"百年一遇"的洪灾为何年年遇?

李永乐老师

▶ 看视频

Hello everyone, I'm Teacher Li Yongle	各位同学大家好 我是李永乐老师	**各位** (gè wèi) everybody; all (guests, colleagues etc); all of you. **永乐** (yǒng lè) Yongle Emperor, reign name of third Ming emperor Zhu Di 朱棣 (zhū dì) (1360-1424), reigned 1403-1424, Temple name 明成祖 (míng chéng zǔ).
Recently, many areas across the country have encountered floods	最近 全国很多地区遇到了洪涝灾害	**全国** (quán guó) whole nation; nationwide; countrywide; national. **地区** (dì qū) local; regional; district (not necessarily formal administrative unit); region; area; as suffix to city name, means prefecture or county (area administered by a prefecture-level city or county level city). **洪涝** (hóng lào) flood; inundation; flooding. **灾害** (zāi hài) calamity; disaster.
The water level in some areas of Poyang Lake even exceeded 1998	鄱阳湖一些地区的水位甚至超过了1998年	**鄱阳湖** (pó yáng hú) Poyang Lake in Shangrao 上饶 (shàng ráo), Jiangxi. **水位** (shuǐ wèi) water level.
A kid told me	有一个小朋友跟我说	**小朋友** (xiǎo péng yǒu) child.
There is flooding in their place again	他们那个地方又发大水了	**大水** (dà shuǐ) flood.
Encountered a flood once in a hundred years	遇到了百年一遇的洪水	**百年** (bǎi nián) hundred years; century; lifetime. **洪水** (hóng shuǐ) deluge; flood.
He said in the last ten years	他说最近十年	
This once-in-a-hundred-year flood has been encountered three times	这百年一遇的洪水都已经遇到三次了	**三次** (sān cì) third; three times; (math.) degree three, cubic (equation).
He wanted to ask me what is once in a century	他想问我究竟什么是百年一遇呢	

Why does it happen only once in a hundred years	为什么明明一百年才会遇到一次的事	明明 (míng míng) obviously; plainly; undoubtedly; definitely.
You can meet three times in ten years	十年之内却可以遇到三次呢	之内 (zhī nèi) inside; within.
Today we will explain this problem	今天我们来解释一下这个问题	
So to explain this once in a hundred years	那么为了解释这个百年一遇	
Its proper noun should be called flood return period	它的专有名词应该叫洪水的重现期	专有名词 (zhuān yǒu míng cí) proper noun. 重现 (chóng xiàn) to reappear.
How often is the return period	多长时间重复一次叫重现期	重复 (chóng fù) to repeat; to duplicate.
To explain this concept	为了解释这个概念	概念 (gài niàn) concept; idea.
Let's first give an example	我们首先 先来举个例子	例子 (lì zi) case; (for) instance; example.
for example	举个例子	
For example, there is a region with a thousand years of hydrological data	比如说有一个地区有一千年的水文资料	千年 (qiān nián) millennium. 水文 (shuǐ wén) hydrology. 资料 (zī liào) material; resources; data; information; profile (Internet).
We know that many regions in China have a long history	我们知道中国很多地区历史悠久	历史悠久 (lì shǐ yōu jiǔ) long-established; time-honored.
It has a long history of hydrological data	它有很长时间的水文资料记载	记载 (jì zǎi) to write down; to record; written account.
Then said that it recorded a river	然后说记载了一条河	
There is not much water in this river	这条河平时也没多大水	多大 (duō dà) how big; how much; how old etc.
But sometimes	但是有的时候	有的时候 (yǒu de shí hòu) sometimes; at times.
This river will flood up to 100 cubic meters per second	这河会发洪水达到100立方米每秒	达到 (dá dào) to reach; to achieve; to attain. 立方米 (lì fāng mǐ) cubic meter (unit of volume). 秒 (miǎo) second (unit of time); arc second (angular measurement unit); (coll.) instantly.
Such a large flow	这么大的流量	流量 (liú liàng) flow rate; rate; throughput; site traffic (Internet).
How many years does it reach 100 cubic meters per second?	达到100立方米每秒 有多少年呢	
A hundred years	有一百年	
This flow rate is reached in one hundred of a thousand years	就是在一千年中有一百年是达到这个流量的	

