Data Collection

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1 Audience Retention

1.1 Function

1.1.1 2020

Retrieving audience retention data of videos from subtopic 2.1 Fungsi. The data was retrieved on 6 January 2024.

```
# A tibble: 400 x 4
   vid_id      elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                    <dbl>                <dbl>                     <dbl>
 1 7g35w-sL_JA               0.01                0.991                     0.696
 2 7g35w-sL_JA               0.02                0.894                     0.817
 3 7g35w-sL_JA               0.03                0.832                     0.905
 4 7g35w-sL_JA               0.04                0.858                     0.940
 5 7g35w-sL_JA               0.05                0.832                     0.949
 6 7g35w-sL_JA               0.06                0.858                     0.950
 7 7g35w-sL_JA               0.07                0.823                     0.950
 8 7g35w-sL_JA               0.08                0.832                     0.950
 9 7g35w-sL_JA               0.09                0.796                     0.950
10 7g35w-sL_JA               0.1                 0.832                     0.950
# i 390 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 2.2 Grafik Fungsi. The data was retrieved on 7 January 2024.

```
# A tibble: 600 x 4
   vid_id      elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                    <dbl>                <dbl>                     <dbl>
 1 aHo1kbccgLM               0.01                1                         0.690
 2 aHo1kbccgLM               0.02                0.9                       0.807
 3 aHo1kbccgLM               0.03                0.8                       0.894
 4 aHo1kbccgLM               0.04                0.854                     0.927
 5 aHo1kbccgLM               0.05                0.836                     0.937
```

```
 6 aHo1kbccgLM                     0.06               0.864                    0.940
 7 aHo1kbccgLM                     0.07               0.818                    0.942
 8 aHo1kbccgLM                     0.08               0.782                    0.944
 9 aHo1kbccgLM                     0.09               0.773                    0.946
10 aHo1kbccgLM                     0.1                0.754                    0.948
# i 590 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 2.3 Informasi Penting Grafik
Fungsi. The data was retrieved on 7 January 2024 from Youtube API Explorer with these
codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=elapsedVideoTimeRatio&en
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 400 x 4
   vid_id       elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                     <dbl>                <dbl>                     <dbl>
 1 MD5LDDmH3Lo                0.01                 1.01                      0.770
 2 MD5LDDmH3Lo                0.02                 0.840                     0.862
 3 MD5LDDmH3Lo                0.03                 0.774                     0.922
 4 MD5LDDmH3Lo                0.04                 0.755                     0.939
 5 MD5LDDmH3Lo                0.05                 0.802                     0.943
 6 MD5LDDmH3Lo                0.06                 0.783                     0.945
 7 MD5LDDmH3Lo                0.07                 0.764                     0.948
 8 MD5LDDmH3Lo                0.08                 0.755                     0.949
 9 MD5LDDmH3Lo                0.09                 0.736                     0.950
10 MD5LDDmH3Lo                0.1                  0.708                     0.950
# i 390 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 2.4 Fungsi Linear dan Model-
nya. The data was retrieved on 7 January 2024 from Youtube API Explorer with these
codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTime
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 300 x 4
   vid_id       elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                     <dbl>                <dbl>                     <dbl>
```

