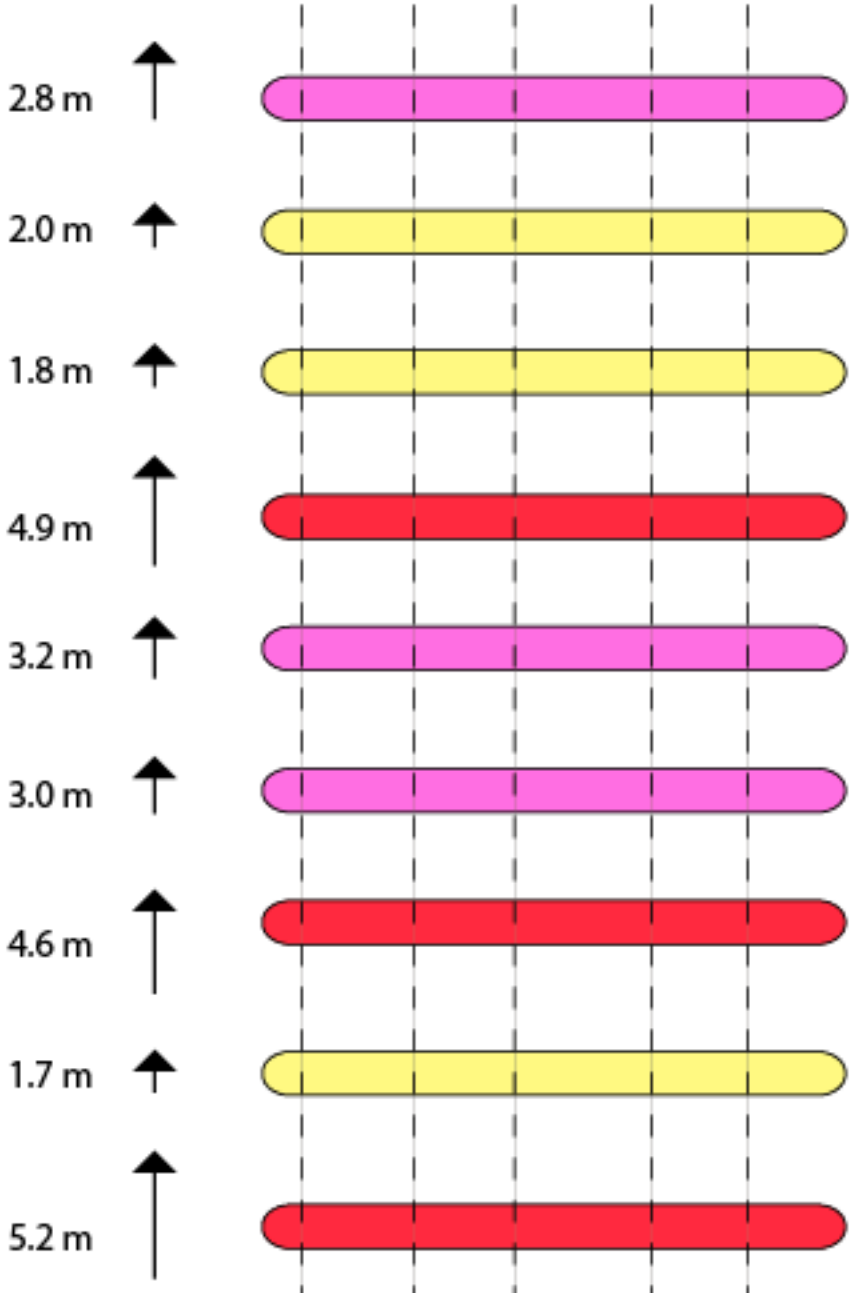
The Data: We cannot see everything about a dragon's chromosomes, but are able to learn selected information about the chromosomes at certain locations along the chromosomes. By looking carefully at each of these locations, we can tell if a dragon's chromosome at that location looks more like a tall dragon, a short dragon, or a cross between tall and short.

The Question, and Challenge: Using only the information about individual dragons' heights and the information from selected locations on the dragons' chromosomes, determine the where on the first chromosome the gene controlling for height is most likely located.

