

Reliability Making
Money

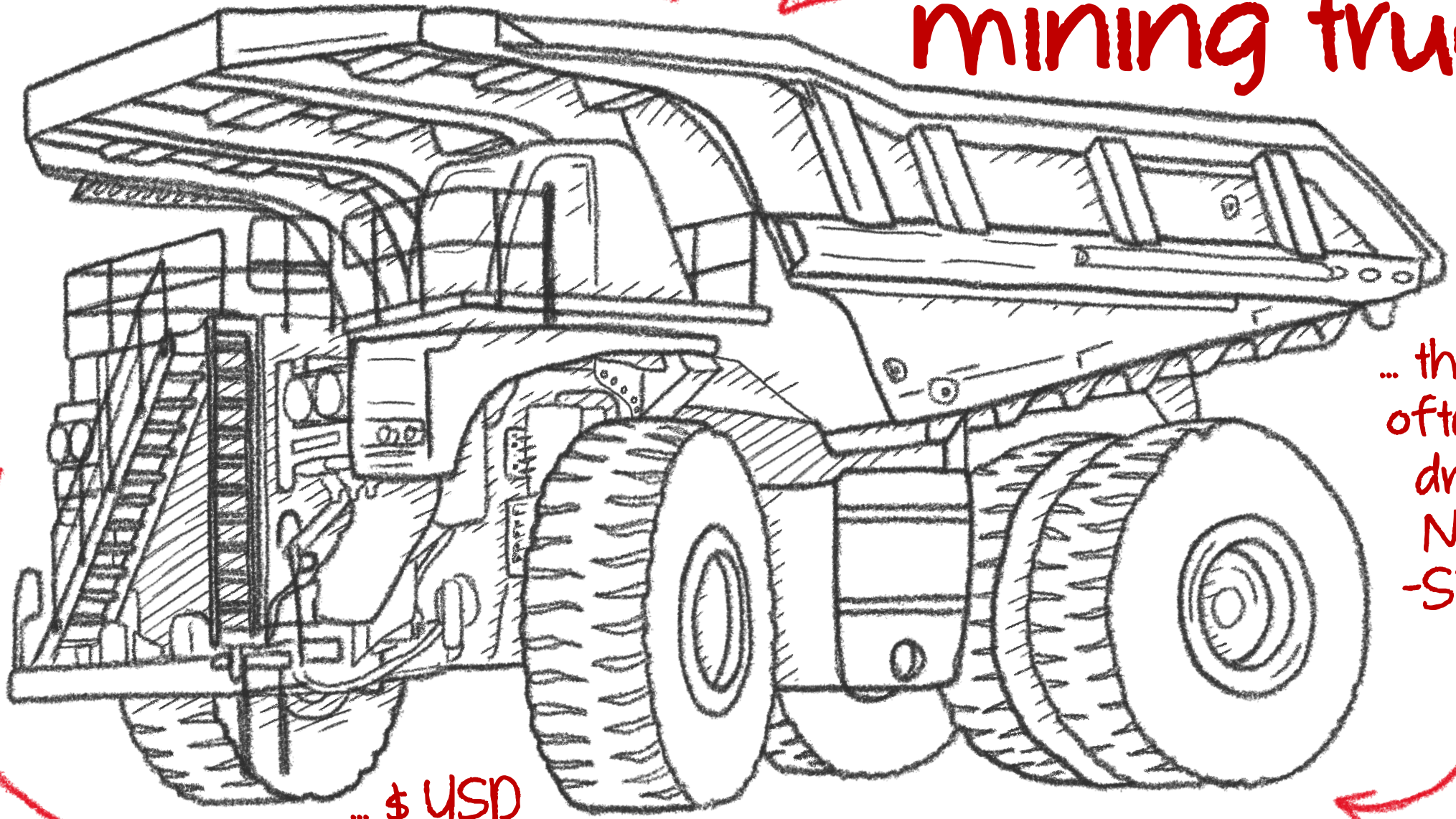
#2

... being DUMB
is expensive

... 400 tonne payload

... really big

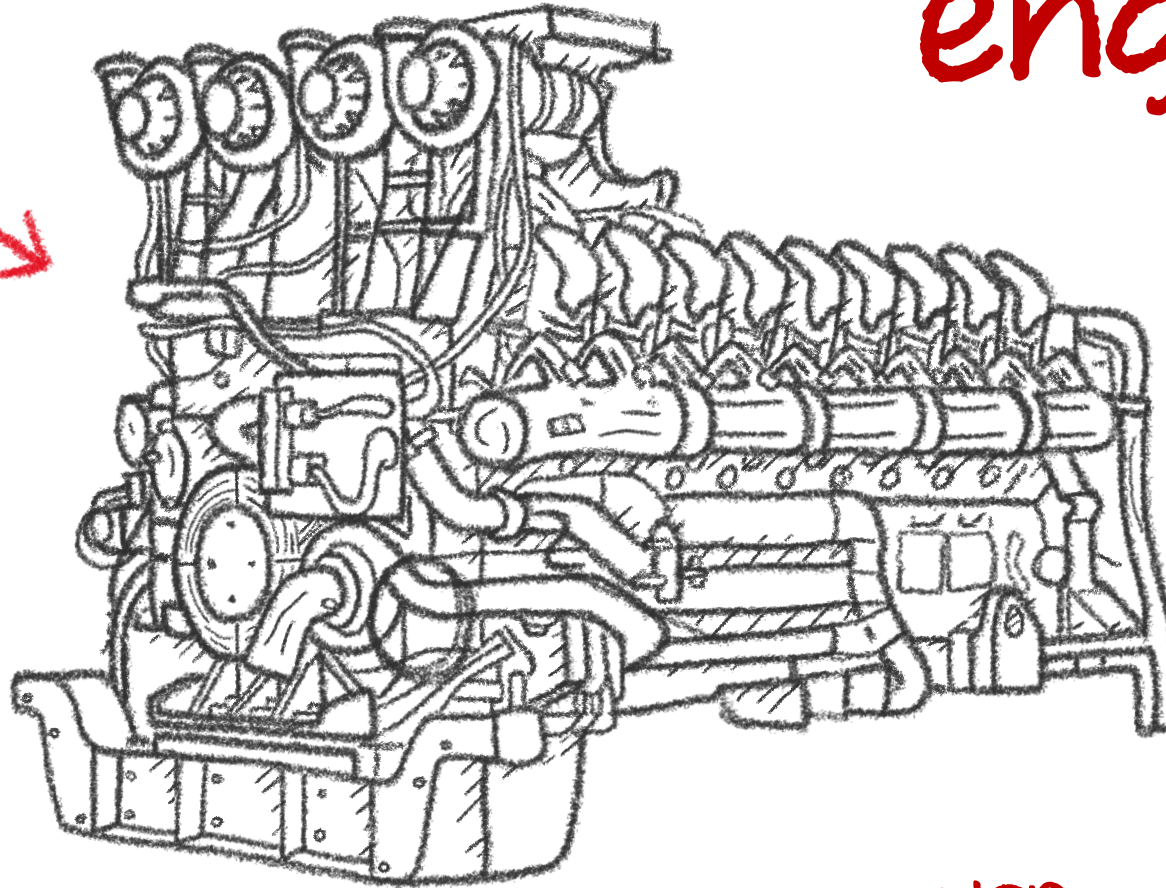
mining truck



... they will
often be
driven
NON
-STOP

... \$ USD
5-6 million

... 20
cylinder
engine



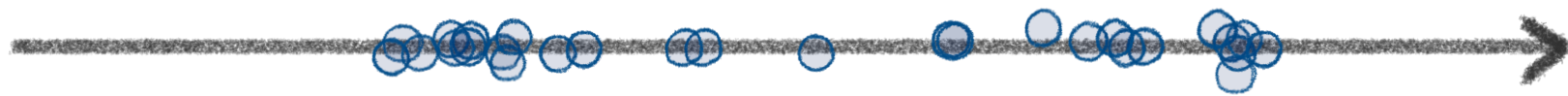
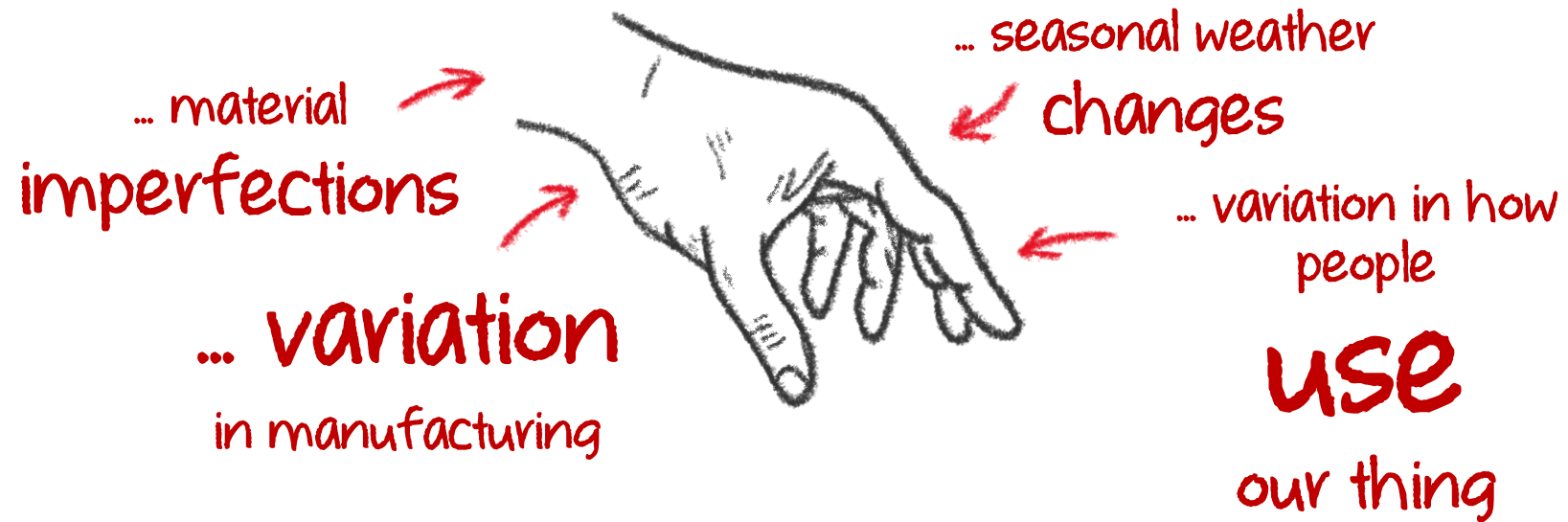
... really big
engine

... \$ USD
700 - 800 thousand

... so how many spare
engines do I need for a
3-year period
for 1 truck?

