

# Eksplorasi Peubah PDB per Kapita & Consumer Prices

Oleh: Kelompok 5

## Kelompok 5 Beranggotakan

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# PDB per Kapita

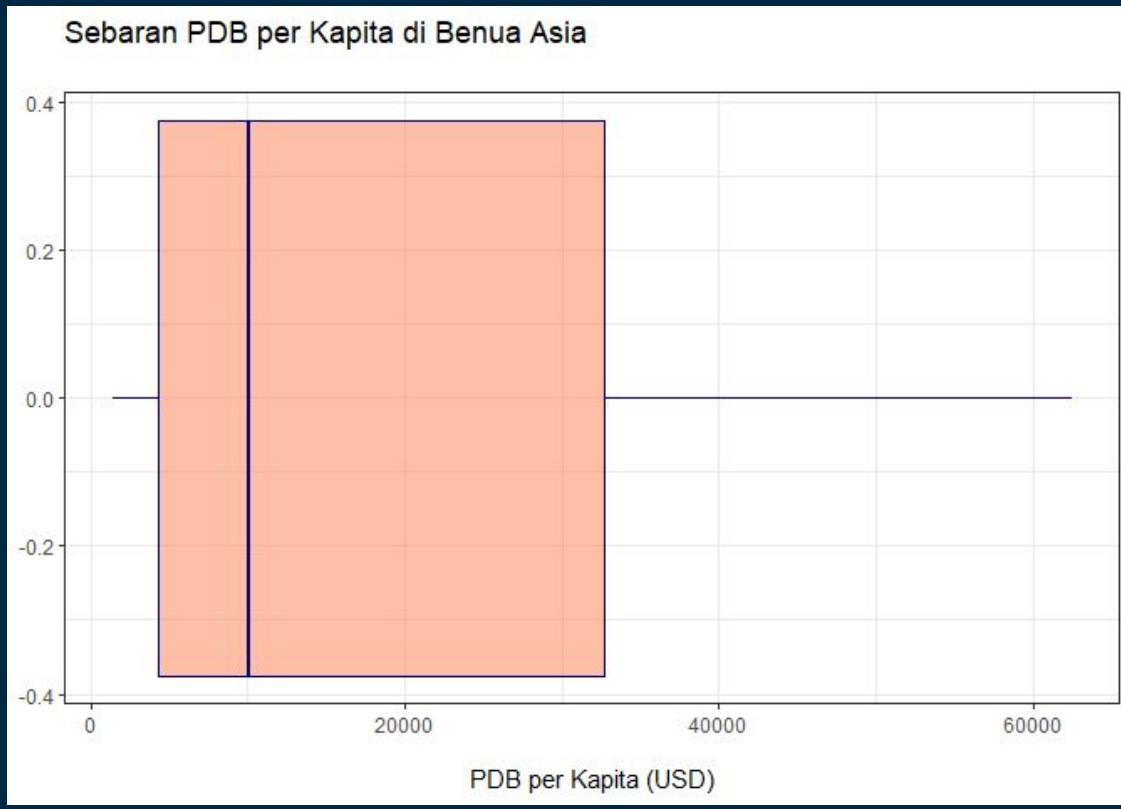
Pendapatan tiap individu pada  
suatu negara (USD)

01

# EKSPLORASI DATA



# BOXPLOT



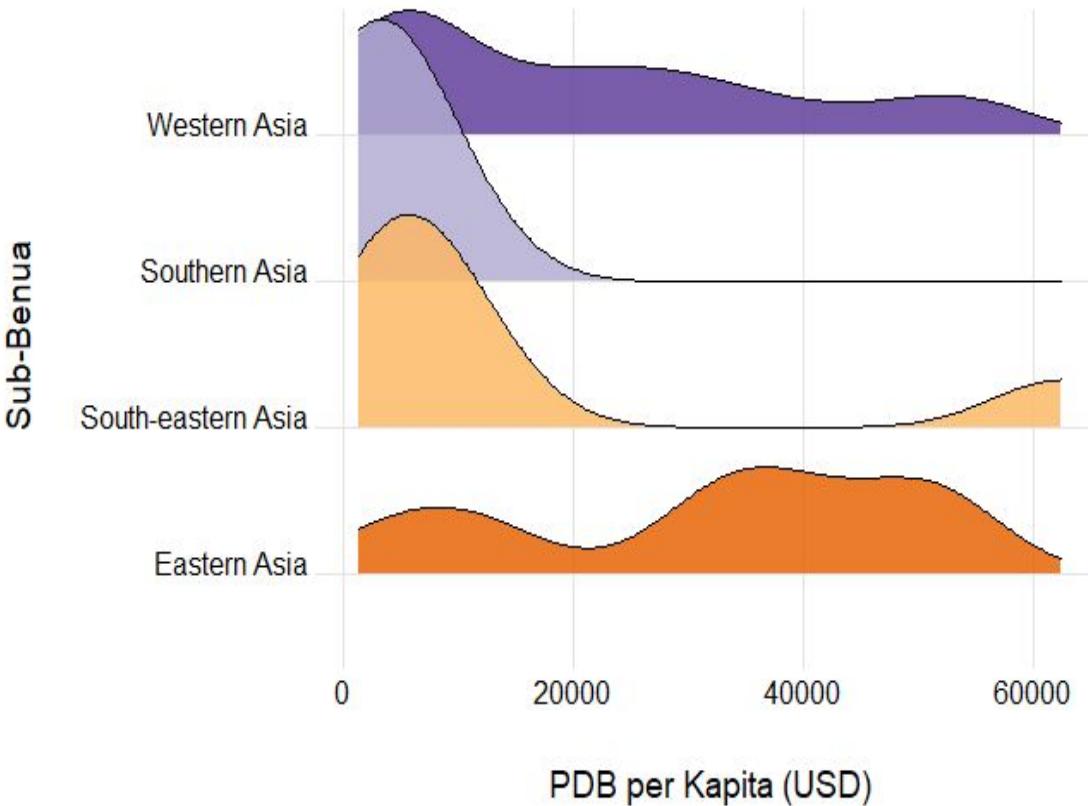
Dari boxplot disamping, terlihat bahwa sebaran data menjulur ke kanan, dengan kata lain sebagian besar negara di Asia memiliki besaran PDB per Kapita yang dekat dengan 25% negara dengan nilai terendah, yaitu sekitar 668 USD.

# DENSITY PLOT

Walaupun secara umum terlihat menjulur ke kanan, tetapi pada Asia Barat dan Asia Timur, negara dengan PDB per Kapita yang cenderung tinggi, yaitu di atas 20 ribu USD, jumlah dan keragamannya cukup besar. Bahkan, sebaran terlihat seragam dengan dua puncak pada Asia Timur.



Sebaran PDB per Kapita di Benua Asia



# Uji Formal dengan K-Smirnov Test

GDP per cap. (USD)

```
> ## Uji Formal Kolmogorov-Smirnov Test
> ## Normal
> set.seed(42)
> ks.test(B, "pnorm", mean = mean(B), sd = sd(B))

  One-sample Kolmogorov-Smirnov test

data: B
D = 0.22915, p-value = 0.0473
alternative hypothesis: two-sided

> ## Exponential
> set.seed(42)
> ks.test(log(B), "pexp", rate = 1/mean(B))

  One-sample Kolmogorov-Smirnov test

data: log(B)
D = 0.99942, p-value = 2.22e-16
alternative hypothesis: two-sided

> ## Chi-Squared
> set.seed(42)
> ks.test(B, "pchisq", df = mean(B))

  One-sample Kolmogorov-Smirnov test

data: B
D = 0.61765, p-value = 5.057e-13
alternative hypothesis: two-sided

>
> ## Lognormal
> set.seed(42)
> ks.test(B, "plnorm", meanlog = mean(log(B)), sdlog = sd(log(B)))

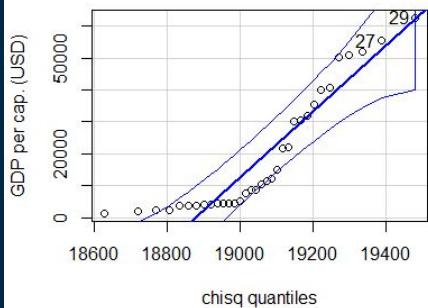
  One-sample Kolmogorov-Smirnov test

data: B
D = 0.16192, p-value = 0.3012
alternative hypothesis: two-sided
```

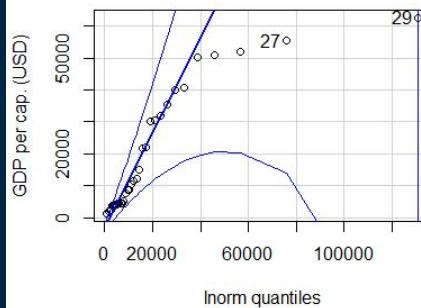
Berdasarkan hasil Uji Formal K-Smirnov, diperoleh hanya P-Value sebaran Lognormal yang lebih besar dibandingkan nilai alpha (0.05) atau Terima H0. Sehingga dapat disimpulkan sebaran data GDP mendekati sebaran Lognormal. — □ □ □

# QQPLOT - GDP per cap. (USD)

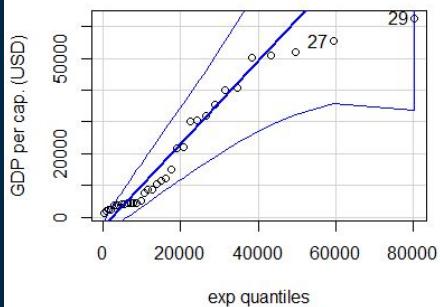
QQ-plot Terhadap Sebaran Chi-Squared



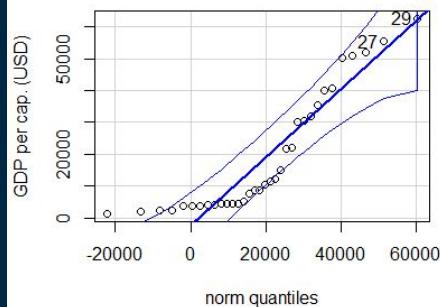
QQ-plot Terhadap Sebaran Lognormal



QQ-plot Terhadap Sebaran eksponensial



QQ-plot Terhadap Sebaran normal



Hasil dari Uji Formal K-Smirnov diperoleh bahwa sebaran data GDP mendekati sebaran Lognormal. Hal ini selaras dengan hasil QQPLOT pada sebaran Lognormal yang cenderung paling mendekati garis diagonal sebaran Lognormal.

