World Rowing Masters Handicaps Calculator

1 Introduction

Through the Masters age-category system, athletes of a wide range of ages are often competing against eachother. As athletic performance is known to decline with age, the use of age-based handicaps is essential to preserving fairness and comparability in these races.

The World Rowing Masters Regatta (WRMR) provides an extensive and globally representative dataset of competitive performances across boat classes, genders, and age groups. These results offer a robust empirical foundation for evaluating age-related performance trends and for developing handicap systems that are transparent, evidence-based, and consistent across events.

2 Data and Methodology

2.1 Data Source

The dataset consists of official results from the World Rowing Masters Regatta (WRMR) between 2014 and 2024. For each entry, the following variables were available:

- discipline and event metadata,
- average age of the crew $x \in \mathbb{N}$,
- race time t in milliseconds.

To remove outliers, disqualifications, and erroneous entries, only performances within the interval

$$t \in [162\,970 \text{ ms},\ 420\,250 \text{ ms}]$$

were analyzed.

2.2 Data Transformation

For each specific event (boat class, gender and age), the upper quartile of the finishing times was computed:

$$Q_3(x) = \inf\{t \in \mathbb{R} \mid F_x(t) \geq 0.75\},$$

where F_x is the empirical cumulative distribution function of results for age x. The upper quartile represents the time separating the top 25% of performances from the bottom 75%. It was selected as the representative performance metric for the following reasons:

- **Robustness to outliers:** Unlike the mean (average), the upper quartile is less susceptible to extreme outliers (very slow or very fast times) that could skew the model's prediction.
- **Consistency:** By focusing on the top 25%, it provides a consistent measure of the competitive level across categories.

2.3 Mathematical Modelling Framework

The core of the analysis involved fitting a mathematical curve to the relationship between age and the upper quartile performance time. For each gender and event we approximate the function $y = f(x)$ using two regression models:

1. a polynomial function of degree two,
2. an exponential function.

Both models are estimated using least squares, minimising the residual sum of squares:

$$\min_{\theta} \sum_{i=1}^{n} \left(Q_3(x_i) - f(x_i; \theta)\right)^2 .$$

with θ denoting the model parameters.

2.4 Model A: Polynomial function

The quadratic polynomial is the simplest mathematical function capable of modeling non-linear decline. It takes the general form:

$$f_p(x) = ax^2 + bx + c,$$

Where:

- x is the age
- $f_p(x)$ is the predicted time as a function of age
- a, b, c are the coefficients determined by the fitting process. a and b represent the performance decline as the age increases while c approximates baseline performance at $x = 0$.

Exclusion of higher-degree polynomials Polynomials of degree three of higher were excluded from the consideration before detailed fitting. While a higher-degree polynomial could achieve an extremely high R^2 value, it often leads to overfitting. Overfitting means the model is too complex and takes into consideration random noise or measurement errors in the data. This results in a cureve that is higly accurate for the existing data points but is often not accurate in predicting new data or future results. On top of that, higher-degree polynomials usually include biologically unexplainable local extremes.

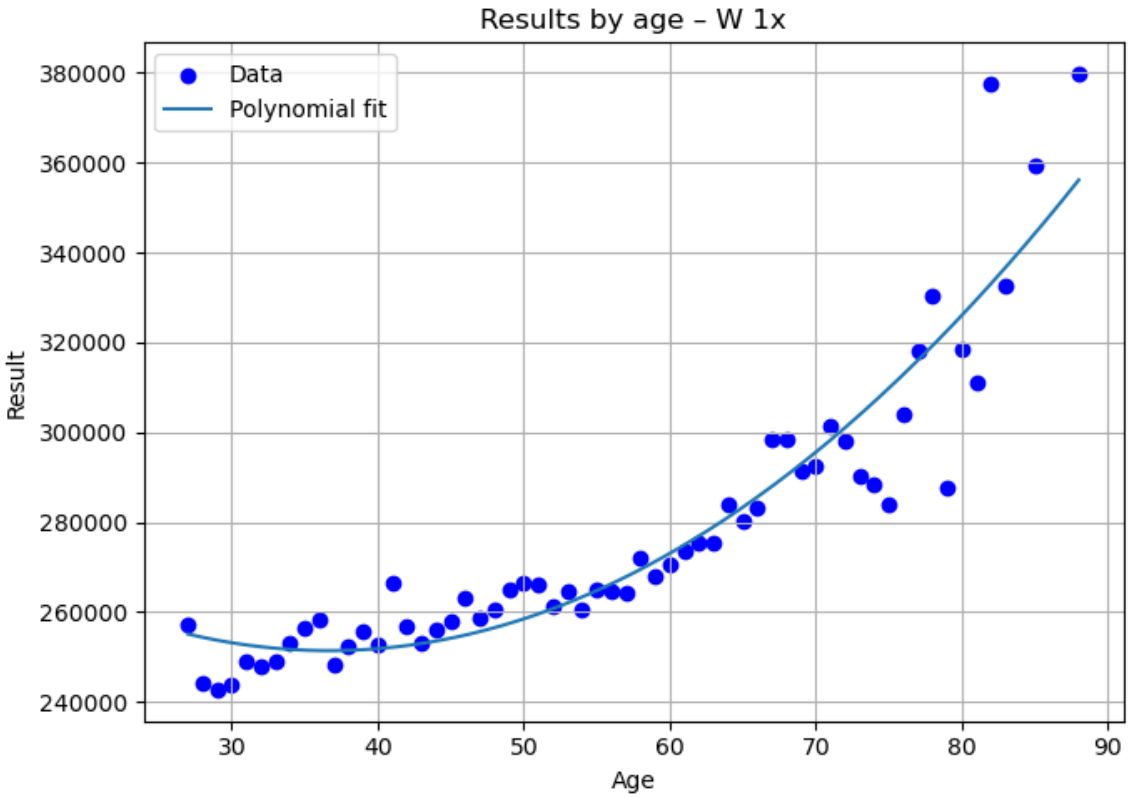

Figure 1: Polynomial model for W 1x

2.5 Model B: Exponential Function

The exponential function is highly used in biological and physiological modeling because it assumes a constant percentage rate of change per unit of time (or age). The general form of the exponential function is:

$$f_{\exp}(x) = ae^{bx} + c,$$

Where:

- x is the age
- $f_{\exp}(x)$ is the predicted time as a function of age
- a is the theoretical minimum time
- e is the base of the natural logarithm
- b is the rate of decline constant (a smaller b means a slower rate of decline)
- c is the constant vertical offset