We call this kind of flood once every ten years	这种洪水我们就管它叫十年一遇	
Why is it called once in ten years?	为什么叫十年一遇呢	
You see me in a thousand years	你看我在一千年中	
I met it a hundred times, right?	我遇到了一百次 对不对	**对不对** (duì bù duì) right or wrong?; Is it right?; OK, yes? (colloquial).
So I will meet once every ten years	所以就是每隔十年我会遇到一次	**每隔** (měi gé) at intervals of; every (so often).
On average, it's called once in ten years	平均来讲 叫十年一遇	**平均** (píng jūn) average; on average; evenly; in equal proportions. **来讲** (lái jiǎng) as to; considering; for.
Flood once in ten years	十年一遇的洪水	
So what is the probability of encountering each year?	那么每一年遇到的概率是多大呢	**概率** (gài lǜ) probability (math.).
The probability of encountering every year is 1/10	每一年遇到的概率就是1/10	
Only once in ten years	平均十年才会遇到一次	
If the flow rate reaches 200 cubic meters per second	如果流量达到了200立方米每秒了	
At this time, the water is even bigger	这种时候这水就更大了	
How many times? Ten times	有多少次呢 有十次	
There are ten times in historical records	在历史记载上一共有十次	
Ten times in a thousand years	一千年中有十次	
So it's only once every 100 years	所以平均一百年才会遇到一次	
We call such a flood called once in a hundred years	我们称这样的洪水就叫百年一遇	**称** (chēng) to weigh; to state; to name; name; appellation; to praise.
The corresponding probability is 1/100	相应的概率就是1/100	**相应** (xiāng yìng) to correspond; answering (one another); to agree (among the part); corresponding; relevant; appropriate; (modify) accordingly.
The probability of such a big flood every year is 1%	每一年发这么大洪水的概率都是1%	
Let's look at this river again	咱们再看假如说这条河流	**假如** (jiǎ rú) if. **河流** (hé liú) river.

Sometimes it will reach 300 cubic meters per second	也有的时候会达到300立方米每秒	
And only once in the historical record	而在历史记载中只**有一次**	**有一次** (yǒu yī cì) once; once upon a time.
Then we call it once in a thousand years	那我们就叫它千年一遇	
Because only once in a thousand years of records, right?	因为在一千年的记载中只有一次 对不对	
Correspondingly, the probability of such a big flood every year	相应的 每一年发生这么大洪水的概率	
Only 1/1000	就只有1/1000	
If we have a thousand years of hydrological data	那如果我们有一千年的水文资料	
I can only count it here	就**只能**算到这儿了	**只能** (zhǐ néng) can only; obliged to do sth; to have no other choice.
You want to calculate how big the flood is once in 10,000 years	你想算**万年**一遇的洪水有多大	**万年** (wàn nián) Wannian county in Shangrao 上饶, Jiangxi.
Can't calculate, only estimate	**没法**算 只能是估计	**没法** (méi fǎ) at a loss; unable to do anything about it; to have no choice.
If there is a region	那假如有一个地区	
If it only has 50 years of hydrological data	它只有**五十**年的水文资料的话	**五十** (wǔ shí) fifty.
You want to calculate this area	你想**计算**这个地区	**计算** (jì suàn) to count; to calculate; to compute.
Flood magnitude once in a hundred years, once in a thousand years	百年一遇 千年一遇的洪水量级	
It's all very difficult	这都是非常困难的	
Okay, we probably understand what a once-in-a-century encounter is	好的 我们大概明白了什么是百年一遇	
Let's summarize it	我们把它总结一下	
It means that if in N years	意思**就是说**假如在N**年中**	**就是说** (jiù shì shuō) in other words; that is. **年中** (nián zhōng) within the year; in the middle of the year; mid-year.
This flood occurred k times	这个洪水出现了k次	

