

**BOSSES ARE USUALLY
PRETTY DUMB.**

BOSSSES ARE USUALLY PRETTY DUMB.

- **THEY DON'T LISTEN MUCH (EXCEPT TO THEIR BOSSES)**
- **THEY DON'T KNOW MUCH (EXCEPT HOW TO KEEP THEIR BOSSES HAPPY)**
- **THEY THINK THEY KNOW A LOT, EVEN WHEN THEY DON'T**

“JUST GIVE ME THE 10-SECOND VERSION”

EVERYDAY AT 4 O'CLOCK
THE MAD HATTER HAS A TEA PARTY



AND EVERYDAY
THE WHITE RABBIT IS LATE FOR IT



ONE DAY THE HATTER HAS AN IDEA



I'll tell the Rabbit that the party has
been moved to an earlier time

**WHAT TIME SHOULD THE
HATTER TELL HIM TO COME?**

THE HATTER HAS KEPT METICULOUS RECORDS

Date	Rabbit late by
Jan 1, 2016	40 mins
Jan 2, 2016	30 mins
Jan 3, 2016	20 mins
Jan 4, 2016	45 mins
Jan 5, 2016	60 mins
Jan 6, 2016	120 mins
Jan 7, 2016	35 mins
Jan 8, 2016	40 mins
Jan 9, 2016	50 mins
Jan 10, 2016	55 mins
Jan 11, 2016	53 mins
Jan 12, 2016	22 mins
Jan 13, 2016	27 mins
Jan 14, 2016	48 mins
Jan 15, 2016	62 mins
Jan 16, 2016	33 mins
Jan 17, 2016	35 mins
Jan 18, 2016	40 mins
Jan 19, 2016	45 mins

IT LOOKS LIKE THE RABBIT'S
TIMING IS **ALL OVER THE PLACE**

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Jan 1, 2016	40 mins
Jan 2, 2016	30 mins
Jan 3, 2016	20 mins
Jan 4, 2016	45 mins
Jan 5, 2016	60 mins
Jan 6, 2016	120 mins
Jan 7, 2016	35 mins
Jan 8, 2016	40 mins
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Jan 17, 2016	35 mins
Jan 18, 2016	40 mins
Jan 19, 2016	45 mins

IT COVERS A **RANGE**
FROM **20 MINS** TO **2 HOURS**

THE MAD HATTER HAS A MAD IDEA

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Jan 4, 2016	45 mins
Jan 5, 2016	60 mins
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Jan 7, 2016	35 mins
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LET ME TAKE SMALL
INTERVALS OF TIME
AND COUNT HOW
OFTEN THEY OCCUR

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Jan 1, 2016	40 mins
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Jan 14, 2016	48 mins
Jan 15, 2016	62 mins
Jan 16, 2016	33 mins
Jan 17, 2016	35 mins
Jan 18, 2016	40 mins
Jan 19, 2016	45 mins

INTERVALS OF TIME HOW OFTEN THEY OCCUR

20-29 mins	3
30-39 mins	
40-49 mins	
50-59 mins	
60-69 mins	
70-79 mins	
80-89 mins	
90-99 mins	
100-109 mins	
110 -120 mins	

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Jan 17, 2016	35 mins
Jan 18, 2016	40 mins
Jan 19, 2016	45 mins

INTERVALS OF TIME HOW OFTEN THEY OCCUR

20-29 mins	3
30-39 mins	4
40-49 mins	6
50-59 mins	3
60-69 mins	2
70-79 mins	0
80-89 mins	0
90-99 mins	0
100-109 mins	0
110 -120 mins	1

INTERVALS OF
TIME

HOW OFTEN
THEY OCCUR

20-29 mins	3
30-39 mins	4
40-49 mins	6
50-59 mins	3
60-69 mins	2
70-79 mins	0
80-89 mins	0
90-99 mins	0
100-109 mins	0
110 -120 mins	1