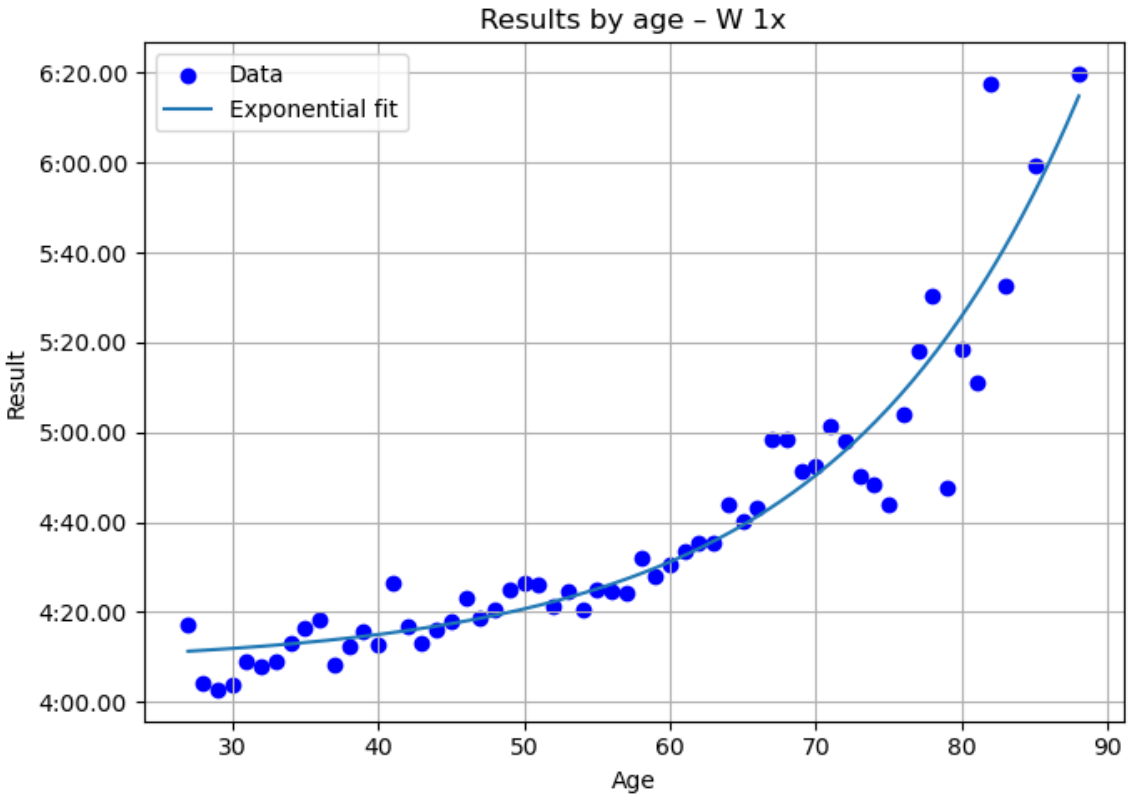

Figure 2: Exponential model for W 1x

Given the parameters above, the model predicts following values for each of the constants

- W 1x: a=593.412155, b=0.060944, c=248198.55
- W 2-: a=51.739949, b=0.100135, c=241913.69
- W 2x: a=107.897288, b=0.083460, c=232805.20
- W 4+: a=133.567973, b=0.082740, c=230522.42
- W 4-: a=37.757312, b=0.101028, c=224773.51
- W 4x: a=203.715661, b=0.075920, c=215614.50
- W 8+: a=1445.255236, b=0.051188, c=200634.53
- M 1x: a=541.875264, b=0.060336, c=223315.25
- M 2-: a=94.472618, b=0.083517, c=215719.17
- M 2x: a=180.859039, b=0.073397, c=207503.74
- M 4+: a=176.986362, b=0.076098, c=201171.56
- M 4-: a=99.643289, b=0.082633, c=196006.62
- M 4x: a=21.234877, b=0.100418, c=193034.44

- M 8+: a=410.512958, b=0.065059, c=179410.20
- Mix 2x: a=507.518724, b=0.060768, c=219822.01
- Mix 4x: a=287.194532, b=0.070187, c=200534.19
- Mix 8+: a=113.865242, b=0.081584, c=199496.19

2.6 Model Evaluation

To determine the most appropriate model, a detailed comparison was performed based on statistical fit (the R^2 value) and physiological plausibility. The coefficient of determination, or the R^2 value is a crucial statistical measure used to evaluate the goodness of fit of a model. It is a value between 0 and 1 that tells us the proportion of the variation in the dependent variable (in our case, time) that is predictable from the independent variable (in our case, age). The higheer the values is, the model is more fitting to our data.

The average values across all evaluated disciplines and categories are:

$$\bar{R}^2_{\text{poly}} = 0.8912, \qquad \bar{R}^2_{\text{exp}} = 0.9233.$$

These results indicate that the exponential model provides a more accurate and biologically plausible description of performance decline with age.

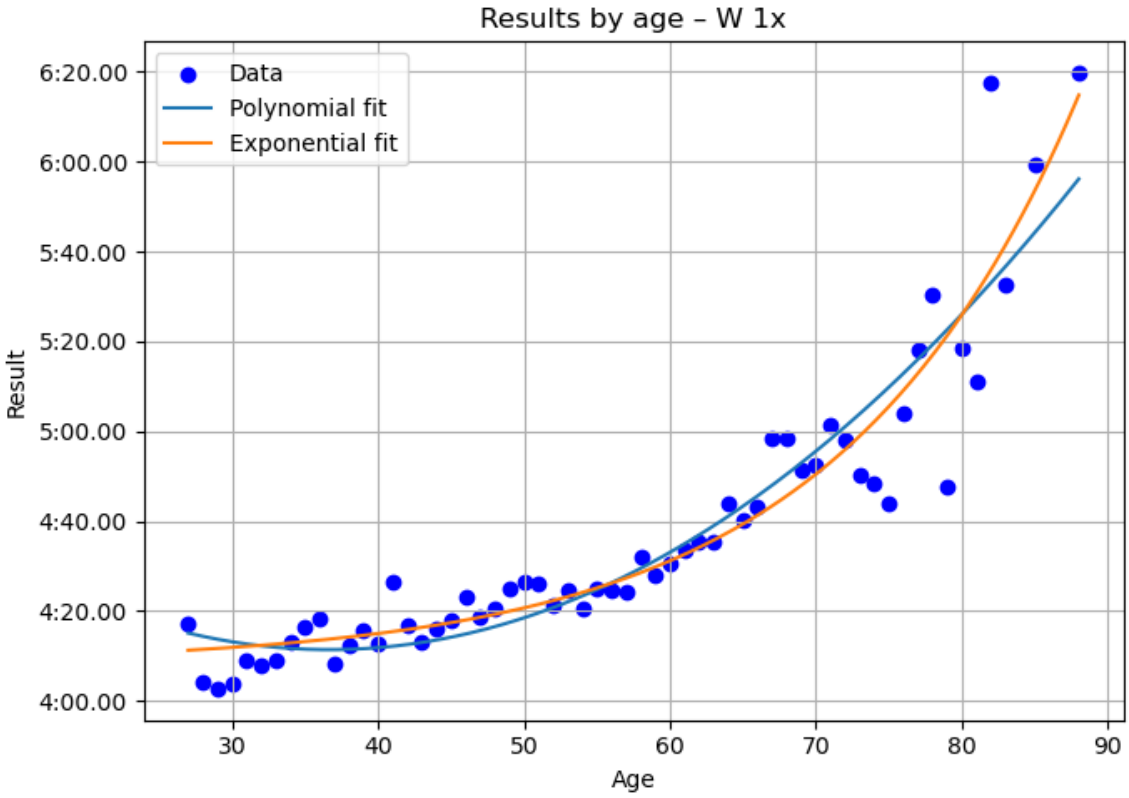

Figure 3: Comparison of the exponential and polynomial model for W 1x

Flaws of the Polynomial Model The defining flaw that led to the rejection of the quadratic model is rooted in its mathematical necessity to contain a vertex (a maximum or a minimum point). Our fits often placed this vertex (the predicted fastest time) at an age older than the youngest Masters. Consequently, the model incorrectly predicted that the performance times for ages before this mathematical vertex were slower than the predicted time at the vertex. This means that the model suggested that in younger categories, performance improves with age (e.g. predicting that a 27-year-old is slower than a 35-year-old) which directly contradicts established sports physiological consensus.