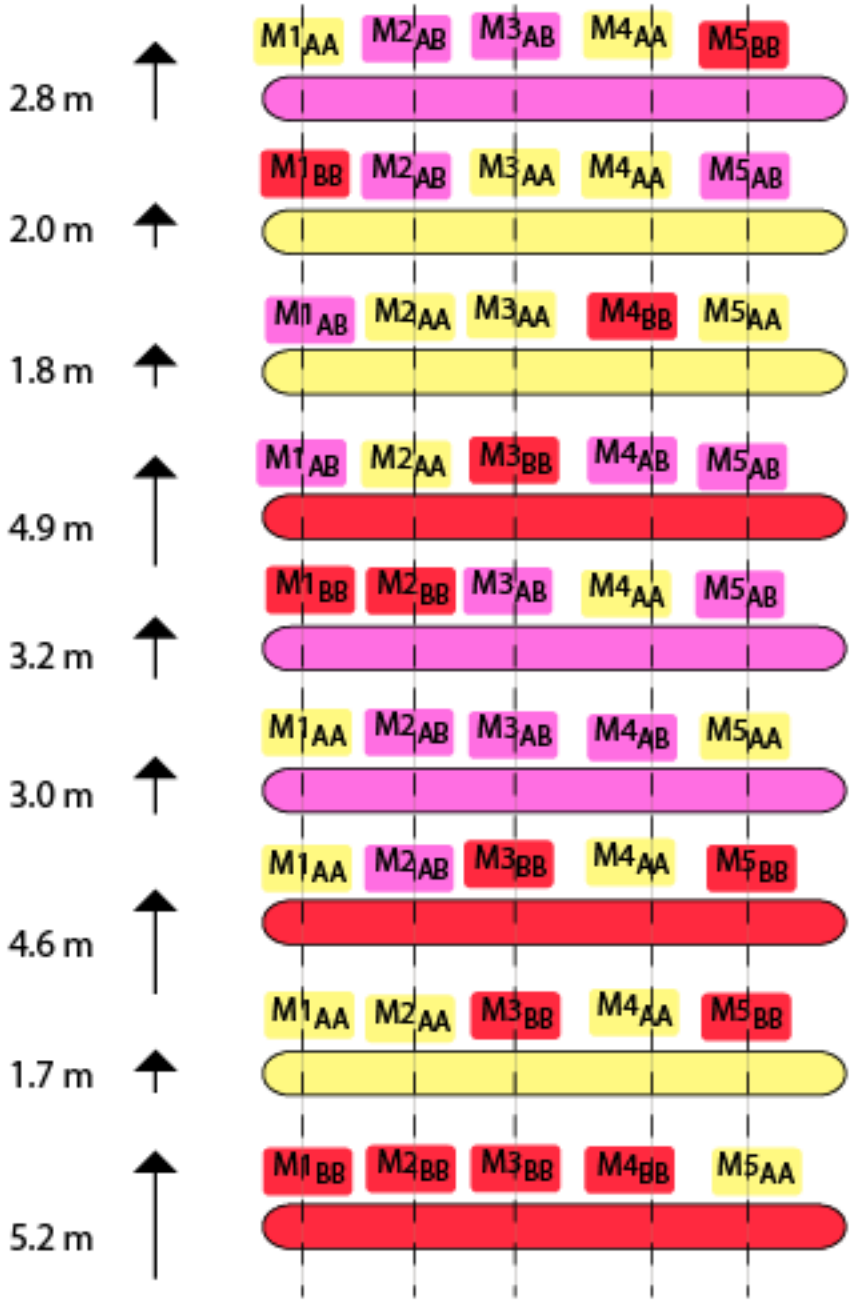
The Process:

You have a group of 9 individual "sample" dragons. The sample dragons come from crosses between the long-established tall and short strains of dragons. The resulting sample individuals may be classified as tall, short or in-between.

