# Visualizing Nonlinear Narratives with Story Curves

Supplementary Material

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In this supplementary material, we provide snapshots of the initial prototype and the two tasks & surveys used in our readability study. The study was conducted through an online website. The answers from the pattern reading task and an analysis script is attached as separate files.

Initial Prototype

The figure below shows an earlier prototype of Story Explorer presenting two thumbnail views for movies and characters. The detailed view on the right shows per-scene information using a matrix along with the script text. A bipartite graph is vertically aligned with the list of scenes to show to which point of the story each scene belongs. After some initial testing we discarded this prototype to focus on the nonlinear temporal aspect of the narrative because it does not harness the power of visualization as a pattern finding tool.
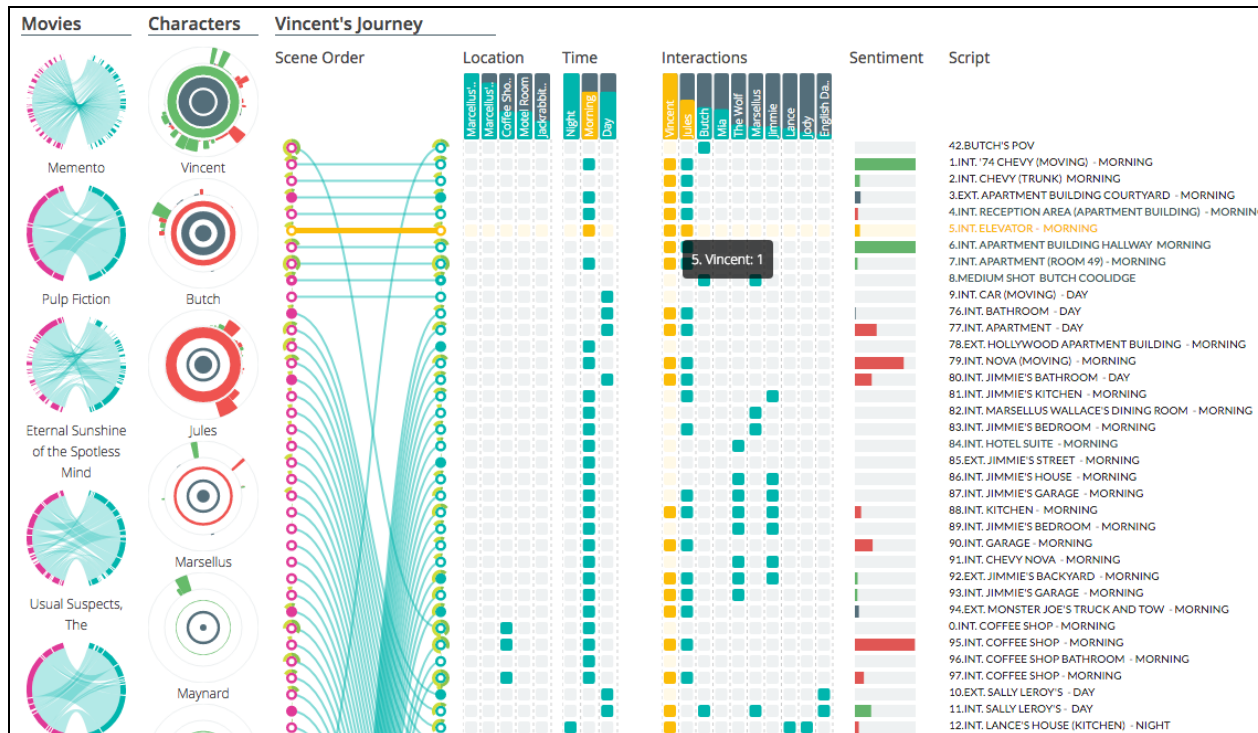
Sketching Task

Read the following plot summary of _Pulp Fiction_
The events are numbered and listed in narrative order.

A Late one morning in a restaurant, a couple of young Brits called **Honey Bunny** and **Pumpkin** discuss the pros and cons of robbing banks versus liquor stores. Then they add restaurants to the equation, realizing they can make more by taking customers' wallets than they get out of the till. The two kiss, declare they love each other and stand up in their booth, announcing that they're robbing the diner.

B Earlier in the day, Hitmen **Jules** Winnfield and **Vincent** Vega arrive at the apartment of **Brett** to retrieve a briefcase for their boss, gangster Marsellus Wallace. After **Vincent** checks the contents of the briefcase, **Jules** shoots one of Brett's associates, then declaims a passage from the Bible before he and **Vincent** kill Brett.

C Some time later, champion boxer **Butch** Coolidge accepts a large sum from **Marsellus** to take a dive in his upcoming match. **Vincent** and **Jules** deliver the briefcase.

D The next day, **Vincent** purchases heroin from his drug dealer Lance. He shoots up to pass the day, then drives to meet **Mia**, Marsellus's wife, who **Marsellus** has asked Vincent to escort while he is out of town.

E They head to a 1950s-themed restaurant and participate in a twist contest, then return to the Wallace house with the trophy. While **Vincent** is in the bathroom, **Mia** finds his heroin, mistakes it for cocaine, snorts it and overdoses. **Vincent** rushes her to Lance's house, where they revive her with an adrenaline shot to her heart.

F The following night, before his fight, **Butch** dreams of an incident from his childhood: Back at his **Tennessee home in 1973**, Captain **Koons** visited Butch to bring him a gold watch. The watch had belonged to Butch's great-grandfather, who took it to World War I with him. Butch's grandfather had taken it to World War II, and Butch's father to Vietnam. Butch's father died as a POW, but gave the watch to **Koons** to return to **Butch**. **Koons** says that he and Butch's father had to hide the watch in their rectums to keep it away from their captors. Butch reaches up with his hand and takes the watch from **Koons**.

G **Butch** wakes from the dream. **Butch** double-crosses Marsellus and wins the bout. At the motel where he and his girlfriend **Fabienne** are lying low, **Butch** discovers she has forgotten to pack his father's watch, a beloved heirloom, and flies into a rage. He returns to his apartment and retrieves the watch, but notices a gun on the kitchen counter and hears the toilet flush. **Vincent** exits the bathroom and **Butch** shoots him dead.

H As **Butch** waits at a traffic light in his car, **Marsellus** walks by, recognizes him, and chases him into a pawnshop. The owner, **Maynard**, captures them at gunpoint and ties them up in the basement. **Maynard** is joined by **Zed**, a security guard; they take **Marsellus** to another room to rape him, leaving the "gimp", a silent figure in a bondage suit, to watch **Butch**.

I **Butch** breaks loose and knocks out the gimp. He is about to flee, but decides to save **Marsellus**. As **Zed** rapes **Marsellus**, **Butch** kills **Maynard** with a katana retrieved from the pawnshop. **Marsellus** retrieves Maynard's shotgun and shoots **Zed**. **Marsellus** informs **Butch** that they are even, so long as he tells no one about the rape and departs Los Angeles forever. **Butch** picks up **Fabienne** on Zed's chopper.

J Some time earlier, after **Vincent** and **Jules** have executed **Brett** in his apartment, another man bursts out of the bathroom and shoots wildly, missing every time; **Jules** and **Vincent** shoot him. **Jules** decides their lucky escape was a miracle, which **Vincent** disputes.