Justification for selection of the Exponential Model The exponential model resolves the issues inherent in the polynomial model. It is monotonic, meaning it only shows a continuous, uninterrupted increase in time (decline in speed) across the entire age spectrum. Exponential function also provide a more stable and predictable trajectory for projecting performance at very old ages.

3 Practical Application

3.1 Determining the Representative age for performance prediction

The model requires a single age value as input to predict the performance time for an entire age category which spans multiple years. To establish the most accurate method for representing an age category, two approaches were tested and compared:

1. **Averaging predicted ages:** This method involved calculating the predicted time for every single age within the category using the exponential function and taking the arithmetic mean of those predicted times

2. **Central age prediction:** This involved calculating the predicted time based solely on the central (median) age of the category. (e.g. using 31 for A category)

The validation revealed that the expected handicap difference between these two methods was negligible, varying by less than a hundredth od a second across the full range of disciplines and age brackets. Due to its simplicity and computational efficiency, the central age prediction method was selected as the standard for final factor determination.

3.2 Comparing Age Categories

A web tool was developed to make it easier for users to calculate handicaps for different events. The tool allows users to select the gender, boat class and an age category for two boats. It then displays the model's predicted time for each chosen boat and the resulting handicap. It also shows the graph of predicted times for both boat classes.

On top of the web tool, tables with overall handicaps and handicaps for Womens, Mens and Mixed crews can be found in the appendices of this document.

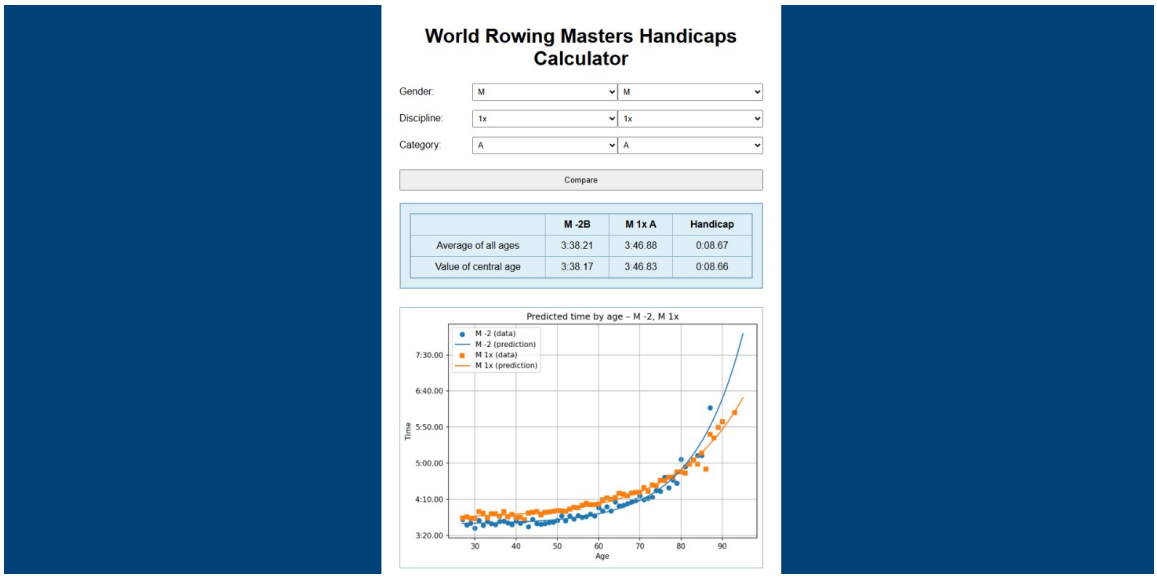

Figure 4: WR Masters Handicaps Calculator

4 Conclusion

The analysis of ten years of WRMR data confirms that the exponential model provides the most mathematically robust and physiologically accurate fit for the decline in Masters rowing performance with age. The web tool can be found on the World Rowing Masters Portal here: https://masters.worldrowing.com

Table 1: Handicaps table (W)

	W						
Age	8+	4x	4−	4+	2x	2−	1x
27	00:00.0	00:10.8	00:19.0	00:25.4	00:27.4	00:36.3	00:44.9
28	00:00.3	00:10.9	00:19.0	00:25.5	00:27.5	00:36.4	00:45.1
29	00:00.6	00:11.1	00:19.1	00:25.6	00:27.6	00:36.5	00:45.3
30	00:01.0	00:11.2	00:19.2	00:25.7	00:27.7	00:36.6	00:45.5
31	00:01.3	00:11.4	00:19.2	00:25.9	00:27.8	00:36.7	00:45.7
32	00:01.7	00:11.5	00:19.3	00:26.0	00:28.0	00:36.8	00:46.0
33	00:02.1	00:11.7	00:19.4	00:26.2	00:28.1	00:36.9	00:46.2
34	00:02.5	00:11.9	00:19.6	00:26.4	00:28.3	00:37.1	00:46.5
35	00:02.9	00:12.1	00:19.7	00:26.5	00:28.4	00:37.2	00:46.8
36	00:03.4	00:12.4	00:19.8	00:26.8	00:28.6	00:37.4	00:47.1
37	00:03.8	00:12.6	00:20.0	00:27.0	00:28.8	00:37.6	00:47.5
38	00:04.4	00:12.9	00:20.1	00:27.2	00:29.0	00:37.8	00:47.8
39	00:04.9	00:13.2	00:20.3	00:27.5	00:29.2	00:38.1	00:48.2
40	00:05.4	00:13.5	00:20.5	00:27.8	00:29.5	00:38.4	00:48.6
41	00:06.0	00:13.8	00:20.8	00:28.1	00:29.7	00:38.7	00:49.0
42	00:06.6	00:14.2	00:21.0	00:28.4	00:30.0	00:39.0	00:49.5
43	00:07.3	00:14.6	00:21.3	00:28.8	00:30.3	00:39.4	00:50.0
44	00:08.0	00:15.0	00:21.6	00:29.2	00:30.7	00:39.8	00:50.5
45	00:08.7	00:15.4	00:21.9	00:29.7	00:31.0	00:40.2	00:51.0
46	00:09.5	00:15.9	00:22.3	00:30.1	00:31.4	00:40.7	00:51.6
47	00:10.3	00:16.4	00:22.7	00:30.7	00:31.9	00:41.2	00:52.2
48	00:11.1	00:17.0	00:23.2	00:31.2	00:32.3	00:41.9	00:52.9
49	00:12.0	00:17.6	00:23.7	00:31.8	00:32.9	00:42.5	00:53.6
50	00:12.9	00:18.3	00:24.3	00:32.5	00:33.4	00:43.3	00:54.3
51	00:13.9	00:19.0	00:24.9	00:33.2	00:34.0	00:44.1	00:55.1
52	00:14.9	00:19.8	00:25.6	00:34.0	00:34.7	00:45.0	00:55.9
53	00:16.0	00:20.6	00:26.4	00:34.9	00:35.4	00:46.0	00:56.8
54	00:17.2	00:21.5	00:27.2	00:35.8	00:36.2	00:47.1	00:57.8
55	00:18.4	00:22.5	00:28.2	00:36.8	00:37.0	00:48.3	00:58.8
56	00:19.6	00:23.5	00:29.2	00:37.9	00:38.0	00:49.6	00:59.8
57	00:21.0	00:24.7	00:30.3	00:39.1	00:39.0	00:51.1	01:01.0
58	00:22.4	00:25.9	00:31.6	00:40.3	00:40.1	00:52.7	01:02.2
59	00:23.9	00:27.2	00:33.0	00:41.7	00:41.3	00:54.6	01:03.4
60	00:25.4	00:28.6	00:34.6	00:43.3	00:42.5	00:56.6	01:04.8
61	00:27.1	00:30.1	00:36.3	00:44.9	00:44.0	00:58.8	01:06.2
62	00:28.8	00:31.8	00:38.2	00:46.7	00:45.5	01:01.2	01:07.8
63	00:30.6	00:33.6	00:40.3	00:48.7	00:47.1	01:03.9	01:09.4
64	00:32.5	00:35.5	00:42.7	00:50.8	00:48.9	01:06.9	01:11.1
65	00:34.5	00:37.5	00:45.2	00:53.1	00:50.9	01:10.2	01:13.0