```
 1 LIkQgdMtovQ              0.01              0.929                    0.478
 2 LIkQgdMtovQ              0.02              0.788                    0.602
 3 LIkQgdMtovQ              0.03              0.718                    0.712
 4 LIkQgdMtovQ              0.04              0.718                    0.776
 5 LIkQgdMtovQ              0.05              0.706                    0.812
 6 LIkQgdMtovQ              0.06              0.718                    0.841
 7 LIkQgdMtovQ              0.07              0.694                    0.875
 8 LIkQgdMtovQ              0.08              0.718                    0.908
 9 LIkQgdMtovQ              0.09              0.776                    0.928
10 LIkQgdMtovQ              0.1               0.788                    0.936
# i 290 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 2.5 Transformasi Fungsi. The data was retrieved on 7 January 2024 from Youtube API Explorer with these codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTime
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 600 x 4
   vid_id      elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                    <dbl>                <dbl>                     <dbl>
 1 jytZgg-oQyM               0.01                0.986                     0.643
 2 jytZgg-oQyM               0.02                0.851                     0.763
 3 jytZgg-oQyM               0.03                0.865                     0.856
 4 jytZgg-oQyM               0.04                0.824                     0.902
 5 jytZgg-oQyM               0.05                0.838                     0.923
 6 jytZgg-oQyM               0.06                0.824                     0.933
 7 jytZgg-oQyM               0.07                0.878                     0.932
 8 jytZgg-oQyM               0.08                0.838                     0.922
 9 jytZgg-oQyM               0.09                0.824                     0.903
10 jytZgg-oQyM               0.1                 0.824                     0.881
# i 590 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 2.6 Kombinasi Beberapa Fungsi. The data was retrieved on 7 January 2024 from Youtube API Explorer with these codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTime
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 300 x 4
   vid_id      elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                    <dbl>                <dbl>                     <dbl>
 1 oKlJDBsc_A0               0.01                1.01                      0.747
 2 oKlJDBsc_A0               0.02                0.872                     0.835
 3 oKlJDBsc_A0               0.03                0.820                     0.893
 4 oKlJDBsc_A0               0.04                0.808                     0.910
 5 oKlJDBsc_A0               0.05                0.820                     0.914
 6 oKlJDBsc_A0               0.06                0.769                     0.914
 7 oKlJDBsc_A0               0.07                0.731                     0.913
 8 oKlJDBsc_A0               0.08                0.731                     0.912
 9 oKlJDBsc_A0               0.09                0.718                     0.909
10 oKlJDBsc_A0               0.1                 0.705                     0.904
# i 290 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 2.7 Fungsi Satu-Satu dan Inversnya. The data was retrieved on 7 January 2024 from Youtube API Explorer with these codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTime
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 500 x 4
   vid_id      elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                    <dbl>                <dbl>                     <dbl>
 1 hcUC4IFisL4               0.01                0.937                     0.700
 2 hcUC4IFisL4               0.02                0.747                     0.788
 3 hcUC4IFisL4               0.03                0.709                     0.850
 4 hcUC4IFisL4               0.04                0.709                     0.878
 5 hcUC4IFisL4               0.05                0.709                     0.895
 6 hcUC4IFisL4               0.06                0.722                     0.909
 7 hcUC4IFisL4               0.07                0.722                     0.918
 8 hcUC4IFisL4               0.08                0.709                     0.923
 9 hcUC4IFisL4               0.09                0.696                     0.927
10 hcUC4IFisL4               0.1                 0.760                     0.930
# i 490 more rows
# i abbreviated name: 1: relative_retention_performance
```

Combining subtopic data into one topic.

```
# A tibble: 3,100 x 5
   vid_id   elapsed_time_ratio audience_watch_ratio relative_retention_p~1  year
   <chr>                 <dbl>                <dbl>                  <dbl> <dbl>
 1 7g35w-s~               0.01                0.991                  0.696  2020
```

```
 2 7g35w-s~                0.02                0.894                0.817  2020
 3 7g35w-s~                0.03                0.832                0.905  2020
 4 7g35w-s~                0.04                0.858                0.940  2020
 5 7g35w-s~                0.05                0.832                0.949  2020
 6 7g35w-s~                0.06                0.858                0.950  2020
 7 7g35w-s~                0.07                0.823                0.950  2020
 8 7g35w-s~                0.08                0.832                0.950  2020
 9 7g35w-s~                0.09                0.796                0.950  2020
10 7g35w-s~                0.1                 0.832                0.950  2020
# i 3,090 more rows
# i abbreviated name: 1: relative_retention_performance
```

1.1.2 2021

Retrieving audience retention data of videos from subtopic 2.1 Fungsi with `start_date`
2021-08-22 and `end_date` 2021-12-31. The data was retrieved on 7 January 2024. The code
used for retrieving data from Youtube Analytics and Reporting API were as follows.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTime
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 400 x 4
   vid_id    elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                  <dbl>                <dbl>                     <dbl>
 1 7g35w-sL_JA             0.01                 1.03                     0.721
 2 7g35w-sL_JA             0.02                 0.858                    0.825
 3 7g35w-sL_JA             0.03                 0.850                    0.901
 4 7g35w-sL_JA             0.04                 0.876                    0.933
 5 7g35w-sL_JA             0.05                 0.903                    0.946
 6 7g35w-sL_JA             0.06                 0.903                    0.950
 7 7g35w-sL_JA             0.07                 0.920                    0.950
 8 7g35w-sL_JA             0.08                 0.885                    0.950
 9 7g35w-sL_JA             0.09                 0.876                    0.950
10 7g35w-sL_JA             0.1                  0.850                    0.950
# i 390 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 2.2 Grafik Fungsi for the 2021.
The data was retrieved on 7 January 2024.