K As **Jules** drives, **Vincent** accidentally shoots Brett's associate **Marvin** in the face. They hide the car at the home of their associate **Jimmie**, who insists they deal with the problem before his wife comes home. **Marsellus** sends his cleaner, Winston **Wolfe**, who directs **Jules** and **Vincent** to clean the car, hide the body in the trunk, dispose of their bloody clothes, and drive the car to a junk yard.

L At a diner, **Jules** tells **Vincent** he plans to retire from his life of crime, taking their "miraculous" survival as a sign. While Vincent is in the bathroom, a couple, "**Pumpkin**" and "**Honey Bunny**", hold up the restaurant. When **Jules** holds **Pumpkin** at gunpoint, **Honey Bunny** becomes hysterical and trains her gun on him.

M **Vincent** returns with his gun trained on her, creating a Mexican standoff. **Jules** recites the biblical passage, expresses ambivalence about his life of crime, and allows the robbers to take his own cash and leave. **Jules** and **Vincent** leave the diner with the briefcase.

✏ Draw the Story Curve of the Plot Summary
Please use the drawing tool below. It does not have to be beautiful!

**Click & drag on the canvas to draw a stroke.**

Clear Canvas

Hint
Use available temporal information (e.g., 'Some time later', 'Some time earlier'), character co-occurrences & interactions (e.g., who killed whom), or anything useful.

Rearrage the events in story order and draw the Story Curve in a rentangular grid where the horizontal axis is narrative order and the vertical axis is story order.

You may want to use a pen and paper to draft the sketch before drawing it on the canvas below.

A B C D E F G H I J K L M
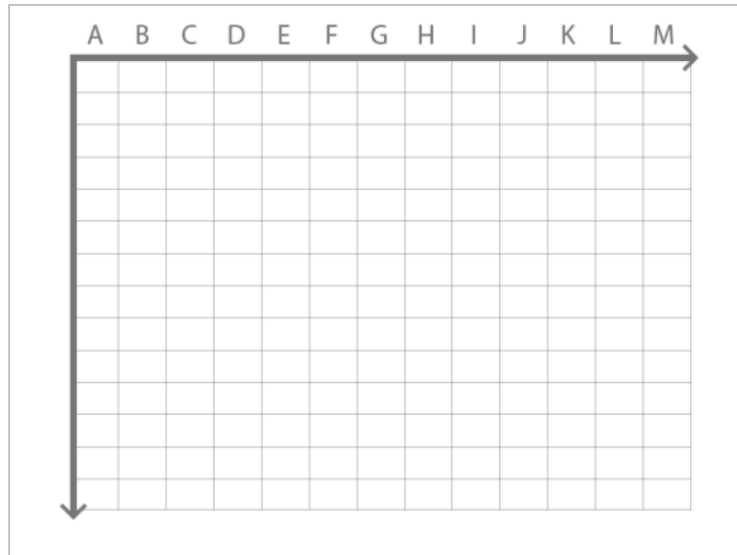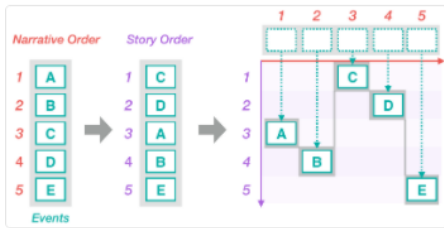
💬 Briefly describe your drawing
If necessary, especially if your drawing deviates from the example we showed before.

Pattern Reading Task

In this task, we asked a total of 20 questions, showing 5 story curves that correspond to the movies, Pulp Fiction, Memento, 12 Monkeys, 500 Days of Summer, and Fight Club. In this supplement, we show all the questions (blue) and answers (red) we asked in this task as below.
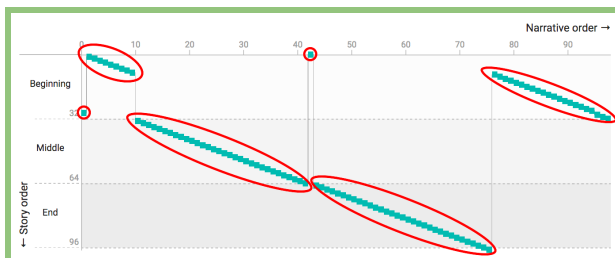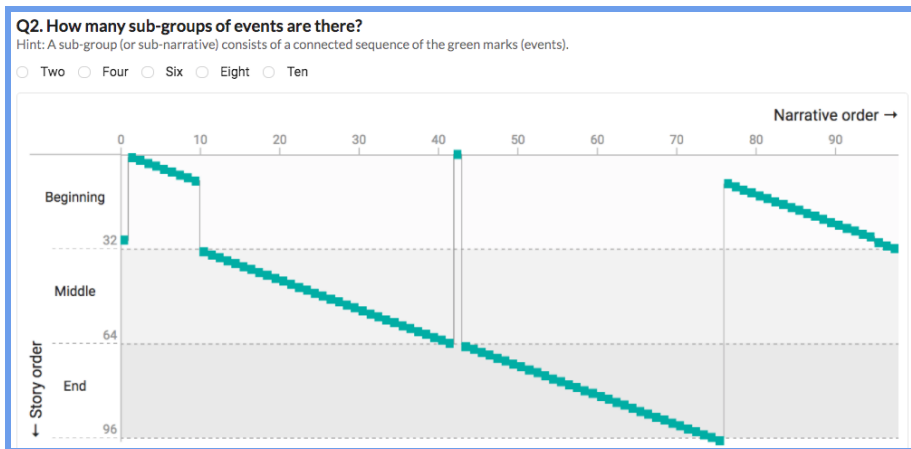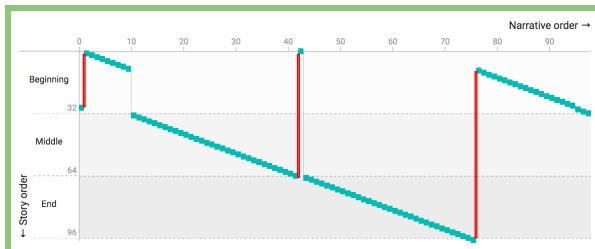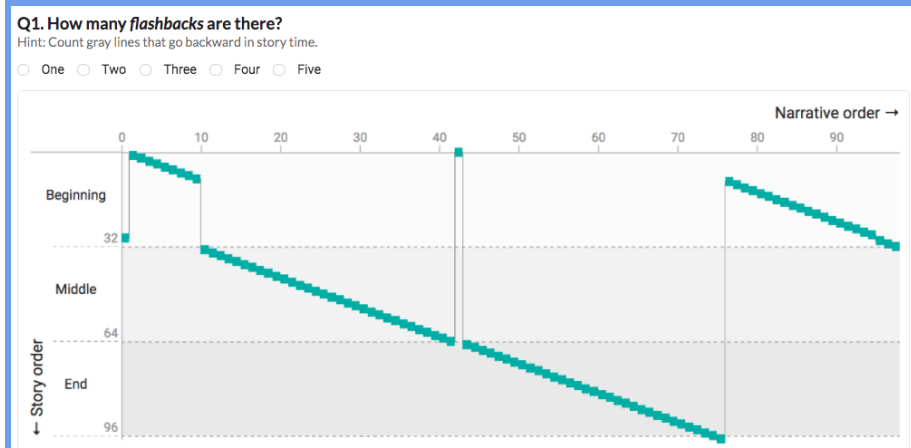
Q3. How many *flashforwards* are there?
Hint: Count gray lines that go forward in story time.