THIS TABLE IS
CALLED A
FREQUENCY TABLE

INTERVALS OF
TIME

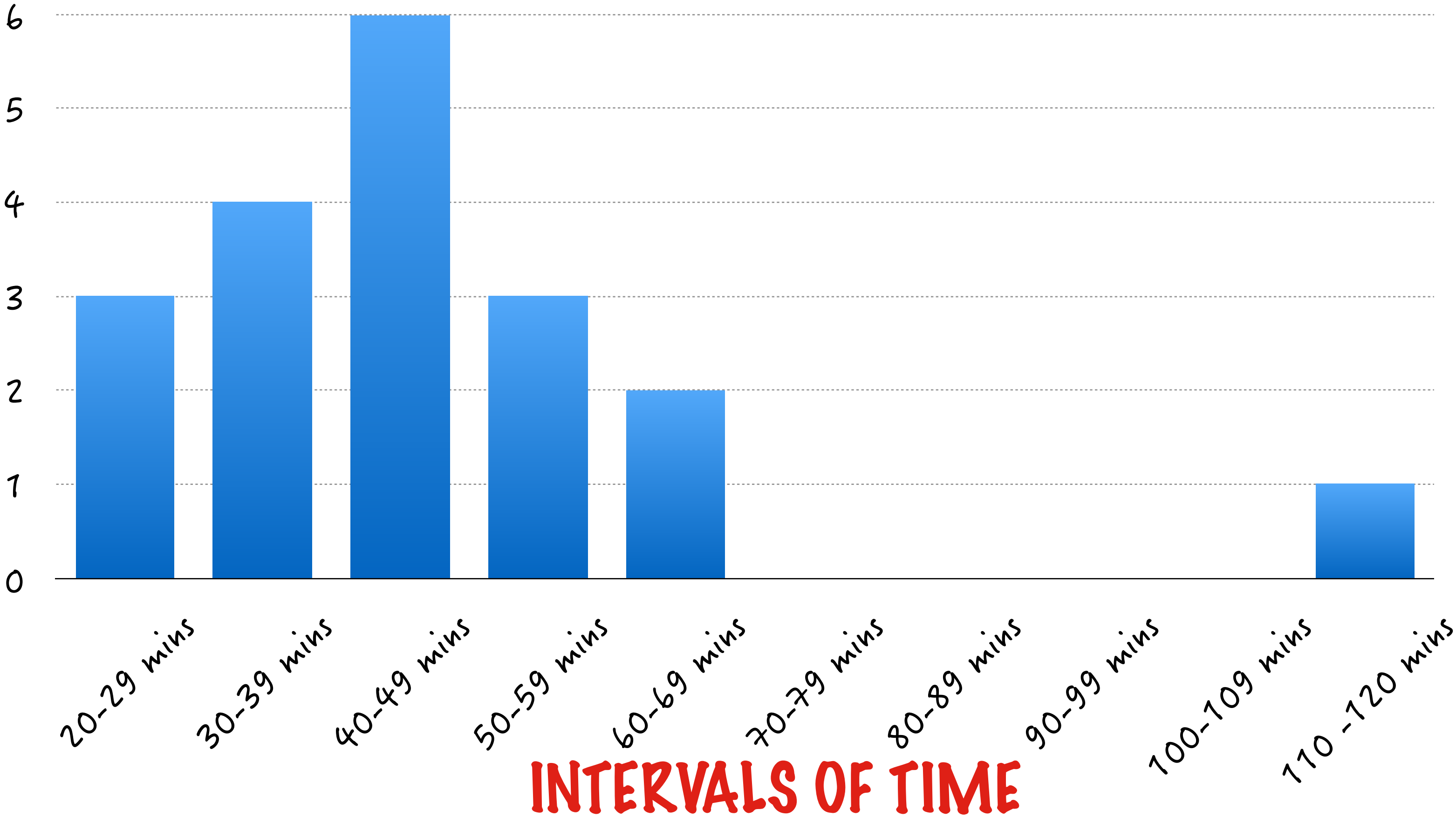