English	Chinese	Vocabulary
Appeared k times	出现了k次	
Then we call it once in many years	那我们就称它是多少年一遇	
Its return period	它的重现期	
The return period is called T	重现期叫做T	叫做 (jiào zuò) to be called; to be known as.
Is N/k	就是N/k	
This flood occurred 10 times in a thousand years	这个洪水一千年中出现10次	
The return period is 1000 divided by 10	重现期就是1000再除以10	除以 (chú yǐ) (math.) divided by.
That's it, right	就这意思 对吧	
Return period	重现期有了	有了 (yǒu le) I've got a solution!; to have a bun in the oven (abbr. for 有了胎 (yǒu le tāi)).
We can also calculate the probability of occurrence each year	我们还可以算出每一年发生的概率	算出 (suàn chū) to figure out.
What is the probability of occurrence every year?	每一年发生的概率有多大呢	
P is k/N	P就是k/N	
Appeared k times in N years	在N年中出现了k次	
So k/N is the probability of occurrence every year	所以k/N就是每一年发生的概率	
The two of them are the reciprocal of each other	他们两个是互为倒数的	倒数 (dào shǔ) to count backwards (from 10 down to 0); to count down; from the bottom (lines on a page); from the back (rows of seats).
So the once-in-a-hundred-year flood	所以百年一遇的洪水	
The probability of occurrence every year is one percent	每一年出现的概率就是百分之一	
Flood once in a thousand years	千年一遇的洪水	
The probability of occurrence every year is one in a thousand	每一年出现的概率就是千分之一	之一 (zhī yǐ) one of (sth); one out of a multitude; one (third, quarter, percent etc).
This is a question of statistics	这就是一个统计的问题	统计 (tǒng jì) statistics; to count; to add up.
But we need to know	但是我们要知道	
Flood once in a hundred years	百年一遇的洪水	

It's not that it must be once every 100 years	不是说一定是隔一百年就一次	隔 (gé) to separate; to partition; to stand or lie between; at a distance from; after or at an interval of.
Like Halley's Comet	就像哈雷彗星一样	哈雷彗星 (hā léi huì xīng) Halley's Comet.
Return every 76 years	每隔76年回归一次	回归 (huí guī) to return to; to retreat; regression (statistics).
Not that	不是那意思	
It is encountered once in a hundred years on average	它是平均来讲一百年会遇到一次	
But it might not happen in a hundred years	但是一百年也可能会遇不到	不到 (bù dào) not to arrive; not reaching; insufficient; less than.
It is also possible to encounter twice, three times, four times	也有可能会遇到两次 三次 四次	有可能 (yǒu kě néng) possible; probable; possibly; probably; may; might. 四次 (sì cì) fourth; four times; quartic.
Okay, let's do the calculations	那好 我们就来算一算	
If we want to ask	假如说我们想问一下	
Said it was a once-in-a-hundred-year flood	说是一个百年一遇的洪水	
What is the probability of encountering in thirty years	三十年内遇到的概率有多大	三十 (sān shí) thirty; 30. 年内 (nián nèi) during the current year.
We might as well	我们不妨普遍一点	不妨 (bù fáng) there is no harm in; might as well.
We say in N years	我们说在N年中	
N years	N年中	
We have to count at least once	我们要算至少遇到一次	
Flood once in a hundred years	百年一遇的洪水	
We want to calculate this probability	我们想算一下这个概率	
At least one flood once in a hundred years in N years	N年中至少遇到一次百年一遇的洪水	
We know that the once-in-a-hundred-year flood	我们知道 百年一遇的洪水	
What is the probability of occurrence every year	每一年发生的概率是多大	
The probability of occurrence per year is 1/100	每一年发生的概率 就是1/100	
This is the probability of occurrence, right	这是发生的概率 对不对	

Then it doesn't happen	那么不发生呢	
The probability of not happening is 99% 0.99	不发生的概率就是99% 0.99	
This does not happen every year	这是每一年不发生的	
Okay, how about N years	好 那么N年呢	
If N years, it will not happen	如果N年的话它不发生	
It doesn't happen in N years, it doesn't happen every year in N years	N年不发生 就是这N年中每一年都不发生	
So it is 0.99^N right	所以它是0.99^N 对不对	
OK, then I ask it happened at least once in N years	好 那我问N年至少发生一次呢	
At least once	至少一次怎么算	
We just use 1 minus this N years	我们就用1减去这个N年都不发生的	减去 (jiǎn qù) minus; to subtract.
$1-0.99^N$	$1-0.99^N$	
This is encountered at least once in N years	这就是在N年中至少遇到一次	
Probability of a flood once in a hundred years	百年一遇洪水的概率	
If we draw this picture	如果我们把这个图画出来	图画 (tú huà) drawing; picture.
You may see it more clearly	大家可能会看得更清楚一点	
The abscissa is this N, which is the number of years	横坐标是这个N 也就是年数	横坐标 (héng zuò biāo) horizontal coordinate; abscissa. 也就是 (yě jiù shì) that is; i.e..
The ordinate is	纵坐标是	纵坐标 (zòng zuò biāo) vertical coordinate; ordinate.
The probability of this once-in-a-hundred-year flood occurring at least once	至少发生一次这个百年一遇洪水的概率	
What will it look like after drawing	画出来之后长什么样呢	什么样 (shén me yàng) what kind?; what sort?; what appearance?.
Probably looks like this	大概是长这个样子	
OK, in 10 years	好 那么在10年的时候	
Probability of at least one flood once in a century	至少发生一次百年一遇洪水的概率	