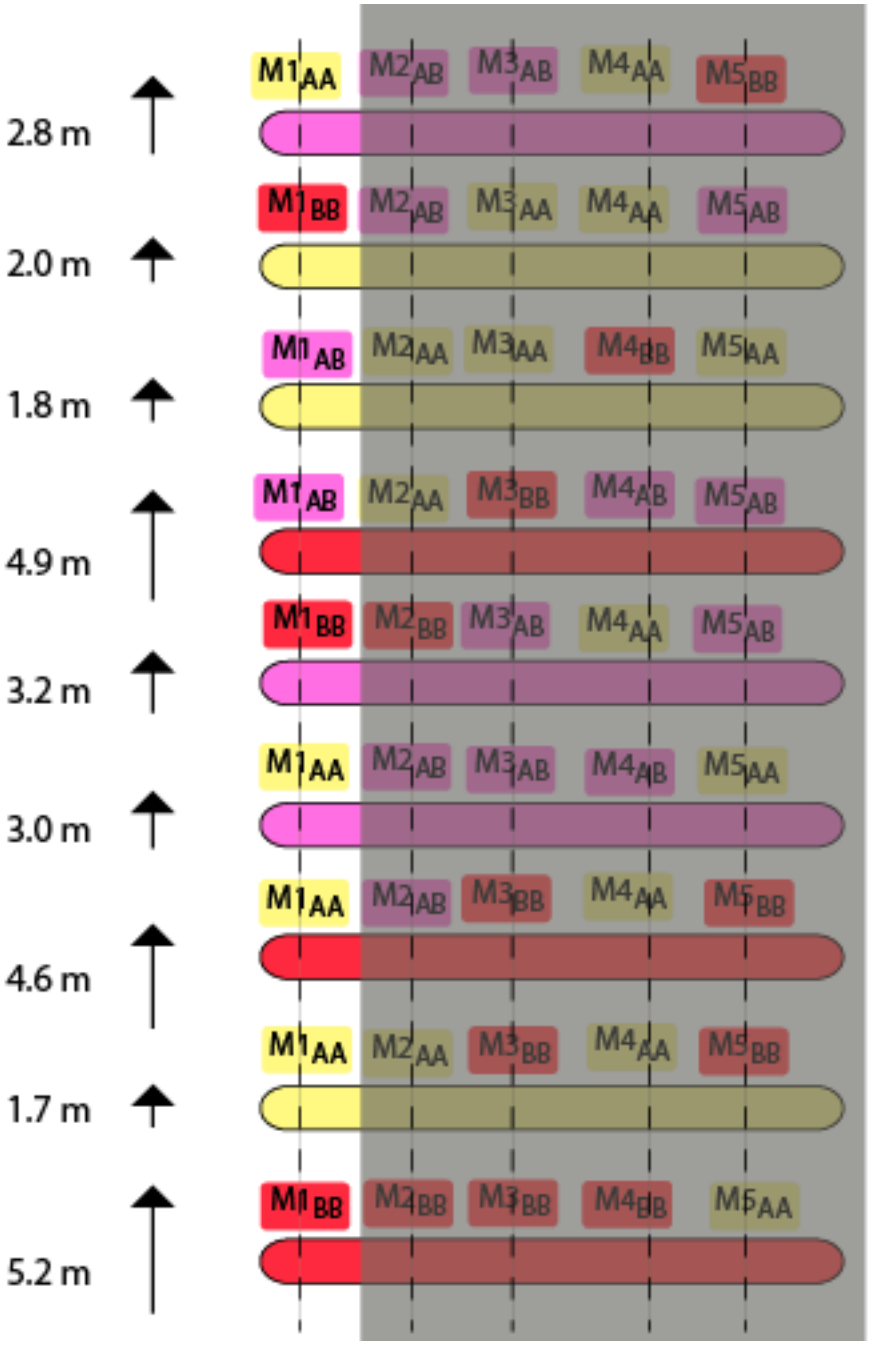
1. Look at each dragon, and decide whether it is tall (AA), short (BB) or an in-between cross (AB). Color the tall dragons' chromosomes red, the short dragons' chromosomes yellow, and the in-between dragons' chromosomes purple.