○ One   ○ Two   ○ Three   ○ Four   ○ Five
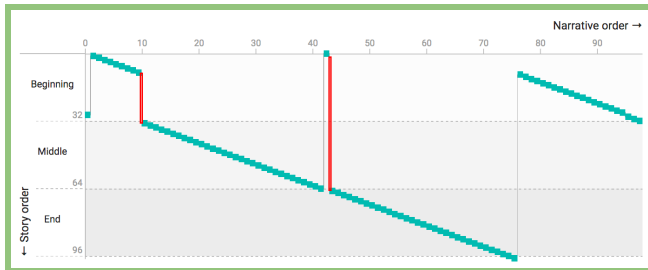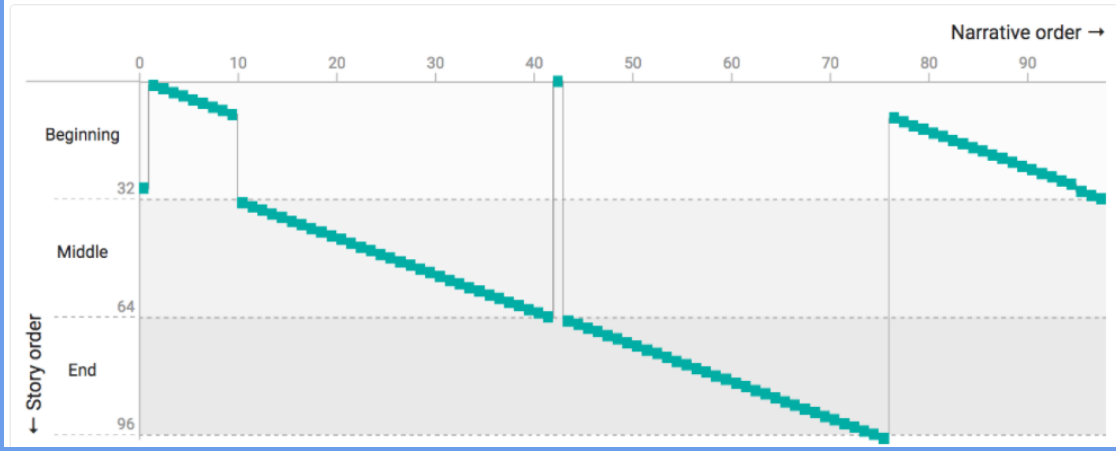
Q4. *In which range of narrative order, can you find the* **flashback** *that goes nearest back in story time?*
Hint: Find the shortest gray line that goes backward in story order. For visual aids, each range is shown as a thick gray line at the top.

○ 0 - 20   ○ 20 - 40   ○ 40 - 60   ○ 60 - 80   ○ 80 - 96
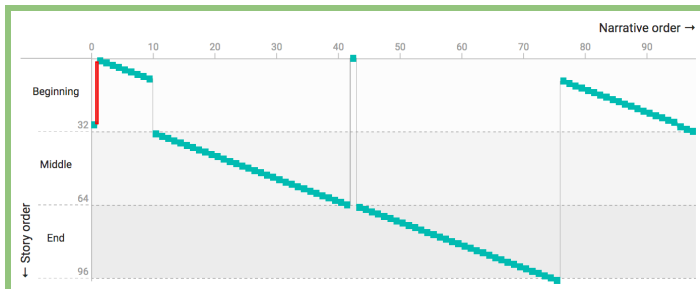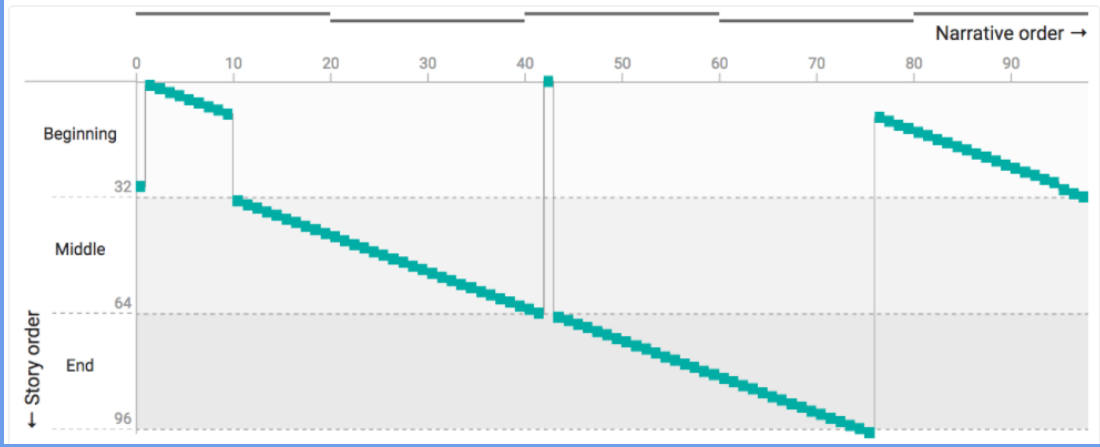
Q5. Among five basic patterns (Chronological, Retrograde, Flashback, Flashforward, Zigzag), how many of them do you seen in this story curve?
Hint: Be careful and look at both overall patterns as well as sub-group patterns.

○ One ○ Two ○ Three ○ Four ○ All Five
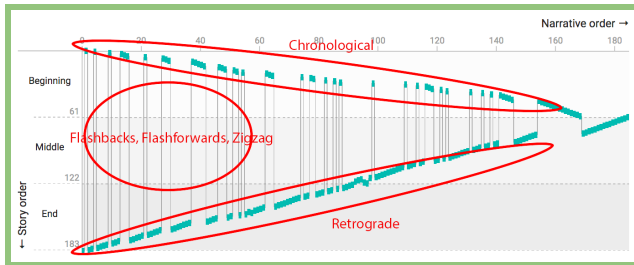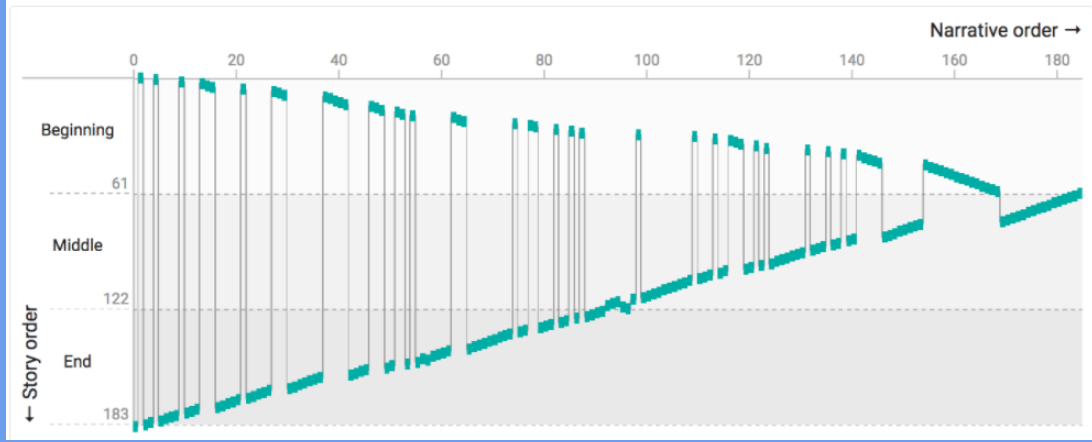
Q6. What is the overall pattern of the events belonging to the *beginning* of the story (not narrative)?
Hint: Do not consider the events that lie in the middle and the end of the story.

