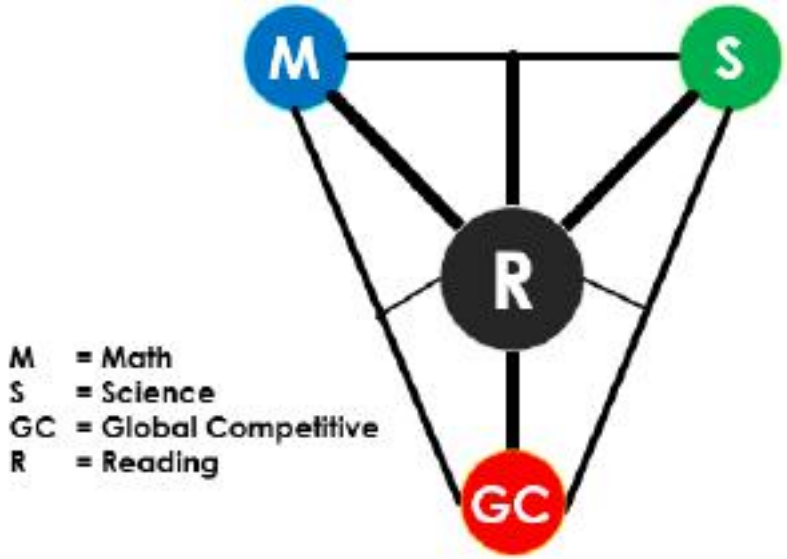
PISA 2021
DAN
COMPUTATIONAL THINKING (CT)

Dr. Yogi Anggraena, M.Si
Koordinator Pengembangan Kurikulum
di Pusat Kurikulum dan Perbukuan Kemdikbud

PISA

PISA (*Programme for International Student Assessment*) adalah studi internasional tentang prestasi literasi **membaca, matematika**, dan **sains** siswa sekolah berusia **15 tahun**



PISA merupakan sebuah Tes Internasional untuk melihat kemampuat Matematika, Ilmu Pengetahuan Alam (Science), Membaca (Reading), dan Kemampuan Global (Global Competitiveness)

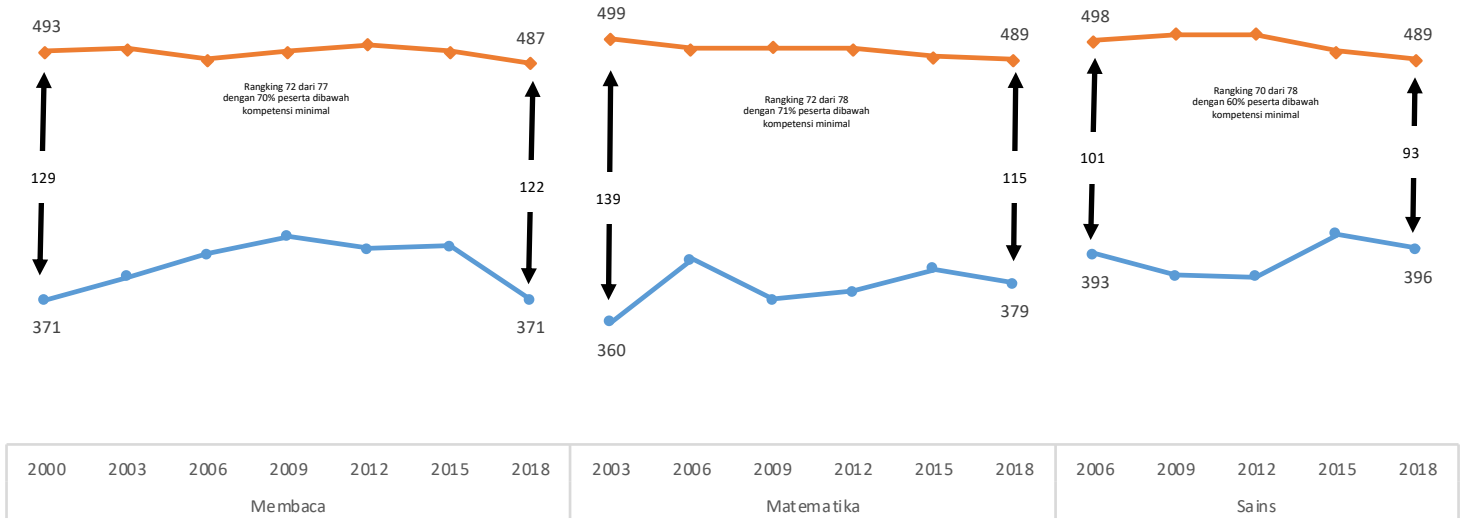
Penyelenggaran PISA

- PISA merupakan studi yang diselenggarakan setiap tiga tahun sekali, yaitu pada tahun 2000, 2003, 2006, 2009, 2012, 2015, 2018, dan seterusnya. Indonesia mulai sepenuhnya berpartisipasi sejak tahun 2001.