About 9.6%	大约是9.6%	
That is to say within 10 years	也就是说在10年之内	也就是说 (yě jiù shì shuō) in other words; that is to say; so; thus.
The probability of a once-in-a-hundred-year flood is 9.6%	发生一次百年一遇洪水的概率 9.6%	
What if it's up to 30 years	如果是上升到30年的时间呢	上升 (shàng shēng) to rise; to go up; to ascend.
The probability of a 100-year flood within 30 years is 26%	在30年内发生百年一遇洪水的概率是26%	
26% probability within 30 years	30年之内有26%的概率	
There will be a flood once in a hundred years	会发生百年一遇洪水	
50 years	50年呢	
The probability of a 100-year flood within 50 years is 39%	50年内发生百年一遇洪水的概率是39%	
A hundred years	一百年呢	
If we draw a little longer for 100 years	假如说我们画长一点 100年	
Will a 100-year flood happen in 100 years	100年是不是一定会发生百年一遇洪水	
No, about 63%	不是 大约是63%	
That's about 37% probability in 100 years	就是100年内还有大概37%的概率	
It won't happen once in a hundred years	它是不会发生百年一遇洪水的	
So we will find this once in a hundred years is good	所以我们会发现这个百年一遇也好	
Once in a thousand years	千年一遇也好	
It's all a question of probability	它都是个概率问题	
It does not mean that it will happen every once in a while	它并不是说每隔一段时间就一定会发生一次	
Even if you only watch it within 10 years	就算你只在10年的范围内看	就算 (jiù suàn) granted that; even if. 范围 (fàn wéi) range; scope; limit; extent.
You also have a 10% probability	你也大概有10%的概率	

There will be a flood once in a hundred years	是会发生百年一遇洪水	
Then let's go back and say	那么我们回过头来说	**过头** (guò tóu) to overdo it; to overstep the limit; excessively; above one's head; overhead.
Many flood control measures have certain standards	说很多防洪措施它都有一定的标准	**防洪** (fáng hóng) flood control; flood prevention. **措施** (cuò shī) measure; step.
For example, a dam in a big city	比如说一个大城市的堤坝	**大城市** (dà chéng shì) major city; metropolis. **堤坝** (dī bà) dam; dike.
When it was designed	它设计的时候	**设计** (shè jì) plan; design; to design; to plan.
It may be designed according to the once-in-a-century standard	可能是按照百年一遇标准去设计的	
So does it mean that the dam is designed according to the once-in-a-century standard?	那么是不是说按照百年一遇标准去设计的大坝	**大坝** (dà bà) dam.
It will be guaranteed for 100 years.	就一定能保100年呢 不是	
If we have a flood protection facility	如果我们有一个防洪设施	**设施** (shè shī) facilities; installation.
The standard of this flood control facility	这个防洪的设施的标准	
The flood control standard is once in a hundred years	防洪标准它是百年一遇的	
In other words, there will not be a once-in-a-hundred-year flood, it can withstand it	也就是说不发生百年一遇的洪水 它是能扛住	**扛** (gāng) to raise aloft with both hands; (of two or more people) to carry sth together.
Once in a hundred years, it won't be able to handle the flood	一遇到百年一遇洪水就扛不住了	**不住** (bù zhù) repeatedly; continuously; constantly; unable to (resist, conceal etc).
If it looks like this	假如说这个样子的	
Then let's see how likely it is to be safe in 10 years	那我们看它在10年内安全的概率有多少	
Safe within 10 years	10年内安全	
It means that there will be no once-in-a-hundred-year flood in 10 years	就是10年内不发生百年一遇洪水	
Then use 1-9.6%, right	那就用1-9.6% 对不对	
So it's about 90%	所以大概是90%	