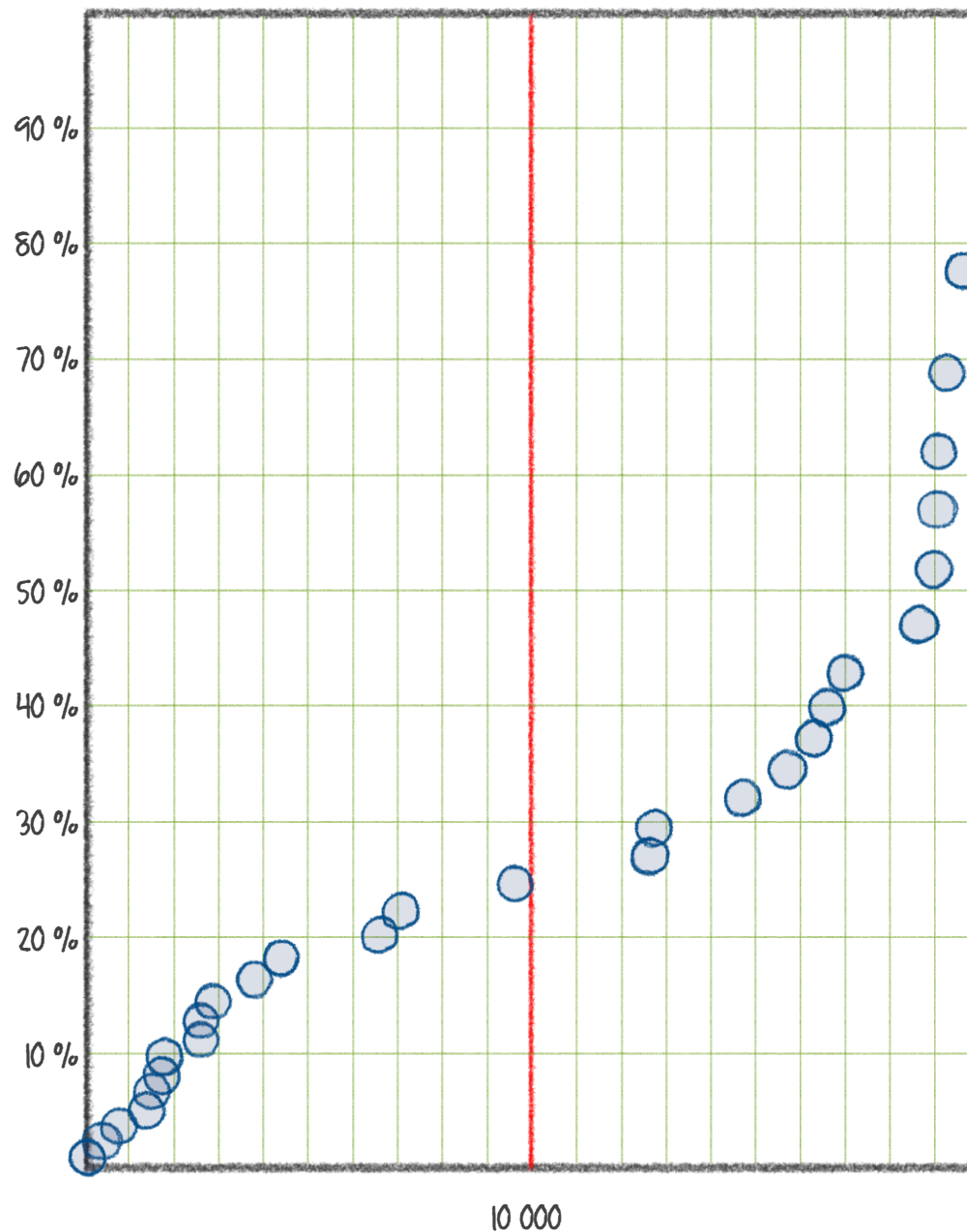
... that was last
month's webinar!

the (random) hand of failure



time to failure (TTF)

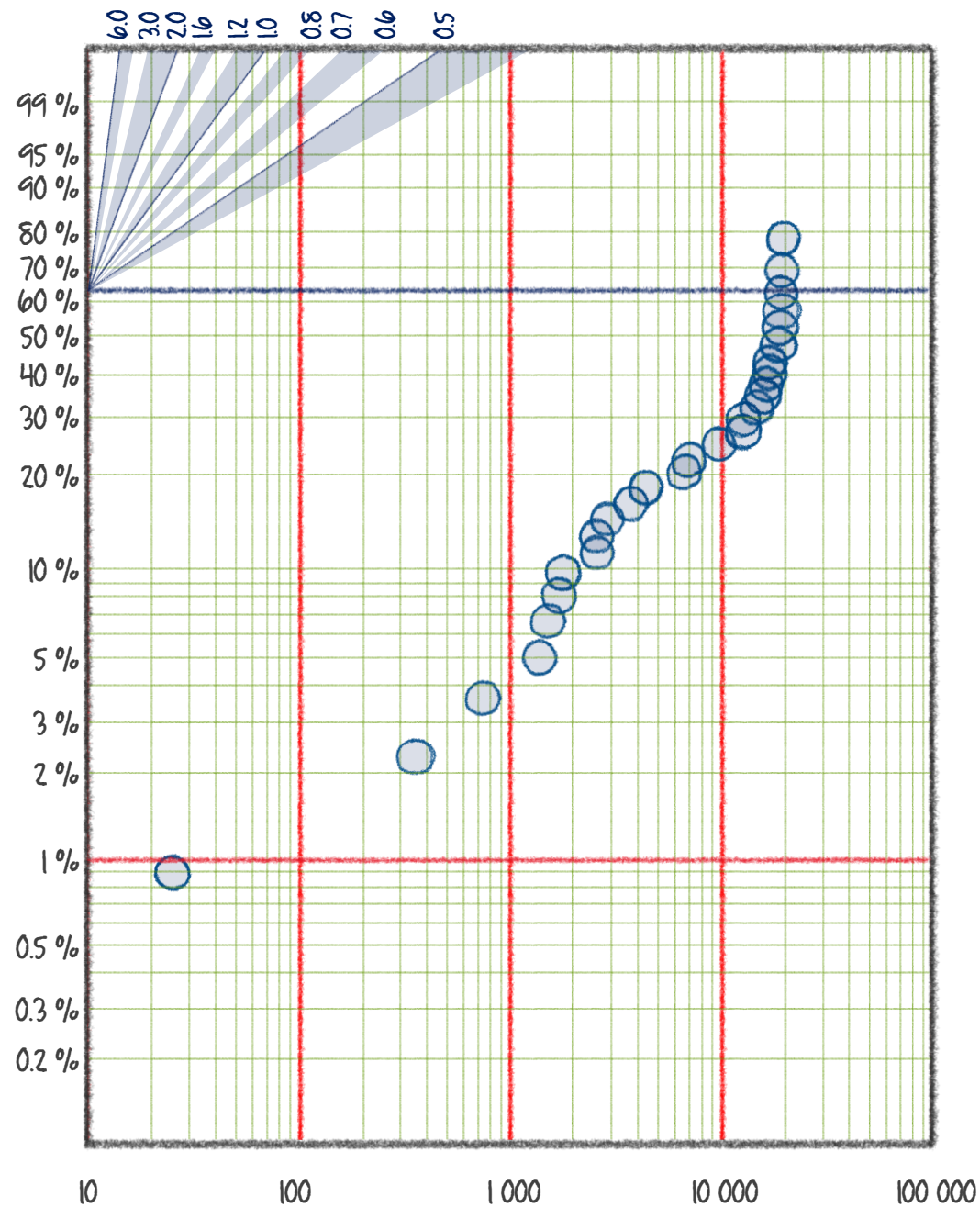
CUMULATIVE DISTRIBUTION FUNCTION (CDF)



28 times to failure ...