HOW OFTEN
THEY OCCUR

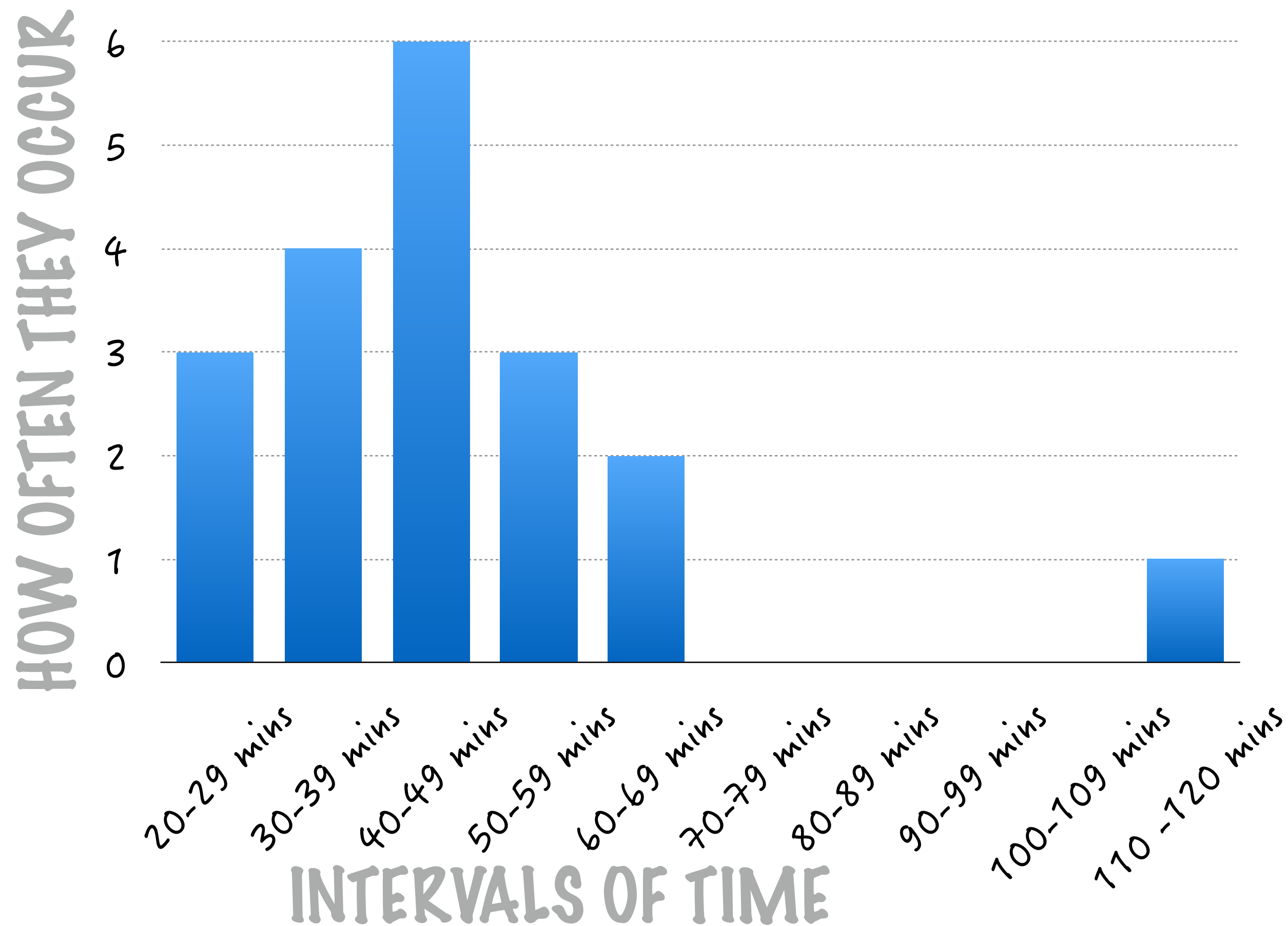
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