○ Chronological ○ Retrograde ○ Flashback ○ Flashforward ○ Zigzag
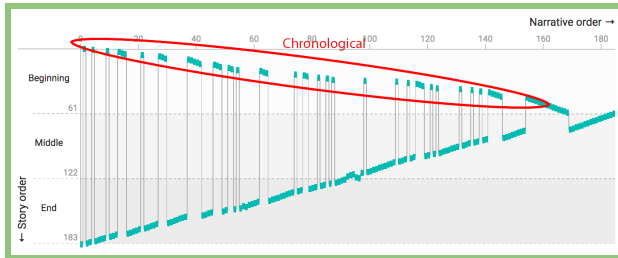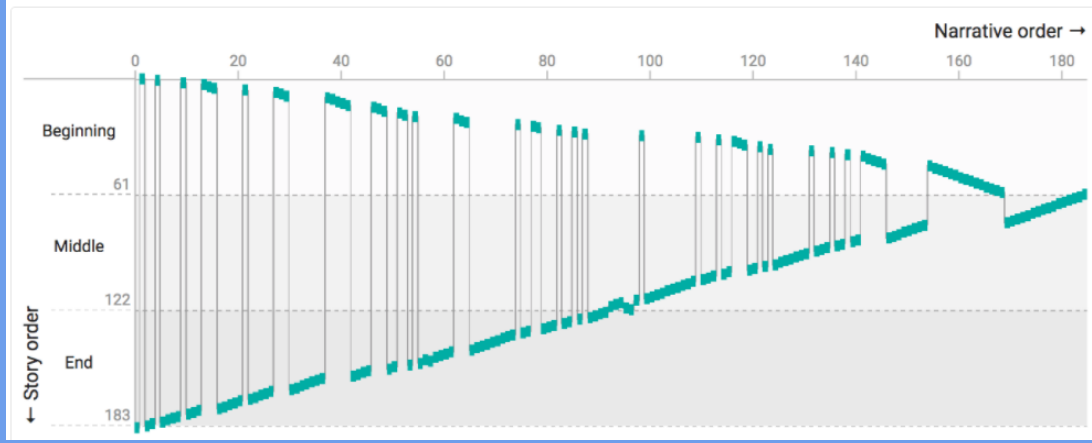
Q7. What is the overall pattern of the events belonging to the *middle & end* of the story (not narrative)?

Hint: Do not consider the events that lie in the beginning of the story.

○ Chronological ○ Retrograde ○ Flashback ○ Flashforward ○ Zigzag
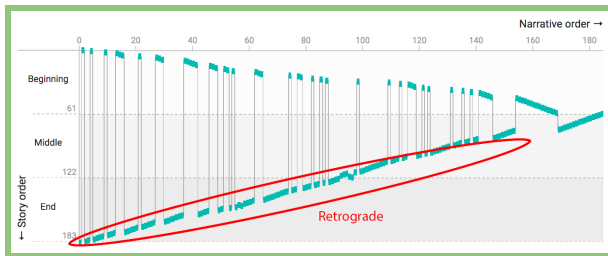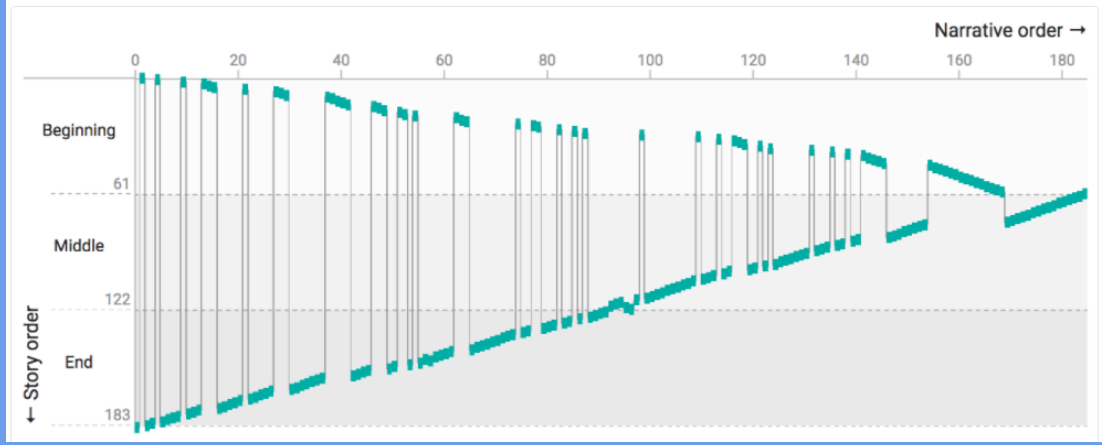
Retrograde

Q8. In which range of narrative order, can you find the longest retrograde?

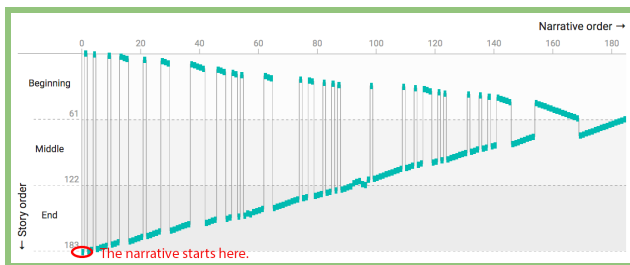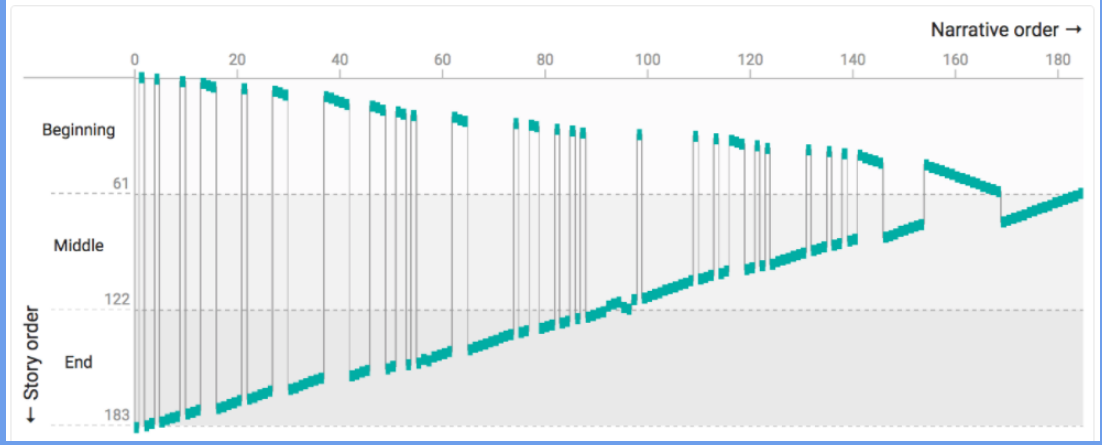Hint: Find the longest subgroup that is narrated in reverse order. For visual aids, each range is shown as a thick gray line at the top.