... and
50 !!!
right-
censored
data points

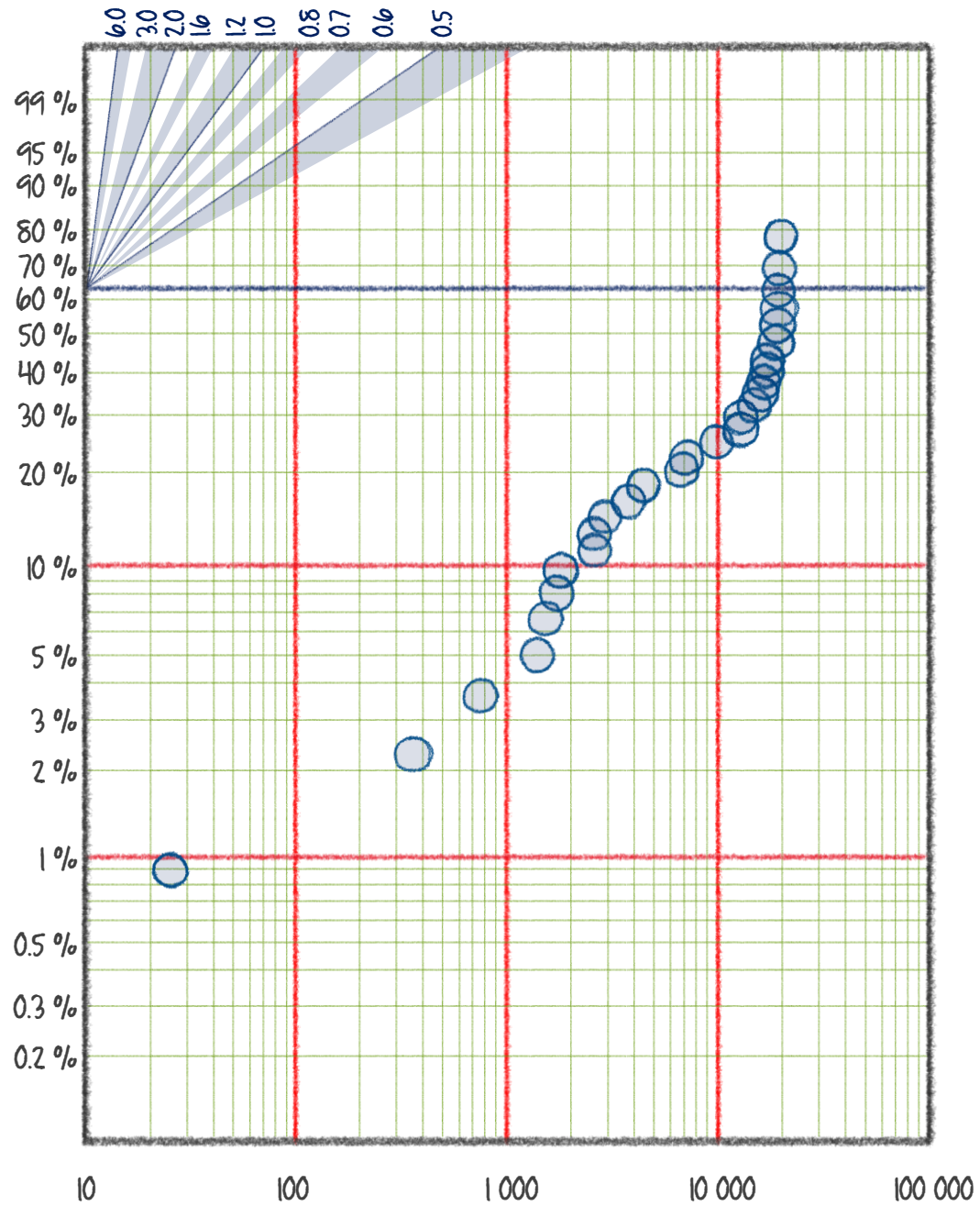
CUMULATIVE DISTRIBUTION FUNCTION (CDF)



Weibull
plot

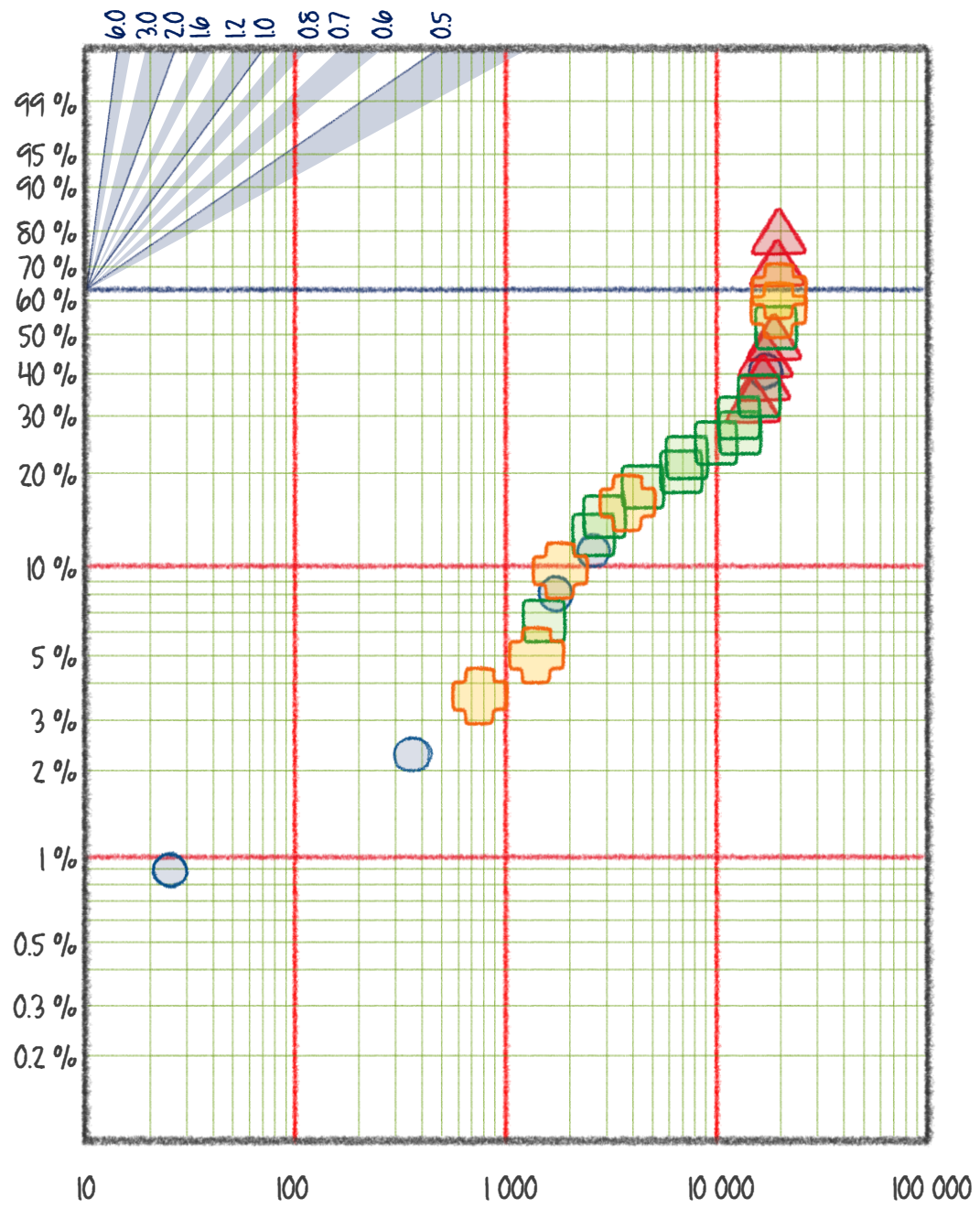
... should I schedule
for my engine to be
swapped out?

CUMULATIVE DISTRIBUTION FUNCTION (CDF)

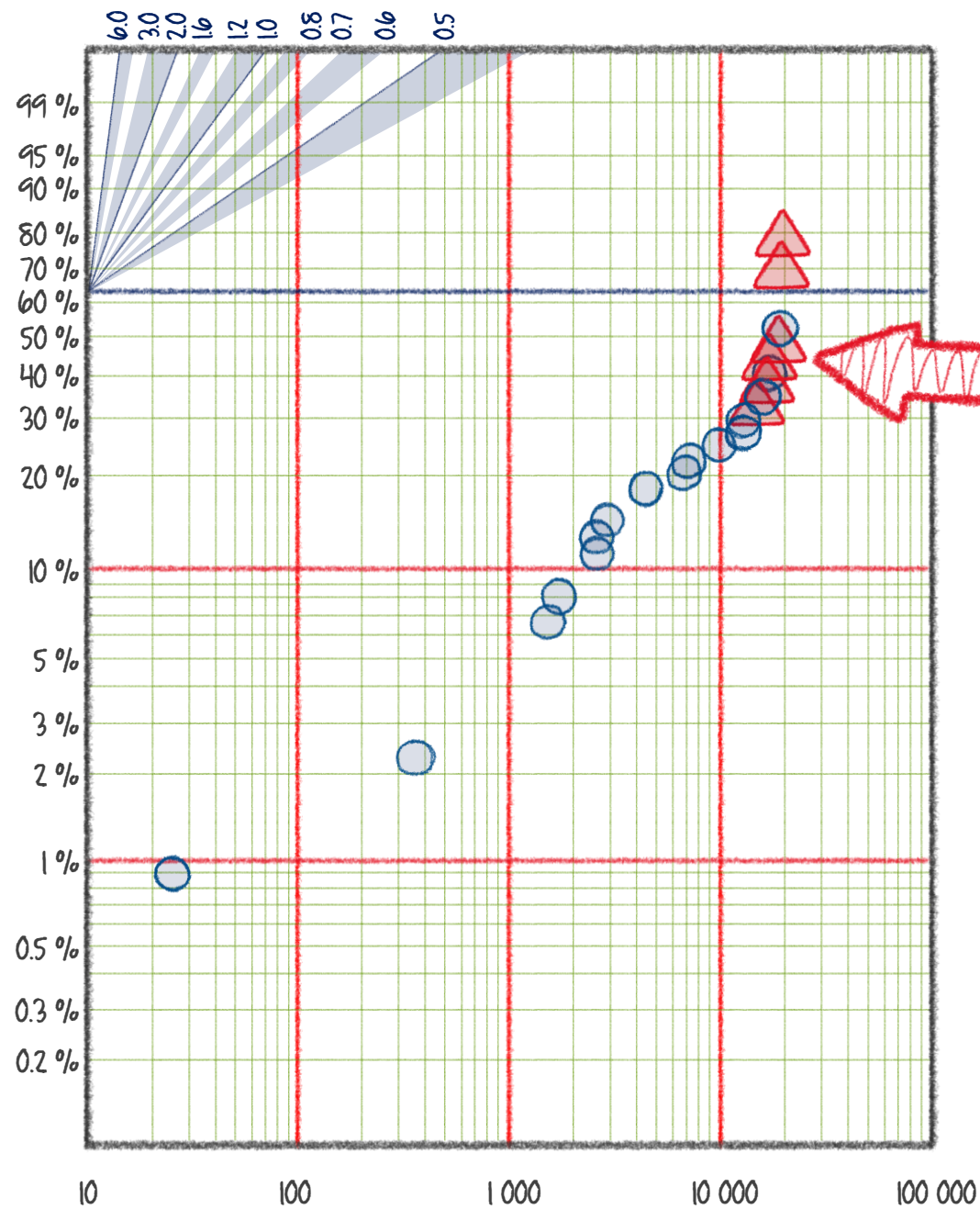


... what might be
'driving' failure?