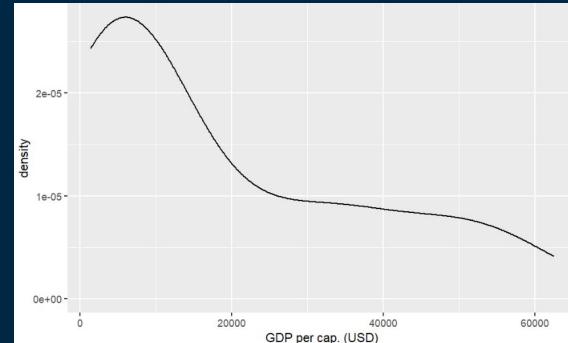
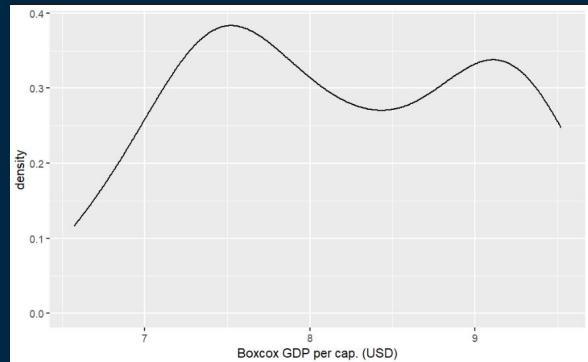
# Transformasi DATA



# Transformasi PDB per Kapita

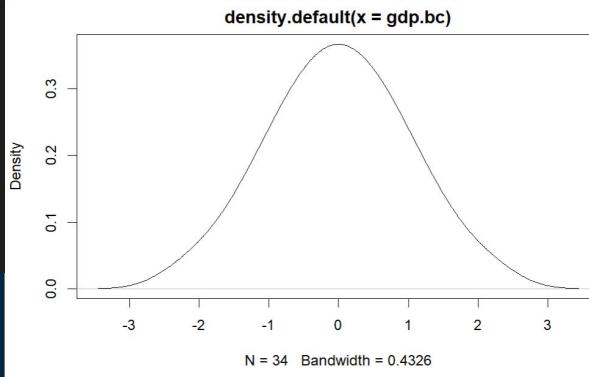
Untuk Keseluruhan Data

jika menggunakan tukey dan boxcox , akan menghasilkan distribusi yang cenderung bimodal distribusi ya



```
Best Normalizing transformation with 34 Observations
Estimated Normality Statistics (Pearson P / df, lower => more normal):
- arcsinh(x): 1.4133
- Box-Cox: 1.4533
- Center+scale: 1.9867
- Log_b(x+a): 1.4133
- orderNorm (ORQ): 1.3067
- sqrt(x + a): 1.68
- Yeo-Johnson: 1.4533
Estimation method: Out-of-sample via CV with 10 folds and 5 repeats

Based off these, bestNormalize chose:
orderNorm Transformation with 34 nonmissing obs and no ties
- Original quantiles:
  0%   25%   50%   75%   100%
1406.130 4256.246 9622.804 31548.284 62432.995
```



# Transformasi PDB per Kapita dengan Sub-Benua

Central Asia ditiadakan dikarenakan kurang cocok untuk buat distribusi . Pada Data western Asia inilah yang menyebabkan bimodal dikarenakan banyak data di Western Asia

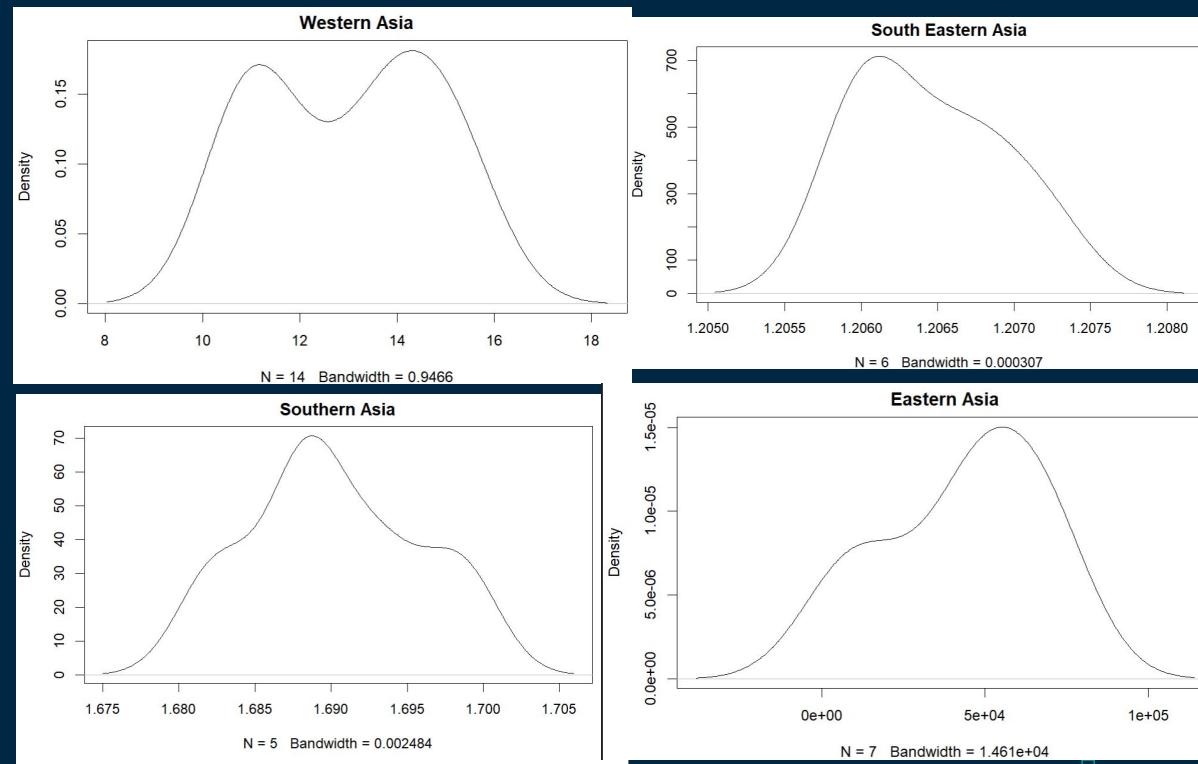
Ini boxcox Transformation per sub region

$$\lambda_{\text{western}} = 0.0606060$$

$$\lambda_{\text{eastern}} = 1.0303030$$

$$\lambda_{\text{south}} = -0.5858586$$

$$\lambda_{\text{south eastern}} = -0.8282828$$



# Transformasi PDB per Kapita dengan Sub-Benua

```
Shapiro-Wilk normality test

data: DA[DA["sub-region"] == "Southern Asia", "GDP per cap. (USD)"]
W = 0.9776, p-value = 0.9214

Shapiro-Wilk normality test

data: DA[DA["sub-region"] == "Western Asia", "GDP per cap. (USD)"]
W = 0.87086, p-value = 0.04315

Shapiro-Wilk normality test

data: DA[DA["sub-region"] == "Eastern Asia", "GDP per cap. (USD)"]
W = 0.91535, p-value = 0.4342

Shapiro-Wilk normality test

data: DA[DA["sub-region"] == "South-eastern Asia", "GDP per cap. (USD)"]
W = 0.90324, p-value = 0.3934
```