```
# A tibble: 600 x 4
   vid_id     elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                   <dbl>                <dbl>                     <dbl>
 1 aHo1kbccgLM             0.01                 1.01                     0.725
```

```
 2 aHo1kbccgLM                0.02              0.867                   0.832
 3 aHo1kbccgLM                0.03              0.876                   0.910
 4 aHo1kbccgLM                0.04              0.895                   0.940
 5 aHo1kbccgLM                0.05              0.943                   0.949
 6 aHo1kbccgLM                0.06              0.971                   0.950
 7 aHo1kbccgLM                0.07              1                       0.950
 8 aHo1kbccgLM                0.08              0.971                   0.950
 9 aHo1kbccgLM                0.09              1.01                    0.950
10 aHo1kbccgLM                0.1               0.924                   0.950
# i 590 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 2.3 Informasi Penting Grafik Fungsi. The data was retrieved on 7 January 2024 from Youtube API Explorer with these codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTime
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 400 x 4
   vid_id      elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                    <dbl>                <dbl>                     <dbl>
 1 MD5LDDmH3Lo               0.01                1                         0.773
 2 MD5LDDmH3Lo               0.02                0.884                     0.872
 3 MD5LDDmH3Lo               0.03                0.990                     0.934
 4 MD5LDDmH3Lo               0.04                0.958                     0.949
 5 MD5LDDmH3Lo               0.05                0.916                     0.951
 6 MD5LDDmH3Lo               0.06                0.905                     0.951
 7 MD5LDDmH3Lo               0.07                0.926                     0.951
 8 MD5LDDmH3Lo               0.08                0.916                     0.951
 9 MD5LDDmH3Lo               0.09                0.926                     0.951
10 MD5LDDmH3Lo               0.1                 0.979                     0.951
# i 390 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 2.4 Fungsi Linear dan Model-nya. The data was retrieved on 7 January 2024 from Youtube API Explorer with these codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTime
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 300 x 4
   vid_id      elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                    <dbl>                <dbl>                     <dbl>
 1 LIkQgdMtovQ               0.01                 1.05                     0.711
 2 LIkQgdMtovQ               0.02                 0.920                    0.808
 3 LIkQgdMtovQ               0.03                 0.875                    0.873
 4 LIkQgdMtovQ               0.04                 0.807                    0.895
 5 LIkQgdMtovQ               0.05                 0.818                    0.906
 6 LIkQgdMtovQ               0.06                 0.807                    0.919
 7 LIkQgdMtovQ               0.07                 0.807                    0.932
 8 LIkQgdMtovQ               0.08                 0.852                    0.942
 9 LIkQgdMtovQ               0.09                 0.886                    0.947
10 LIkQgdMtovQ               0.1                  0.920                    0.949
# i 290 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 2.5 Transformasi Fungsi. The data was retrieved on 7 January 2024 from Youtube API Explorer with these codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTimeR
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 600 x 4
   vid_id      elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                    <dbl>                <dbl>                     <dbl>
 1 jytZgg-oQyM               0.01                 1.03                     0.676
 2 jytZgg-oQyM               0.02                 1                        0.781
 3 jytZgg-oQyM               0.03                 0.931                    0.852
 4 jytZgg-oQyM               0.04                 0.861                    0.877
 5 jytZgg-oQyM               0.05                 0.833                    0.888
 6 jytZgg-oQyM               0.06                 0.875                    0.898
 7 jytZgg-oQyM               0.07                 0.889                    0.905
 8 jytZgg-oQyM               0.08                 0.875                    0.907
 9 jytZgg-oQyM               0.09                 0.833                    0.908
10 jytZgg-oQyM               0.1                  0.889                    0.909
# i 590 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 2.6 Kombinasi Beberapa Fungsi. The data was retrieved on 7 January 2024 from Youtube API Explorer with these codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTimeR
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
```