CUMULATIVE DISTRIBUTION FUNCTION (CDF)



CUMULATIVE DISTRIBUTION FUNCTION (CDF)



... scavenge
pump
failures

CUMULATIVE DISTRIBUTION FUNCTION (CDF)

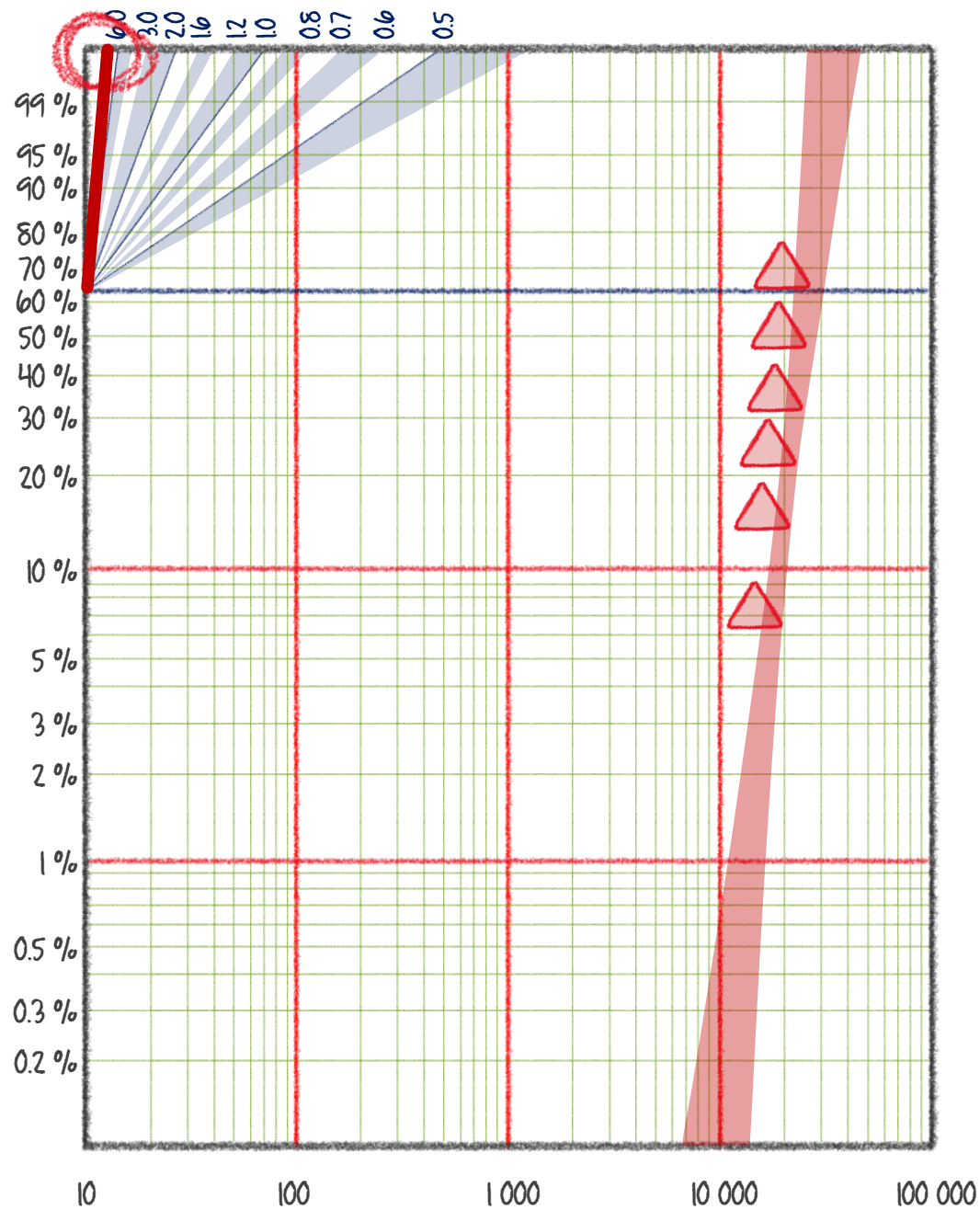


95 %
confidence
interval
... but why
are our
plotted
points
outside???

... commercial Weibull
plotting software
sucks ...

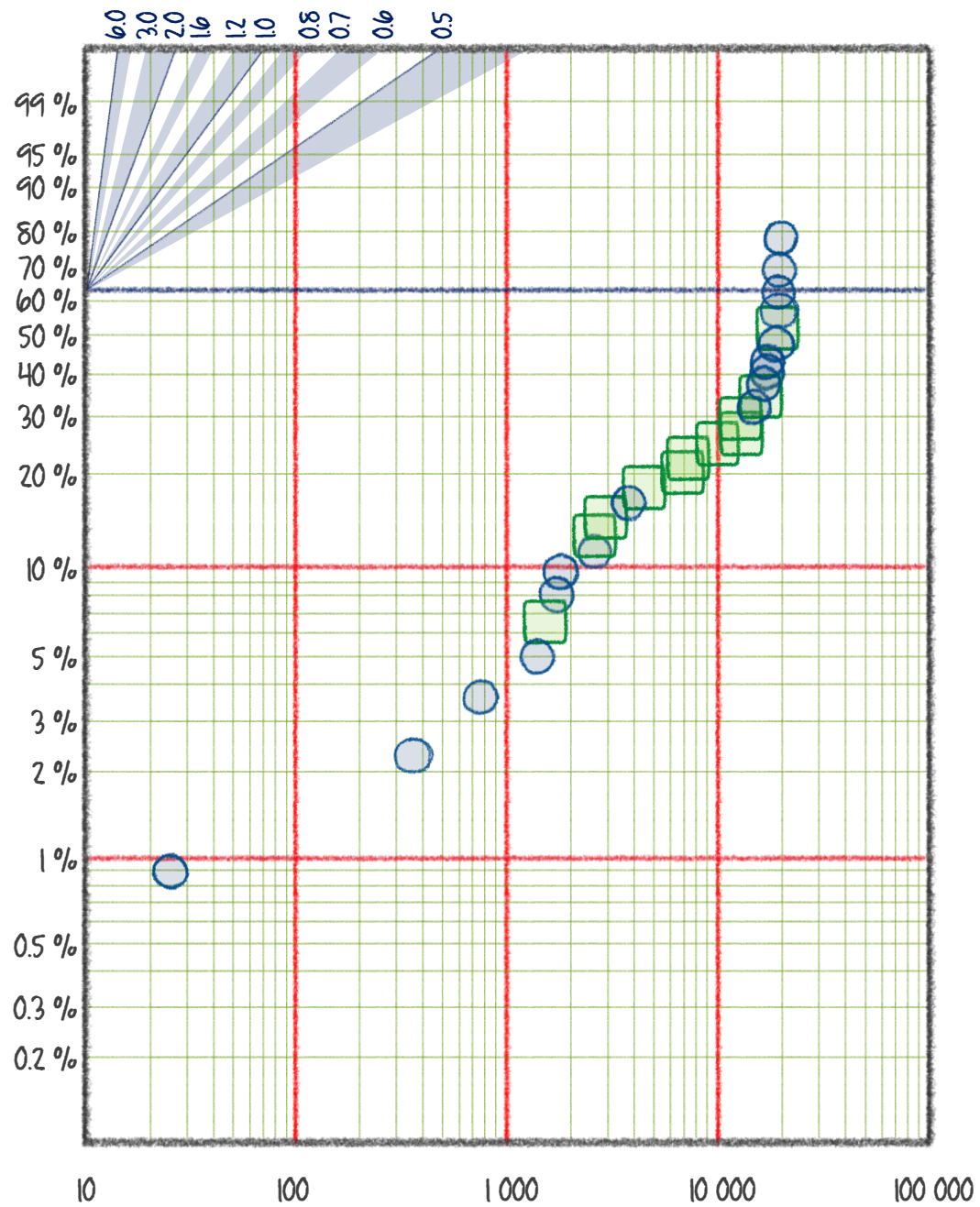
3
= 8.96

CUMULATIVE DISTRIBUTION FUNCTION
(CDF)