○ 0 - 40 ○ 40 - 80 ○ 80 - 120 ○ 120 - 160 ○ 160 - 183
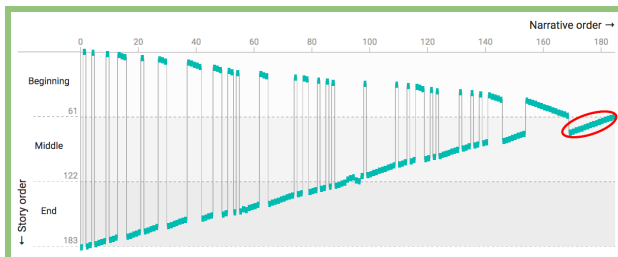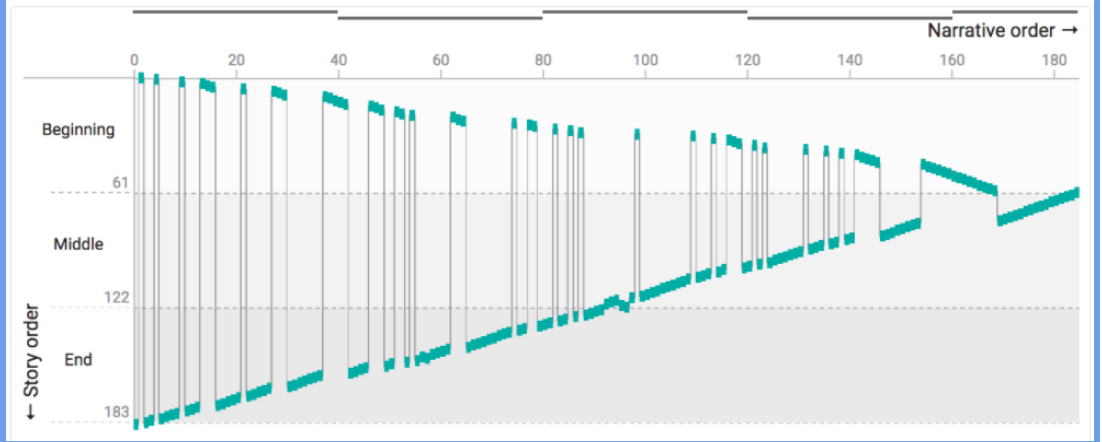
Q9. Does the narrative start at the point earlier or later than the middle of the story?
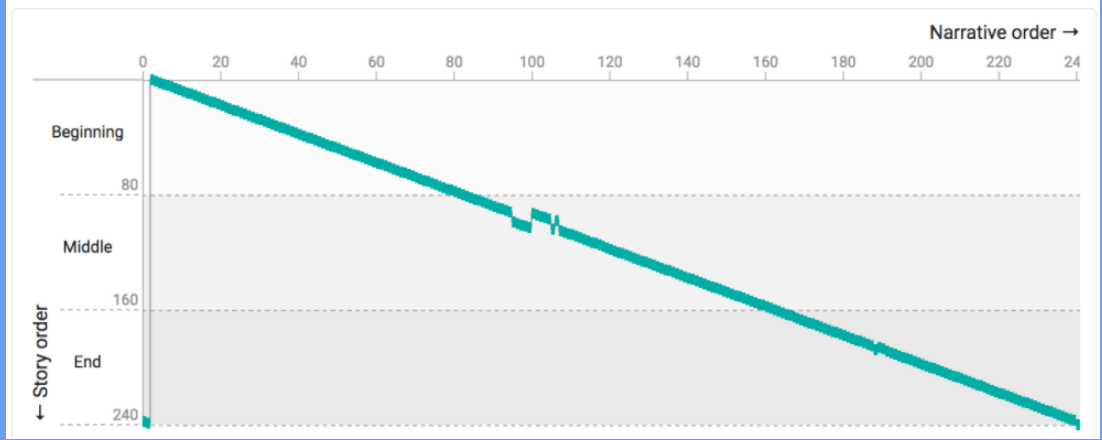
Hint: Identify the vertical position of the first event.

○ Earlier   ○ Later   ○ Same

The narrative starts here.

Q10. At which point of the story, does the narrative *start*?

Hint: Identify the vertical position of the first event.

○ Beginning   ○ Middle   ○ End
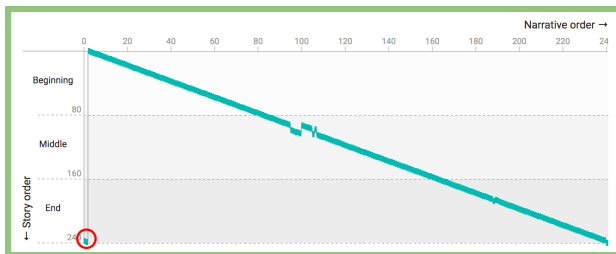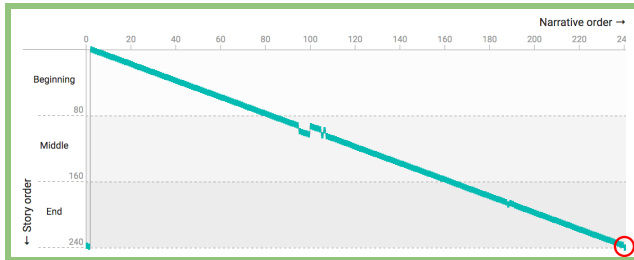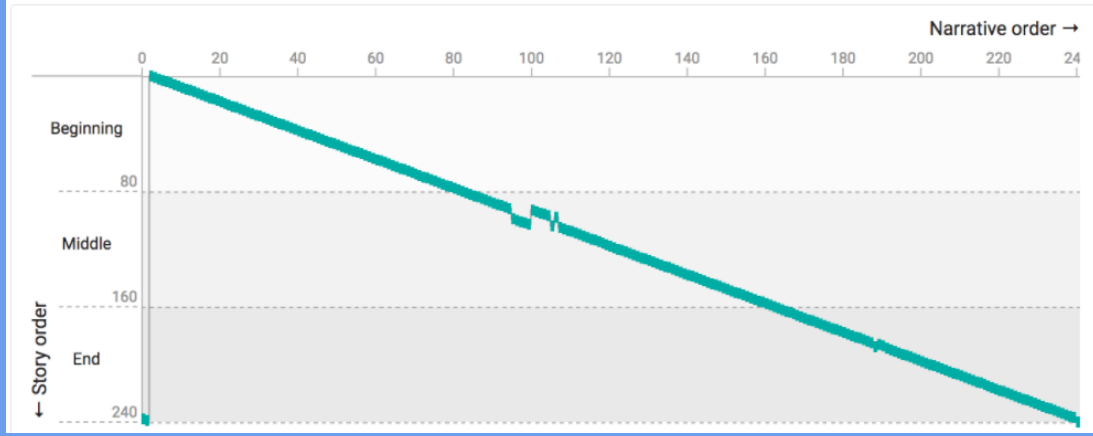
Q11. At which point of the story, does the narrative *end*?
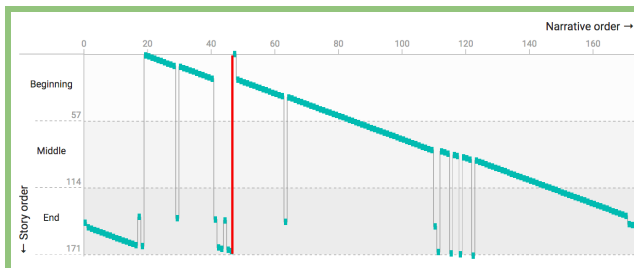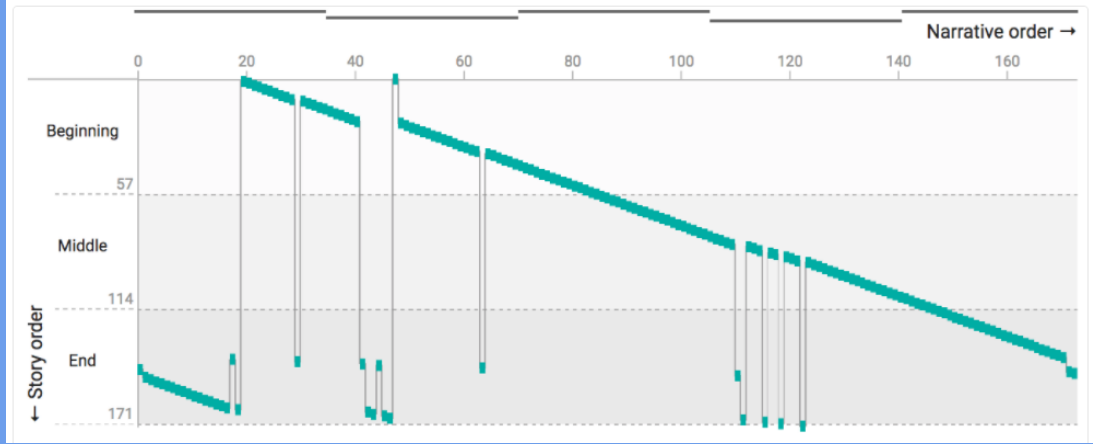Hint: Identify the vertical position of the last event.