- **Penyelenggara** studi adalah **OECD** (*Organisation for Economic Cooperation and Development*) beserta konsorsium internasional yang membidangi masalah Sampling, Instrumen, Data, Pelaporan, dan sekretariat

PISA tidak hanya memberikan informasi tentang benchmark Internasional tetapi juga informasi mengenai kelemahan serta kekuatan siswa beserta faktor-faktor yang mempengaruhinya

Tren Nilai dan Peringkat PISA Indonesia



Sumber: OECD, 2019

Ide sentral PISA untuk bidang matematika adalah tentang kemampuan **literasi matematika**

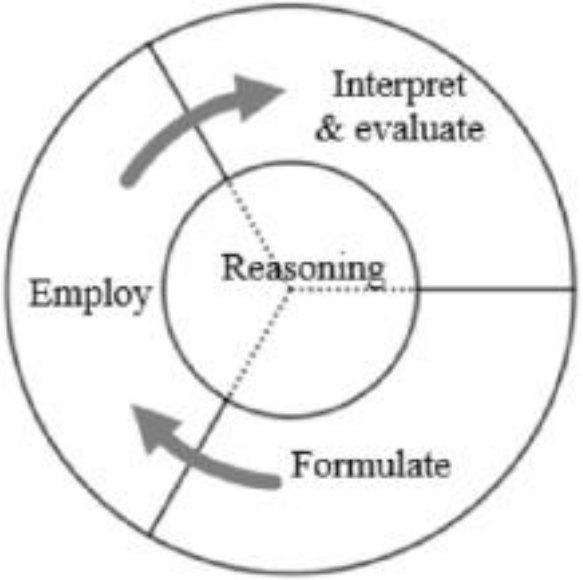
Literasi Matematika

- *Mathematical literacy is an individual's capacity to formulate, employ, and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena. It assists individuals to recognise the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged and reflective citizens (OECD, 2013, p. 25).*

- *Mathematical literacy is an individual's capacity to reason mathematically and to formulate, employ, and interpret mathematics to solve problems in a variety of real-world contexts. It includes concepts, procedures, facts and tools to describe, explain and predict phenomena. It assists individuals to know the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged and reflective 21st century citizens (OECD, 2018, p. 7).*

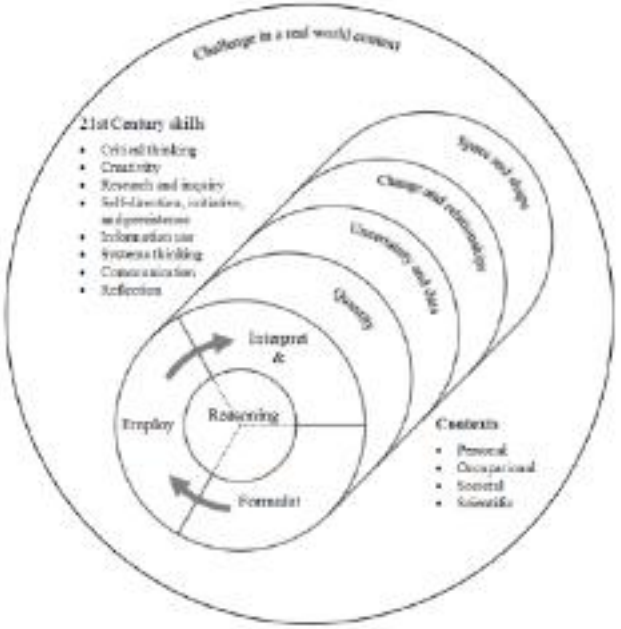
OECD mempertahankan definisi literasi matematika PISA 2012 pada PISA tahun 2015 dan 2018. Namun di tahun 2021 kemampuan literasi matematika didefinisikan ulang oleh OECD. Kerangka kerja PISA 2021 melihat bahwa literasi matematika yang awalnya fokus pada kemampuan perhitungan dasar harus didefinisikan ulang dengan memperhatikan kemajuan teknologi yang sangat cepat

PISA 2012



Hubungan antara penalaran matematika dan siklus pemecahan masalah (pemodelan matematis)

PISA 2021



Hubungan antara penalaran matematika, siklus pemecahan masalah (pemodelan matematika), kontenmatematika, konteks dan keterampilan abad ke-21

Dalam *framework* PISA 2021, literasi matematika disebut haruslah mencakup hubungan sinergis dan timbal balik antara ***mathematical thinking*** (berpikir matematis) dan ***computational thinking*** (berpikir komputasional).

Computational Thingking dalam PISA 2021

- *Computational thinking* didefinisikan sebagai kemampuan yang memayungi abstraksi, pemikiran algoritmik, otomasi, dekomposisi, dan generalisasi, yang kesemuanya dianggap penting dalam proses penalaran matematis dan penyelesaian masalah.
- *Computational thinking* dalam matematika dikonseptualisasikan sebagai kemampuan mendefinisikan dan menguraikan pengetahuan matematika yang dapat diekspresikan oleh pemrograman, yang memungkinkan siswa untuk memodelkan konsep dan hubungan matematika secara dinamis

Taksonomi *computational thinking* dalam PISA 2021

- Praktik data
- Praktik pemodelan dan simulasi,
- Praktik penyelesaian masalah komputasi, dan
- Praktik pemikiran sistem

Aspek-aspek organisasi domain PISA yang terkait dengan *computational thinking*

- Abstraksi dan representasi simbolis
- Pemodelan matematika
- Pemecahan masalah
- Penafsiran, aplikasi, dan
- Evaluasi luaran matematis

Dalam hal konten matematika, *computational thinking* disebut dalam pembahasan seluruh subkonten matematika