```
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 300 x 4
   vid_id      elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                    <dbl>                <dbl>                     <dbl>
 1 oKlJDBsc_A0               0.01                0.956                     0.633
 2 oKlJDBsc_A0               0.02                0.769                     0.752
 3 oKlJDBsc_A0               0.03                0.736                     0.84
 4 oKlJDBsc_A0               0.04                0.802                     0.866
 5 oKlJDBsc_A0               0.05                0.758                     0.848
 6 oKlJDBsc_A0               0.06                0.714                     0.794
 7 oKlJDBsc_A0               0.07                0.659                     0.719
 8 oKlJDBsc_A0               0.08                0.681                     0.655
 9 oKlJDBsc_A0               0.09                0.648                     0.625
10 oKlJDBsc_A0               0.1                 0.615                     0.628
# i 290 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 2.7 Fungsi Satu-Satu dan Inversnya. The data was retrieved on 7 January 2024 from Youtube API Explorer with these codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTime
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 500 x 4
   vid_id      elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                    <dbl>                <dbl>                     <dbl>
 1 hcUC4IFisL4               0.01                0.908                     0.564
 2 hcUC4IFisL4               0.02                0.776                     0.694
 3 hcUC4IFisL4               0.03                0.710                     0.805
 4 hcUC4IFisL4               0.04                0.710                     0.871
 5 hcUC4IFisL4               0.05                0.763                     0.909
 6 hcUC4IFisL4               0.06                0.790                     0.928
 7 hcUC4IFisL4               0.07                0.790                     0.933
 8 hcUC4IFisL4               0.08                0.737                     0.931
 9 hcUC4IFisL4               0.09                0.710                     0.928
10 hcUC4IFisL4               0.1                 0.697                     0.928
# i 490 more rows
# i abbreviated name: 1: relative_retention_performance
```

Combining subtopic data into one topic.

```
# A tibble: 3,100 x 5
   vid_id   elapsed_time_ratio audience_watch_ratio relative_retention_p~1  year
   <chr>                 <dbl>                <dbl>                  <dbl> <dbl>
 1 7g35w-s~               0.01                 1.03                  0.721  2021
 2 7g35w-s~               0.02                0.858                  0.825  2021
 3 7g35w-s~               0.03                0.850                  0.901  2021
 4 7g35w-s~               0.04                0.876                  0.933  2021
 5 7g35w-s~               0.05                0.903                  0.946  2021
 6 7g35w-s~               0.06                0.903                  0.950  2021
 7 7g35w-s~               0.07                0.920                  0.950  2021
 8 7g35w-s~               0.08                0.885                  0.950  2021
 9 7g35w-s~               0.09                0.876                  0.950  2021
10 7g35w-s~               0.1                 0.850                  0.950  2021
# i 3,090 more rows
# i abbreviated name: 1: relative_retention_performance
```

1.1.3 Two Year Data

```
retention_2 <- bind_rows(retention_2020_2,
                         retention_2021_2)

write_csv(retention_2,
          file = "datasets/retention_2.csv")