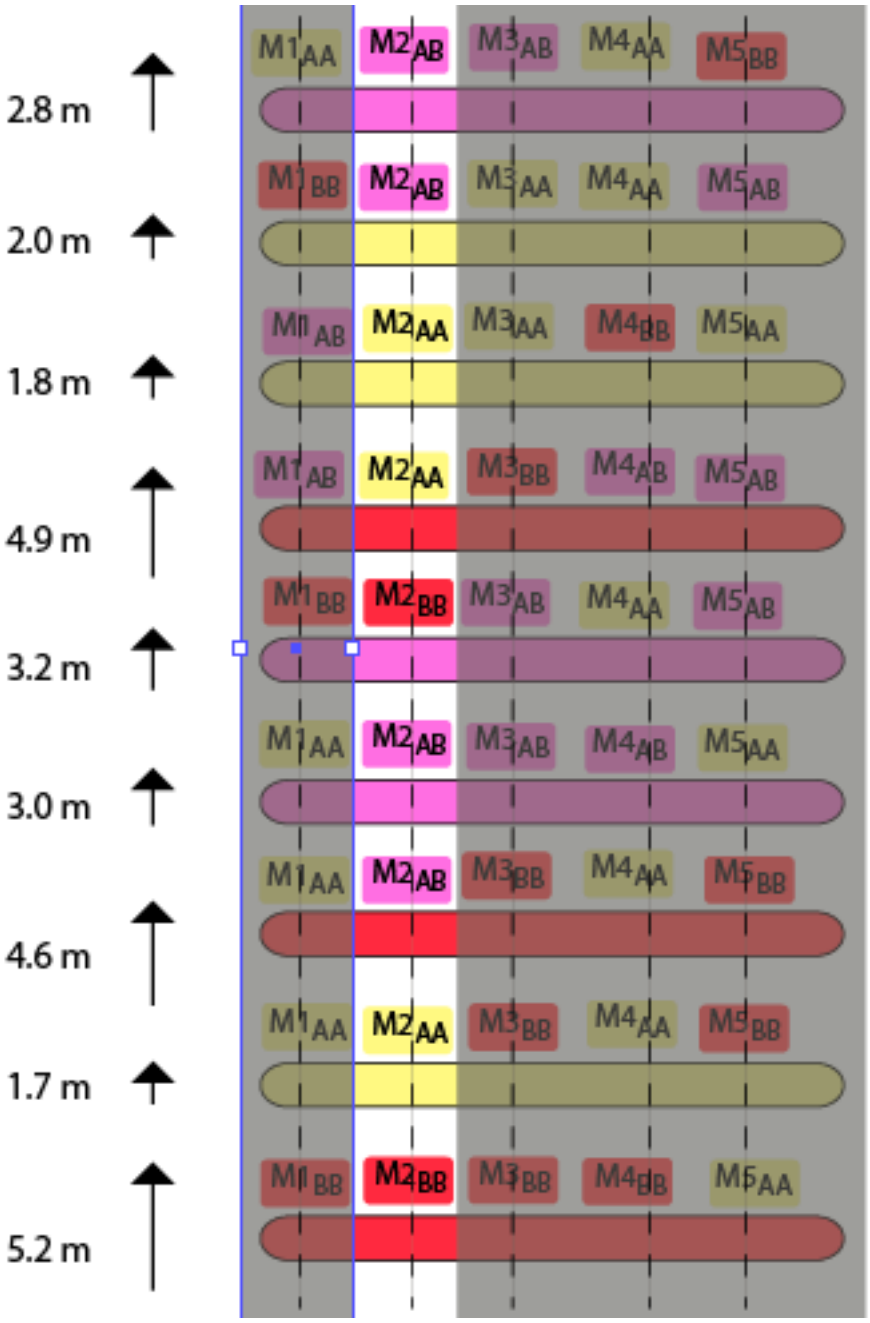


2. For each sample dragon, look at each marker position on its first chromosome, and decide if it is a tall, short or in-between marker. Label the markers as you decide, and color the markers red for tall, yellow for short and purple for in-between.