- Quantity
- Uncertainty and data
- Change and relationships
- Space and shape

Pembelajaran Computational Thinking di Indonesia

- Mengintegrasikan thinking skill pada pelajaran-pelajaran yang sudah ada

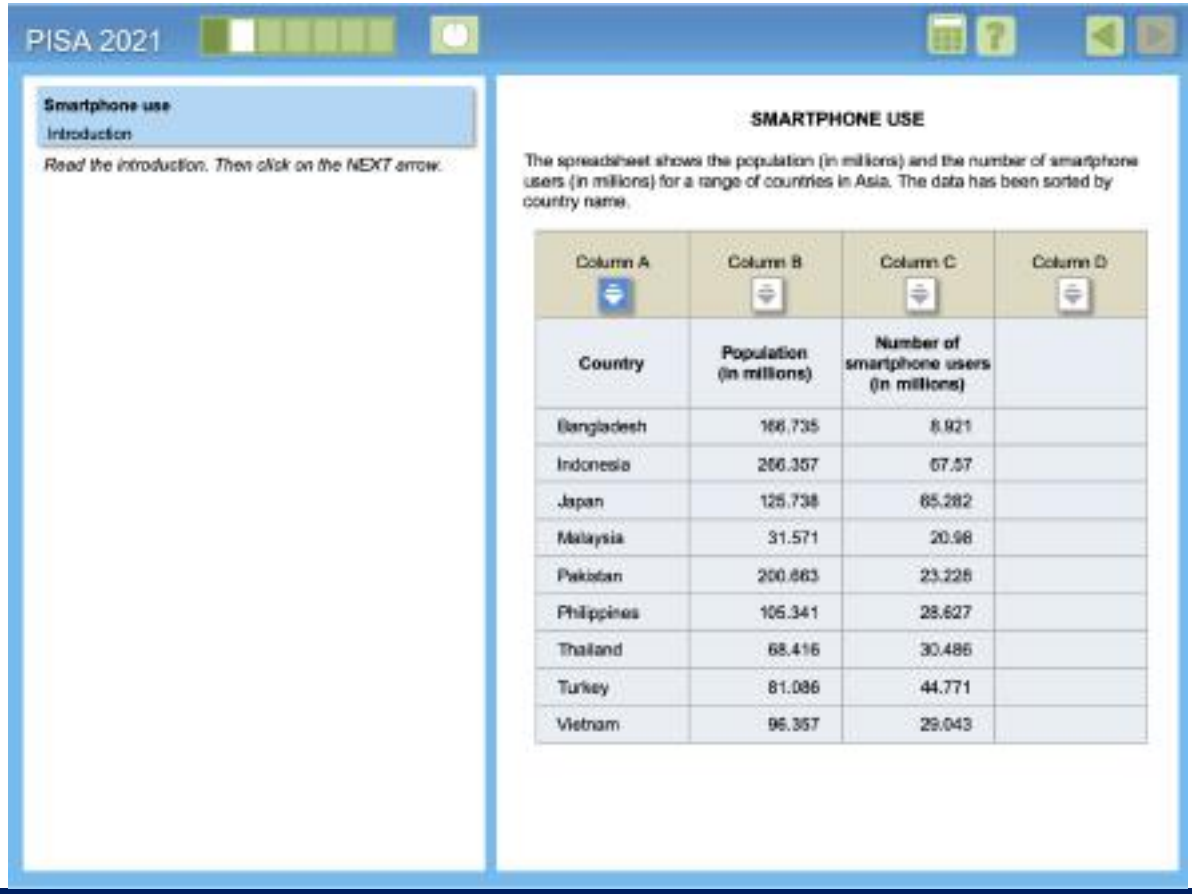
- Menyediakan kelas dan aktivitas tertentu yang memang khusus membahas *computational thinking* (Informatika)

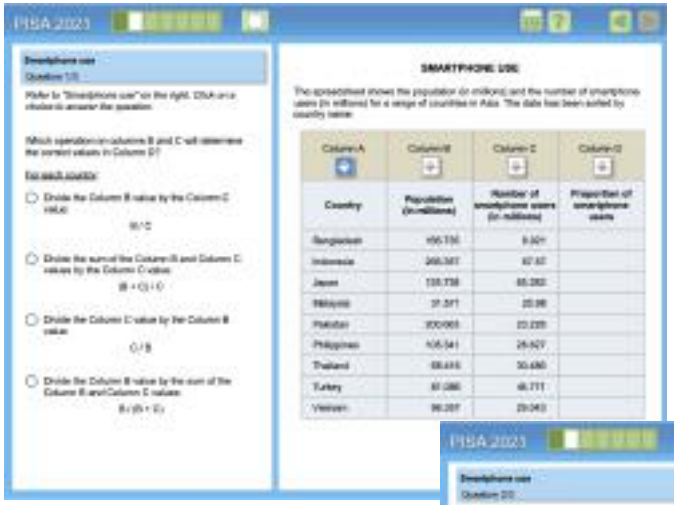
- Di kalangan peneliti di bidang *computational thinking* dikenal istilah *Computer Science Unplugged Activities*, sebuah istilah untuk menyebut aktifitas-aktifitas pembelajaran prinsip-prinsip ilmu komputer yang tidak membutuhkan penggunaan computer
- Beberapa riset terbaru menunjukkan bahwa *computational thinking* bahkan dapat diintegrasikan dalam mata pelajaran-mata pelajaran yang ada . Misalnya, prinsip *Unified Modeling Language* (UML), yang dipelajari dalam bidang software engineering, ternyata dapat diintegrasikan dalam pembelajaran bahasa di tingkat sekolah dasar (di Austria)