○ Beginning ○ Middle ○ End

Q12. In which range of narrative order, can you find the *flashback* that goes farthest back in story time?
Hint: Find the longest gray line that goes backward in story order. For visual aids, each range is shown as a thick gray line at the top.
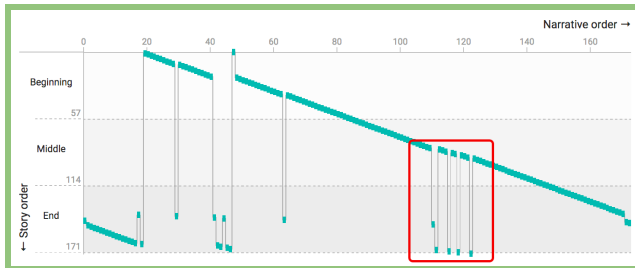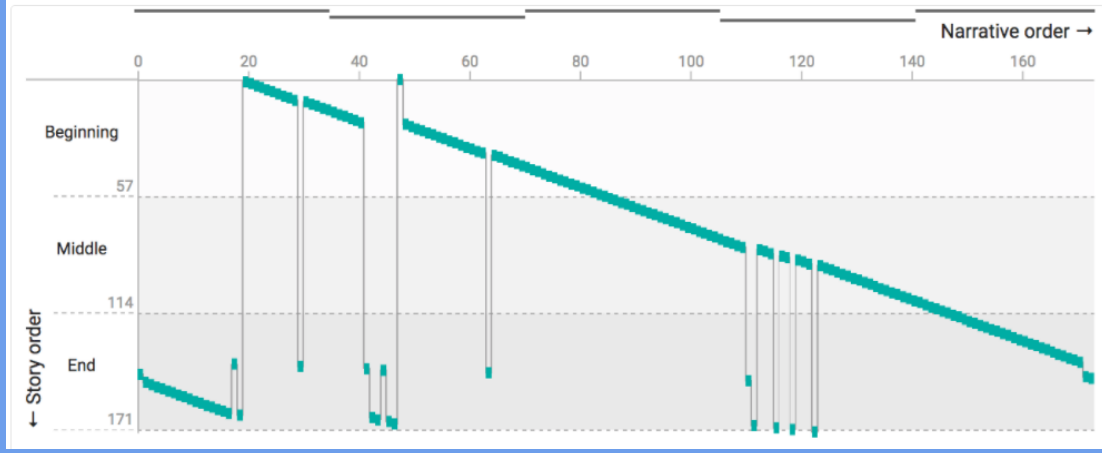
○ 0 - 35 ○ 35 - 70 ○ 70 - 105 ○ 105 - 140 ○ 140 - 175

Q13. In which range of narrative order, can you find the most number of *flashbacks*?

Hint: Count gray lines in each range that go backward in story time. For visual aids, each range is shown as a thick gray line at the top.
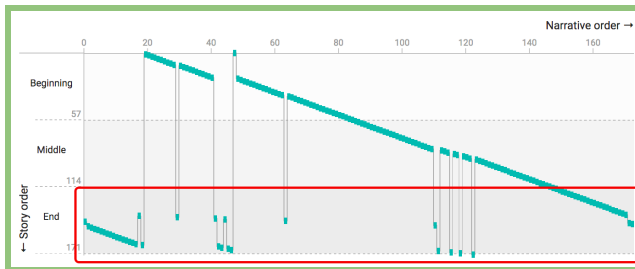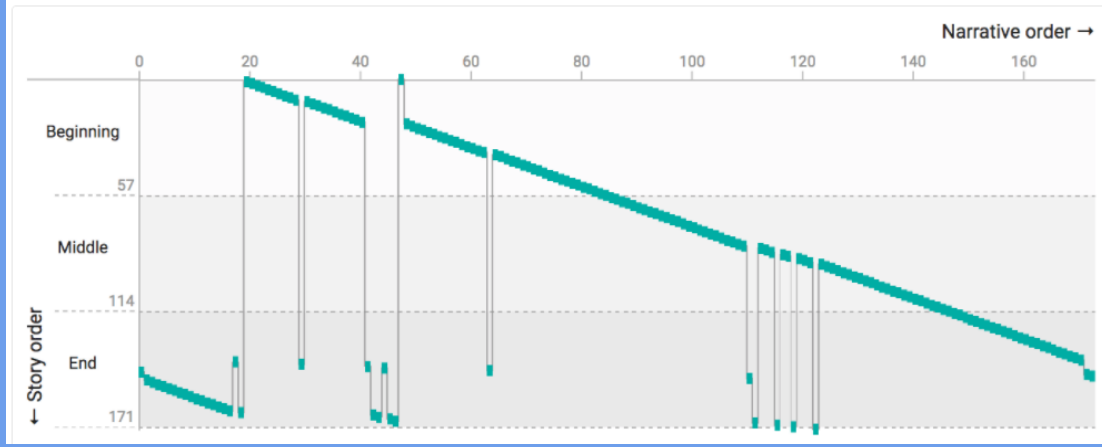
○ 0 - 35   ○ 35 - 70   ○ 70 - 105   ○ 105 - 140   ○ 140 - 175

Q14. To which point of the story, does the narrative most frequently jump in time?

Hint: Count gray lines that end in each part of the story.

○ Beginning   ○ Middle   ○ End

Q15. In which range of narrative order, can you find a zigzag pattern jumping between the middle and the end of the story?