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How about safety in 30 years	那30年内安全呢	
Safe in 30 years is in 30 years	30年内安全 就是在30年内	
There is no flood once in a hundred years	都不发生百年一遇洪水	
1-26% 74%	1-26% 74%	
In other words, the probability that you are safe within 30 years is only 74%	也就是说你在30年内安全的概率只有74%	
Then you have a 36% chance	那你还有36%的可能性	可能性 (kě néng xìng) possibility; probability.
There will be a once-in-a-hundred-year flood within 30 years	30年之内就会出现百年一遇洪水	
So this flood control standard cannot be met, right?	所以这个防洪标准达不到的 对不对	达不到 (dá bù dào) cannot achieve; cannot reach.
So we say that your design standard is a once-in-a-hundred-year flood	因此我们说你设计标准是百年一遇的洪水	
But it may not guarantee 100 years	但是不一定能保100年	不一定 (bù yī dìng) not necessarily; maybe.
Similarly, if your design standard is a once-in-ten-year flood	同样的 如果你设计标准是10年一遇的洪水的话	同样 (tóng yàng) same; equal; equivalent.
Then you have a high probability that you will not be able to keep it for 10 years	那你有极大的概率是保不了10年的	极大 (jí dà) maximum; enormous. 不了 (bù liǎo) unable to; without end.
Just now we calculated the probability of encountering at least once	刚才我们计算的是 至少遇到一次的概率	
Then I want to ask that in 10 years	那我想问说10年内	
There are three times the probability of encountering a 100-year flood	有三次遇到百年一遇洪水的概率	
How to calculate this	这个又该怎么算呢	
For this we have to use a mathematical distribution	这个我们就得用一个数学分布了	分布 (fēn bù) to scatter; to distribute; to be distributed (over an area etc); (statistical, geographic) distribution.
Its name is binomial distribution	它的名字叫做二项式分布	二项式 (èr xiàng shì) two items; binomial (math.).

What is the binomial distribution?	什么是二项式分布呢	
The binomial distribution is actually like flipping a coin	二项式分布其实就跟抛硬币差不多	抛 (pāo) to throw; to toss; to fling; to cast; to abandon. 硬币 (yìng bì) coin.
The probability that we succeed in doing one thing is P	我们做一件事成功的概率是P	
Of course, what is the corresponding probability of failure	当然了 相应的失败的概率是多少	
The probability of failure is 1-P	失败的概率就是1-P	
We repeat N times	我们重复N次	
Then we have to succeed k times	然后我们要成功k次	
I just asked what is the probability	我就问这个概率有多大	
We call this probability distribution the binomial distribution	这种概率分布我们就称之为二项式分布	称之为 (chēng zhī wéi) to call it...; known as....
It can be written as f(k, N, P)	它可以写作f(k,N,P)	写作 (xiě zuò) to write; to compose; writing; written works.
For example	举个例子来说	
For example, when we shoot the basket	比如我们投篮 投篮的时候呢	投篮 (tóu lán) to shoot for the basket (basketball).
The probability of hitting is 30%, the probability of not hitting is 70%	投中的概率是30% 不中的概率是70%	投 (tóu) to cast; to send; to throw oneself (into the river etc); to seek refuge; to place oneself into the hands of.
I made 10 baskets and 3 times. What is the probability?	我投10次篮有3次投中 概率多大	投中 (tóu zhòng) to hit the target with one's throw; (basketball) to score.
We can write like this, right	我们就是可以这么写 对吧	
This is called the binomial distribution. Let me give you another example	这叫二项式分布 再举个例子	
For example, this flood	比如说这个洪水	
Flood once in a century	百年一遇洪水	
The probability of appearance is 1%, right?	出现的概率是1% 是吧	

English	Chinese	Vocabulary
The probability of not appearing is 99%	不出现的概率是99%	
So it appeared 3 times in 10 years but not 7 times	那么在10年之中出现了3次 不出现7次	之中 (zhī zhōng) inside; among; in the midst of (doing sth); during.
How big is this probability can also be calculated by this	这个概率是多大 也可以用这个来算	
Then the formula of the binomial distribution looks like this	那么二项式分布的公式是这个样子的	公式 (gōng shì) formula.
Call it C(N k) and then call it $p^k(1-p)^{(N-k)}$	叫做C(N k) 然后呢 叫$p^k(1-p)^{(N-k)}$	
Some students may think this is too messy	有同学可能觉得 这什么玩意 太乱了	玩意 (wán yì) toy; plaything; thing; act; trick (in a performance, stage show, acrobatics etc).
Actually this is not difficult to understand	其实这个并不难理解	
Let's see what p is and p is the probability of success	咱们看这个p是什么 p是成功的概率	
The probability of a success is p	一次成功概率就是p	
You have succeeded k times, right	你有k次成功的 对不对	
So it is p^k	所以就是p^k	
In the same way (1-p) is failure, you have succeeded k times	同样道理(1-p)是失败 你有k次成功了	道理 (dào li) reason; argument; sense; principle; basis; justification.
A total of N times, isn't there (N-k) failures?	一共是N次 那不就有(N-k)次失败吗	
So the one on the right means	所以右边的这个就表示的是	
There are (N-k) failures	有(N-k)次失败	
So what does C(N k) mean?	那么C(N k)又表示什么呢	
For example, you have 3 major floods in 10 years	比如说你在10年中有3次大洪水	
Then these 3 major floods	那么这3次大洪水	
It's the first year, the second year, the third year	是第一年 第二年 第三年呢	
It's the first year, the second year, and the fourth year.	还是第一年 第二年 第四年呢	

