

MODUL SEEP

SARAWAK EDUCATION ENHANCEMENT PROGRAMME

ADDITIONAL MATHEMATICS | FORM 5

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MINISTRY OF EDUCATION, INOVATION AND TALENT DEVELOPMENT

MODUL SEEP

SARAWAK EDUCATION ENHANCEMENT PROGRAMME

ADDITIONAL MATHEMATICS | FORM 5

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Hak cipta terpelihara. Setiap bahagian terbitan ini tidak boleh diterbitkan semula, disimpan untuk pengeluaran atau dipindahkan kepada bentuk lain, sama ada dengan cara elektronik, mekanik, gambar, rakaman dan sebagainya tanpa izin bertulis daripada Penerbit MEITD.

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Preface

Welcome to the Sarawak Education Enhancement Programme (SEEP) Module Book. This book has been developed as part of our shared mission to strengthen education in Sarawak and to provide targeted, practical, and innovative resources for both students and teachers. SEEP reflects the Ministry of Education, Innovation, and Talent Development (MEITD)'s steadfast commitment to uplifting the quality of education through collaborative efforts, innovative teaching strategies, and holistic development opportunities. These modules are designed to meet the diverse learning needs of our students while equipping our teachers with the tools and guidance to improve learning outcomes meaningfully. We extend our highest appreciation to the Right Honourable Premier of Sarawak for his unwavering leadership and steadfast commitment to advancing education in the state. We also wish to place on record our deepest gratitude to YB Datuk Sri Roland Sagah Wee Inn, Minister for Education, Innovation and Talent Development Sarawak, for his visionary leadership and guidance in steering education towards greater heights; to YB Datuk Dr. Annuar Rapa'ee, Deputy Minister for Education, Innovation and Talent Development (Higher Education and Innovation) and Chairman of the Sarawak Education Assistance Initiatives (SEAI), for his invaluable insights and dedication throughout the module-writing process; and to YB Datuk Francis Harden Hollis, Deputy Minister for Education, Innovation and Talent Development (Talent Development), for his steadfast support in advancing our shared goals. Our sincere gratitude is extended to the dedicated teachers from all over Sarawak who served as SEEP module writers. Your time, expertise, and creativity have ensured that the content is relevant, practical, and engaging for both students and educators. We also thank the officers of the Sarawak State Education Department (JPNS), the District Education Offices (PPD), and all participating schools for their invaluable cooperation and contributions in shaping and delivering the SEEP programme. To our teachers, thank you for your dedication, passion, and tireless efforts in guiding and inspiring your students. To our students, these modules are created for you to succeed both academically and in life. It is the Ministry's hope that these modules will be fully utilised by teachers and students alike, serving as an effective tool towards achieving our goal of excellence in education. Let us continue working together—one school, one teacher, and one student at a time—to shape a future for Sarawak that is better, stronger and equitable for all.