Southern Asia = Normal

Western Asia = tidak Normal

Eastern Asia = Normal

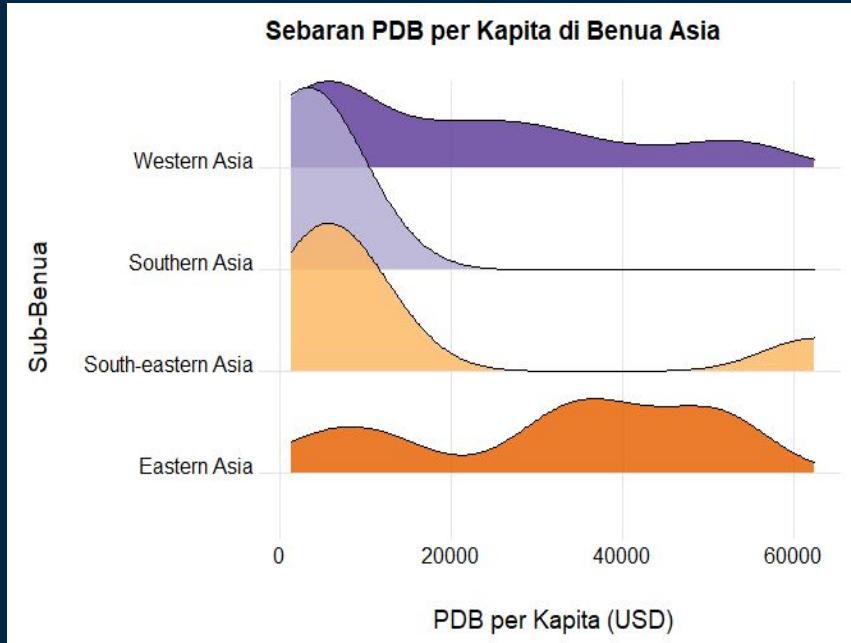
South-Eastern Asia = Normal

# VISUALISASI POST-TRANSFORMATION

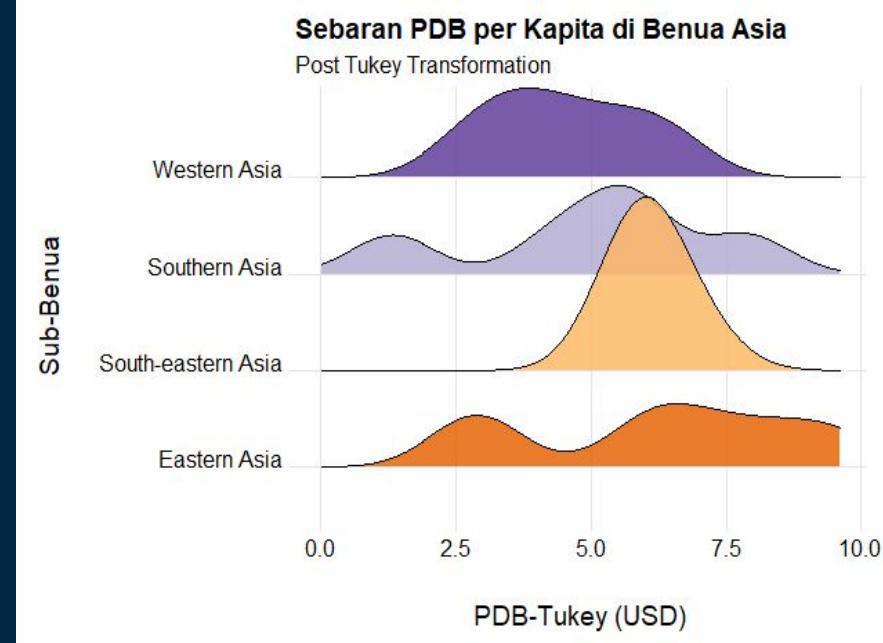


# Transformasi Tukey~PDB per Kapita

Sebelum transformasi

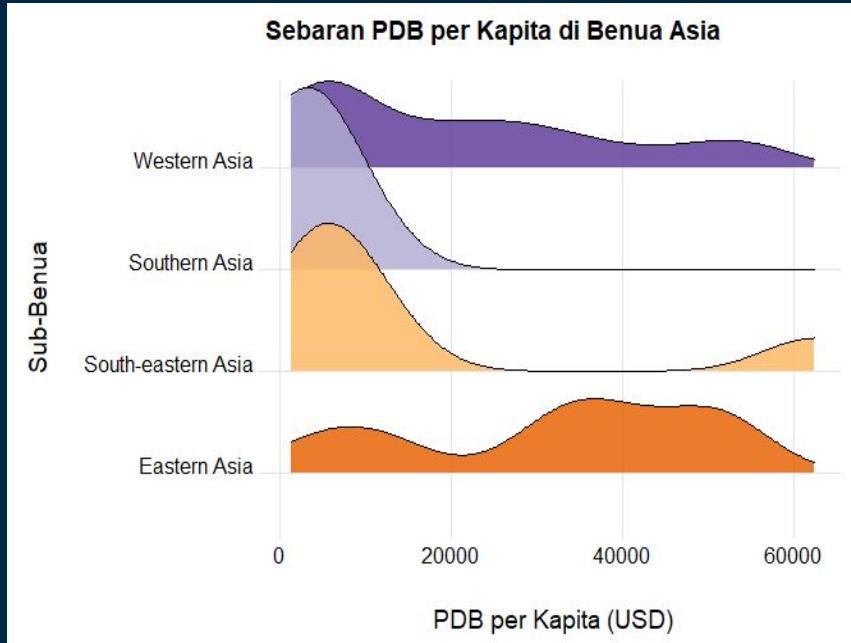


Sesudah transformasi

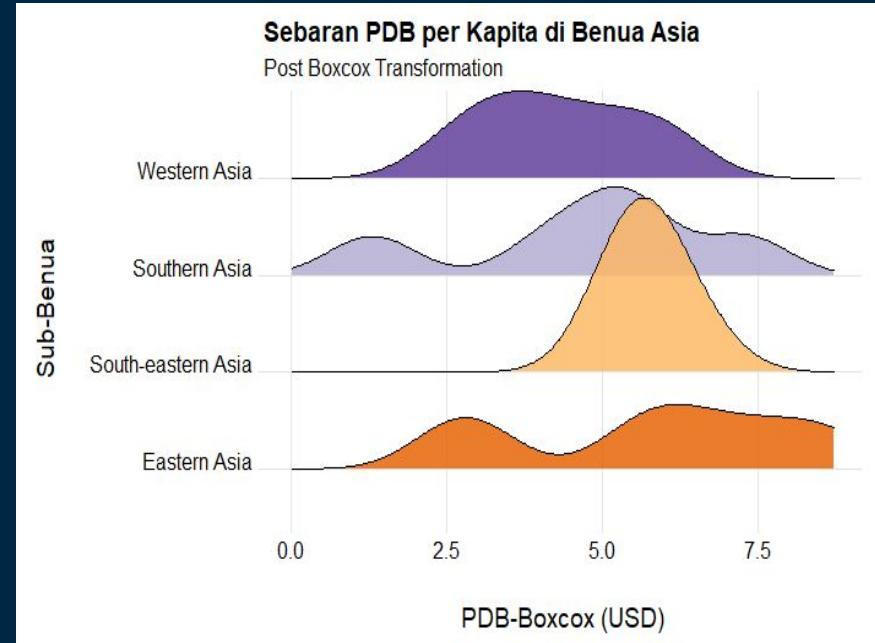


# Transformasi Boxcox~PDB per Kapita

Sebelum transformasi



Sesudah transformasi



# Uji Formal Setelah Transformasi Data

```
> var1 <- DA$`GDP per cap. (USD)`  
> ks.test(var1, "pnorm", mean = mean(var1), sd = sd(var1))  
  
One-sample Kolmogorov-Smirnov test  
  
data: var1  
D = 0.22023, p-value = 0.07642  
alternative hypothesis: two-sided
```

```
> var1.bc<-(var1^lambda1-1)/lambda1  
> ks.test(var1.bc, "pnorm", mean=mean(var1.bc), sd=sd(var1.bc))  
  
One-sample Kolmogorov-Smirnov test  
  
data: var1.bc  
D = 0.16905, p-value = 0.2863  
alternative hypothesis: two-sided
```

Nilai P-Value K-Smirnov Test setelah transformasi data jauh lebih besar dari nilai P-Value sebelum dilakukan transformasi data.

Data hasil transformasi menjadi data menyebarkan normal dan lebih simetris

# KESIMPULAN

## PDB

# Kesimpulannya

Pada data awal:

Data terlihat menjulur ke kanan (menyerupai sebaran lognormal) dengan beberapa kelompok data pada tiap sub-benua serta memiliki bimodus (2 puncak).

Pada Transformasi :

Distribution half t untuk gabungan data, sekilas ya.

Boxcox → bimodal distribution,

Boxcox per subregion → Western Asia yang kuat bimodal

Visualisasi Akhir: Data sudah simetris atau menyebar normal dengan ciri bimodal dan berkelompok



# Harga Konsumen

Rataan tahunan dari pertumbuhan harga konsumen (%) dalam 5 tahun terakhir

02

## Harga konsumen

Indeks Harga Konsumen (IHK) adalah ukuran yang memeriksa rata-rata tertimbang dari harga sekeranjang barang dan jasa konsumen, seperti transportasi, makanan, dan perawatan medis. Ini dihitung dengan mengambil perubahan harga untuk setiap item dalam keranjang barang yang telah ditentukan dan merata-ratakannya.