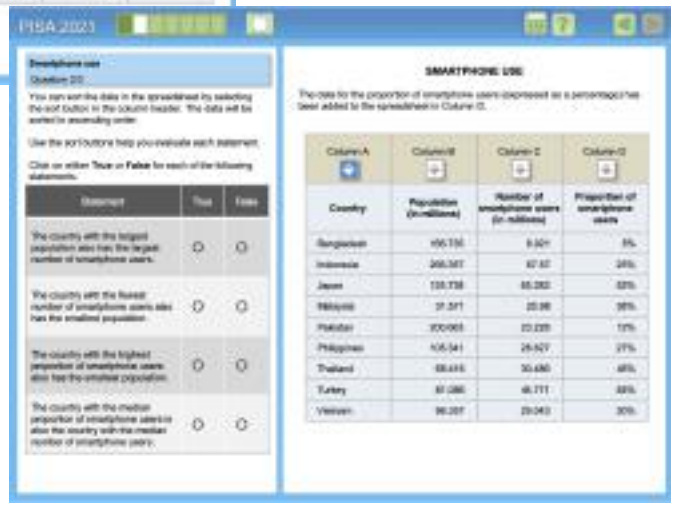
Contoh Soal Matematika dalam *Framework* PISA 2021

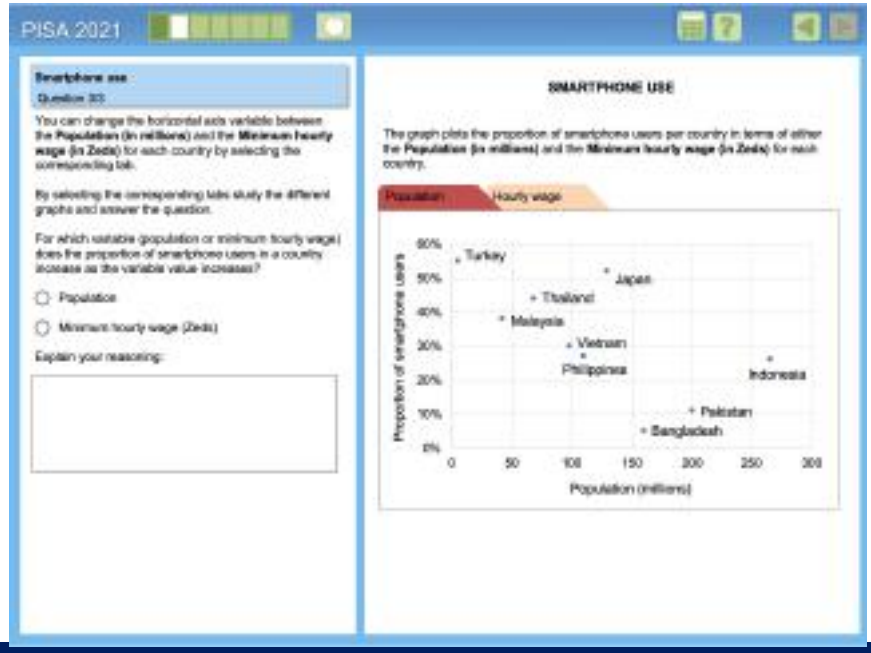
Smartphone Use

Soal ini menggambarkan kemampuan penilaian matematika berbasis komputer khususnya penggunaan spreadsheet dengan *sorting* dan kemampuan lainnya.