Is it the fifth year, the sixth year, the seventh year?	还是第五年 第六年 第七年呢	第五 (dì wǔ) fifth.
You have to choose 3 years for me in 10 years	你在10年中你得给我选3年吧	
So this C(N k) means	所以这个C(N k)它的意思就是	
K successes out of N experiments	在N次实验中有k次成功	实验 (shí yàn) experiment; test; experimental; to experiment.
How many ways are there, right?	到底有多少种方法 对不对	
This is actually the number of methods	这个其实就是方法数	
The number of methods to select k times in N experiments	在N次实验中选出k次的方法数	中选 (zhòng xuǎn) to win an election; to get a position by passing the imperial exam.
Number of methods	方法数	
We multiply the number of methods by the k power of success	我们用方法数乘以成功的k次幂	乘以 (chéng yǐ) (math.) multiplied with. 幂 (mì) power; exponent (math.); to cover with a cloth; cloth cover; veil.
Multiplied by the failed (N-k) power	乘以失败的(N-k)次幂	
The final result is the binomial distribution we just mentioned.	最后得到的就是我们刚才所说的二项式分布了	
Everyone can press these two calculators	这里面后面这两项大家计算器都能摁出来	项 (xiàng) back of neck; item; thing; term (in a mathematical formula); sum (of money); classifier for principles, items, clauses, tasks, research projects etc. 计算器 (jì suàn qì) calculator; calculating machine. 摁 (èn) to press (with finger).
How did you get the previous item?	前面这一项怎么弄出来呢	
How to calculate C(N k)	这C(N k)怎么算呢 其实也不难算	
Do you remember there is a gadget called Yanghui Triangle	大家还记得有一个玩意儿叫杨辉三角吗	玩意儿 (wán yì r) erhua variant of 玩意 (wán yì). 辉 (huī) splendor; to shine upon. 三角 (sān jiǎo) triangle.
Yanghui triangle What does Yanghui triangle mean?	杨辉三角 杨辉三角是什么意思呢	
The first row is 1 The second row is 1 1	第一行是1 第二行是1 1	

The third row is 1 2 1 The fourth row is 1 3 3 1	第三行是１２１第四行１３３１	
The fifth line 1 4 6 4 1 just keep writing down	第五行１４６４１就往下一直写	
What's the characteristic? It is 1 in the left and right columns.	有什么特点呢 就是它左和右这两列它都是1	
Then any number	然后任意一个数字	任意 (rèn yì) arbitrary; at will; at random.
Are equal to the sum of the two numbers on its shoulder	都等于它肩膀上两个数字的和	等于 (děng yú) to equal; to be tantamount to. 肩膀 (jiān bǎng) shoulder.
For example, 2=1+1 3=1+2	比如2=1+1 3=1+2	
1+2=3 right	1+2=3 对吧	
Just like this, can you write the next line?	就这个样子 那你能写出下一行吗	一行 (yī xíng) party; delegation.
The next line is 1 4 6 4 1, right? Yang Hui triangle	下一行就是１４６４１对吧 杨辉三角	
What does Yanghui Triangle have to do with this?	说杨辉三角跟这个有什么关系呢	
In fact, every number on the Yang Hui triangle	其实杨辉三角上的每一个数字	
All correspond to a C(N k), do you know	都对应了一个C(N k) 你知道吗	对应 (duì yìng) to correspond; a correspondence; corresponding; homologous; matching with sth; counterpart.
The first number 1	第一个数字1	
It actually corresponds to C(0 0)	它其实对应的就是C(0 0)	
Choose 0 out of 0	在0次里边选0次	里边 (lǐ bian) inside.
The two 1 in the second row	第二行这两个1	
Is C(1 0) and C(1 1)	就是C(1 0)和C(1 1)	
Choose 0 times in 1 time and choose 1 time in 1 time	在1次里边选0次和在1次里边选1次	
The third line 1 2 1 is C(2 0) C(2 1) C(2 2)	第三行１２１就是 C(2 0) C(2 1) C(2 2)	
So if you want	所以如果你想	
I want to know how to calculate this C(N k)	想知道这个C(N k)到底怎么算	