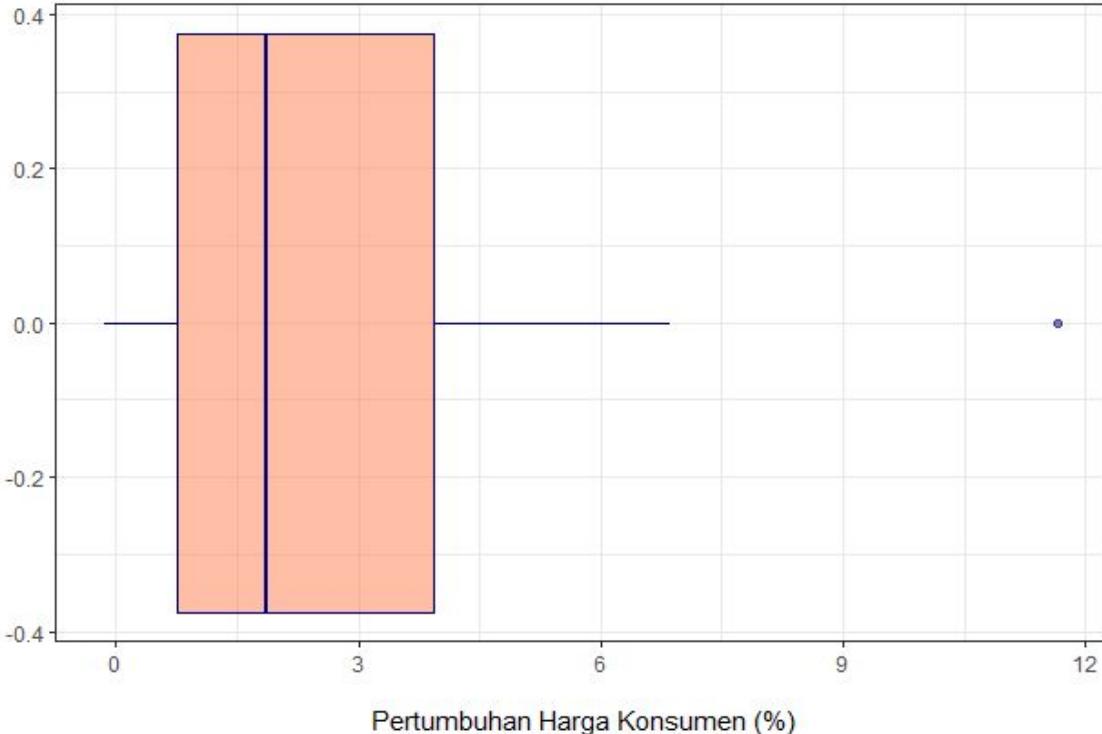
# EKSPLORASI DATA



# BOXPLOT

Sebaran Pertumbuhan Harga Konsumen di Benua Asia

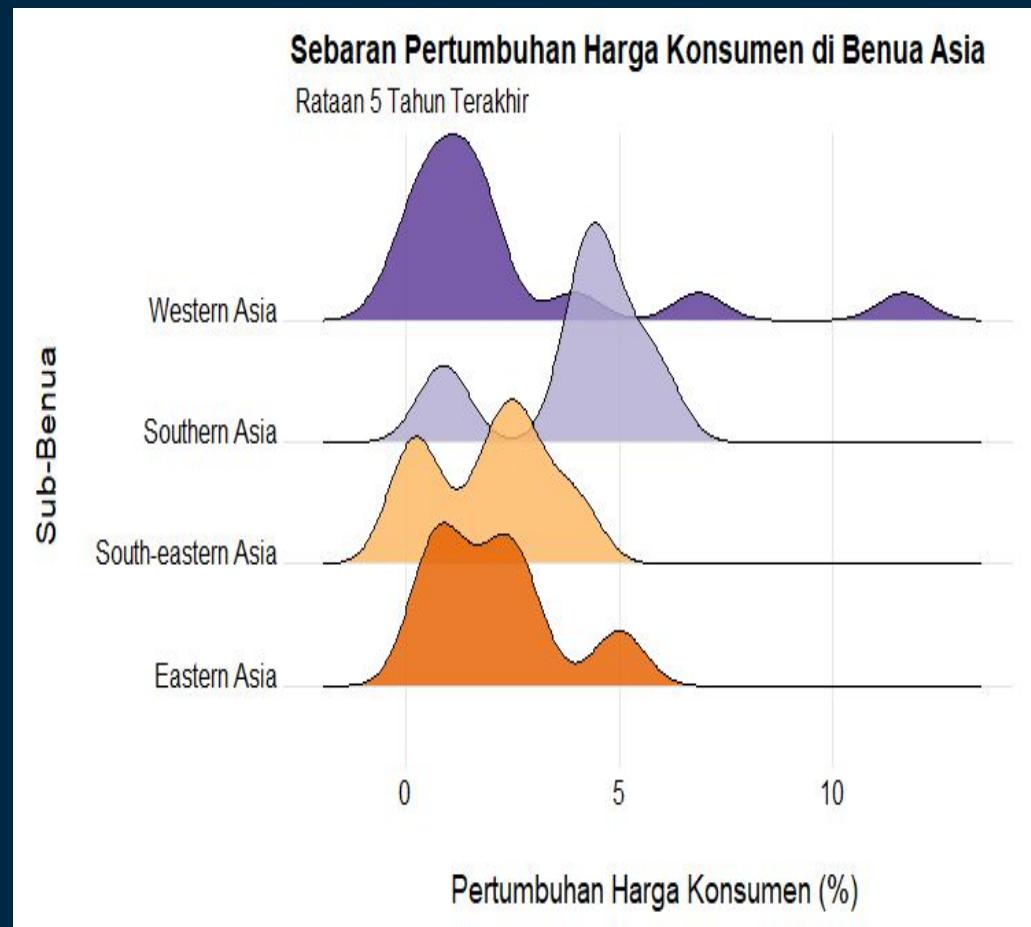
Rataan Tahunan dalam 5 Tahun Terakhir



Dari boxplot disamping, terlihat bahwa sebaran data menjulur ke kanan, dengan kata lain sebagian besar negara di Asia memiliki rataan kenaikan harga konsumen tahunan yang dekat dengan 25% negara dengan kenaikan terendah, yaitu sekitar 1.8 %.

# DENSITY PLOT

Pada tiap Sub-Benua nampak ada beberapa data yang berkelompok membentuk bimodus, dengan sebagian besar negara memiliki kisaran pertumbuhan harga konsumen 0-6% yang didominasi oleh negara-negara di Asia Barat. Namun, kenaikan tertinggi yaitu sekitar 10-12% juga terjadi pada beberapa negara di sub-benua ini.



# Uji Formal dengan K-Smirnov Test

Consumer prices ( avg annual avg. % growth 5yrs)

```
> ## Uji Formal Kolmogorov-Smirnov Test
> ## Normal
> set.seed(42)
> ks.test(c, "pnorm", mean = mean(c), sd = sd(c))

One-sample Kolmogorov-Smirnov test

data: c
D = 0.19469, p-value = 0.1326
alternative hypothesis: two-sided

> ## Exponential
> set.seed(42)
> ks.test(log(c), "pexp", rate = 1/mean(c))

One-sample Kolmogorov-Smirnov test

data: log(c)
D = 0.43286, p-value = 3.884e-06
alternative hypothesis: two-sided
```

```
> ## Chi-Squared
> set.seed(42)
> ks.test(c, "pchisq", df = mean(c))

One-sample Kolmogorov-Smirnov test

data: c
D = 0.14481, p-value = 0.4332
alternative hypothesis: two-sided

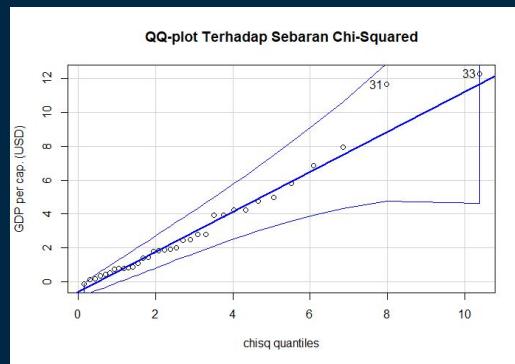
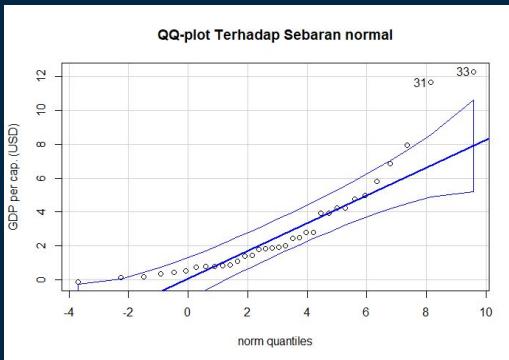
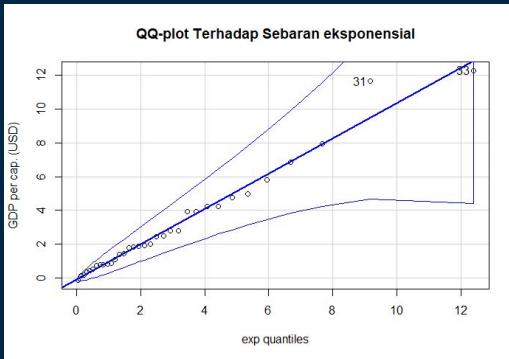
> ## Lognormal
> set.seed(42)
> ks.test(c, "plnorm", meanlog = mean(log(c)), sdlog = sd(log(c)))

One-sample Kolmogorov-Smirnov test

data: c
D = NA, p-value = NA
alternative hypothesis: two-sided
```

Berdasarkan hasil Uji Formal K-Smirnov, diperoleh hanya P-Value sebaran Normal dan Chi-Square lebih besar dibandingkan nilai alpha (0.05) atau Terima H<sub>0</sub>. Sehingga dapat disimpulkan sebaran data Harga Konsumen mendekati sebaran Normal dan Chi-Square (lebih baik).