print(retention_2)
```

```
# A tibble: 6,200 x 5
   vid_id   elapsed_time_ratio audience_watch_ratio relative_retention_p~1  year
   <chr>                 <dbl>                <dbl>                  <dbl> <dbl>
 1 7g35w-s~               0.01                0.991                  0.696  2020
 2 7g35w-s~               0.02                0.894                  0.817  2020
 3 7g35w-s~               0.03                0.832                  0.905  2020
 4 7g35w-s~               0.04                0.858                  0.940  2020
 5 7g35w-s~               0.05                0.832                  0.949  2020
 6 7g35w-s~               0.06                0.858                  0.950  2020
 7 7g35w-s~               0.07                0.823                  0.950  2020
 8 7g35w-s~               0.08                0.832                  0.950  2020
 9 7g35w-s~               0.09                0.796                  0.950  2020
10 7g35w-s~               0.1                 0.832                  0.950  2020
# i 6,190 more rows
# i abbreviated name: 1: relative_retention_performance
```

1.2 Rational Functions

1.2.1 2020

Retrieving audience retention data of videos from subtopic 3.1 Fungsi Rasional. The data
was retrieved on 7 January 2024 from Youtube API Explorer with these codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTime
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 300 x 4
   vid_id      elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                    <dbl>                <dbl>                     <dbl>
 1 fS8JmmjCg4Y               0.01                0.954                     0.660
 2 fS8JmmjCg4Y               0.02                0.853                     0.760
 3 fS8JmmjCg4Y               0.03                0.767                     0.823
 4 fS8JmmjCg4Y               0.04                0.705                     0.838
 5 fS8JmmjCg4Y               0.05                0.690                     0.842
 6 fS8JmmjCg4Y               0.06                0.667                     0.853
 7 fS8JmmjCg4Y               0.07                0.659                     0.869
 8 fS8JmmjCg4Y               0.08                0.690                     0.884
 9 fS8JmmjCg4Y               0.09                0.674                     0.897
10 fS8JmmjCg4Y               0.1                 0.643                     0.908
# i 290 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 3.2 Grafik Fungsi Rasional. The
data was retrieved on 7 January 2024 from Youtube API Explorer with these codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTime
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 400 x 4
   vid_id      elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                    <dbl>                <dbl>                     <dbl>
 1 7Ji0rZA-D7k               0.01                1.01                      0.725
 2 7Ji0rZA-D7k               0.02                0.817                     0.821
 3 7Ji0rZA-D7k               0.03                0.742                     0.888
 4 7Ji0rZA-D7k               0.04                0.656                     0.910
 5 7Ji0rZA-D7k               0.05                0.688                     0.916
 6 7Ji0rZA-D7k               0.06                0.667                     0.919
 7 7Ji0rZA-D7k               0.07                0.570                     0.921
```

```
 8 7Ji0rZA-D7k             0.08           0.570                  0.923
 9 7Ji0rZA-D7k             0.09           0.645                  0.926
10 7Ji0rZA-D7k             0.1            0.634                  0.930
# i 390 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 3.3 Pertidaksamaan Rasional.
The data was retrieved on 7 January 2024 from Youtube API Explorer with these codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTimeR
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 200 x 4
   vid_id      elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                    <dbl>                <dbl>                     <dbl>
 1 quoIHoqCJs4               0.01                0.966                     0.772
 2 quoIHoqCJs4               0.02                0.864                     0.867
 3 quoIHoqCJs4               0.03                0.864                     0.925
 4 quoIHoqCJs4               0.04                0.796                     0.938
 5 quoIHoqCJs4               0.05                0.739                     0.940
 6 quoIHoqCJs4               0.06                0.716                     0.940
 7 quoIHoqCJs4               0.07                0.693                     0.940
 8 quoIHoqCJs4               0.08                0.648                     0.939
 9 quoIHoqCJs4               0.09                0.693                     0.935
10 quoIHoqCJs4               0.1                 0.682                     0.928
# i 190 more rows
# i abbreviated name: 1: relative_retention_performance
```

Combining subtopics into one topic data.

```
# A tibble: 900 x 5
   vid_id  elapsed_time_ratio audience_watch_ratio relative_retention_p~1  year
   <chr>                <dbl>                <dbl>                  <dbl> <dbl>
 1 fS8Jmmj~              0.01                0.954                  0.660  2020
 2 fS8Jmmj~              0.02                0.853                  0.760  2020
 3 fS8Jmmj~              0.03                0.767                  0.823  2020
 4 fS8Jmmj~              0.04                0.705                  0.838  2020
 5 fS8Jmmj~              0.05                0.690                  0.842  2020
 6 fS8Jmmj~              0.06                0.667                  0.853  2020
 7 fS8Jmmj~              0.07                0.659                  0.869  2020
 8 fS8Jmmj~              0.08                0.690                  0.884  2020
 9 fS8Jmmj~              0.09                0.674                  0.897  2020
10 fS8Jmmj~              0.1                 0.643                  0.908  2020
# i 890 more rows
# i abbreviated name: 1: relative_retention_performance
```

1.2.2 2021

Retrieving audience retention data of videos from subtopic 3.1 Fungsi Rasional. The data was retrieved on 7 January 2024 from Youtube API Explorer with these codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTime
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 300 x 4
   vid_id       elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                    <dbl>                <dbl>                     <dbl>
 1 fS8JmmjCg4Y               0.01                0.971                     0.674
 2 fS8JmmjCg4Y               0.02                0.754                     0.771
 3 fS8JmmjCg4Y               0.03                0.696                     0.845
 4 fS8JmmjCg4Y               0.04                0.659                     0.885
 5 fS8JmmjCg4Y               0.05                0.630                     0.913
 6 fS8JmmjCg4Y               0.06                0.659                     0.931
 7 fS8JmmjCg4Y               0.07                0.681                     0.940
 8 fS8JmmjCg4Y               0.08                0.652                     0.944
 9 fS8JmmjCg4Y               0.09                0.674                     0.944
10 fS8JmmjCg4Y               0.1                 0.725                     0.943
# i 290 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 3.2 Grafik Fungsi Rasional. The data was retrieved on 7 January 2024 from Youtube API Explorer with these codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTime
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 400 x 4
   vid_id       elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                    <dbl>                <dbl>                     <dbl>
 1 7Ji0rZA-D7k               0.01                0.966                     0.749
 2 7Ji0rZA-D7k               0.02                0.716                     0.837
 3 7Ji0rZA-D7k               0.03                0.716                     0.896
 4 7Ji0rZA-D7k               0.04                0.636                     0.915
 5 7Ji0rZA-D7k               0.05                0.557                     0.918
 6 7Ji0rZA-D7k               0.06                0.557                     0.919
 7 7Ji0rZA-D7k               0.07                0.568                     0.921
 8 7Ji0rZA-D7k               0.08                0.557                     0.924
 9 7Ji0rZA-D7k               0.09                0.523                     0.927
```