You can take out the Yanghui Triangle. After taking it out	你可以杨辉三角取出来 取出来了之后	
Just find the number and substitute it in	找到那个数字代进去就可以了	进去 (jìn qù) to go in.
Of course the easier way is to search on the Internet, right?	当然更简单的方法是在网上搜一下 对吧	搜 (sōu) to search.
You can figure it out by searching for this number of combinations	搜一下这个组合数你也能算得出来	组合 (zǔ hé) to assemble; to combine; to compose; combination; association; set; compilation; (math.) combinatorial.
Okay, we're done with the Yang Hui triangle	好 这杨辉三角我们说完了	完了 (wán le) to be finished; to be done for; ruined; gone to the dogs; oh no.
Then we will calculate this binomial distribution, right	这样我们就会算这个二项式分布了 对吧	
Now we want to ask that there is a flood once in a hundred years	现在我们就想问 说有一个百年一遇的洪水	
The probability of a once-in-a-hundred-year flood is 0.01	百年一遇的洪水它出现的概率是 0.01	
How many years are there now? 10 years	现在有多少年呢 有10年的时间	
As a result it appeared 3 times	结果它出现了3次	
I want to ask you how big this probability should be and how to calculate it	我想问 你说这个概率应该有多大 怎么算呢	
Then the probability P should be f(3,10,0.01)	那这个概率P就应该是 f(3,10,0.01)	
According to this formula, it should be	按照这个公式那应该是	
C(10 3)×0.01³×0.99⁷	$C(10\ 3)\times0.01^3\times0.99^7$	
In this way, the probability is about 0.01%	这么一算这个概率大概是0.01%	
Let's take a look at 0.01% means 1/10000	大家看一下0.01%的意思就是万分之一	万分 (wàn fēn) very much; extremely; one ten thousandth part.
That means you met 3 times in 10 years	就是说你在10年内遇到3次	
The probability of a flood once in a hundred years is one in ten thousand	百年一遇洪水的概率是万分之一	

It's almost impossible, right	这几乎是不可能的 对吧	不可能 (bù kě néng) impossible; cannot; not able.
But the kids vowed to me	但是小朋友信誓旦旦跟我说	信誓旦旦 (xìn shì dàn dàn) to make a solemn vow.
How do you understand this three times in 10 years?	他就是10年遇到3次 这个怎么理解呢	
I think it might be because of this reason	那我想可能是因为这个原因	
That is, a lot of floods did not happen in their river	就是很多洪水并不是就发生在他们家那条河	
Is near their home	是在他们家附近	
Or rivers in other parts of the country	或者是在全国其它地方的河流	其它 (qí tā) other; the others; else; other than it; in addition to the thing mentioned above.
The flood happened once in a hundred years	发生了百年一遇的洪水	
As a result, news communication is particularly developed	结果因为新闻传播特别发达	传播 (chuán bō) to disseminate; to propagate; to spread. 发达 (fā dá) developed (country etc); flourishing; to develop.
Every time he encounters a flood once in a hundred years, he will remember	每一次遇到百年一遇洪水 他都会记住	记住 (jì zhu) to remember; to bear in mind; to learn by heart.
So he counted like this 3 times in 10 years	所以他这么一数 10年就遇到3次	
Then let's think about it now	那咱们现在想一想	
If we take the 34 provinces	假如咱们把全国34个省	
We think there is only one river in each province	每个省咱们就认为只有1条河	
Of course it's impossible, right?	当然实际上是不可能的 对吧	实际上 (shí jì shàng) in fact; in reality; as a matter of fact; in practice.
Let's say that each of the 34 provinces has only 1 river	咱们假如34个省 每个省都只有1条河	
Then save 34 for 10 years, right	然后34省 10年 对吧	
Then this time I asked	那这回我问	
How many times do you say there is a once-in-a-hundred-year flood?	你说有多少次发生百年一遇洪水的机会呢	
That should be 340 times, right?	那应该是340次吧 是吧	

