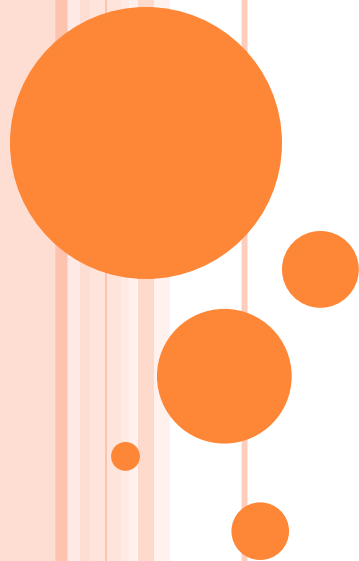


# REVIEW QUESTIONS ( $\Sigma$ AND $\Pi$ NOTATION)



TED HIGH SCHOOL  
11 F IB HL

Around 1260 AD, the Kurdish historian Ibn Khallikān recorded the following story about Sissa ibn Dahir and a chess game against the Indian King Shihram. (The story is also told in the Legend of the Ambalappuzha Paal Payasam, where the Lord Krishna takes the place of Sissa ibn Dahir, and they play a game of chess with the prize of rice grains rather than wheat.)

King Shihram was a tyrant king, and his subject Sissa ibn Dahir wanted to teach him how important all of his people were. He invented the game of chess for the king, and the king was greatly impressed. He insisted on Sissa ibn Dahir naming his reward, and the wise man asked for one grain of wheat for the first square, two grains of wheat for the second square, four grains of wheat for the third square, and so on, doubling the wheat on each successive square on the board.

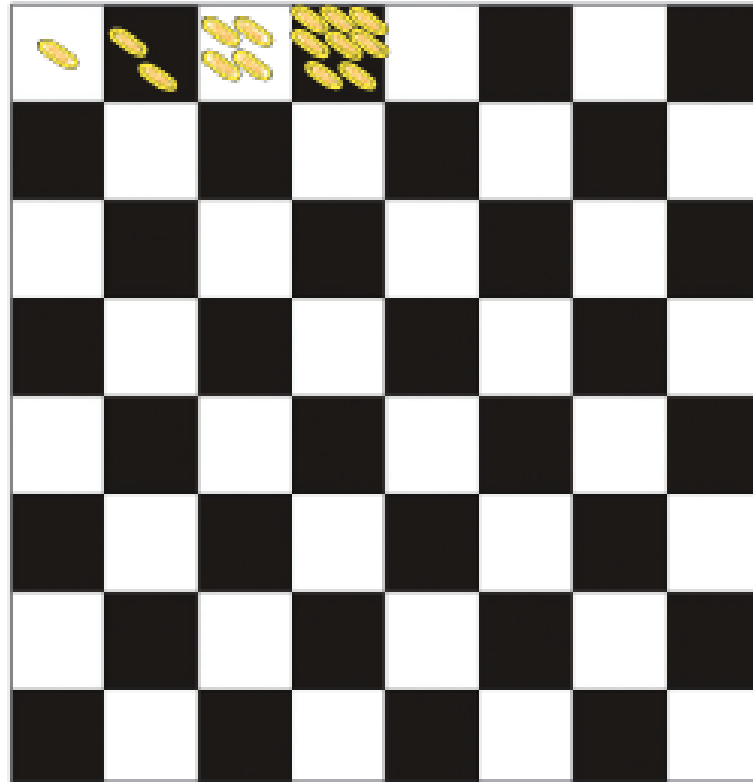
The king laughed at first and agreed, for there was so little grain on the first few squares. By halfway he was surprised at the amount of grain being paid, and soon he realised his great error: that he owed more grain than there was in the world.

**Things to think about:**

- a How can we describe the number of grains of wheat for each square?
- b What expression gives the number of grains of wheat for the  $n$ th square?
- c Find the total number of grains of wheat that the king owed.

# HAVE A CLOSER LOOK

- 1<sup>st</sup> square:  $1 = 2^0$
- 2<sup>nd</sup> square:  $2 = 2^1$
- 3<sup>rd</sup> square:  $4 = 2^2$
- ...
- 64<sup>th</sup> square: ?
- ...
- n<sup>th</sup> square: ?



# MISCELLANEOUS QUESTIONS

1- 
$$\sum_{k=5}^{12} \frac{1}{k^2 - 7k + 12} = ?$$

2- What is the remainder when the summation of  $\sum_{k=0}^{20} k!$  is divided by 15?



3- 
$$\sum_{k=1}^{10} e^{2 \ln k} = ?$$

4- 
$$1 + \frac{1}{1+2} + \frac{1}{1+2+3} + \dots + \frac{1}{1+2+3+\dots+25} = ?$$



5-  $\sum_{k=1}^{90} \sin^2 k = ?$

6-  $\sum_{k=-10}^{10} \frac{1 + k + k^2 + k^3 + \dots + k^9}{1 + k + k^2 + k^3 + k^4} = ?$



7- If  $\prod_{k=1}^n 8^{\frac{1}{k(k+1)}} = \sqrt[3]{256}$  then what is the value of  $n$ ?

8-  $\prod_{k=2}^{63} \log_k (k+1) = ?$



9- The number A is defined as below:

$$A = \prod_{k=1}^8 625.2^k$$

Hence, how many digits does the number have?

10- 
$$\prod_{k=1}^{15} \frac{k^2 + 3k + 2}{k^2 + 4k} = ?$$





**11-**  $x_1, x_2$  are the roots of the equation  $3x^2 - 4x - 2 = 0$ .

$$\prod_{k=1}^2 (3x_k - 1) = ?$$

**12-**  $f(x) = \sum_{k=1}^x k^2$  and

$g(x) = \prod_{k=2}^x \left(1 + \frac{1}{k}\right)$ . Then what is the value of  $f \circ g(11)$ ?



**13-** 
$$\frac{\prod_{k=1}^{27} (k^2 + k)}{\sum_{k=1}^7 k} = ?$$

**14-**  $i^2 = -1;$

Then 
$$\prod_{n=1}^{15} \frac{i^n}{\sqrt[5]{2}} = ?$$



## 2010 LYS

What is the remainder when the summation of  $\sum_{n=0}^{100} 3^n$  is divided by 5?