# QQPLOT - Consumer prices ( avg annual avg. % growth 5yrs)



Hasil dari Uji Formal K-Smirnov diperoleh bahwa sebaran data GDP mendekati sebaran Normal dan Chi-Square. Hal ini selaras dengan hasil QQPLOT pada sebaran Normal dan Chi-Square yang cenderung mendekati garis diagonal sebarannya. Namun dapat dilihat sebaran Chi-Square memiliki sebaran lebih mendekati garis diagonalnya dibandingkan dengan sebaran Normal ■



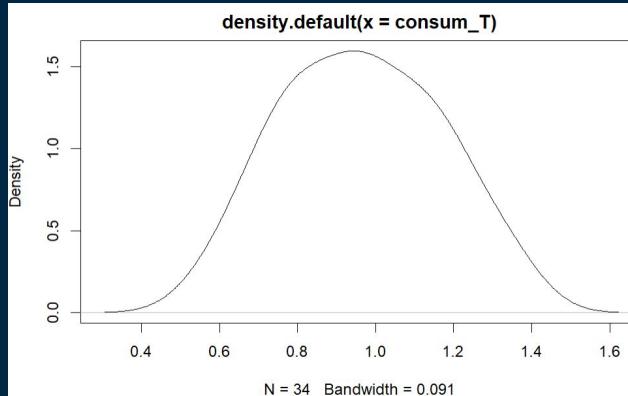
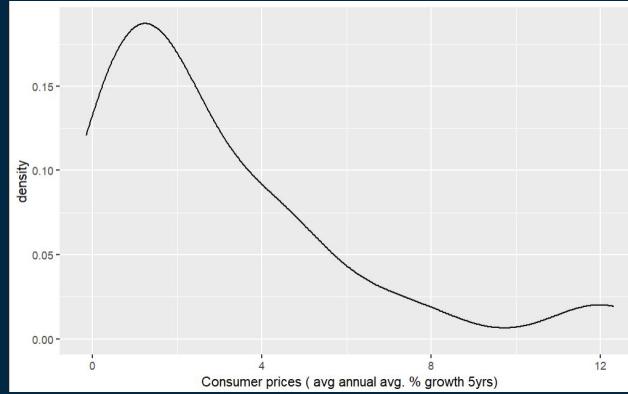
# TRANSFORMASI DATA



# Transformasi consumer Price avg 5Year

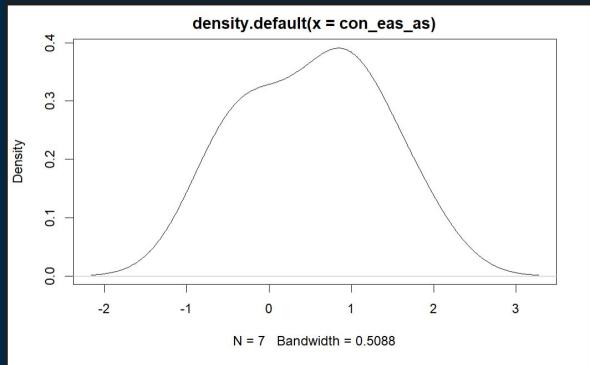
Dengan menggunakan boxcox,  
maka hasilnya adalah Seperti  
berikut ya

$$\lambda = -0.585858$$

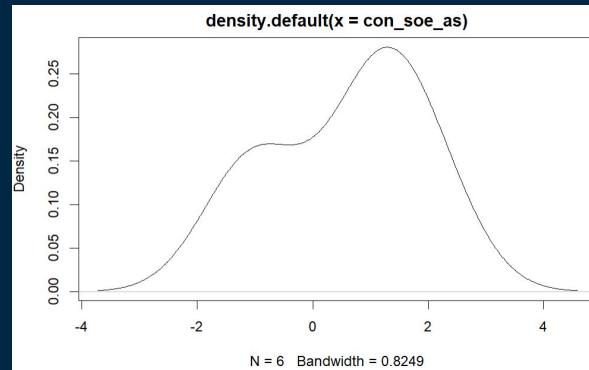


# Transformasi consumer Price avg 5 Year subregion

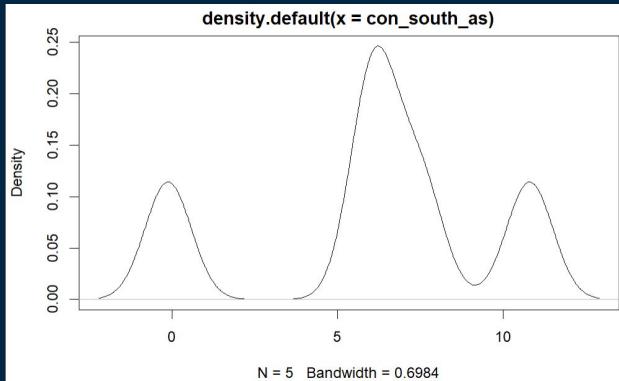
Eastern Asia



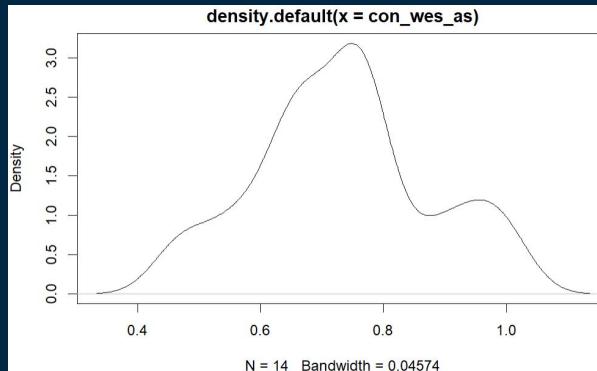
South eastern Asia



Southern Asia



Western Asia



# Transformasi consumer Price avg 5 Year subregion

```
Shapiro-Wilk normality test  
data: con_eas_as  
W = 0.96659, p-value = 0.8729  
  
Shapiro-Wilk normality test  
data: con_soe_as  
W = 0.91107, p-value = 0.4435  
  
Shapiro-Wilk normality test  
data: con_south_as  
W = 0.92189, p-value = 0.5422  
  
Shapiro-Wilk normality test  
data: con_wes_as  
W = 0.97542, p-value = 0.9395
```

Eastern Asia = Normal

South eastern Asia = Normal

South Asia = Normal

western Asia = Normal

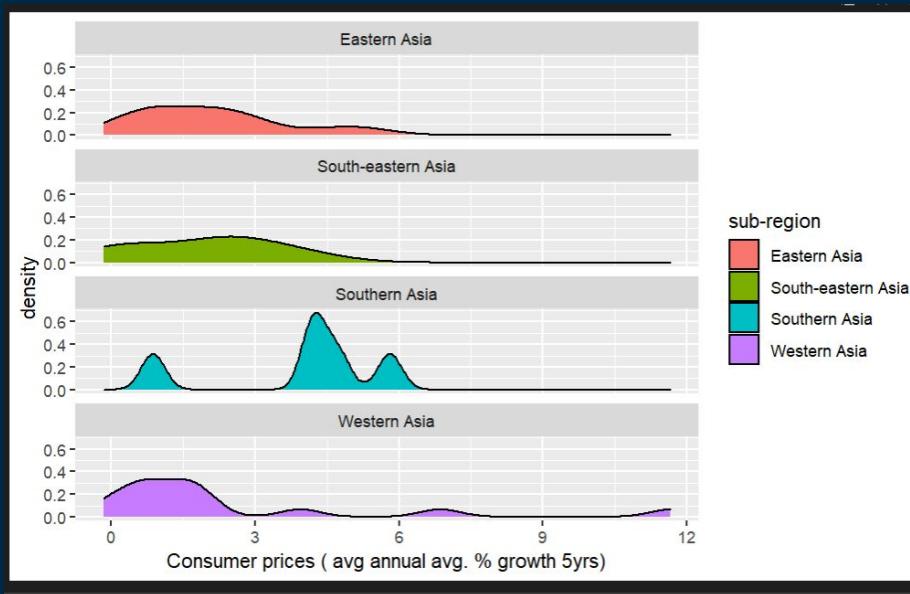


# VISUALISASI POST-TRANSFORMATION

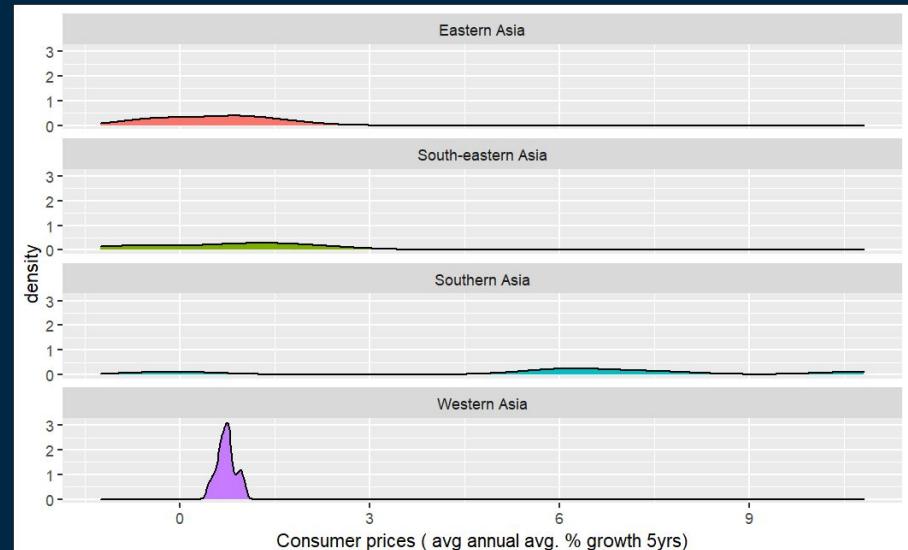


# Transformasi consumer Price avg 5 Year subregion

Sebelum di transformasi



Sesudah Di transformasi



# KESIMPULAN

# HARGA KONSUMEN

# Kesimpulannya

Pada data awal :

Data masih terlihat menjulur ke kanan pada boxplot, walaupun ketika divisualisasikan oleh density plot untuk tiap sub-benua dan hasil dari uji formal, data menyerupai sebaran normal ataupun chi-square.

Pada Transformasi : Data tersebut sangat lah bagus ditransformasi oleh boxcox, dan digrupkan sub region juga dominan ke normal setelah ditransformasi

Visualisasi akhir: Data sudah menyebar normal baik secara visual maupun menggunakan uji formal.