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	W (nastavak)						
Age	8+	4x	4−	4+	2x	2−	1x
66	00:36.6	00:39.8	00:48.1	00:55.6	00:53.0	01:13.9	01:14.9
67	00:38.8	00:42.2	00:51.2	00:58.3	00:55.4	01:17.9	01:17.0
68	00:41.2	00:44.8	00:54.7	01:01.2	00:57.9	01:22.4	01:19.2
69	00:43.7	00:47.6	00:58.6	01:04.4	01:00.6	01:27.3	01:21.6
70	00:46.3	00:50.6	01:02.9	01:07.9	01:03.6	01:32.8	01:24.1
71	00:49.0	00:53.9	01:07.6	01:11.7	01:06.8	01:38.8	01:26.7
72	00:51.9	00:57.4	01:12.8	01:15.8	01:10.3	01:45.5	01:29.6
73	00:54.9	01:01.2	01:18.6	01:20.2	01:14.2	01:52.9	01:32.6
74	00:58.1	01:05.3	01:25.0	01:25.1	01:18.3	02:01.0	01:35.8
75	01:01.4	01:09.7	01:32.1	01:30.3	01:22.8	02:10.0	01:39.1
76	01:05.0	01:14.5	01:40.0	01:36.0	01:27.8	02:20.0	01:42.7
77	01:08.7	01:19.7	01:48.6	01:42.2	01:33.1	02:31.0	01:46.6
78	01:12.6	01:25.2	01:58.2	01:49.0	01:38.9	02:43.1	01:50.6
79	01:16.7	01:31.2	02:08.8	01:56.3	01:45.2	02:56.6	01:55.0
80	01:21.0	01:37.7	02:20.6	02:04.2	01:52.1	03:11.4	01:59.6
81	01:25.6	01:44.7	02:33.6	02:12.9	01:59.5	03:27.9	02:04.5
82	01:30.4	01:52.2	02:47.9	02:22.2	02:07.6	03:46.0	02:09.6
83	01:35.4	02:00.3	03:03.8	02:32.4	02:16.4	04:06.1	02:15.2
84	01:40.7	02:09.1	03:21.4	02:43.5	02:26.0	04:28.2	02:21.0
85	01:46.3	02:18.5	03:40.9	02:55.5	02:36.4	04:52.7	02:27.3
86	01:52.2	02:28.7	04:02.4	03:08.6	02:47.7	05:19.8	02:33.9
87	01:58.4	02:39.7	04:26.2	03:22.7	03:00.0	05:49.8	02:40.9
88	02:04.9	02:51.6	04:52.6	03:38.2	03:13.4	06:22.9	02:48.4
89	02:11.8	03:04.4	05:21.7	03:54.9	03:27.9	06:59.5	02:56.4
90	02:19.0	03:18.2	05:54.0	04:13.1	03:43.7	07:39.9	03:04.8
91	02:26.6	03:33.1	06:29.7	04:32.8	04:00.9	08:24.6	03:13.8
92	02:34.6	03:49.2	07:09.1	04:54.3	04:19.6	09:14.0	03:23.4
93	02:43.1	04:06.6	07:52.8	05:17.6	04:39.9	10:08.6	03:33.5
94	02:51.9	04:25.3	08:41.1	05:42.9	05:01.9	11:09.0	03:44.3
95	03:01.3	04:45.5	09:34.6	06:10.4	05:25.9	12:15.7	03:55.8
96	03:11.1	05:07.3	10:33.7	06:40.2	05:52.0	13:29.4	04:08.0
97	03:21.4	05:30.8	11:39.1	07:12.7	06:20.3	14:50.9	04:20.9
98	03:32.3	05:56.2	12:51.5	07:47.9	06:51.1	16:21.0	04:34.7
99	03:43.7	06:23.5	14:11.5	08:26.2	07:24.6	18:00.6	04:49.4

Table 2: Handicaps table (M)