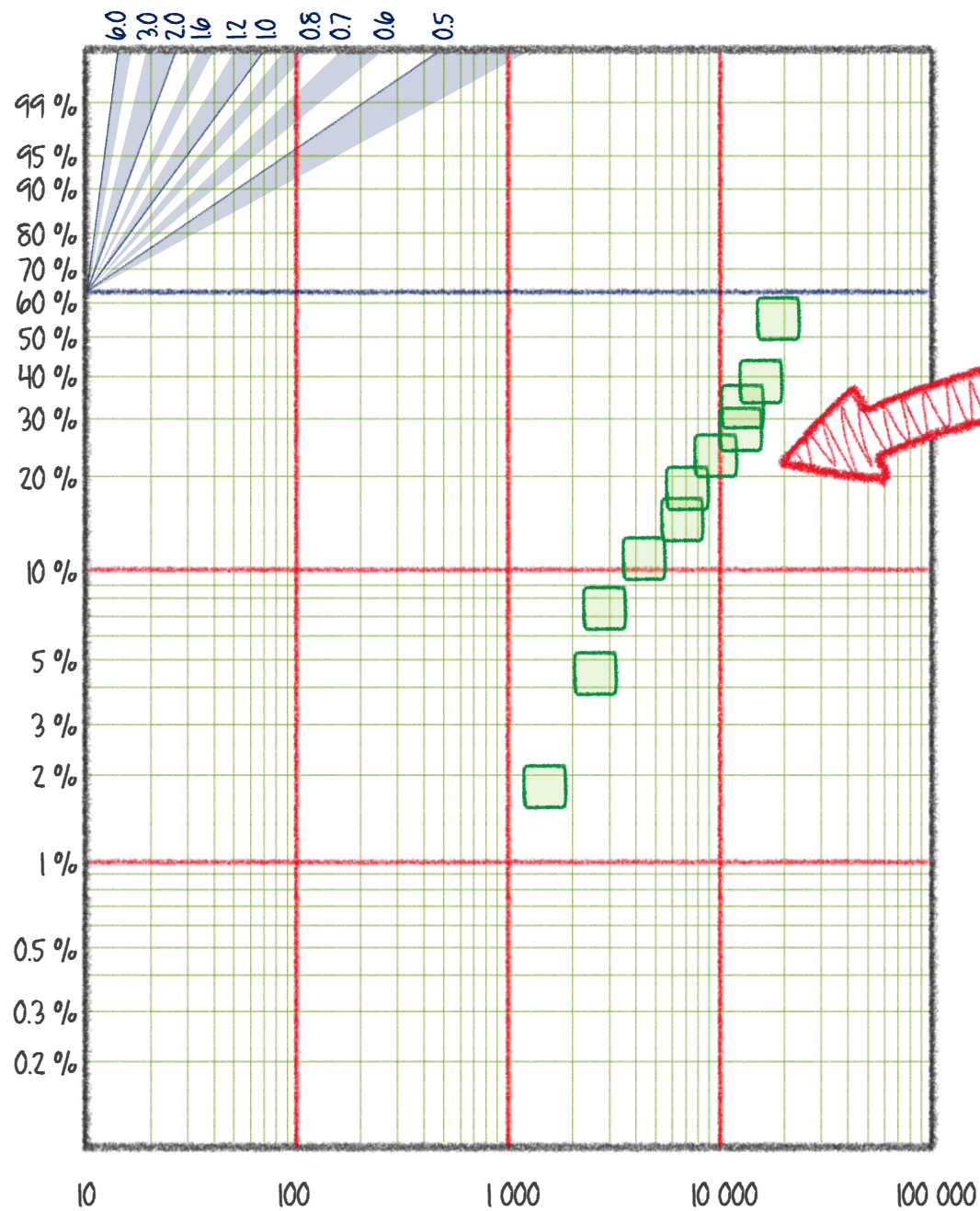


... now what would
you recommend?

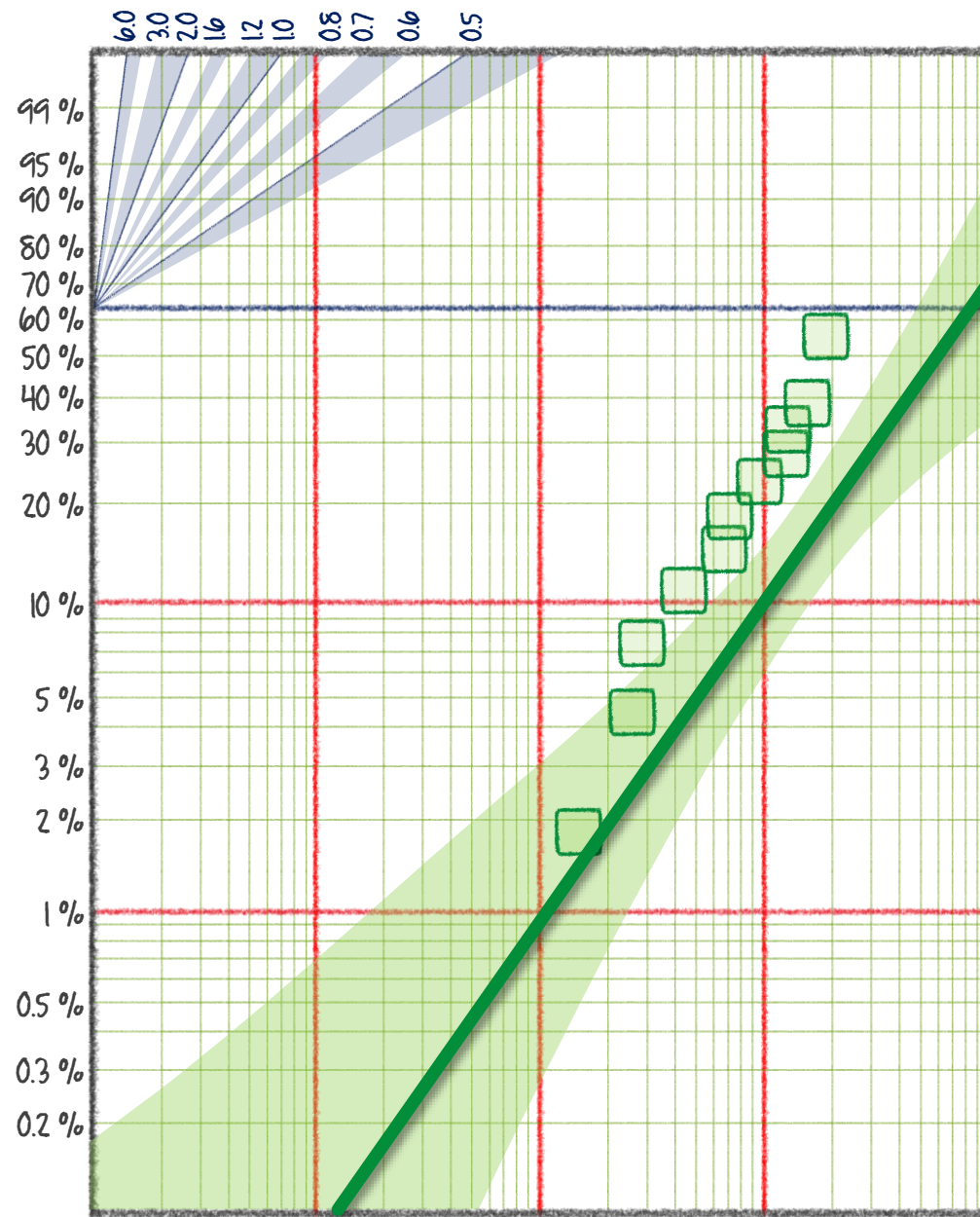
CUMULATIVE DISTRIBUTION FUNCTION (CDF)



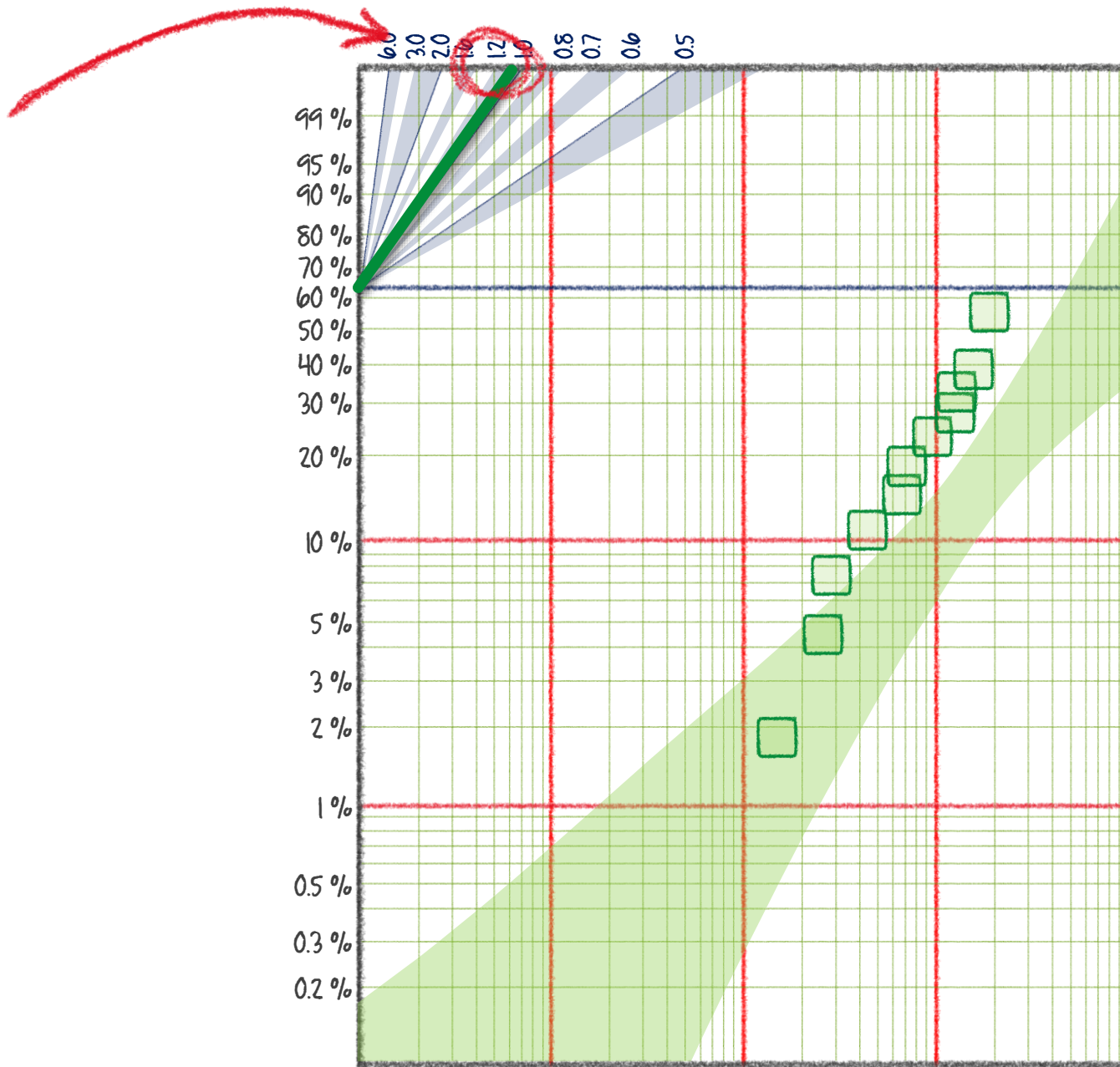
CUMULATIVE DISTRIBUTION FUNCTION (CDF)