```
10 7Ji0rZA-D7k            0.1            0.546            0.930
# i 390 more rows
# i abbreviated name: 1: relative_retention_performance
```

Retrieving audience retention data of videos from subtopic 3.3 Pertidaksamaan Rasional.
The data was retrieved on 7 January 2024 from Youtube API Explorer with these codes.

```
curl \
  'https://youtubeanalytics.googleapis.com/v2/reports?dimensions=video%2CelapsedVideoTime
  --header 'Authorization: Bearer [YOUR_ACCESS_TOKEN]' \
  --header 'Accept: application/json' \
  --compressed
```

```
# A tibble: 200 x 4
   vid_id      elapsed_time_ratio audience_watch_ratio relative_retention_perf~1
   <chr>                   <dbl>                <dbl>                     <dbl>
 1 quoIHoqCJs4              0.01                0.971                     0.762
 2 quoIHoqCJs4              0.02                0.714                     0.865
 3 quoIHoqCJs4              0.03                0.657                     0.931
 4 quoIHoqCJs4              0.04                0.757                     0.948
 5 quoIHoqCJs4              0.05                0.714                     0.950
 6 quoIHoqCJs4              0.06                0.7                       0.947
 7 quoIHoqCJs4              0.07                0.7                       0.938
 8 quoIHoqCJs4              0.08                0.671                     0.919
 9 quoIHoqCJs4              0.09                0.614                     0.896
10 quoIHoqCJs4              0.1                 0.614                     0.885
# i 190 more rows
# i abbreviated name: 1: relative_retention_performance
```

Combining subtopics into one topic data.

```
# A tibble: 900 x 5
   vid_id   elapsed_time_ratio audience_watch_ratio relative_retention_p~1  year
   <chr>                 <dbl>                <dbl>                  <dbl> <dbl>
 1 fS8Jmmj~               0.01               0.971                  0.674  2021
 2 fS8Jmmj~               0.02               0.754                  0.771  2021
 3 fS8Jmmj~               0.03               0.696                  0.845  2021
 4 fS8Jmmj~               0.04               0.659                  0.885  2021
 5 fS8Jmmj~               0.05               0.630                  0.913  2021
 6 fS8Jmmj~               0.06               0.659                  0.931  2021
 7 fS8Jmmj~               0.07               0.681                  0.940  2021
 8 fS8Jmmj~               0.08               0.652                  0.944  2021
 9 fS8Jmmj~               0.09               0.674                  0.944  2021
10 fS8Jmmj~               0.1                0.725                  0.943  2021
# i 890 more rows
# i abbreviated name: 1: relative_retention_performance
```

1.2.3 Two Year Data

```r
retention_3 <- bind_rows(retention_2020_3,
                         retention_2021_3)

write_csv(retention_3,
          file = "datasets/retention_2.csv")

print(retention_3)
```

```
# A tibble: 1,800 x 5
   vid_id   elapsed_time_ratio audience_watch_ratio relative_retention_p~1  year
   <chr>                 <dbl>                <dbl>                  <dbl> <dbl>
 1 fS8Jmmj~               0.01                0.954                  0.660  2020
 2 fS8Jmmj~               0.02                0.853                  0.760  2020
 3 fS8Jmmj~               0.03                0.767                  0.823  2020
 4 fS8Jmmj~               0.04                0.705                  0.838  2020
 5 fS8Jmmj~               0.05                0.690                  0.842  2020
 6 fS8Jmmj~               0.06                0.667                  0.853  2020
 7 fS8Jmmj~               0.07                0.659                  0.869  2020
 8 fS8Jmmj~               0.08                0.690                  0.884  2020
 9 fS8Jmmj~               0.09                0.674                  0.897  2020
10 fS8Jmmj~               0.1                 0.643                  0.908  2020
# i 1,790 more rows
# i abbreviated name: 1: relative_retention_performance
```

1.3 Exponential and Logarithmic Functions

1.3.1 2020