3. When you have done this, take a look at each of the five marker positions. Positions that are more associated with the dragons' height trait will have markers that are the same "type" as the overall chromosome. Based on this, where on the chromosome would you guess the gene controlling height is located?

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2.0 m
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3.0 m
4.6 m
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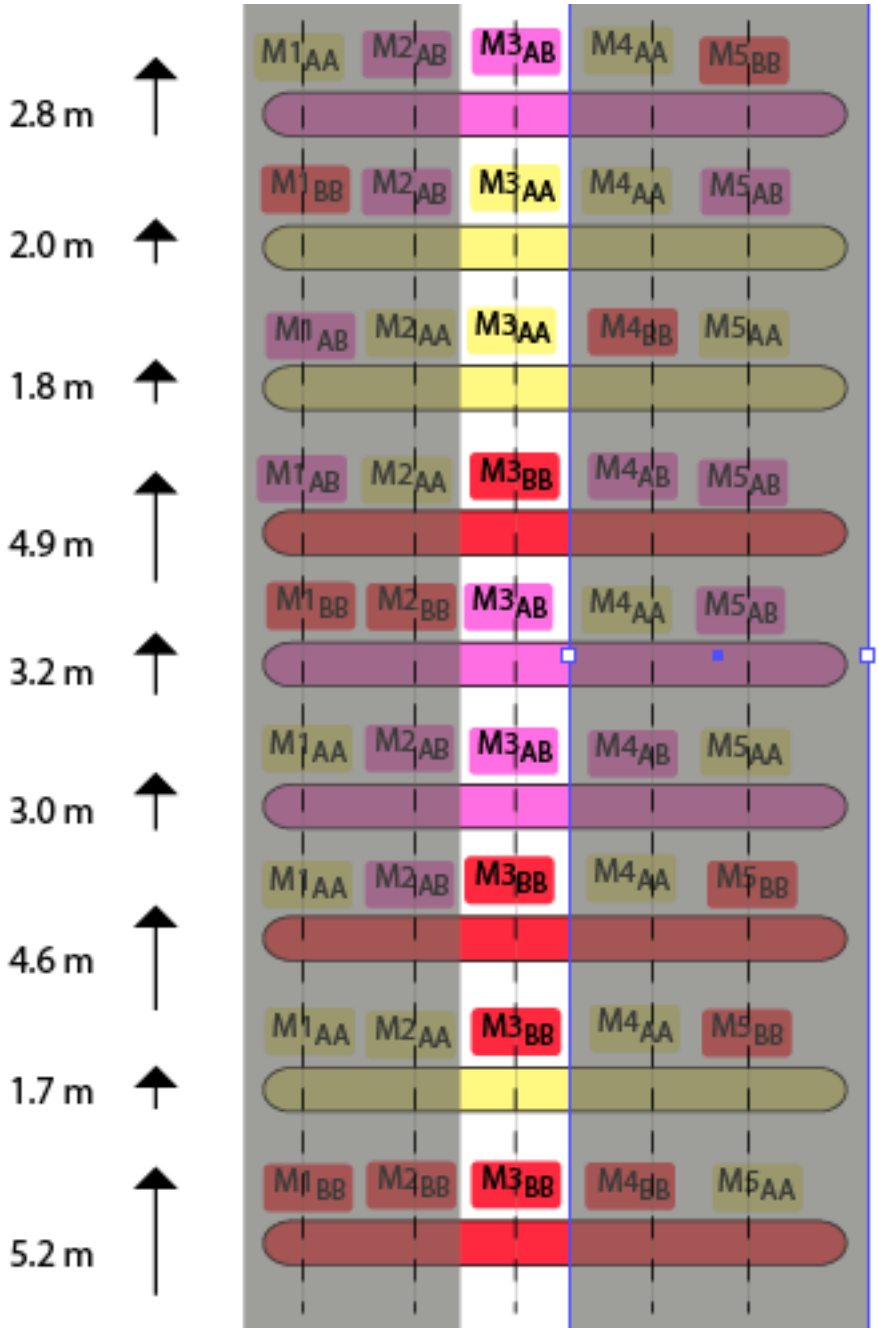
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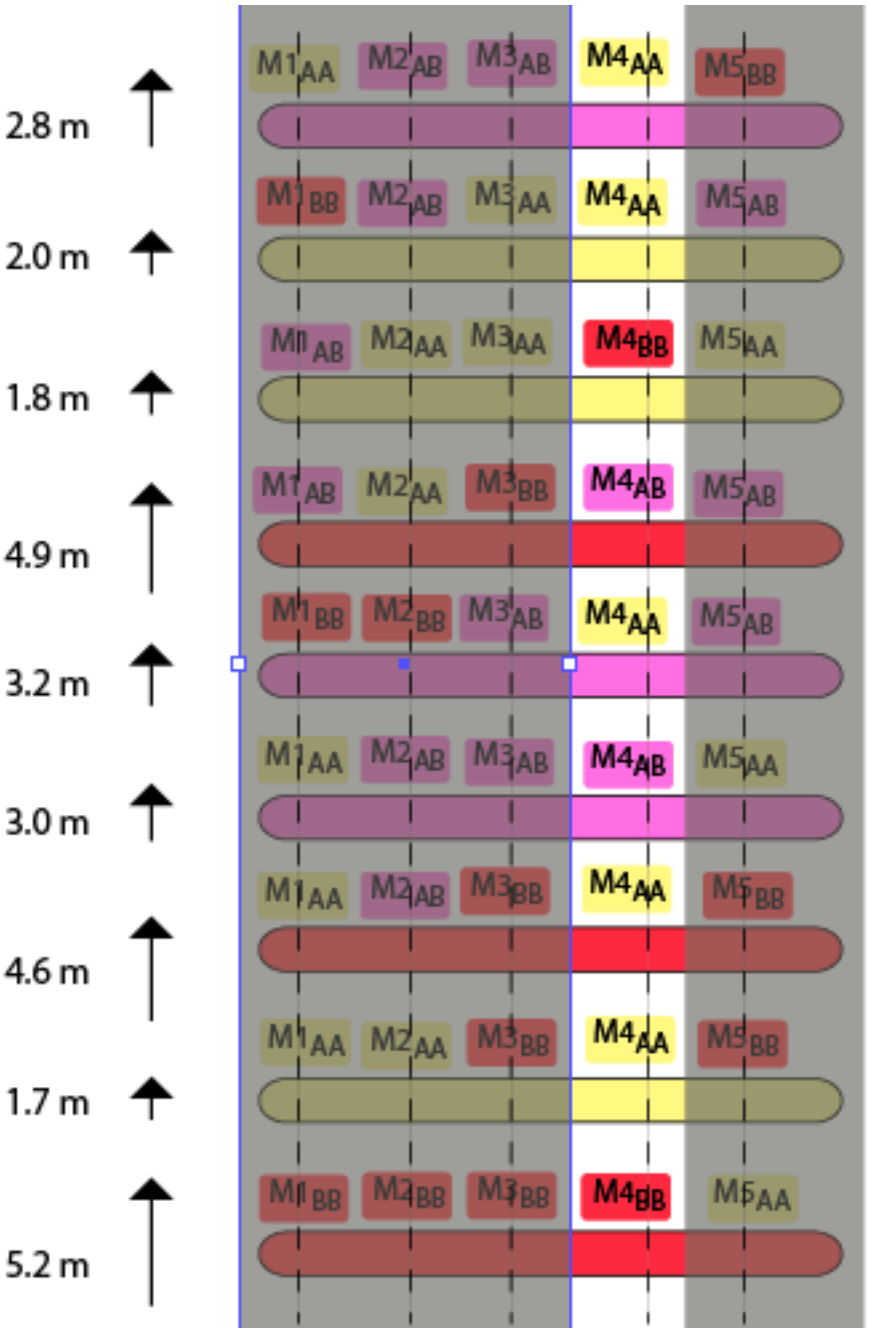
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4.9 m
3.2 m
3.0 m