... bottom
end



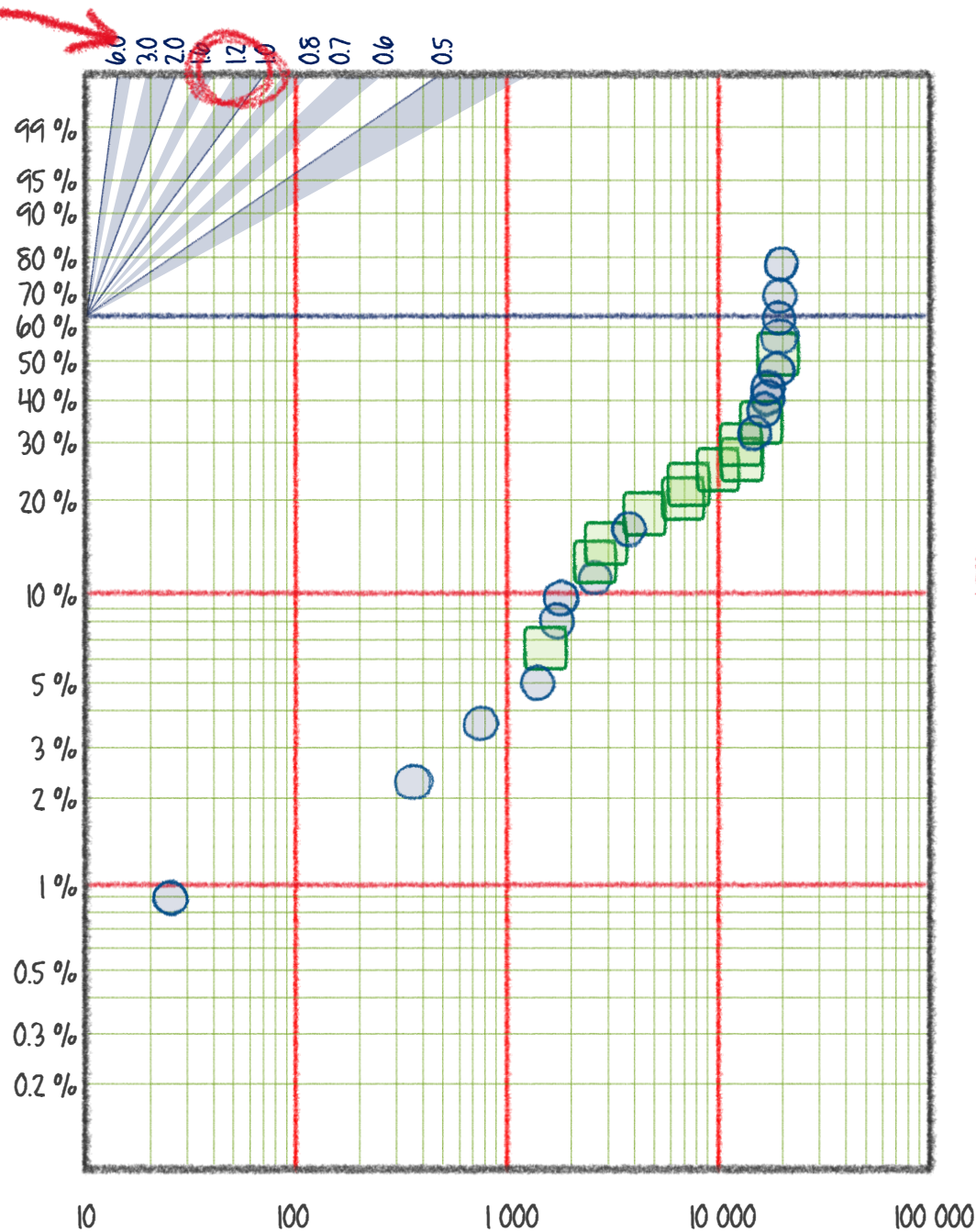
$\beta = 1.11$



... what does this
suggest?

= 3
1.11

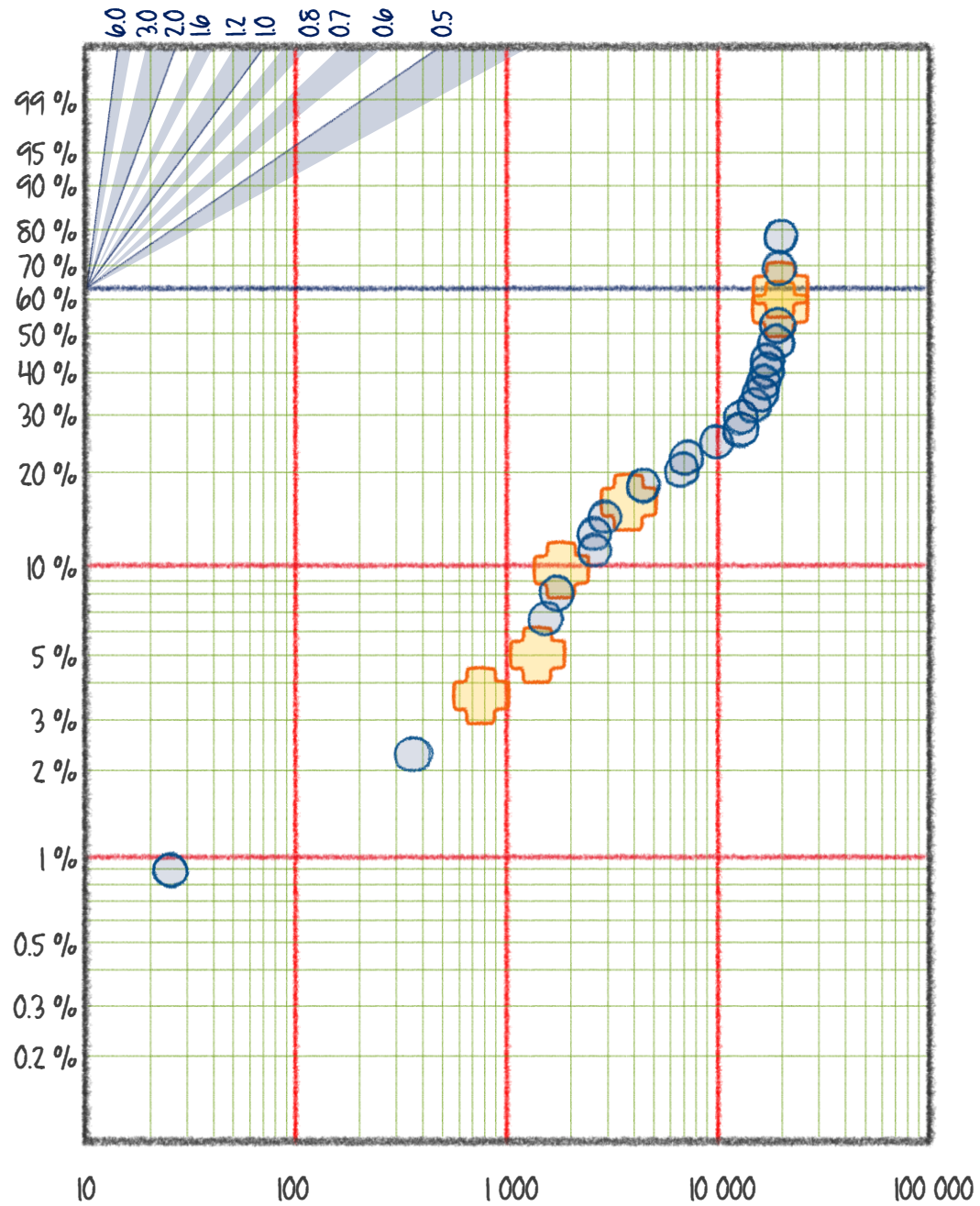
CUMULATIVE DISTRIBUTION FUNCTION
(CDF)



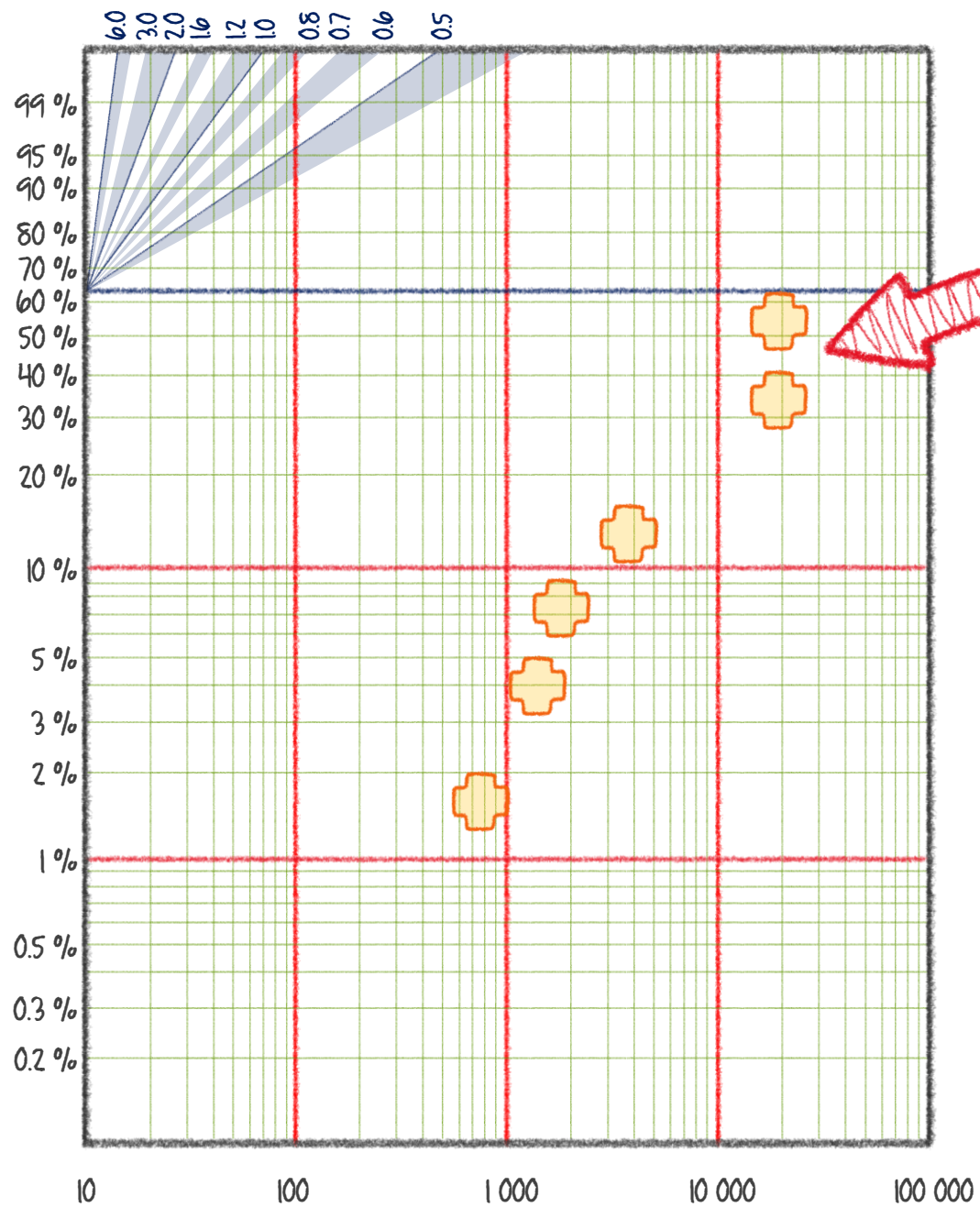
... FAST
FORWARD...