KANDUNGAN

01

BAB / CHAPTER 1- SUKATAN MEMBULAT / CIRCULAR MEASURE

1.1 Radian Dan Panjang Lengkuk Suatu Bulatan
Radians and Arc Length Of A Circle

02

BAB / CHAPTER 1- SUKATAN MEMBULAT / CIRCULAR MEASURE

1.2 Luas Sektor Suatu Bulatan
Area Of Sector Of A Circle

03

BAB / CHAPTER 1- SUKATAN MEMBULAT / CIRCULAR MEASURE

1.3 Luas Tembereng Suatu Bulatan
Area Of Segment Of A Circle

04

BAB / CHAPTER 2 - PEMBEZAAN / DIFFERENTIATION

2.2 Pembezaan Peringkat Pertama (Fungsi Algebra) /
The First Derivative (Algebraic Function)

05

BAB / CHAPTER 2 - PEMBEZAAN / DIFFERENTIATION

2.3 Pembezaan Peringkat Pertama (Fungsi Gubahan)
The First Derivative (Composite Function)



KANDUNGAN

06

BAB / CHAPTER 2 - PEMBEZAAN / DIFFERENTIATION

2.2 Pembezaan Peringkat Pertama (Petua Hasil Darab)
The First Derivative (Product Rule)

07

BAB / CHAPTER 2 - PEMBEZAAN / DIFFERENTIATION

2.2 Pembezaan Peringkat Pertama (Petua Hasil Bahagi)
The First Derivative (Quotient Rule)

08

BAB / CHAPTER 3 - PENGAMIRAN / INTEGRATION

3.2 Kamiran Tak Tentu
Indefinite Integral

09

BAB / CHAPTER 3 - PENGAMIRAN / INTEGRATION

3.2 Kamiran Tak Tentu (Persamaan Lengkung) /
Indefinite Integral (Equation Of Curve)

10

BAB / CHAPTER 3 - PENGAMIRAN / INTEGRATION

3.3 Kamiran Tentu
Definite Integral



KANDUNGAN

11

BAB / CHAPTER 3 - PENGAMIRAN / INTEGRATION

3.3 Kamiran Tentu (Luas Dan Isipadu)
Definite Integral (Area And Volume)

12

BAB / CHAPTER 5 – TABURAN KEBARANGKALIAN PROBABILITY DISTRIBUTION

5.2 Taburan Binomial
Binomial Distribution

13

BAB / CHAPTER 5 – TABURAN KEBARANGKALIAN PROBABILITY DISTRIBUTION

5.3 Taburan Normal
Normal Distribution

14

BAB / CHAPTER 5 – TABURAN KEBARANGKALIAN PROBABILITY DISTRIBUTION

5.3 Taburan Normal (skor-z)
Normal Distribution (z-score)

15

BAB / CHAPTER 6 – FUNGSI TRIGONOMETRI TRIGONOMETRIC FUNCTIONS

6.3 Graf Fungsi Sinus, Kosinus Dan Tangen
Graph Of Sine, Cosine And Tangent Functions



KANDUNGAN

16

BAB / CHAPTER 6 – FUNGSI TRIGONOMETRI TRIGONOMETRIC FUNCTIONS

6.4 Menyelesaikan Persamaan Trigonometric Dengan Kaedah Graf
Solving Trigonometric Equations Using Graphical Method

17

BAB / CHAPTER 7 – PENGATURCARAAN LINEAR LINEAR PROGRAMMING

7.1 Model Pengaturcaraan Linear
Linear Programming Model

18

BAB / CHAPTER 7 – PENGATURCARAAN LINEAR LINEAR PROGRAMMING

7.2 Menyelesaikan Masalah Yang Melibatkan Pengaturcaraan
Linear Secara Graf
Solving Problems Involving Linear Programming Graphically

19

BAB / CHAPTER 9 – PENYELESAIAN SEGITIGA SOLUTION OF TRIANGLES

9.1 Petua Sinus Dan Petua Kosinus
Sine Rule And Cosine Rule

20

BAB / CHAPTER 9 – PENYELESAIAN SEGITIGA SOLUTION OF TRIANGLES

9.2 Luas Segi Tiga Dan Kes Berambiguiti Suatu Segi Tiga
Area Of Triangle And Ambiguous Case Of A Triangle



KANDUNGAN

21

BAB / CHAPTER 9 – PENYELESAIAN SEGITIGA SOLUTION OF TRIANGLES

9.3 Aplikasi Petua Sinus, Petua Kosinus Dan Luas Segi Tiga
Application Of Sine Rule, Cosine Rule And Area Of Triangle

22

BAB / CHAPTER 10 – NOMBOR INDEKS / INDEX NUMBER

10.1 Nombor Indeks
Index Number

23

BAB / CHAPTER 10 – NOMBOR INDEKS / INDEX NUMBER

10.2 Indeks Gubahan
Composite Index

24

BAB / CHAPTER 10 – NOMBOR INDEKS / INDEX NUMBER

10.3 Indeks Gubahan (Penyelesaian Masalah)
Composite Index (Problems Solving)



SESI PEMBELAJARAN 1

TINGKATAN 5

BAB

1

SUKATAN MEMBULAT
CIRCULAR MEASURE

1.1

Radian dan Panjang Lengkok Suatu Bulatan
Radians and Arc Length of a Circle

Objektif Pembelajaran:

Learning objective:

- Mengaitkan hubungan antara ukuran sudut dalam radian dan darjah.
Relate angle measurement in radian and degree.
- Tentukan
Determine
 - (i) panjang lengkok,
arc length,
 - (ii) jejari, dan
radius, and
 - (iii) sudut yang dicangkum di pusat bulatan
angle subtended at the centre of a circle.

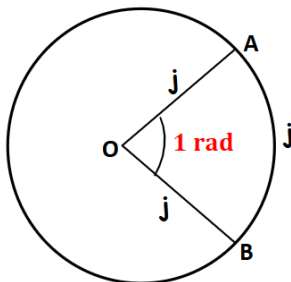
Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

1. Definisi radian / *Definition of radian*

Radian: Radian adalah unit ukuran sudut yang lain. Ia ditakrifkan sebagai sudut yang dicangkum di pusat bulatan oleh lengkok yang panjangnya sama dengan jejari bulatan.

Radians: *A radian is another unit of angular measurement. It's defined as the angle subtended at the centre of a circle by an arc whose length is equal to the radius of the circle.*



Jika panjang lengkok suatu bulatan sama dengan panjang jejari bulatan tersebut, maka sudut yang terbentuk di pusat bulatan adalah bernilai **1 radian**.

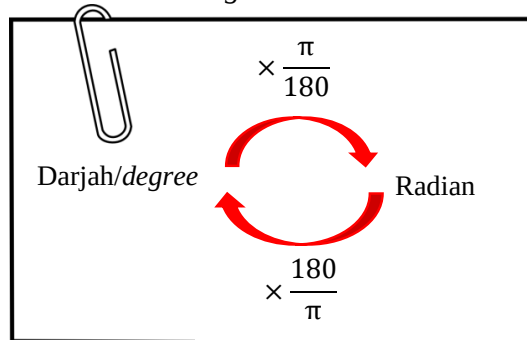
*If the arc length of a circle is equal to the radius of the circle, then the angle formed at the centre of the circle is **1 radian**.*

2. Radian dinyatakan dalam sebutan π /
Radians are quoted in terms of π

$$2\pi \text{ radians} = 360^\circ$$

$$\pi \text{ radians} = 180^\circ$$

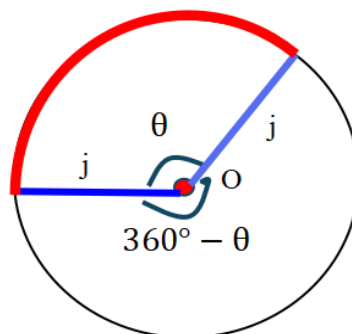
3. Pertukaran antara radian dan darjah/
Conversion between radians and degrees



4. **Panjang lengkok** adalah sebahagian daripada lilitan bulatan.
Arc is a part of the circumference of a circle.

Lengkok kecil/Minor arc

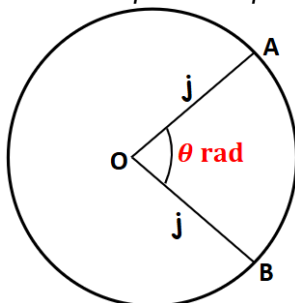
Sudut di pusat kurang daripada 180° / *the angle at the centre is less than 180°*



Lengkok major/Major arc

Sudut di pusat lebih daripada 180° / *the angle at the centre is more than 180°*

5. Rumus panjang lengkok suatu bulatan
Formula of an arc of a circle



$$\text{Panjang lengkok } AB = \frac{\theta}{2\pi} \times 2\pi j$$

$$\text{length of minor arc } AB = \frac{\theta}{2\pi} \times 2\pi r$$

$$s = j\theta / r\theta$$

(dalam radian/in radians)

1. Tukarkan setiap sudut dalam darjah yang berikut kepada radian.
Convert each of the following angles in degrees into radians.