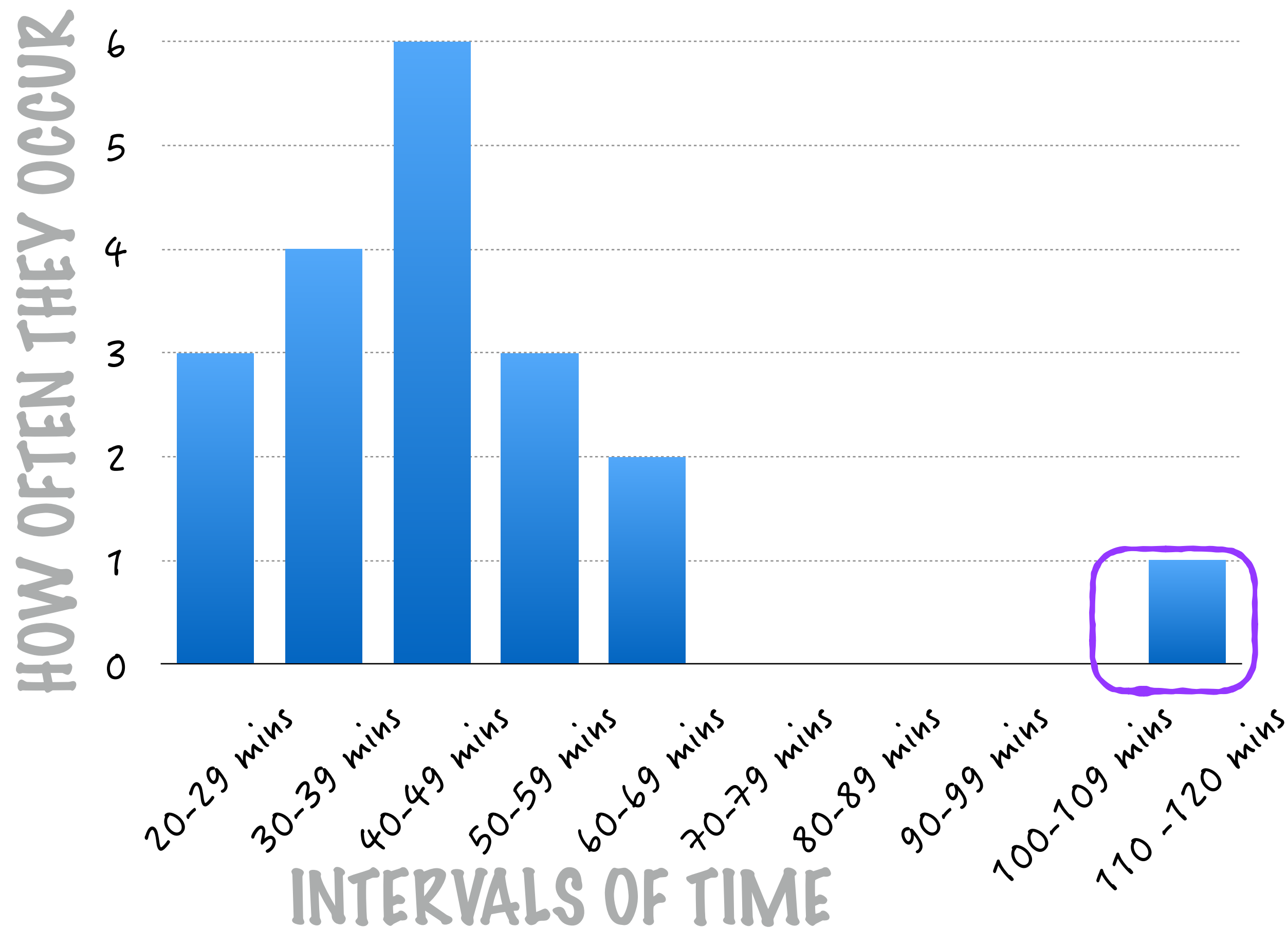
IF YOU PLOT THIS TABLE
YOU GET A HISTOGRAM