TERIMA KASIH

# UNDERSTANDING THE PROBLEM

## MARS

Despite being red, Mars is a cold place. It's full of iron oxide dust, which gives the planet its reddish cast

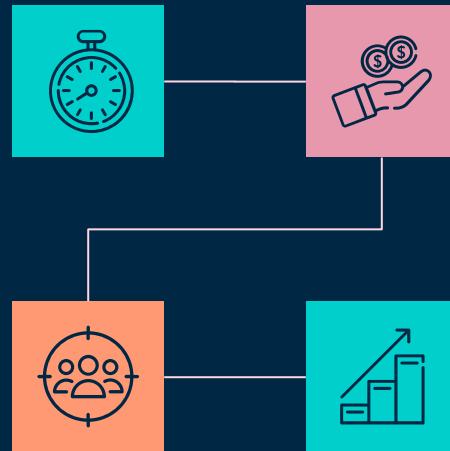
## VENUS

Venus has a beautiful name and is the second planet from the Sun. It's terribly hot, even hotter than Mercury

# OUR SOLUTIONS

## MARS

Despite being red,  
Mars is a cold place



## JUPITER

It's the biggest planet  
in the Solar System

## NEPTUNE

It's the farthest  
planet from the Sun

## SATURN

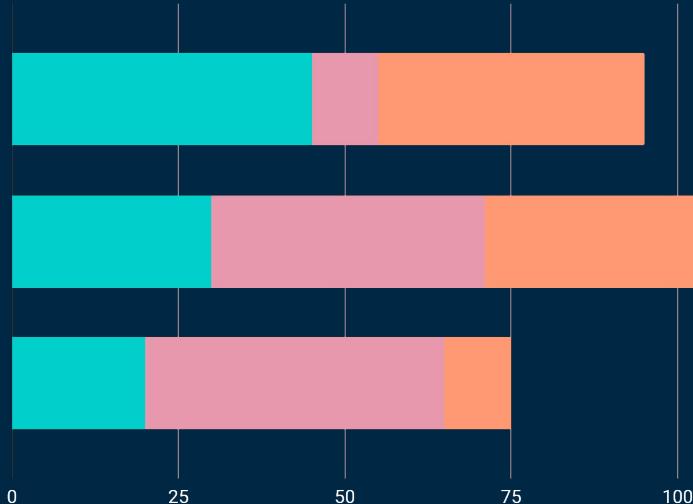
Saturn is the ringed  
one and a gas giant

# COMPANY

You could enter a subtitle  
here if you need it

01

# MARKET RESEARCH



## NEPTUNE

It's the farthest planet from the Sun



## MERCURY

Mercury is the closest planet to the Sun



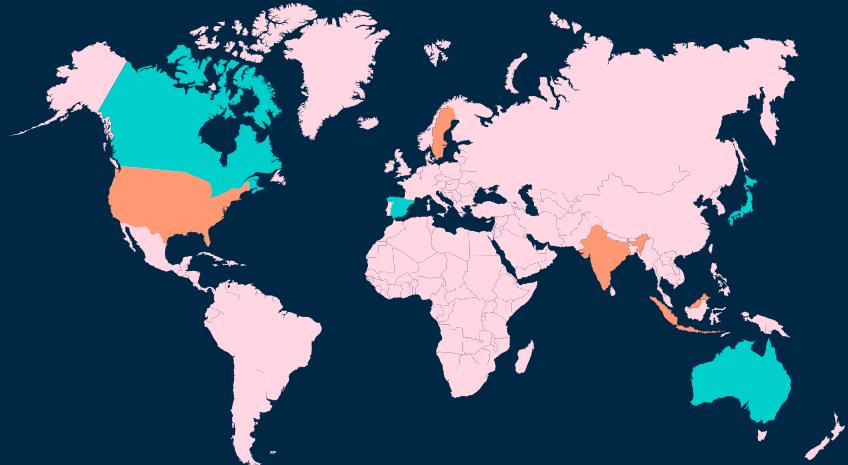
## SATURN

Saturn is composed of hydrogen and helium



# ANALYSIS

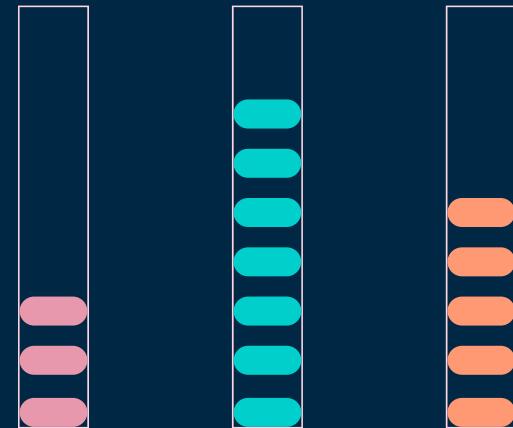
## OUTREACH



Mars

Mercury

## TOP RATED VALUES



30%

Saturn

80%

Neptune

50%

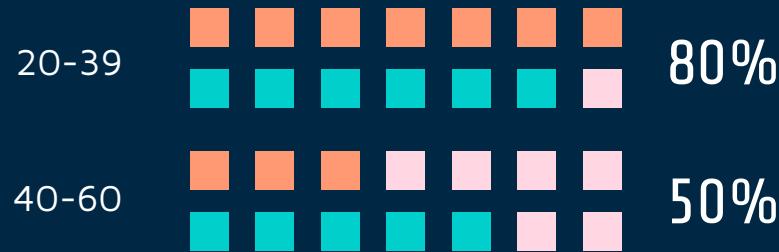
Venus

# TARGET

## GENDER



## AGE



A black and white photograph of two young women standing side-by-side, looking down at a tablet device held by the woman on the right. They are both smiling. The woman on the left has long blonde hair and is wearing a dark denim jacket over a white top. The woman on the right has curly dark hair and is wearing a light-colored cardigan over a t-shirt. The background is a bright, minimalist room with white shelves.

A Picture Is Worth a  
Thousand Words

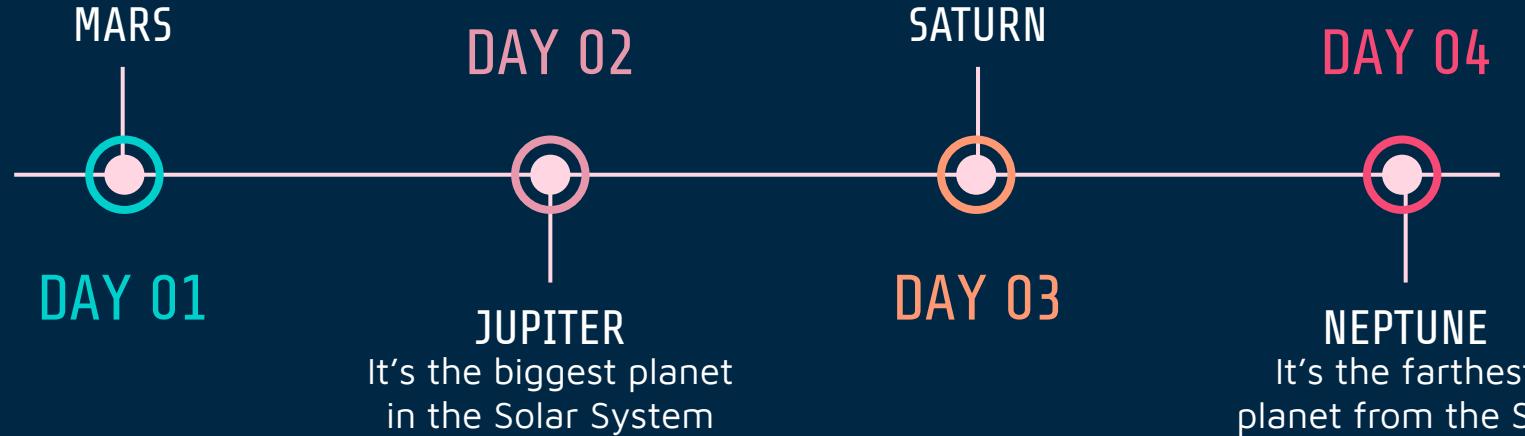


AWEOME  
WORDS



# OUR PROCESS

Despite being red,  
Mars is a cold place



# OUR CONSULTANTS



**HELENA PATTERSON**

You can replace the image on  
the screen with your own

**JANE DOE**

You can replace the image on  
the screen with your own



“This is a quote. Words full of wisdom that someone important said and can make the reader get inspired.”

—SOMEONE FAMOUS

“This is a quote. Words full of wisdom that someone important said and can make the reader get inspired.”