	M						
Age	8+	4x	4−	4+	2x	2−	1x
27	00:00.0	00:11.6	00:15.2	00:20.8	00:27.0	00:34.8	00:44.3
28	00:00.2	00:11.6	00:15.3	00:20.9	00:27.1	00:34.9	00:44.5
29	00:00.3	00:11.6	00:15.4	00:21.0	00:27.2	00:35.0	00:44.6
30	00:00.5	00:11.7	00:15.5	00:21.1	00:27.4	00:35.1	00:44.8
31	00:00.7	00:11.7	00:15.6	00:21.3	00:27.5	00:35.2	00:45.0
32	00:00.9	00:11.8	00:15.7	00:21.4	00:27.6	00:35.3	00:45.3
33	00:01.1	00:11.8	00:15.9	00:21.6	00:27.8	00:35.4	00:45.5
34	00:01.4	00:11.9	00:16.0	00:21.7	00:27.9	00:35.5	00:45.7
35	00:01.6	00:12.0	00:16.2	00:21.9	00:28.1	00:35.7	00:46.0
36	00:01.9	00:12.0	00:16.3	00:22.1	00:28.3	00:35.8	00:46.3
37	00:02.2	00:12.1	00:16.5	00:22.3	00:28.4	00:36.0	00:46.6
38	00:02.5	00:12.2	00:16.7	00:22.6	00:28.7	00:36.2	00:46.9
39	00:02.8	00:12.3	00:16.9	00:22.8	00:28.9	00:36.4	00:47.2
40	00:03.2	00:12.4	00:17.2	00:23.1	00:29.1	00:36.6	00:47.6
41	00:03.5	00:12.5	00:17.4	00:23.4	00:29.4	00:36.8	00:48.0
42	00:03.9	00:12.7	00:17.7	00:23.7	00:29.7	00:37.1	00:48.4
43	00:04.4	00:12.8	00:18.0	00:24.1	00:30.0	00:37.4	00:48.8
44	00:04.8	00:13.0	00:18.3	00:24.4	00:30.3	00:37.7	00:49.2
45	00:05.3	00:13.2	00:18.7	00:24.8	00:30.6	00:38.0	00:49.7
46	00:05.8	00:13.4	00:19.1	00:25.2	00:31.0	00:38.3	00:50.2
47	00:06.4	00:13.6	00:19.5	00:25.7	00:31.4	00:38.7	00:50.8
48	00:06.9	00:13.9	00:19.9	00:26.2	00:31.8	00:39.1	00:51.3
49	00:07.6	00:14.2	00:20.4	00:26.8	00:32.3	00:39.6	00:51.9
50	00:08.2	00:14.5	00:21.0	00:27.3	00:32.8	00:40.1	00:52.6
51	00:09.0	00:14.8	00:21.5	00:28.0	00:33.4	00:40.6	00:53.3
52	00:09.7	00:15.2	00:22.2	00:28.6	00:33.9	00:41.2	00:54.0
53	00:10.5	00:15.6	00:22.9	00:29.4	00:34.6	00:41.8	00:54.8
54	00:11.4	00:16.1	00:23.6	00:30.2	00:35.2	00:42.5	00:55.6
55	00:12.3	00:16.6	00:24.4	00:31.0	00:36.0	00:43.3	00:56.5
56	00:13.3	00:17.1	00:25.3	00:31.9	00:36.7	00:44.1	00:57.4
57	00:14.4	00:17.7	00:26.2	00:32.9	00:37.6	00:45.0	00:58.4
58	00:15.5	00:18.4	00:27.3	00:34.0	00:38.5	00:45.9	00:59.5
59	00:16.7	00:19.2	00:28.4	00:35.2	00:39.5	00:47.0	01:00.6
60	00:18.0	00:20.0	00:29.6	00:36.4	00:40.5	00:48.1	01:01.8
61	00:19.3	00:21.0	00:30.9	00:37.7	00:41.6	00:49.3	01:03.0
62	00:20.8	00:22.0	00:32.4	00:39.2	00:42.8	00:50.7	01:04.4
63	00:22.4	00:23.1	00:34.0	00:40.8	00:44.1	00:52.1	01:05.8
64	00:24.0	00:24.4	00:35.7	00:42.5	00:45.5	00:53.7	01:07.3
65	00:25.8	00:25.8	00:37.5	00:44.3	00:47.1	00:55.5	01:08.9

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	M						
Age	8+	4x	4−	4+	2x	2−	1x
66	00:27.7	00:27.3	00:39.5	00:46.2	00:48.7	00:57.3	01:10.6
67	00:29.7	00:29.0	00:41.7	00:48.4	00:50.4	00:59.4	01:12.4
68	00:31.9	00:30.9	00:44.0	00:50.7	00:52.3	01:01.6	01:14.3
69	00:34.2	00:32.9	00:46.6	00:53.1	00:54.3	01:04.0	01:16.4
70	00:36.6	00:35.2	00:49.4	00:55.8	00:56.5	01:06.6	01:18.5
71	00:39.3	00:37.8	00:52.4	00:58.7	00:58.9	01:09.5	01:20.8
72	00:42.1	00:40.6	00:55.7	01:01.8	01:01.4	01:12.6	01:23.3
73	00:45.0	00:43.7	00:59.3	01:05.1	01:04.1	01:15.9	01:25.9
74	00:48.2	00:47.1	01:03.2	01:08.8	01:07.0	01:19.6	01:28.6
75	00:51.6	00:50.9	01:07.4	01:12.7	01:10.2	01:23.5	01:31.5
76	00:55.3	00:55.0	01:12.0	01:16.9	01:13.6	01:27.9	01:34.7
77	00:59.1	00:59.7	01:17.0	01:21.4	01:17.2	01:32.6	01:38.0
78	01:03.3	01:04.8	01:22.4	01:26.3	01:21.1	01:37.7	01:41.5
79	01:07.7	01:10.4	01:28.2	01:31.6	01:25.4	01:43.2	01:45.2
80	01:12.4	01:16.7	01:34.6	01:37.3	01:29.9	01:49.3	01:49.2
81	01:17.4	01:23.6	01:41.6	01:43.5	01:34.8	01:55.8	01:53.4
82	01:22.8	01:31.3	01:49.1	01:50.2	01:40.0	02:03.0	01:57.8
83	01:28.5	01:39.7	01:57.2	01:57.3	01:45.7	02:10.7	02:02.6
84	01:34.6	01:49.1	02:06.1	02:05.1	01:51.8	02:19.1	02:07.6
85	01:41.1	01:59.4	02:15.8	02:13.4	01:58.4	02:28.3	02:13.0
86	01:48.1	02:10.8	02:26.2	02:22.5	02:05.4	02:38.3	02:18.7
87	01:55.5	02:23.4	02:37.6	02:32.2	02:13.0	02:49.1	02:24.7
88	02:03.4	02:37.4	02:50.0	02:42.7	02:21.2	03:00.9	02:31.1
89	02:11.9	02:52.8	03:03.4	02:54.0	02:30.0	03:13.7	02:37.9
90	02:20.9	03:09.9	03:17.9	03:06.2	02:39.4	03:27.6	02:45.2
91	02:30.6	03:28.8	03:33.8	03:19.4	02:49.6	03:42.7	02:52.9
92	02:40.8	03:49.7	03:51.0	03:33.7	03:00.6	03:59.2	03:01.0
93	02:51.8	04:12.7	04:09.6	03:49.0	03:12.4	04:17.0	03:09.7
94	03:03.5	04:38.2	04:29.9	04:05.6	03:25.1	04:36.5	03:18.9
95	03:16.0	05:06.4	04:51.9	04:23.5	03:38.7	04:57.6	03:28.7
96	03:29.4	05:37.6	05:15.9	04:42.8	03:53.4	05:20.6	03:39.1
97	03:43.6	06:12.1	05:41.8	05:03.6	04:09.2	05:45.5	03:50.2
98	03:58.8	06:50.2	06:10.1	05:26.1	04:26.3	06:12.7	04:01.9
99	04:15.0	07:32.3	06:40.7	05:50.4	04:44.6	06:42.2	04:14.4

Table 3: Handicaps table (Mix)

	Mix		
Age	8+	4x	2x
27	00:00.0	00:01.9	00:21.9
28	00:00.1	00:02.1	00:22.1
29	00:00.2	00:02.2	00:22.3
30	00:00.3	00:02.4	00:22.4
31	00:00.4	00:02.5	00:22.6
32	00:00.5	00:02.7	00:22.8
33	00:00.7	00:02.9	00:23.1
34	00:00.8	00:03.1	00:23.3
35	00:00.9	00:03.4	00:23.6
36	00:01.1	00:03.6	00:23.8
37	00:01.3	00:03.9	00:24.1
38	00:01.5	00:04.1	00:24.4
39	00:01.7	00:04.4	00:24.7
40	00:01.9	00:04.8	00:25.1
41	00:02.2	00:05.1	00:25.4
42	00:02.5	00:05.5	00:25.8
43	00:02.8	00:05.9	00:26.2
44	00:03.1	00:06.3	00:26.7
45	00:03.4	00:06.8	00:27.1
46	00:03.8	00:07.3	00:27.6
47	00:04.2	00:07.8	00:28.1
48	00:04.7	00:08.4	00:28.7
49	00:05.2	00:09.0	00:29.3
50	00:05.7	00:09.6	00:29.9
51	00:06.3	00:10.3	00:30.6
52	00:06.9	00:11.1	00:31.3
53	00:07.6	00:11.9	00:32.0
54	00:08.3	00:12.7	00:32.8
55	00:09.1	00:13.6	00:33.6
56	00:09.9	00:14.6	00:34.5
57	00:10.9	00:15.7	00:35.5
58	00:11.9	00:16.8	00:36.5
59	00:13.0	00:18.1	00:37.6
60	00:14.2	00:19.4	00:38.7
61	00:15.5	00:20.8	00:40.0
62	00:16.9	00:22.3	00:41.3
63	00:18.4	00:23.9	00:42.6
64	00:20.1	00:25.7	00:44.1
65	00:21.8	00:27.5	00:45.7