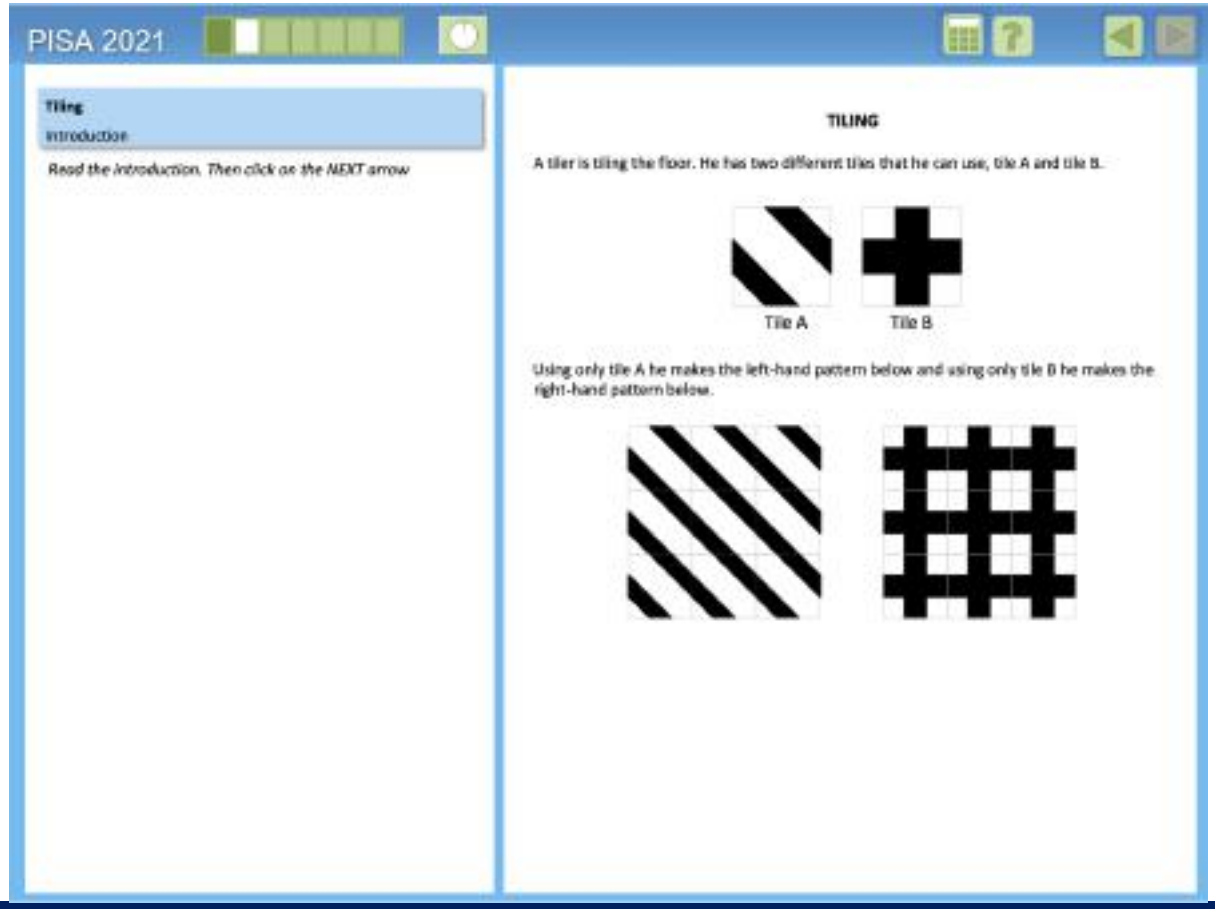

PISA 2021
Smartphone use
Question 1/3
SMARTPHONE USE
Which operation on columns B and C will determine the correct values in Column D?
For each country:
Divide the Column B value by the Column C value.
B / C
Divide the sum of the Column B and Column C values by the Column C value.
(B + C) / C
Divide the Column C value by the Column B value.
C / B
Divide the Column B value by the sum of the Column B and Column C values.
B / (B + C)
Country
Population (in millions)
Number of smartphone users (in millions)
Proportion of smartphone users

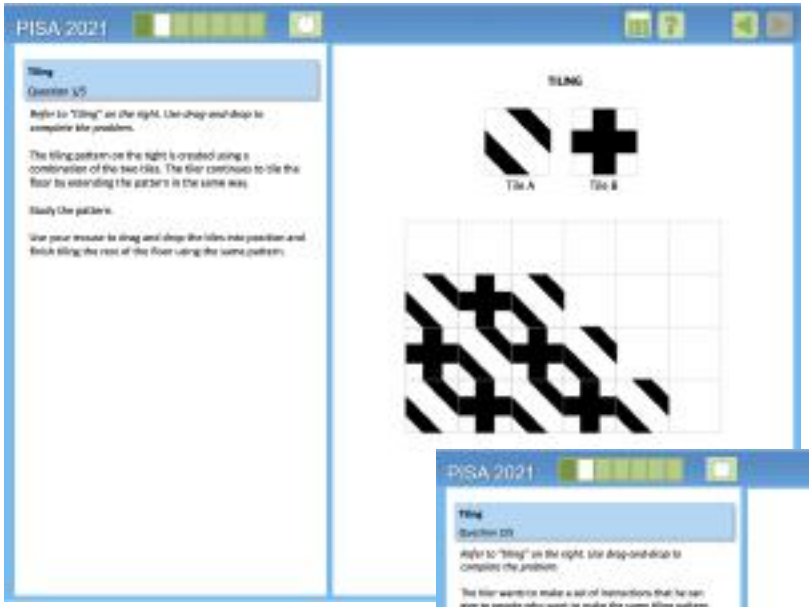

PISA 2021
Smartphone use
Question 2/3
SMARTPHONE USE
You can sort the data in the spreadsheet by selecting the sort button in the column header. The data will be sorted in ascending order.
Use the sort buttons help you evaluate each statement.
Click on either True or False for each of the following statements.
Statement
True
False
The country with the largest population also has the largest number of smartphone users.
The country with the fewest number of smartphone users also has the smallest population.
The country with the highest proportion of smartphone users also has the smallest population.
The country with the median proportion of smartphone users is also the country with the median number of smartphone users.
Country
Population (in millions)
Number of smartphone users (in millions)
Proportion of smartphone users

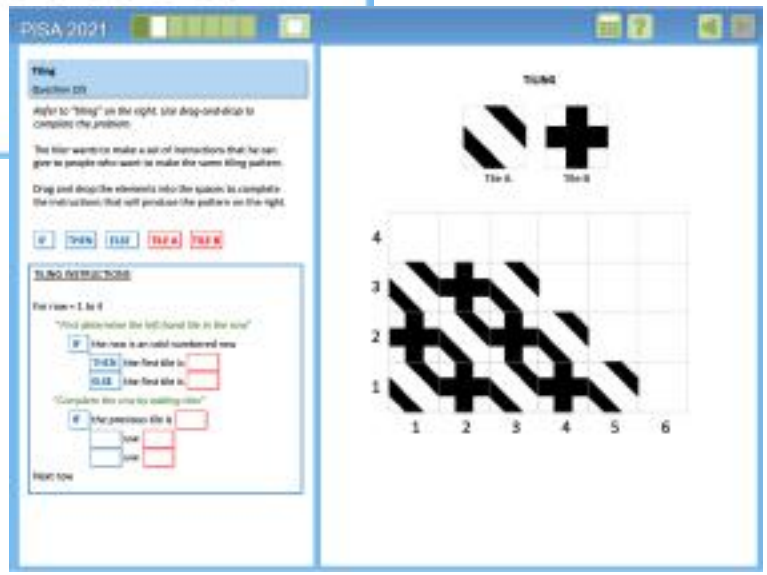

PISA 2021
Smartphone use
Question 3/3
You can change the horizontal axis variable between the Population (in millions) and the Minimum hourly wage (in Zeds) for each country by selecting the corresponding tab.
By selecting the corresponding tabs study the different graphs and answer the question.
For which variable (population or minimum hourly wage) does the proportion of smartphone users in a country increase as the variable value increases?
Population
Minimum hourly wage (Zeds)
Explain your reasoning:
SMARTPHONE USE
The graph plots the proportion of smartphone users per country in terms of either the Population (in millions) and the Minimum hourly wage (in Zeds) for each country.
Population
Hourly wage
Proportion of smartphone users
Population (millions)
Turkey
Japan
Thailand
Malaysia
Vietnam
Philippines
Indonesia
Pakistan
Bangladesh