Hint: Count gray lines in each range that start or end in either the middle or the end of the story. For visual aids, each range is shown as a thick gray line at the top.
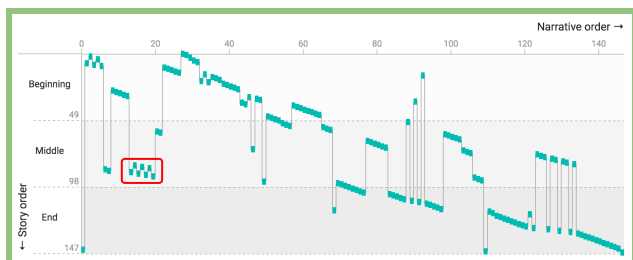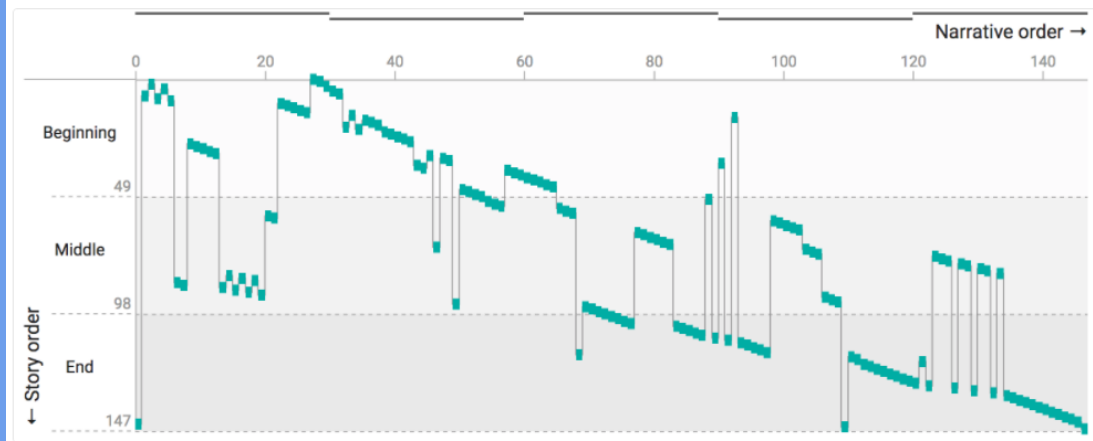
○ 1 - 30 ○ 30 - 60 ○ 60 - 90 ○ 90 - 120 ○ 120 - 147
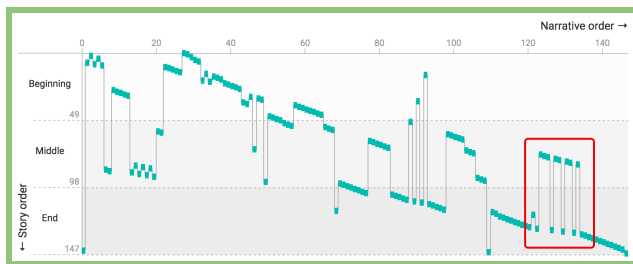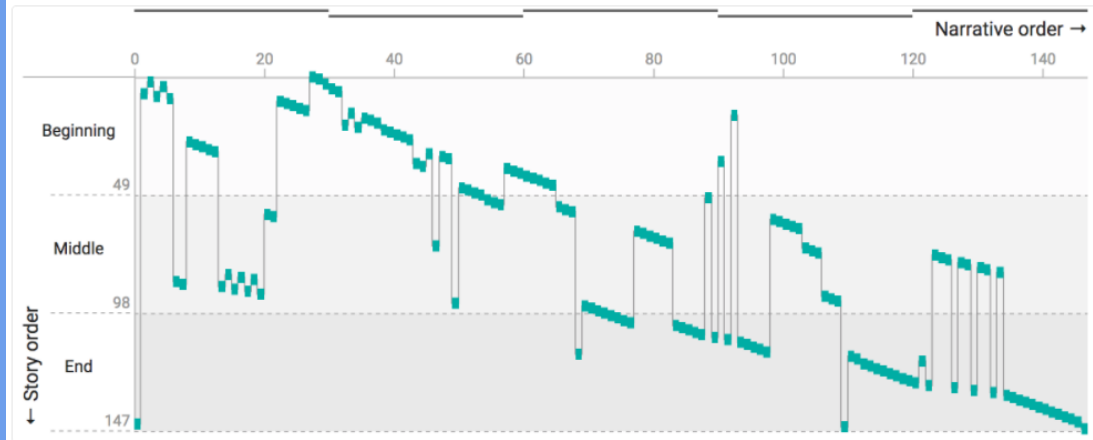
Q16. In which range of narrative order, can you find a *short zigzag* jumping *within* the middle of the story?

Hint: Count gray lines in each range that start or end within the middle of the story. For visual aids, each range is shown as a thick gray line at the top.
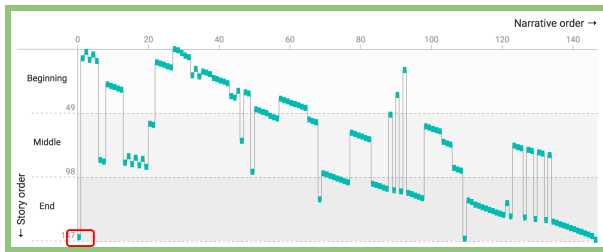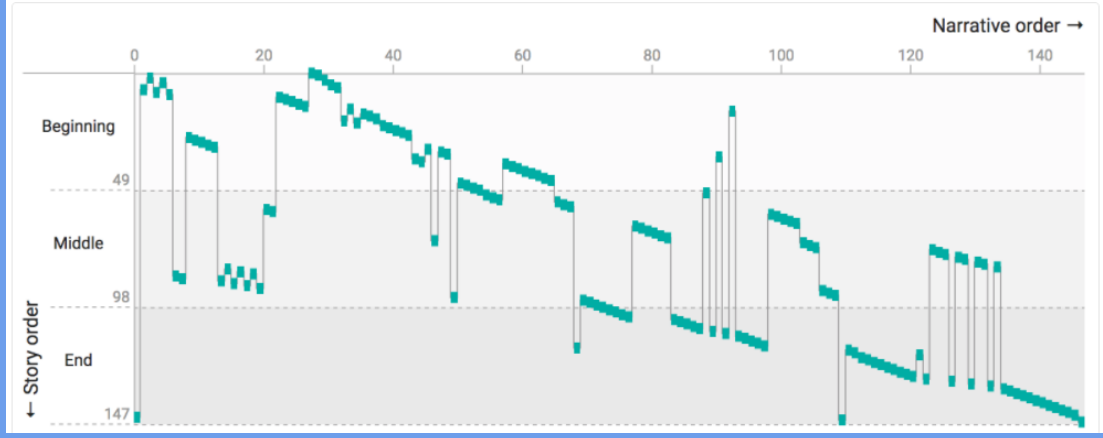
○ 1 - 30 ○ 30 - 60 ○ 60 - 90 ○ 90 - 120 ○ 120 - 147

Q17. At which point of the story, does the narrative *start*?