—SOMEONE FAMOUS

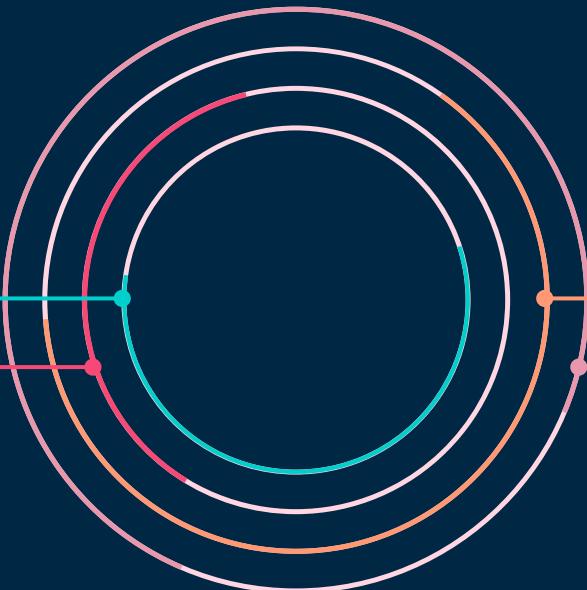
# OUR PARTNERS

Venus has an extremely poisonous atmosphere

**VENUS**

**SATURN**

Saturn is composed mostly of hydrogen and helium



Despite being red, Mars is actually a cold place

**MARS**

**MERCURY**

Mercury is the closest planet to the Sun

# TESTIMONIALS



"Mercury is the closest planet to the Sun and the smallest of them all"

—RYAN DIXON



"Saturn is composed mostly of hydrogen and helium"

—BILLY BROOKS



"Venus has a beautiful name and is the second planet from the Sun"

—ALIYA FARLEY



"The Sun is the star at the center of the Solar System"

—LUCY JADE



"Jupiter is a gas giant and the biggest planet in the Solar System"

—HENRY McKANE



"Neptune is the fourth-largest planet in the Solar System"

—ROSE CLARK

# 4,498,300,000

Big numbers catch your  
audience's attention



# AWARDS

DATE	REASON	DESCRIPTION
------	--------	-------------

MERCURY	2010	Jupiter	It's the closest planet to the Sun and the smallest one
MARS	2012	Neptune	Despite being red, Mars is actually a cold place
VENUS	2016	Saturn	It has a nice name and is the second planet from the Sun

# UPCOMING GOALS

JUPITER

JUNE 2



It's the biggest  
planet in the Solar  
System

SATURN

OCTOBER 14



Saturn is composed  
mostly of hydrogen  
and helium

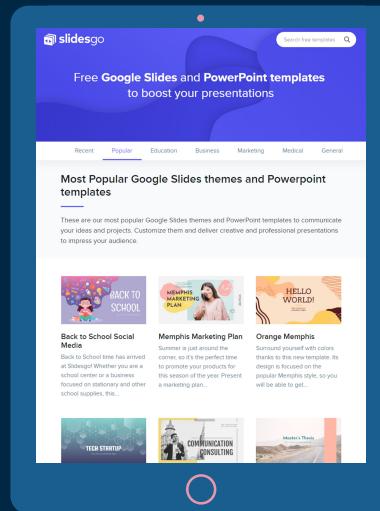
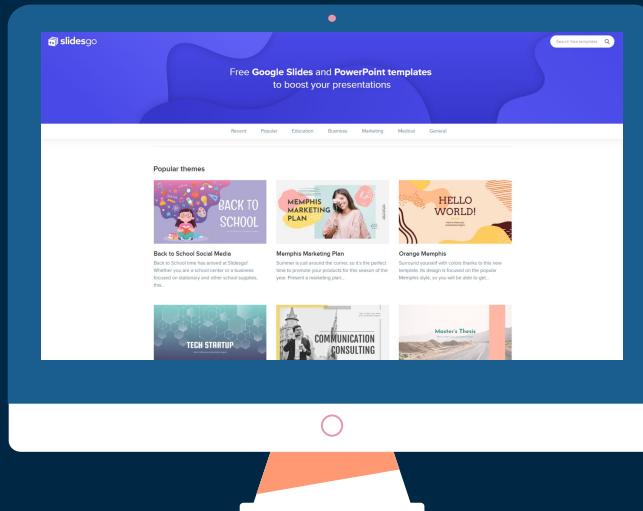
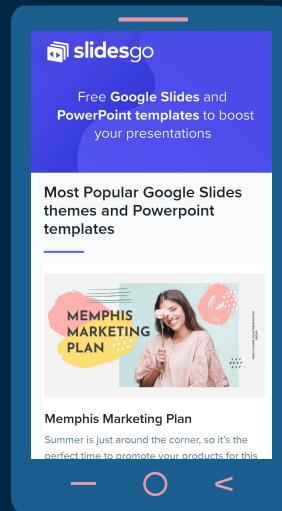
NEPTUNE

JANUARY 23



Neptune is the  
farthest planet from  
the Sun

# SNEAK PEEK



You can replace the images on these screens with your own work

Do you have any questions?

[youremail@freepik.com](mailto:youremail@freepik.com)

+91 620 421 83

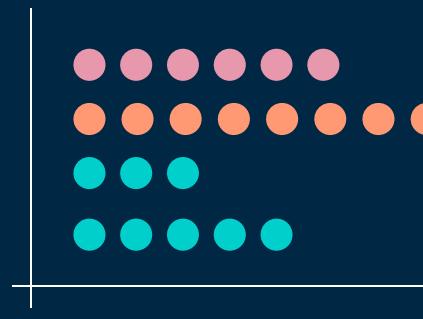
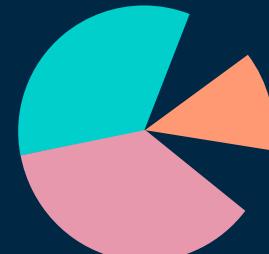
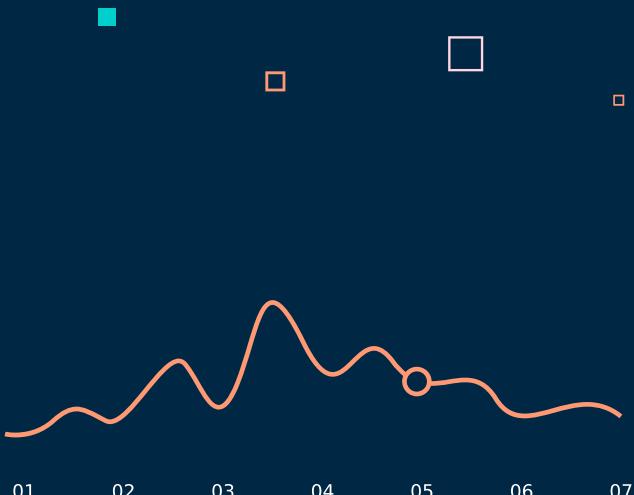
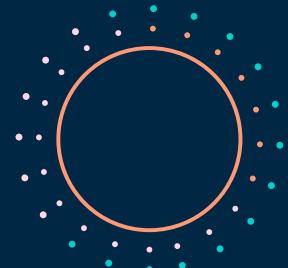
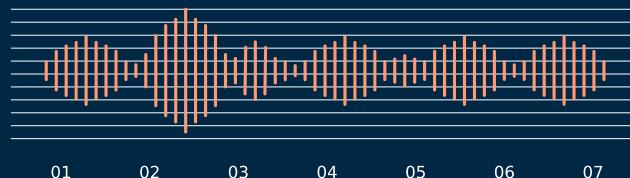
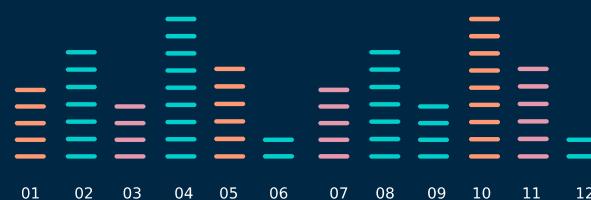
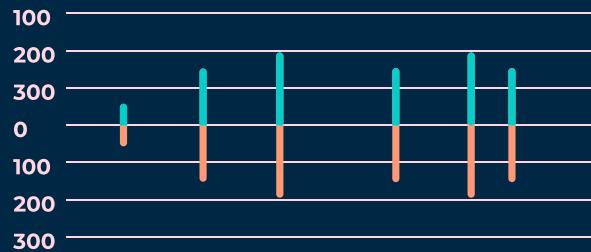
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- Portrait of beautiful adult woman smiling