... an RCA identified
that contaminants
in the lubrication
were randomly
critically damaging
the engine

CUMULATIVE DISTRIBUTION FUNCTION (CDF)

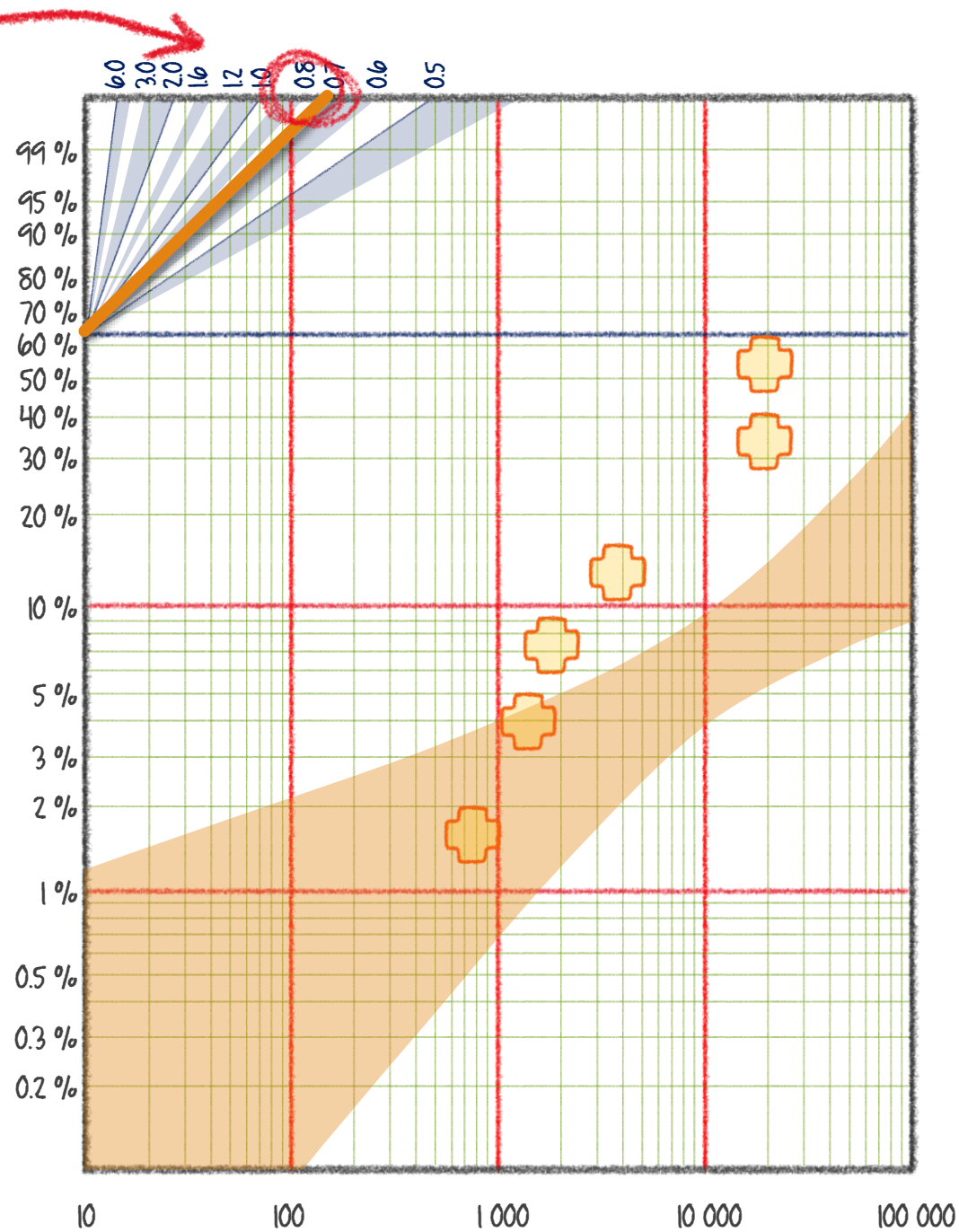


CUMULATIVE DISTRIBUTION FUNCTION (CDF)



$$3 = 0.73$$

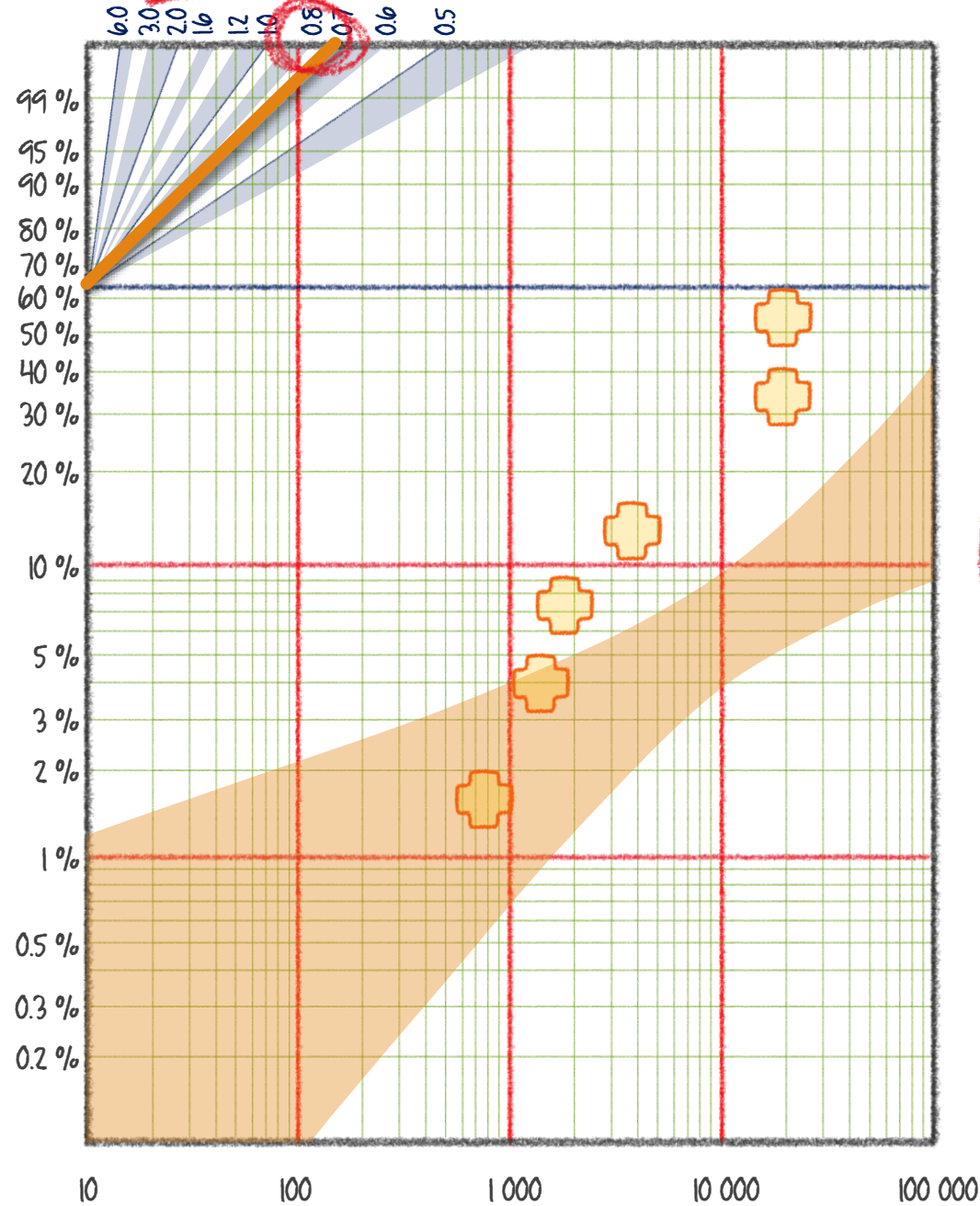
CUMULATIVE DISTRIBUTION FUNCTION
(CDF)



... what does this
suggest?