English	Chinese	Vocabulary
This time it was 340 times	这回就是340次的	
34 provinces, each province has 1 river, right?	34个省 每个省有1条河 对吧	
Then 10 years	然后10年	
So there are a total of 340 attempts	所以一共有340次尝试的机会	尝试 (cháng shì) to try; to attempt.
If at this time I still said it happened several times	假如这个时候我还说 发生了几次呢	几次 (jǐ cì) several times.
Happened 3 times	发生了3次	
The probability of each occurrence is 0.01, right?	每次发生的概率是0.01 是吧	每次 (měi cì) every time.
Then I asked, this time you are within 10 years	那我就问了 说这回你在10年之内	
What is the probability that there are 3 times once in a hundred years in the country?	发现全国有3次百年一遇洪水的概率有多大	
Or this algorithm	还是这个算法	算法 (suàn fǎ) arithmetic; algorithm; method of calculation.
f(3,340,0.01) right	f(3,340,0.01) 对吧	
What is it	等于什么呢	
Equal to C(340 3)×0.01³×0.99³³⁷	等于C(340 3)×0.01^3×0.99^{337}	
If you count this, it's 21.9%	你这个数一算 那可就是21.9%了	
Then this probability is quite high	那这个概率就相当大	相当 (xiāng dāng) equivalent to; appropriate; considerably; to a certain extent; fairly; quite.
In other words, if every province in your country has a once-in-a-hundred-year flood	就是说如果你全国每一个省发生百年一遇洪水	
Words you remember	你都记住的话	
Then within 10 years	那么在10年之内	
There is a probability of more than 20% of floods occurring three times in a hundred years	发生3次百年一遇洪水的概率就有20%多	
This is quite impressive	这个就是相当可观了	可观 (kě guān) considerable; impressive; significant.
So I guess this classmate has a wrong memory	所以我估计这个同学是记错了	

English	Chinese	Vocabulary
He counted the floods in other places to their home, right?	他把其它地方的洪水也算到他们家那边了 是不是	那边 (nà bian) over there; yonder.
This is only 3 times	这还只是3次	
Then you can still happen 4 times, 5 times, 6 times, right?	那你还可以发生4次 5次 6次吧 对不对	
If we want to calculate	如果我们要计算一下	
Said that this happened nationwide within 10 years	说这个10年之内全国发生	
Probability of flooding at least 3 times in a century	至少3次百年一遇洪水的概率	
You will find that this number is about 66%	你会发现这个数大概是66%	
So there is a great possibility	所以有极大的可能	
Nationwide within 10 years	全国在10年之内	
There will be more than three floods once in a hundred years, right?	会遭遇3次以上的百年一遇的洪水 是不是	遭遇 (zāo yù) to meet with; to encounter; (bitter) experience.
This is because you have many provinces	这就是因为你有很多个省份	多个 (duō ge) many; multiple; multi- (faceted, ethnic etc). 省份 (shěng fèn) province.
Let's keep thinking	咱们再继续想	
Then your once-in-a-hundred-year disaster is not just floods, right?	那你这个百年一遇的灾害还不只是洪水 是吧	
For example, what earthquake or typhoon	还比如说有什么地震 什么台风	地震 (dì zhèn) earthquake. 台风 (tái fēng) stage presence, poise.
What kind of locust plague?	什么蝗灾 什么传染病这些	蝗 (huáng) locust. 灾 (zāi) disaster; calamity. 传染病 (chuán rǎn bìng) infectious disease; contagious disease; pestilence.
And the whole country does not say	而且全国也不是说	
Just divide it into 34 provinces and it's over	只划分为34个省就完事了	分为 (fēn wéi) to divide sth into (parts); to subdivide.
It can be subdivided	它可以分得更细	
If you calculate the probability from this perspective	如果你要是从这个角度去算概率的话	角度 (jiǎo dù) angle; point of view.
You will find	你就会发现	

Basically every year there will be some places	基本上每一年都会有一些地方	基本上 (jī běn shang) basically; on the whole. 有一些 (yǒu yī xiē) somewhat; rather; some.
Encountered a once-in-a-hundred-year disaster	遭遇百年一遇的灾害	
So you often see once-in-a-century disasters on TV	所以你在电视上经常看到百年一遇的灾害	
That's not surprising	那也就不足为奇了	不足为奇 (bù zú wéi qí) not at all surprising (idiom).
If you like my video	大家如果喜欢我的视频	视频 (shì pín) video.
You can subscribe to me in the YouTube account Mr. Li Yongle	可以在YouTube账号李永乐老师里订阅我	
Click on the little bell to get updated information the first time	点击小铃铛 可以第一时间获得更新信息	铃铛 (líng dang) little bell. 第一时间 (dì yī shí jiān) in the first moments (of sth happening); immediately (after an event); first thing. 更新 (gēng xīn) to replace the old with new; to renew; to renovate; to upgrade; to update; to regenerate.