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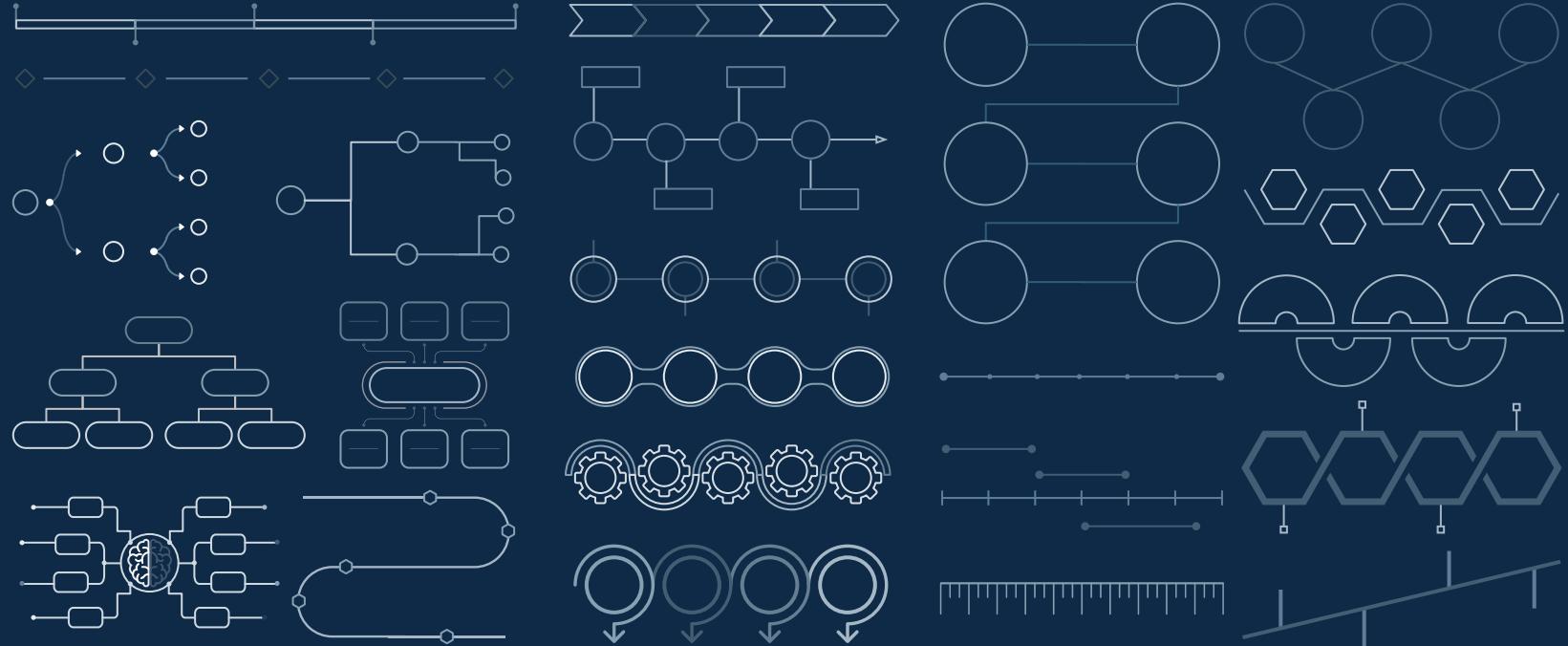
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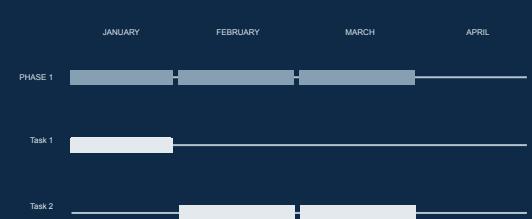
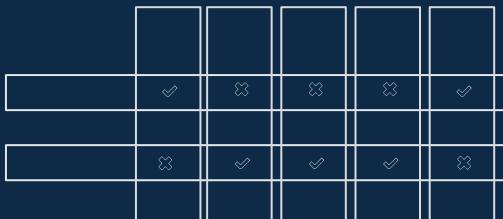
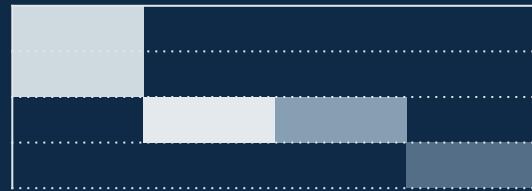
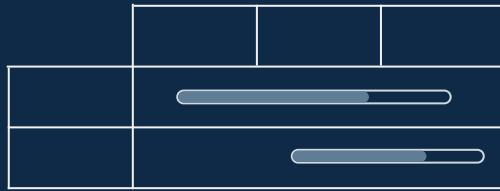
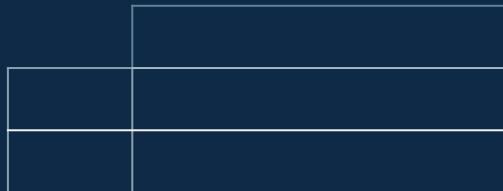
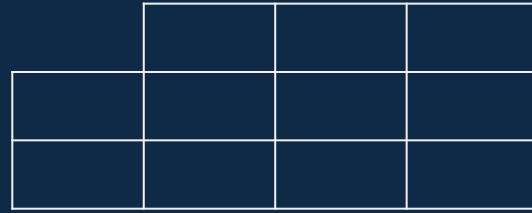
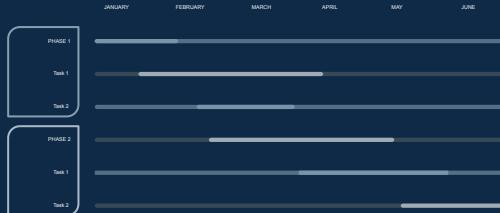
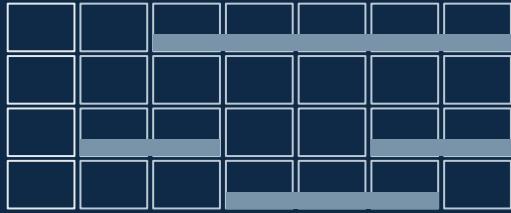
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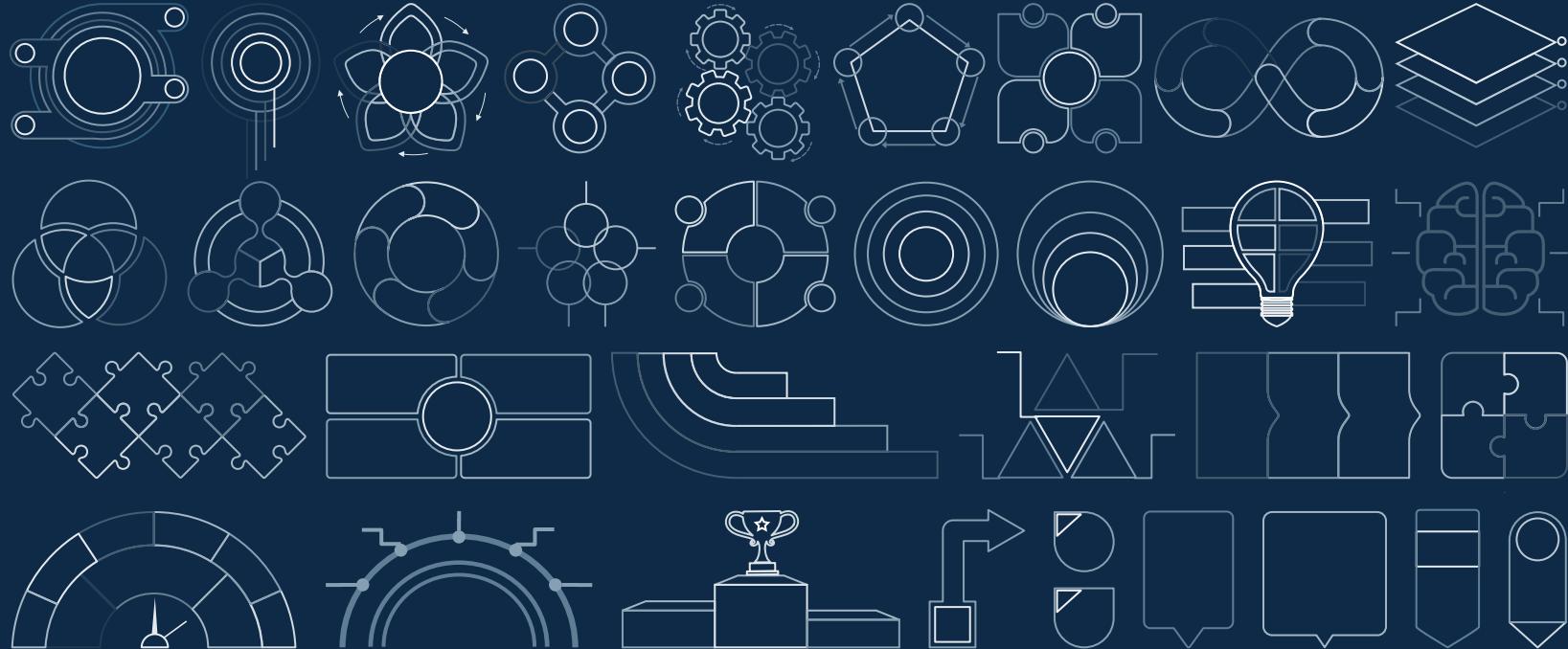
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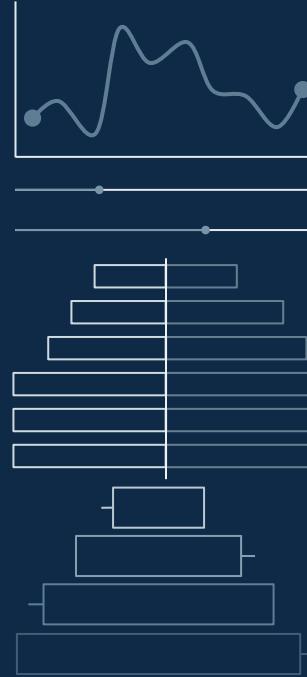
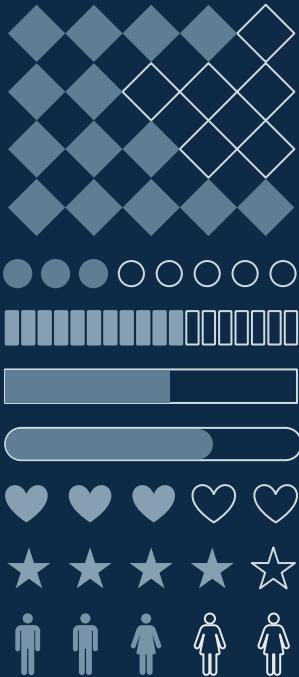
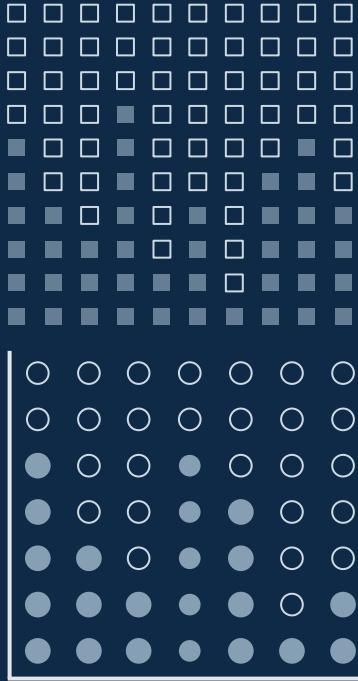












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