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5.2 m
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M1BB M2AB M3AA M4AA M5AB
M1AB M2AA M3AA M4BB M5AA
M1AB M2AA M3BB M4AB M5AB
M1BB M2BB M3AB M4AA M5AB
M1AA M2AB M3AB M4AB M5AA
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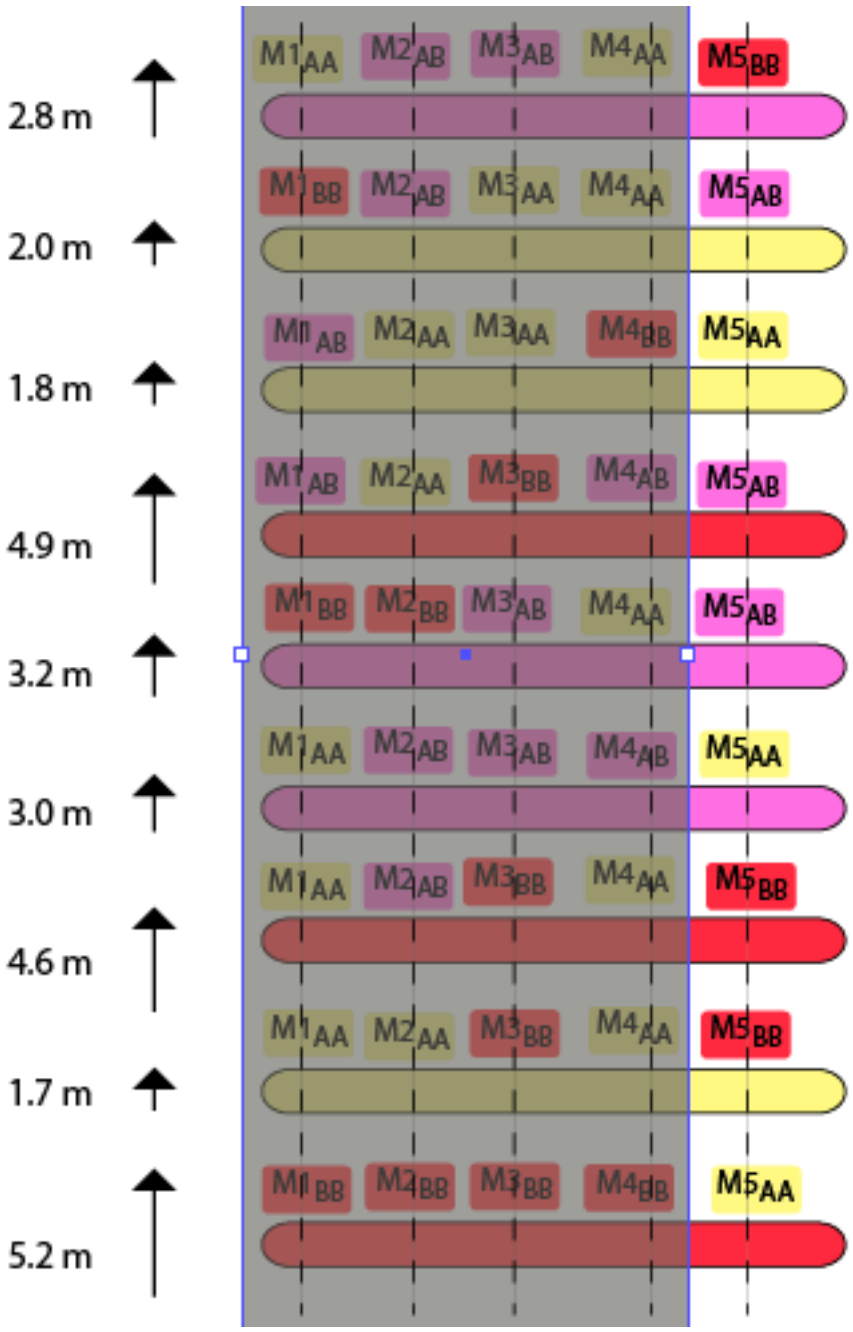
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