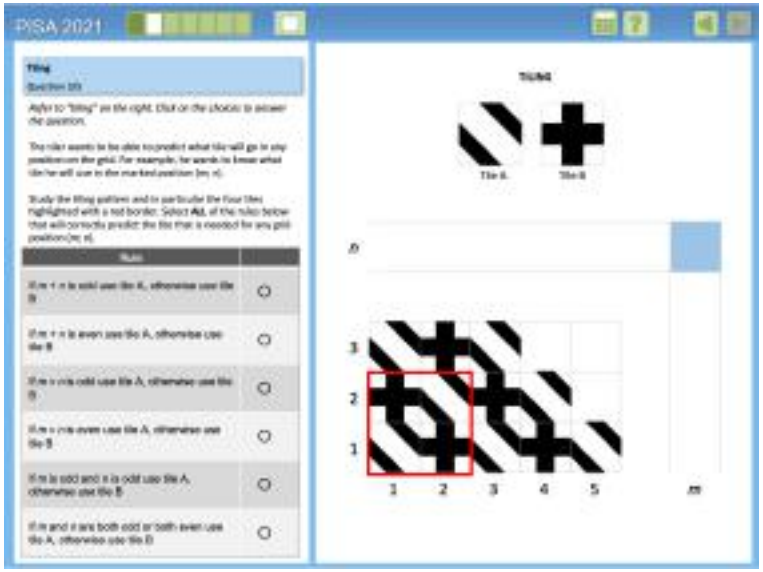
Tiling

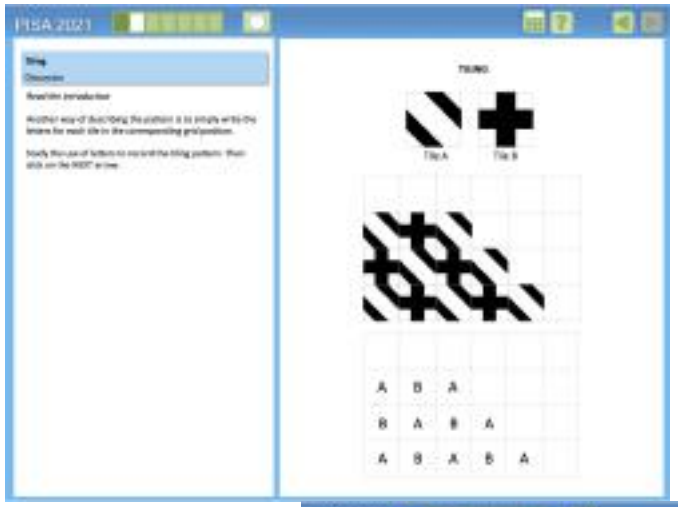
Soal ini menggambarkan penalaran dan computational thinking dan representasi geometris.