Continues on the next page

	Mix		
Age	8+	4x	2x
66	00:23.8	00:29.5	00:47.3
67	00:25.9	00:31.7	00:49.1
68	00:28.2	00:34.0	00:50.9
69	00:30.7	00:36.4	00:52.9
70	00:33.4	00:39.1	00:55.0
71	00:36.3	00:41.9	00:57.2
72	00:39.5	00:45.0	00:59.6
73	00:42.9	00:48.2	01:02.2
74	00:46.6	00:51.7	01:04.8
75	00:50.7	00:55.5	01:07.7
76	00:55.1	00:59.5	01:10.7
77	00:59.9	01:03.9	01:13.9
78	01:05.0	01:08.5	01:17.4
79	01:10.7	01:13.5	01:21.0
80	01:16.8	01:18.8	01:24.9
81	01:23.4	01:24.6	01:29.0
82	01:30.5	01:30.7	01:33.3
83	01:38.3	01:37.3	01:38.0
84	01:46.8	01:44.4	01:42.9
85	01:55.9	01:52.0	01:48.2
86	02:05.9	02:00.1	01:53.7
87	02:16.7	02:08.9	01:59.6
88	02:28.4	02:18.2	02:05.9
89	02:41.1	02:28.3	02:12.6
90	02:54.9	02:39.1	02:19.7
91	03:09.8	02:50.6	02:27.2
92	03:26.0	03:03.0	02:35.3
93	03:43.6	03:16.3	02:43.8
94	04:02.7	03:30.6	02:52.8
95	04:23.4	03:45.9	03:02.5
96	04:45.9	04:02.4	03:12.7
97	05:10.3	04:20.0	03:23.5
98	05:36.8	04:38.9	03:35.1
99	06:05.5	04:59.1	03:47.4
100	06:36.7	05:20.9	04:00.4

Table 4: Handicaps table (M / Mix / W)

	M							Mix			W						
#	8+	4x	4−	4+	2x	2−	1x	8+	4x	2x	8+	4x	4−	4+	2x	2−	1x
27	00:00.0	00:11.6	00:15.2	00:20.8	00:27.0	00:34.8	00:44.3	00:18.7	00:20.7	00:40.7	00:24.6	00:35.4	00:43.6	00:50.0	00:52.0	01:00.9	01:09.5
28	00:00.2	00:11.6	00:15.3	00:20.9	00:27.1	00:34.9	00:44.5	00:18.8	00:20.8	00:40.8	00:24.9	00:35.5	00:43.6	00:50.1	00:52.1	01:01.0	01:09.7
29	00:00.3	00:11.6	00:15.4	00:21.0	00:27.2	00:35.0	00:44.6	00:18.9	00:20.9	00:41.0	00:25.2	00:35.7	00:43.7	00:50.2	00:52.2	01:01.1	01:09.9
30	00:00.5	00:11.7	00:15.5	00:21.1	00:27.4	00:35.1	00:44.8	00:19.0	00:21.1	00:41.2	00:25.6	00:35.8	00:43.8	00:50.3	00:52.3	01:01.2	01:10.1
31	00:00.7	00:11.7	00:15.6	00:21.3	00:27.5	00:35.2	00:45.0	00:19.1	00:21.3	00:41.4	00:25.9	00:36.0	00:43.9	00:50.5	00:52.5	01:01.3	01:10.3
32	00:00.9	00:11.8	00:15.7	00:21.4	00:27.6	00:35.3	00:45.3	00:19.3	00:21.5	00:41.6	00:26.3	00:36.1	00:43.9	00:50.6	00:52.6	01:01.4	01:10.6
33	00:01.1	00:11.8	00:15.9	00:21.6	00:27.8	00:35.4	00:45.5	00:19.4	00:21.7	00:41.8	00:26.7	00:36.3	00:44.0	00:50.8	00:52.7	01:01.5	01:10.8
34	00:01.4	00:11.9	00:16.0	00:21.7	00:27.9	00:35.5	00:45.7	00:19.5	00:21.9	00:42.0	00:27.1	00:36.5	00:44.2	00:51.0	00:52.9	01:01.7	01:11.1
35	00:01.6	00:12.0	00:16.2	00:21.9	00:28.1	00:35.7	00:46.0	00:19.7	00:22.1	00:42.3	00:27.5	00:36.7	00:44.3	00:51.2	00:53.0	01:01.8	01:11.4
36	00:01.9	00:12.0	00:16.3	00:22.1	00:28.3	00:35.8	00:46.3	00:19.9	00:22.3	00:42.6	00:28.0	00:37.0	00:44.4	00:51.4	00:53.2	01:02.0	01:11.7
37	00:02.2	00:12.1	00:16.5	00:22.3	00:28.4	00:36.0	00:46.6	00:20.0	00:22.6	00:42.8	00:28.5	00:37.2	00:44.6	00:51.6	00:53.4	01:02.2	01:12.1
38	00:02.5	00:12.2	00:16.7	00:22.6	00:28.7	00:36.2	00:46.9	00:20.2	00:22.9	00:43.1	00:29.0	00:37.5	00:44.7	00:51.8	00:53.6	01:02.5	01:12.4
39	00:02.8	00:12.3	00:16.9	00:22.8	00:28.9	00:36.4	00:47.2	00:20.5	00:23.2	00:43.5	00:29.5	00:37.8	00:44.9	00:52.1	00:53.8	01:02.7	01:12.8
40	00:03.2	00:12.4	00:17.2	00:23.1	00:29.1	00:36.6	00:47.6	00:20.7	00:23.5	00:43.8	00:30.0	00:38.1	00:45.1	00:52.4	00:54.1	01:03.0	01:13.2
41	00:03.5	00:12.5	00:17.4	00:23.4	00:29.4	00:36.8	00:48.0	00:20.9	00:23.9	00:44.2	00:30.6	00:38.4	00:45.4	00:52.7	00:54.3	01:03.3	01:13.6
42	00:03.9	00:12.7	00:17.7	00:23.7	00:29.7	00:37.1	00:48.4	00:21.2	00:24.2	00:44.5	00:31.3	00:38.8	00:45.6	00:53.0	00:54.6	01:03.6	01:14.1
43	00:04.4	00:12.8	00:18.0	00:24.1	00:30.0	00:37.4	00:48.8	00:21.5	00:24.6	00:45.0	00:31.9	00:39.2	00:45.9	00:53.4	00:54.9	01:04.0	01:14.6
44	00:04.8	00:13.0	00:18.3	00:24.4	00:30.3	00:37.7	00:49.2	00:21.8	00:25.0	00:45.4	00:32.6	00:39.6	00:46.2	00:53.8	00:55.3	01:04.4	01:15.1
45	00:05.3	00:13.2	00:18.7	00:24.8	00:30.6	00:38.0	00:49.7	00:22.2	00:25.5	00:45.9	00:33.3	00:40.0	00:46.5	00:54.3	00:55.6	01:04.8	01:15.6
46	00:05.8	00:13.4	00:19.1	00:25.2	00:31.0	00:38.3	00:50.2	00:22.6	00:26.0	00:46.3	00:34.1	00:40.5	00:46.9	00:54.7	00:56.0	01:05.3	01:16.2
47	00:06.4	00:13.6	00:19.5	00:25.7	00:31.4	00:38.7	00:50.8	00:23.0	00:26.5	00:46.9	00:34.9	00:41.0	00:47.3	00:55.3	00:56.5	01:05.9	01:16.8
48	00:06.9	00:13.9	00:19.9	00:26.2	00:31.8	00:39.1	00:51.3	00:23.4	00:27.1	00:47.4	00:35.7	00:41.6	00:47.8	00:55.8	00:56.9	01:06.5	01:17.5
49	00:07.6	00:14.2	00:20.4	00:26.8	00:32.3	00:39.6	00:51.9	00:23.9	00:27.7	00:48.0	00:36.6	00:42.2	00:48.3	00:56.4	00:57.5	01:07.1	01:18.2