$$B = 0.73$$

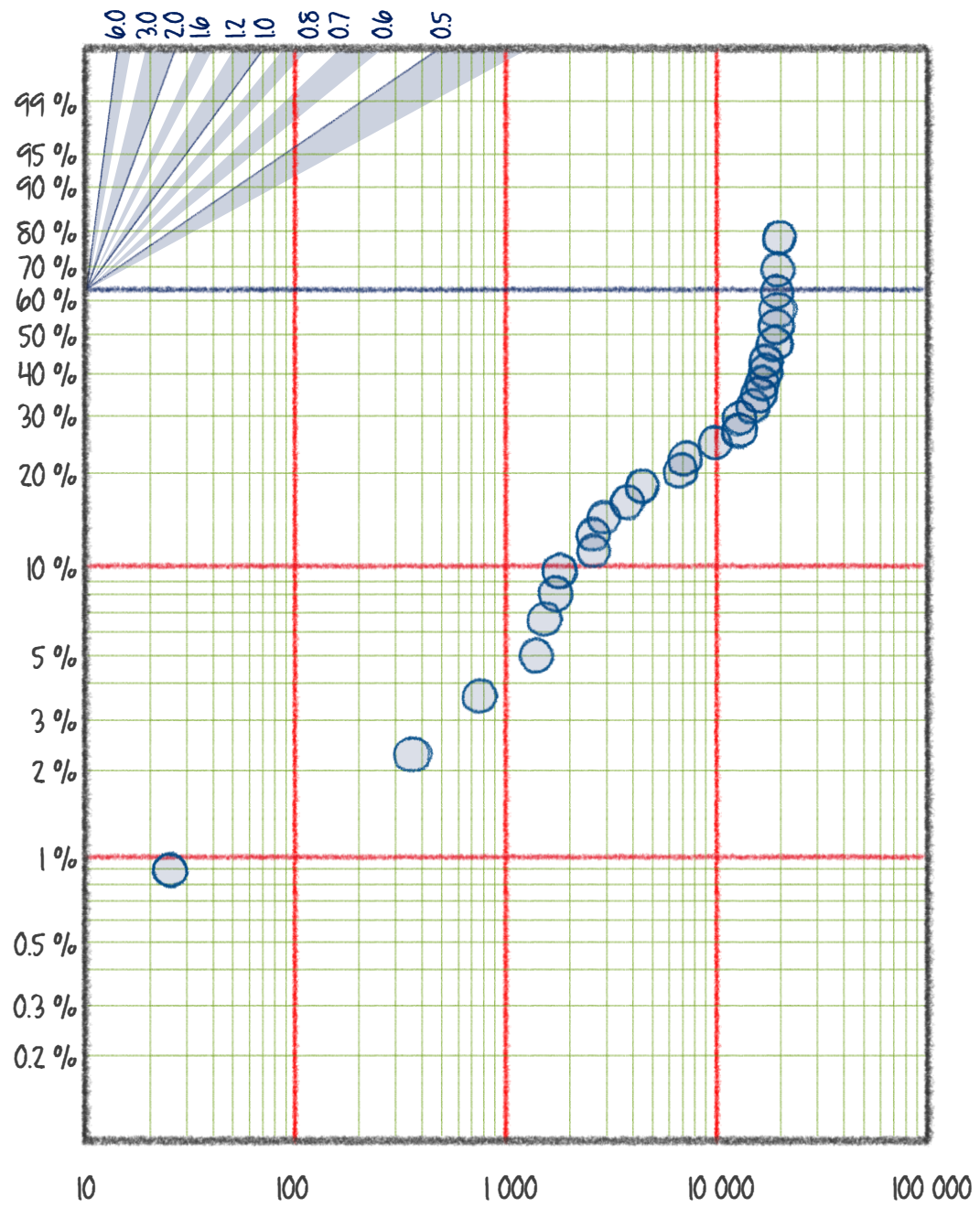
CUMULATIVE DISTRIBUTION FUNCTION
(CDF)



... FAST
FORWARD...

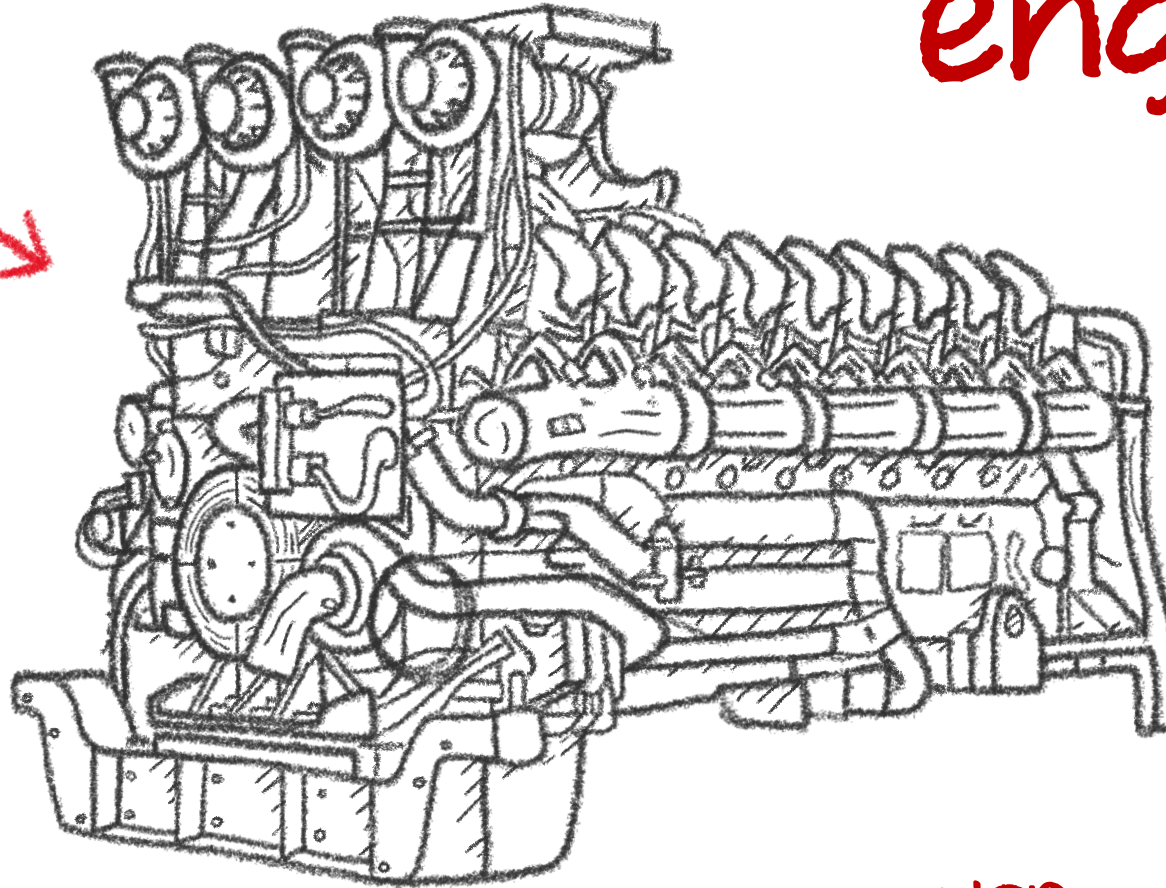
... an RCA identified
that this was due to
an installation issue

CUMULATIVE DISTRIBUTION FUNCTION (CDF)



... but the most
important message of
this lesson is ...

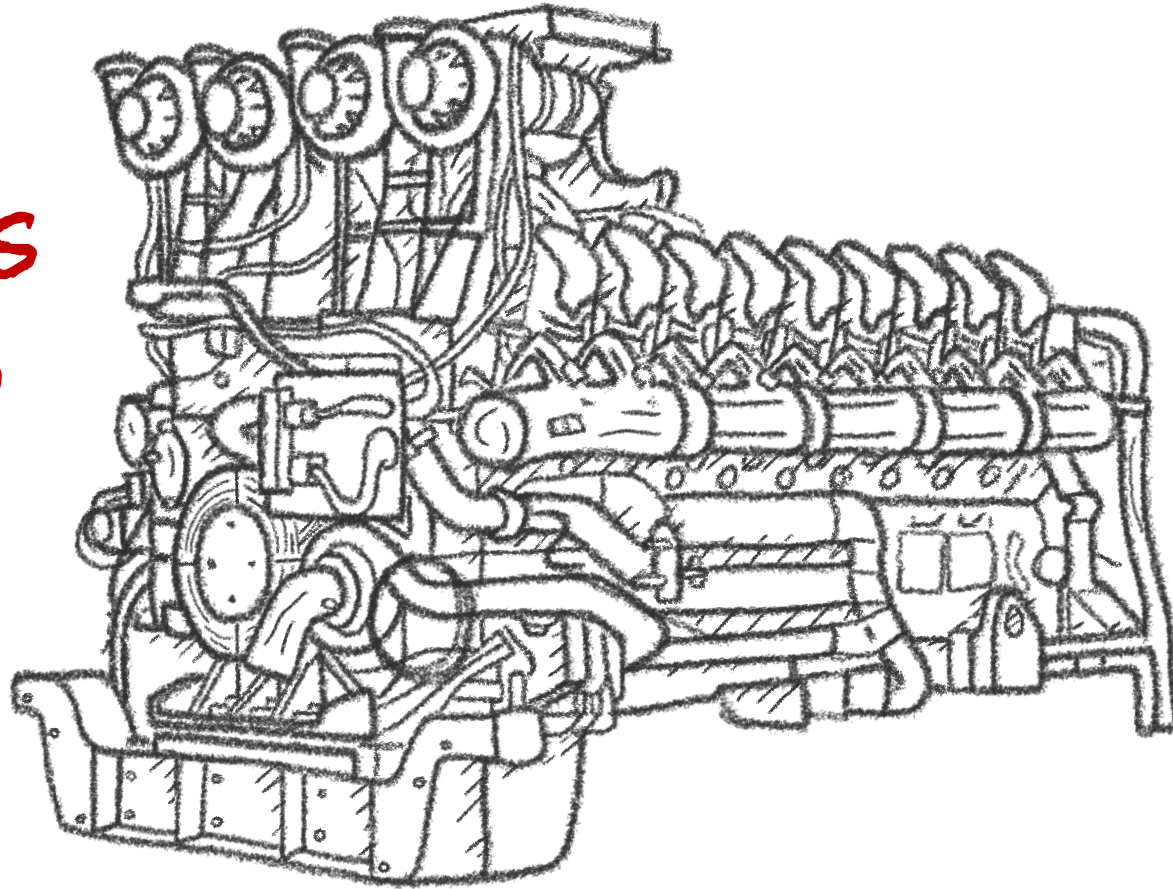
... 20
cylinder
engine



... really big
engine

... \$ USD
700 - 800 thousand

82 %
of all failures
are down to
3
components



... the VITAL FEW ...