HOW OFTEN THEY OCCUR





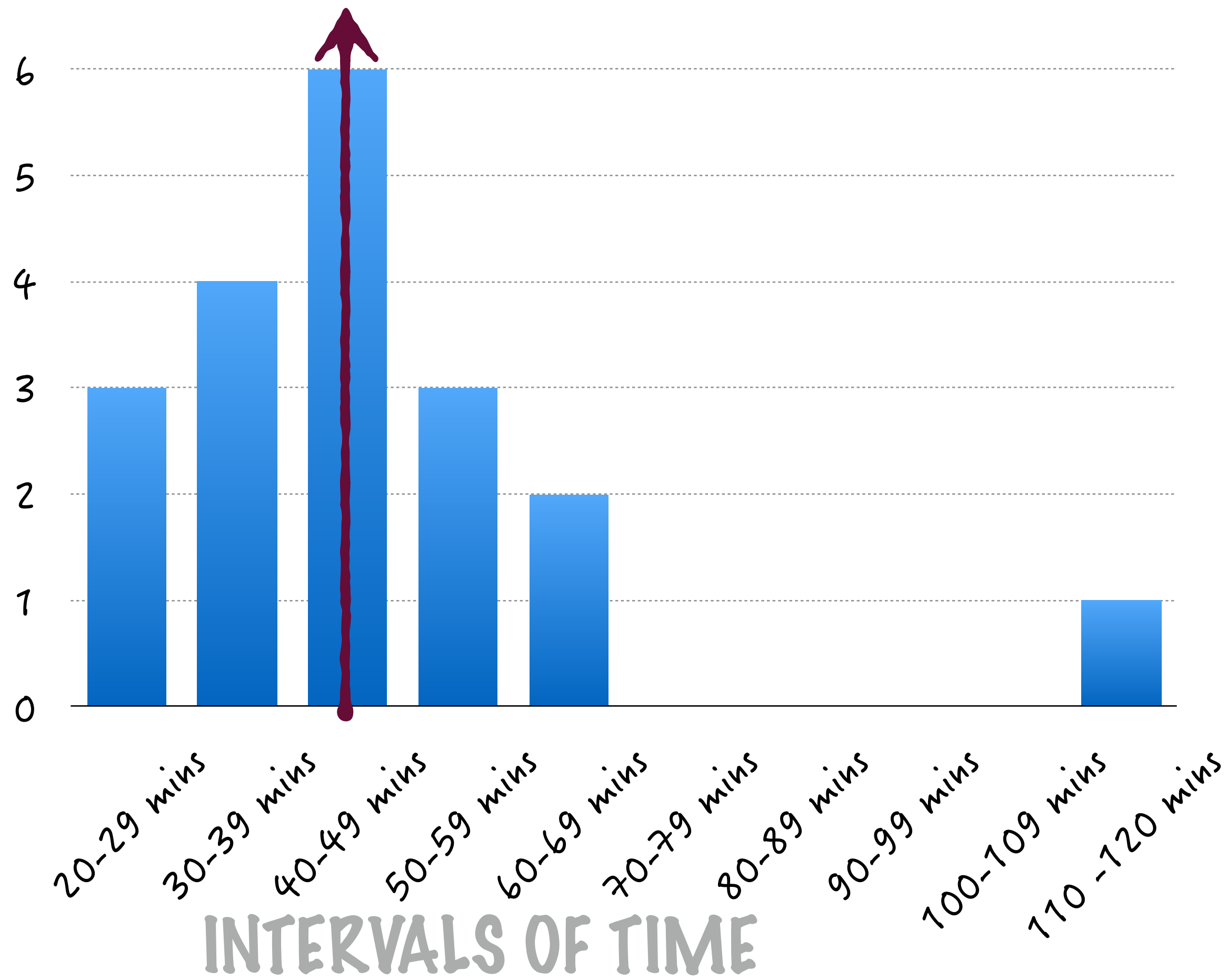
THIS HISTOGRAM
IS PRETTY
INFORMATIVE



FIRST, IT LOOKS LIKE THE
RABBIT BEING 2 HOURS
LATE IS A RARE EXCEPTION

IT IS AN OUTLIER

HOW OFTEN THEY OCCUR



FIRST, IT LOOKS LIKE THE RABBIT BEING
2 HOURS LATE IS A RARE EXCEPTION

SECOND, THE REST OF THE
DATA IS CLUSTERED AROUND
A **CENTRAL POINT**

THE HATTER WANTS TO
FIND THIS **CENTRAL POINT**
THAT'S THE TIME HE'LL SHIFT
THE RABBIT'S INVITATION BY

THE HATTER WANTS TO FIND THIS CENTRAL POINT

METHOD 1 : MEAN

Date	Rabbit late by
Jan 1, 2016	40 mins
Jan 2, 2016	30 mins
Jan 3, 2016	20 mins
Jan 4, 2016	45 mins
Jan 5, 2016	60 mins
Jan 6, 2016	120 mins
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Jan 18, 2016	40 mins
Jan 19, 2016	45 mins