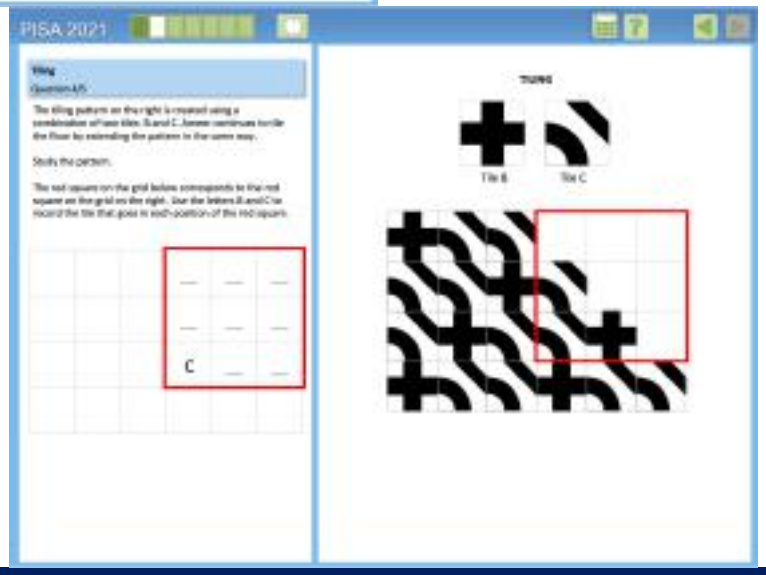


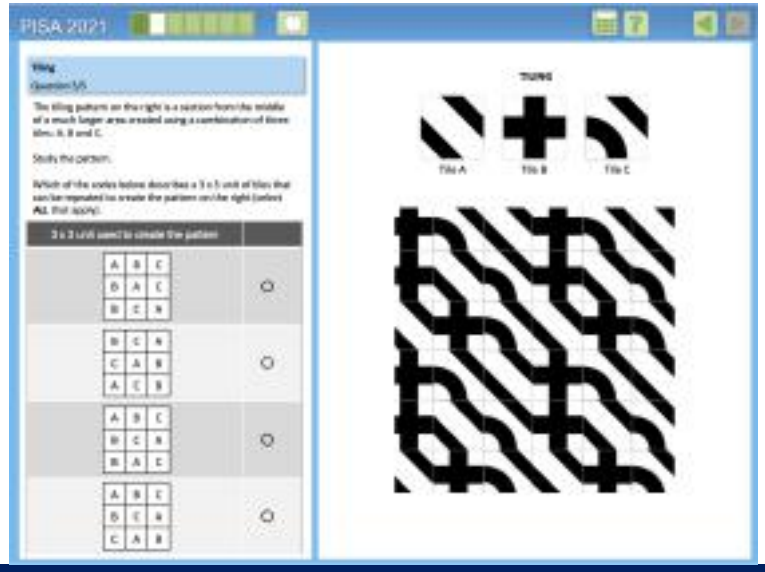

PISA 2021
TILING
Tile A
Tile B


PISA 2021
TILING
Tile A
Tile B
4
3
2
1
1 2 3 4 5 6


PISA 2021
TILING
Tile A
Tile B
n
3
2
1
1 2 3 4 5
m

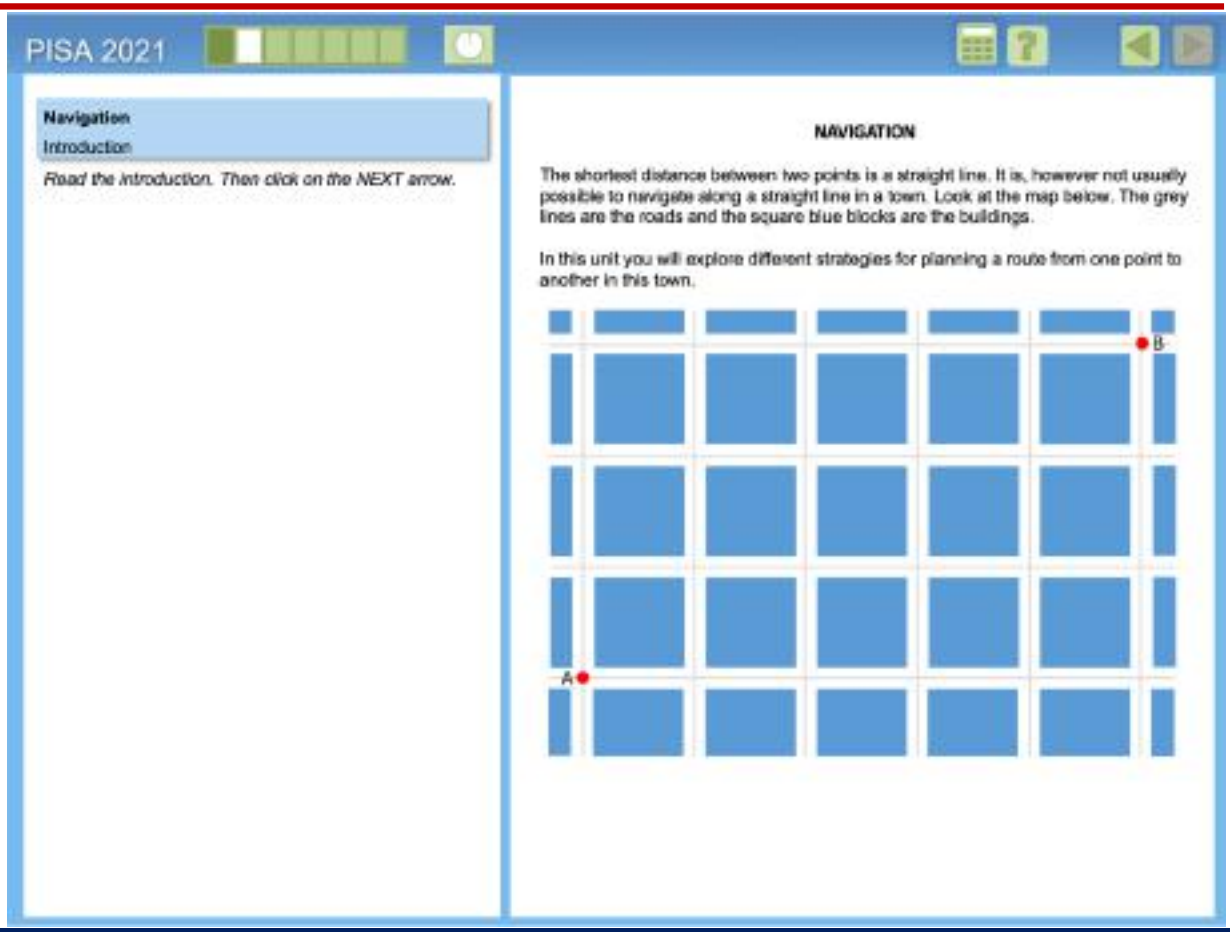

PISA 2021
Tiling
Tiles
TILING
Tile A
Tile B
A B A
B A B A
A B A B A

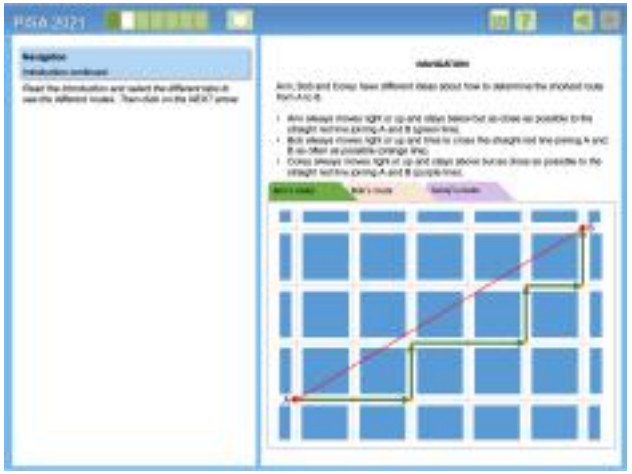

PISA 2021
Tiling
Question 3/5
The tiling pattern on the right is created using a combination of two tiles, B and C. It can continue to tile the floor by extending the pattern in the same way.
Study the pattern.
The red square on the grid below corresponds to the red square on the grid on the right. Use the letters B and C to record the tile that goes in each position of the red square.
C
TILING
Tile B
Tile C