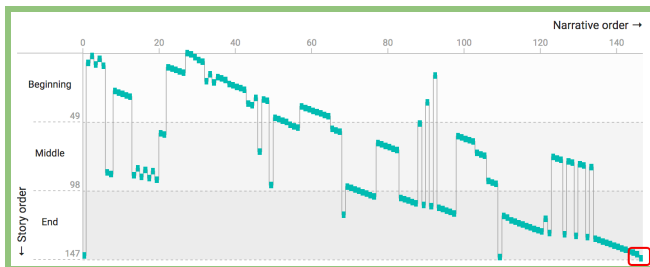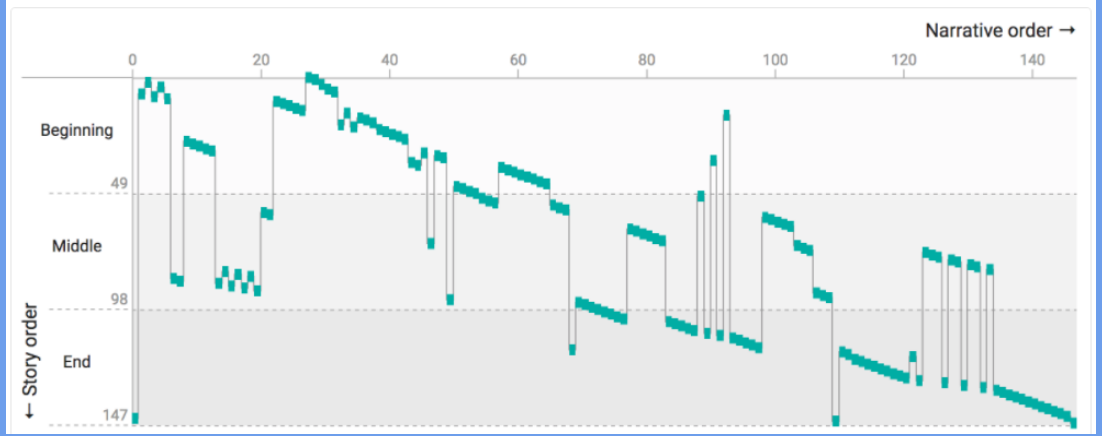Hint: Identify the vertical position of the first event.

○ Beginning ○ Middle ○ End

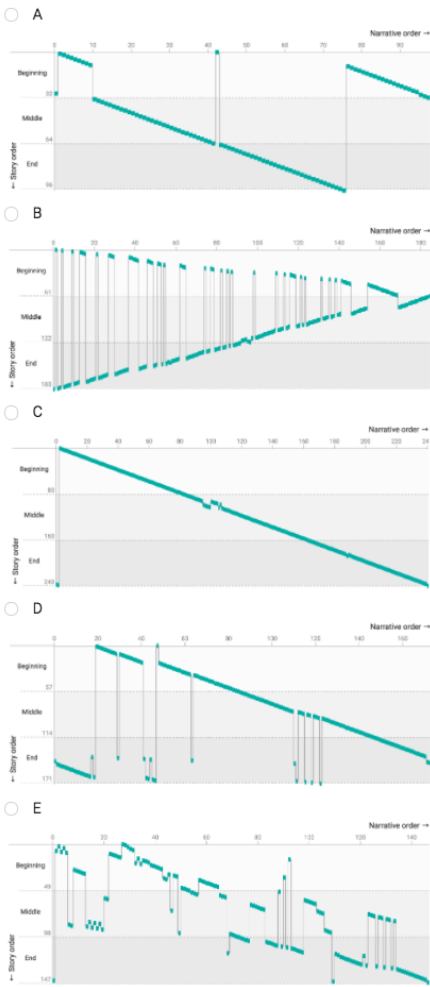## Q18. At which point of the story, does the narrative *end*?

Hint: Identify the vertical position of the last event.
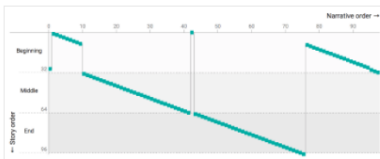
○ Beginning ○ Middle ○ End

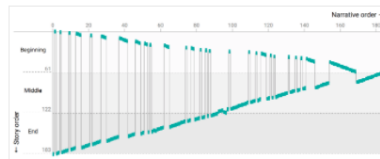**Q20. Which of the following story curves do you think corresponds to the plot summary of Pulp Fiction you read before?**
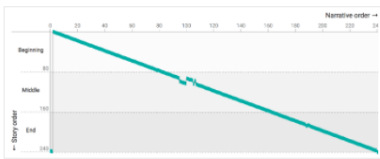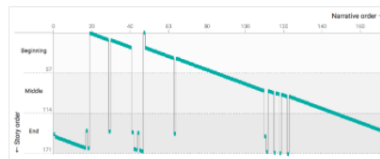
○ A

○ B

○ C

○ D

○ E

Pulp Fiction

Memento
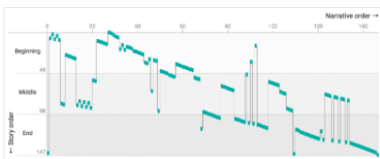

Fight Club

12 Monkeys

500 Days of Summer

Post-task Survey

Have you watched the movie Pulp Fiction before?

○ Yes

○ No

Do you think that you are now able to read Story Curves?

○ 1. Strongly Disagree

○ 2. Disagree

○ 3. Neutral

○ 4. Agree

○ 5. Strongly Agree

Do you think that you are able to use Story Curves to represent the nonlinear structure of films you watched or will watch?

○ 1. Strongly Disagree

○ 2. Disagree

○ 3. Neutral

○ 4. Agree

○ 5. Strongly Agree

Gender

○ Female

○ Male

○ Other

Age

○ 18-25

○ 26-35

○ 36-45

○ 46 or more

English Fluency

○ Native/Bilingual

○ Full Professional Fluency

○ Professional Working Fluency

○ Limited Working Fluency

○ Elementary Fluency

Current Education Level (Earned or Pursuing)

○ Doctorate or similar level

○ Master's degree or simialr level

○ Bachelor's degree or similar level

Do you have any comment or feedback?

Further Follow-up Survey

The following survey was conducted after the study session in order to find out potential issues with the study design or Story Curves.

T1. Sketching task

Overall, how difficult was it to complete the sketching task? *

○ 1. Very Easy
○ 2. Easy
○ 3. Moderate
○ 4. Difficult
○ 5. Very Difficult

Was the sketching task useful for understanding how Story Curves work?

○ 1. Strongly Disagree
○ 2. Disagree
○ 3. Neutral
○ 4. Agree
○ 5. Strongly Agree

How difficult was it to figure out the actual chronological order (story order) of the events?

○ 1. Very Easy
○ 2. Easy
○ 3. Moderate
○ 4. Difficult
○ 5. Very Difficult

How difficult was it to figure out how to draw the story curve once you had the order information?

○ 1. Very Easy
○ 2. Easy
○ 3. Moderate
○ 4. Difficult
○ 5. Very Difficult

If you have any other reason or comment on the sketching task, please mention it here.

T2. Pattern detection task

Overall, how difficult was it to complete the pattern detection task? *

○ 1. Very Easy

○ 2. Easy

○ 3. Moderate

○ 4. Difficult

○ 5. Very Difficult

How difficult was it to understand the definitions of the basic patterns (e.g., flashbacks, flashforwards, etc)?

○ 1. Very Easy

○ 2. Easy

○ 3. Moderate

○ 4. Difficult

○ 5. Very Difficult

How confusing was it to understand the difference between *story* and *narrative*?

○ 1. Very Clear

○ 2. Clear

○ 3. Moderate

○ 4. Confusing

○ 5. Very Confusing

How difficult was it to read patterns from the Story Curves?

○ 1. Very Easy

○ 2. Easy

○ 3. Moderate

○ 4. Difficult

○ 5. Very Difficult

If you have any other reason or comment on the pattern detection task, please mention it here.