THE MEAN IS
NOTHING BUT THE
AVERAGE VALUE

THE HATTER WANTS TO FIND THIS CENTRAL POINT

METHOD 1 : MEAN

THE MEAN IS NOTHING BUT THE
AVERAGE VALUE

Date	Rabbit late by
Jan 1, 2016	40 mins
Jan 2, 2016	30 mins
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Jan 17, 2016	35 mins
Jan 18, 2016	40 mins
Jan 19, 2016	45 mins

MEAN =
$$\frac{\text{SUM OF ALL THE VALUES}}{\text{NUMBER OF VALUES}}$$

= 45

THE HATTER WANTS TO FIND THIS CENTRAL POINT

METHOD 2 : MEDIAN

Date	Rabbit late by
Jan 1, 2016	40 mins
Jan 2, 2016	30 mins
Jan 3, 2016	20 mins
Jan 4, 2016	45 mins
Jan 5, 2016	60 mins
Jan 6, 2016	120 mins
Jan 7, 2016	35 mins
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Jan 9, 2016	50 mins
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Jan 17, 2016	35 mins
Jan 18, 2016	40 mins
Jan 19, 2016	45 mins

THE MEDIAN IS
LITERALLY THE
CENTRAL POINT

THE HATTER WANTS TO FIND THIS CENTRAL POINT

METHOD 2 : MEDIAN

Date	Rabbit late by
Jan 1, 2016	40 mins
Jan 2, 2016	30 mins
Jan 3, 2016	20 mins
Jan 4, 2016	45 mins
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Jan 6, 2016	120 mins
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Jan 18, 2016	40 mins
Jan 19, 2016	45 mins

SORT ALL THE VALUES
IN ASCENDING ORDER

20	22	27	30	33	35	35	40	40	40	45	45	48	50	53	55	60	62	120
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

THE VALUE AT THE CENTER IS THE MEDIAN

MEDIAN = 40

THE HATTER WANTS TO FIND THIS CENTRAL POINT

METHOD 3 : MODE

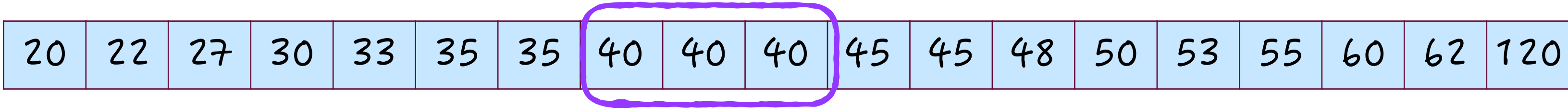
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THE MODE IS THE
VALUE THAT
OCCURS MOST
FREQUENTLY