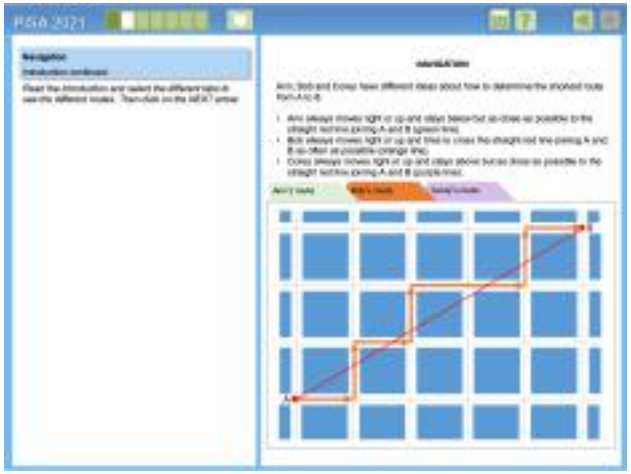

PISA 2021
Tiling
Question 5/5
The tiling pattern on the right is a section from the middle of a much larger area created using a combination of three tiles: A, B and C.
Study the pattern.
Which of the units below describes a 3 x 3 unit of tiles that can be repeated to create the pattern on the right (select ALL that apply).
3 x 3 unit used to create the pattern
TILING
Tile A
Tile B
Tile C

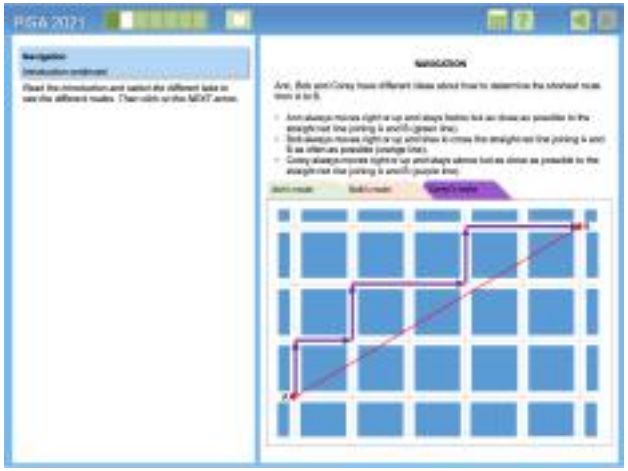
Navigation

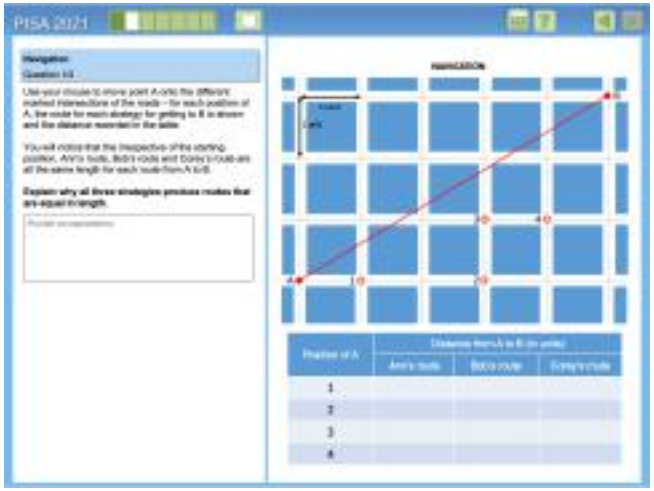
Soal ini menggambarkan penalaran dalam konteks geometris dan kemampuan penilaian matematika) berbasis komputer

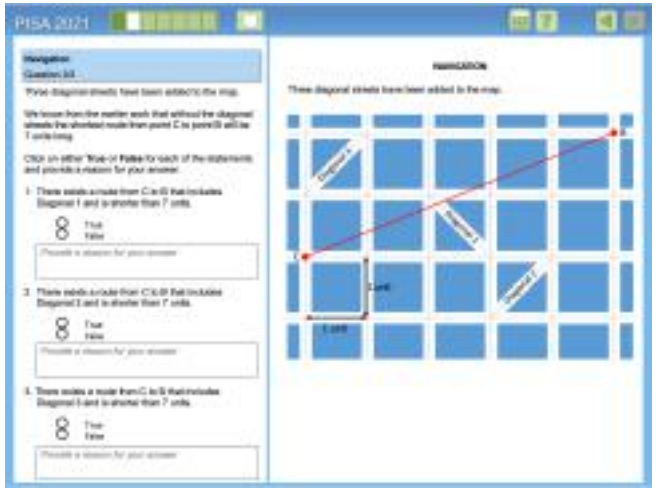



PISA 2021


PISA 2021


PISA 2021


PISA 2021


PISA 2021

TERIMA KASIH