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	M							Mix			W						
#	8+	4x	4−	4+	2x	2−	1x	8+	4x	2x	8+	4x	4−	4+	2x	2−	1x
50	00:08.2	00:14.5	00:21.0	00:27.3	00:32.8	00:40.1	00:52.6	00:24.4	00:28.3	00:48.6	00:37.5	00:42.9	00:48.9	00:57.1	00:58.0	01:07.9	01:18.9
51	00:09.0	00:14.8	00:21.5	00:28.0	00:33.4	00:40.6	00:53.3	00:25.0	00:29.0	00:49.3	00:38.5	00:43.6	00:49.5	00:57.8	00:58.6	01:08.7	01:19.7
52	00:09.7	00:15.2	00:22.2	00:28.6	00:33.9	00:41.2	00:54.0	00:25.6	00:29.8	00:50.0	00:39.5	00:44.4	00:50.2	00:58.6	00:59.3	01:09.6	01:20.5
53	00:10.5	00:15.6	00:22.9	00:29.4	00:34.6	00:41.8	00:54.8	00:26.3	00:30.6	00:50.7	00:40.6	00:45.2	00:51.0	00:59.5	01:00.0	01:10.6	01:21.4
54	00:11.4	00:16.1	00:23.6	00:30.2	00:35.2	00:42.5	00:55.6	00:27.0	00:31.5	00:51.5	00:41.8	00:46.1	00:51.8	01:00.4	01:00.8	01:11.7	01:22.4
55	00:12.3	00:16.6	00:24.4	00:31.0	00:36.0	00:43.3	00:56.5	00:27.8	00:32.4	00:52.4	00:43.0	00:47.1	00:52.8	01:01.4	01:01.6	01:12.9	01:23.4
56	00:13.3	00:17.1	00:25.3	00:31.9	00:36.7	00:44.1	00:57.4	00:28.7	00:33.4	00:53.3	00:44.2	00:48.1	00:53.8	01:02.5	01:02.6	01:14.2	01:24.4
57	00:14.4	00:17.7	00:26.2	00:32.9	00:37.6	00:45.0	00:58.4	00:29.6	00:34.4	00:54.2	00:45.6	00:49.3	00:55.0	01:03.7	01:03.6	01:15.7	01:25.6
58	00:15.5	00:18.4	00:27.3	00:34.0	00:38.5	00:45.9	00:59.5	00:30.6	00:35.6	00:55.3	00:47.0	00:50.5	00:56.2	01:04.9	01:04.7	01:17.3	01:26.8
59	00:16.7	00:19.2	00:28.4	00:35.2	00:39.5	00:47.0	01:00.6	00:31.7	00:36.8	00:56.3	00:48.5	00:51.8	00:57.6	01:06.3	01:05.9	01:19.2	01:28.0
60	00:18.0	00:20.0	00:29.6	00:36.4	00:40.5	00:48.1	01:01.8	00:32.9	00:38.1	00:57.5	00:50.0	00:53.2	00:59.2	01:07.9	01:07.2	01:21.2	01:29.4
61	00:19.3	00:21.0	00:30.9	00:37.7	00:41.6	00:49.3	01:03.0	00:34.2	00:39.5	00:58.7	00:51.7	00:54.7	01:00.9	01:09.5	01:08.6	01:23.4	01:30.8
62	00:20.8	00:22.0	00:32.4	00:39.2	00:42.8	00:50.7	01:04.4	00:35.6	00:41.0	01:00.0	00:53.4	00:56.4	01:02.8	01:11.3	01:10.1	01:25.8	01:32.4
63	00:22.4	00:23.1	00:34.0	00:40.8	00:44.1	00:52.1	01:05.8	00:37.1	00:42.7	01:01.4	00:55.2	00:58.2	01:04.9	01:13.3	01:11.7	01:28.5	01:34.0
64	00:24.0	00:24.4	00:35.7	00:42.5	00:45.5	00:53.7	01:07.3	00:38.8	00:44.4	01:02.8	00:57.1	01:00.1	01:07.3	01:15.4	01:13.5	01:31.5	01:35.7
65	00:25.8	00:25.8	00:37.5	00:44.3	00:47.1	00:55.5	01:08.9	00:40.6	00:46.3	01:04.4	00:59.1	01:02.2	01:09.8	01:17.7	01:15.5	01:34.8	01:37.6
66	00:27.7	00:27.3	00:39.5	00:46.2	00:48.7	00:57.3	01:10.6	00:42.5	00:48.3	01:06.0	01:01.2	01:04.4	01:12.7	01:20.2	01:17.6	01:38.5	01:39.5
67	00:29.7	00:29.0	00:41.7	00:48.4	00:50.4	00:59.4	01:12.4	00:44.6	00:50.4	01:07.8	01:03.5	01:06.8	01:15.8	01:22.9	01:20.0	01:42.5	01:41.6
68	00:31.9	00:30.9	00:44.0	00:50.7	00:52.3	01:01.6	01:14.3	00:46.9	00:52.7	01:09.7	01:05.8	01:09.4	01:19.3	01:25.8	01:22.5	01:47.0	01:43.8
69	00:34.2	00:32.9	00:46.6	00:53.1	00:54.3	01:04.0	01:16.4	00:49.4	00:55.2	01:11.6	01:08.3	01:12.2	01:23.2	01:29.0	01:25.2	01:51.9	01:46.2
70	00:36.6	00:35.2	00:49.4	00:55.8	00:56.5	01:06.6	01:18.5	00:52.1	00:57.8	01:13.7	01:10.9	01:15.2	01:27.5	01:32.5	01:28.2	01:57.4	01:48.7
71	00:39.3	00:37.8	00:52.4	00:58.7	00:58.9	01:09.5	01:20.8	00:55.0	01:00.7	01:16.0	01:13.6	01:18.5	01:32.2	01:36.3	01:31.4	02:03.4	01:51.3
72	00:42.1	00:40.6	00:55.7	01:01.8	01:01.4	01:12.6	01:23.3	00:58.2	01:03.7	01:18.4	01:16.5	01:22.0	01:37.4	01:40.4	01:34.9	02:10.1	01:54.2
73	00:45.0	00:43.7	00:59.3	01:05.1	01:04.1	01:15.9	01:25.9	01:01.7	01:07.0	01:20.9	01:19.5	01:25.8	01:43.2	01:44.8	01:38.8	02:17.5	01:57.2
74	00:48.2	00:47.1	01:03.2	01:08.8	01:07.0	01:19.6	01:28.6	01:05.4	01:10.5	01:23.6	01:22.7	01:29.9	01:49.6	01:49.7	01:42.9	02:25.6	02:00.4