THE HATTER WANTS TO FIND THIS CENTRAL POINT

METHOD 3 : MODE

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Jan 1, 2016	40 mins
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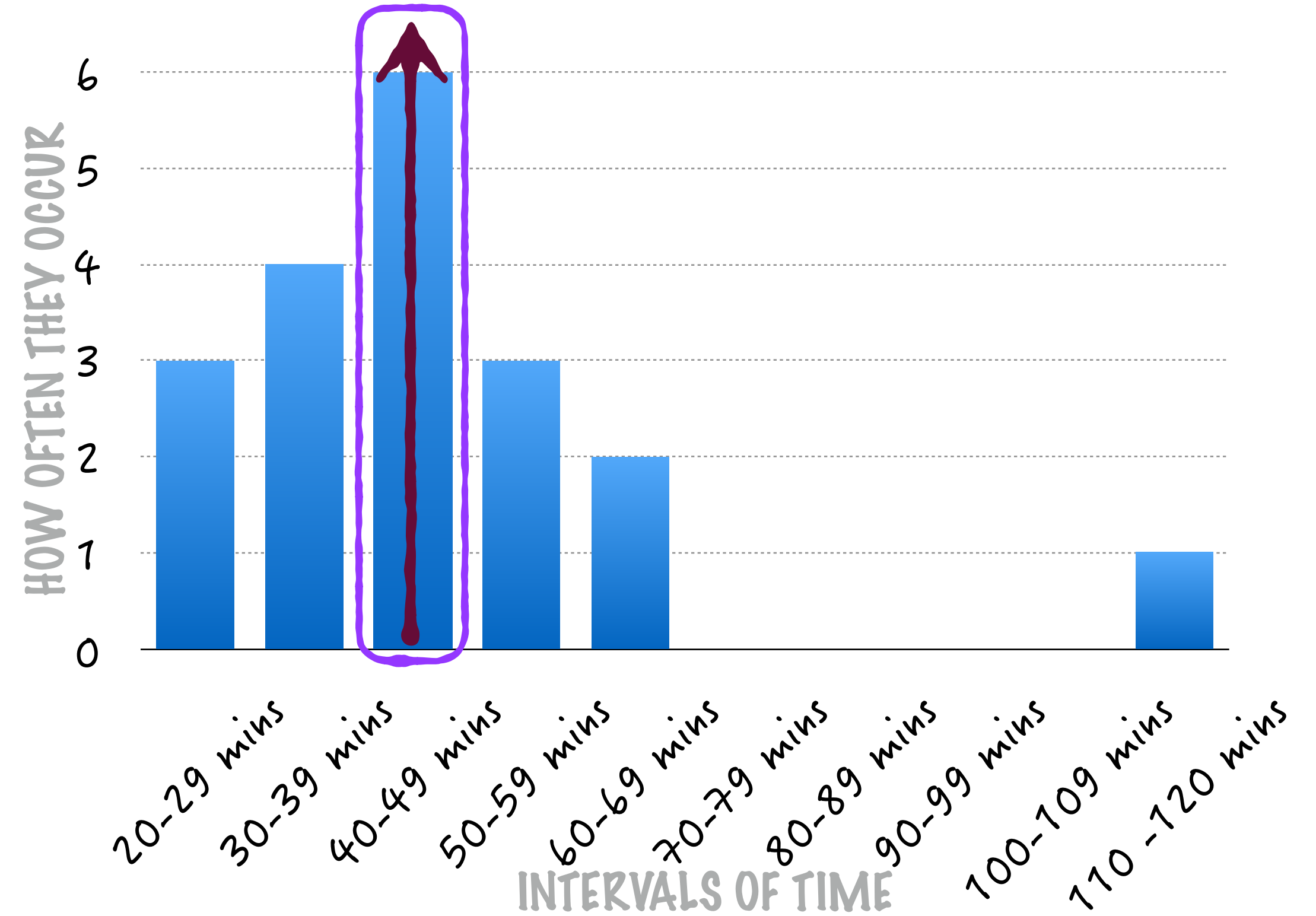
IN THIS DATASET, 40 OCCURS THE MOST NUMBER OF TIMES

MODE = 40

MEAN = 45
MEDIAN = 40
MODE = 40

THE ANSWERS FROM **ALL 3 METHODS**
ARE **PRETTY CLOSE** TO EACH OTHER
AND TO THE CENTRAL POINT

BUT, THIS **MAY NOT**
ALWAYS BE THE CASE



LET'S COMPARE
MEAN VS MEDIAN

MEAN VS MEDIAN

THE MEAN IS SENSITIVE
TO OUTLIERS

THE MEDIAN IS NOT

MEAN VS MEDIAN

THE MEAN IS SENSITIVE TO OUTLIERS
THE MEDIAN IS NOT

HERE ARE THE RABBIT'S TIMINGS SORTED IN ASCENDING ORDER

20	22	27	30	33	35	35	40	40	40	45	45	48	50	53	55	60	62	120
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

120 IS AN OUTLIER

1000

WITH THIS DATA

MEAN = 45
MEDIAN = 40

92

THE MEDIAN IS AT THE MID-POINT
IT REMAINS THE SAME

WHAT IF THE OUTLIER'S
VALUE WAS 1000?