Continues on the next page

	M							Mix			W						
#	8+	4x	4−	4+	2x	2−	1x	8+	4x	2x	8+	4x	4−	4+	2x	2−	1x
75	00:51.6	00:50.9	01:07.4	01:12.7	01:10.2	01:23.5	01:31.5	01:09.4	01:14.2	01:26.4	01:26.0	01:34.3	01:56.7	01:54.9	01:47.4	02:34.6	02:03.7
76	00:55.3	00:55.0	01:12.0	01:16.9	01:13.6	01:27.9	01:34.7	01:13.8	01:18.3	01:29.5	01:29.6	01:39.1	02:04.6	02:00.6	01:52.4	02:44.6	02:07.3
77	00:59.1	00:59.7	01:17.0	01:21.4	01:17.2	01:32.6	01:38.0	01:18.6	01:22.6	01:32.7	01:33.3	01:44.3	02:13.2	02:06.8	01:57.7	02:55.6	02:11.2
78	01:03.3	01:04.8	01:22.4	01:26.3	01:21.1	01:37.7	01:41.5	01:23.8	01:27.3	01:36.1	01:37.2	01:49.8	02:22.8	02:13.6	02:03.5	03:07.7	02:15.2
79	01:07.7	01:10.4	01:28.2	01:31.6	01:25.4	01:43.2	01:45.2	01:29.4	01:32.2	01:39.7	01:41.3	01:55.8	02:33.4	02:20.9	02:09.8	03:21.2	02:19.6
80	01:12.4	01:16.7	01:34.6	01:37.3	01:29.9	01:49.3	01:49.2	01:35.5	01:37.6	01:43.6	01:45.6	02:02.3	02:45.2	02:28.8	02:16.7	03:36.0	02:24.2
81	01:17.4	01:23.6	01:41.6	01:43.5	01:34.8	01:55.8	01:53.4	01:42.1	01:43.3	01:47.7	01:50.2	02:09.3	02:58.2	02:37.5	02:24.1	03:52.5	02:29.1
82	01:22.8	01:31.3	01:49.1	01:50.2	01:40.0	02:03.0	01:57.8	01:49.3	01:49.5	01:52.1	01:55.0	02:16.8	03:12.5	02:46.8	02:32.2	04:10.6	02:34.3
83	01:28.5	01:39.7	01:57.2	01:57.3	01:45.7	02:10.7	02:02.6	01:57.1	01:56.1	01:56.7	02:00.0	02:24.9	03:28.4	02:57.0	02:41.0	04:30.7	02:39.8
84	01:34.6	01:49.1	02:06.1	02:05.1	01:51.8	02:19.1	02:07.6	02:05.5	02:03.1	02:01.7	02:05.3	02:33.7	03:46.0	03:08.1	02:50.6	04:52.8	02:45.6
85	01:41.1	01:59.4	02:15.8	02:13.4	01:58.4	02:28.3	02:13.0	02:14.7	02:10.7	02:06.9	02:10.9	02:43.1	04:05.5	03:20.1	03:01.0	05:17.4	02:51.9
86	01:48.1	02:10.8	02:26.2	02:22.5	02:05.4	02:38.3	02:18.7	02:24.6	02:18.9	02:12.5	02:16.8	02:53.3	04:27.0	03:33.2	03:12.3	05:44.4	02:58.5
87	01:55.5	02:23.4	02:37.6	02:32.2	02:13.0	02:49.1	02:24.7	02:35.4	02:27.6	02:18.4	02:23.0	03:04.3	04:50.8	03:47.3	03:24.6	06:14.4	03:05.5
88	02:03.4	02:37.4	02:50.0	02:42.7	02:21.2	03:00.9	02:31.1	02:47.1	02:37.0	02:24.7	02:29.5	03:16.2	05:17.2	04:02.8	03:38.0	06:47.5	03:13.0
89	02:11.9	02:52.8	03:03.4	02:54.0	02:30.0	03:13.7	02:37.9	02:59.8	02:47.0	02:31.3	02:36.4	03:29.0	05:46.3	04:19.5	03:52.5	07:24.1	03:21.0
90	02:20.9	03:09.9	03:17.9	03:06.2	02:39.4	03:27.6	02:45.2	03:13.6	02:57.8	02:38.4	02:43.6	03:42.8	06:18.6	04:37.7	04:08.3	08:04.5	03:29.4
91	02:30.6	03:28.8	03:33.8	03:19.4	02:49.6	03:42.7	02:52.9	03:28.5	03:09.4	02:46.0	02:51.2	03:57.7	06:54.3	04:57.4	04:25.5	08:49.2	03:38.4
92	02:40.8	03:49.7	03:51.0	03:33.7	03:00.6	03:59.2	03:01.0	03:44.8	03:21.8	02:54.0	02:59.2	04:13.8	07:33.7	05:18.9	04:44.2	09:38.6	03:48.0
93	02:51.8	04:12.7	04:09.6	03:49.0	03:12.4	04:17.0	03:09.7	04:02.4	03:35.1	03:02.5	03:07.7	04:31.2	08:17.4	05:42.2	05:04.5	10:33.2	03:58.1
94	03:03.5	04:38.2	04:29.9	04:05.6	03:25.1	04:36.5	03:18.9	04:21.5	03:49.4	03:11.6	03:16.5	04:49.9	09:05.7	06:07.5	05:26.5	11:33.6	04:08.9
95	03:16.0	05:06.4	04:51.9	04:23.5	03:38.7	04:57.6	03:28.7	04:42.2	04:04.7	03:21.2	03:25.9	05:10.1	09:59.2	06:35.0	05:50.5	12:40.3	04:20.4
96	03:29.4	05:37.6	05:15.9	04:42.8	03:53.4	05:20.6	03:39.1	05:04.7	04:21.1	03:31.4	03:35.7	05:31.9	10:58.3	07:04.8	06:16.6	13:54.0	04:32.6
97	03:43.6	06:12.1	05:41.8	05:03.6	04:09.2	05:45.5	03:50.2	05:29.1	04:38.7	03:42.3	03:46.0	05:55.4	12:03.7	07:37.3	06:44.9	15:15.5	04:45.5
98	03:58.8	06:50.2	06:10.1	05:26.1	04:26.3	06:12.7	04:01.9	05:55.5	04:57.6	03:53.8	03:56.9	06:20.8	13:16.1	08:12.5	07:15.7	16:45.6	04:59.3
99	04:15.0	07:32.3	06:40.7	05:50.4	04:44.6	06:42.2	04:14.4	06:24.2	05:17.9	04:06.1	04:08.3	06:48.1	14:36.1	08:50.8	07:49.2	18:25.2	05:14.0