Aras 1

Contoh Example $100^\circ = 100^\circ \times \frac{\pi}{180^\circ}$ $= 1.746 \text{ rad}$	
1. $45^\circ 10'$	2. 140°

2. Tukarkan setiap sudut dalam radian yang berikut kepada darjah.
Convert each of the following angles in radians into degrees.

Aras 1

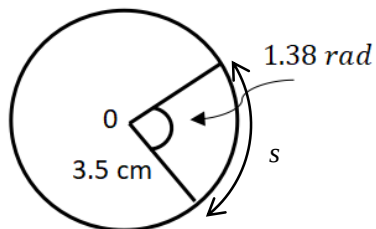
Contoh Example $\frac{5}{9}\pi = \frac{5}{9}\pi \times \frac{180^\circ}{\pi}$ $= 100^\circ$	
1. 1.917 radian	2. $\frac{11}{6} \text{ radians}$

3. Cari panjang lengkok, dalam cm, bagi setiap bulatan berikut. [Guna $\pi = 3.142$]

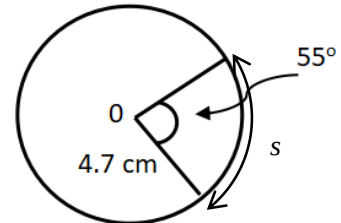
Aras 1

Find the length of the arc, in cm, for each of the following circles. [Using $\pi = 3.142$].

Contoh
Example

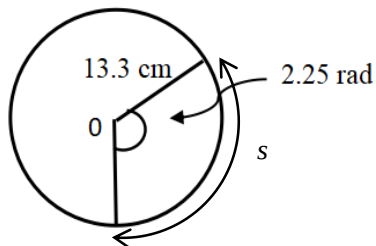


$$s = 3.5 (1.38) \\ = 4.83 \text{ cm}$$

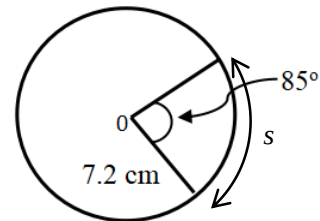


$$s = 4.7 \left(55 \times \frac{\pi}{180} \right) \\ = 4.512 \text{ cm}$$

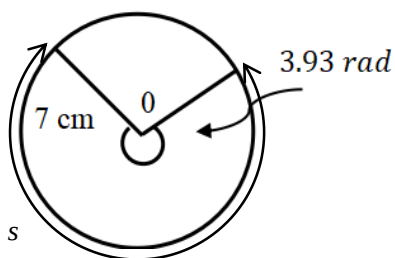
1.



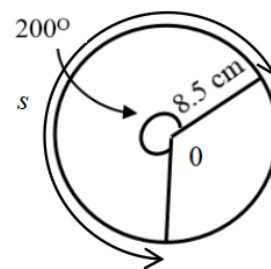
2.



3.



4.



4. Cari nilai bagi jejari, dalam cm dan/atau θ , dalam radian bagi setiap rajah di bawah. [Guna $\pi = 3.142$]
Find the value of length of the arc, in cm and/or θ in radians for each of the following diagram.

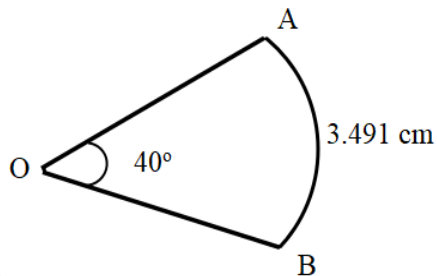
[Using $\pi = 3.142$]

Aras 3

**Contoh
Example**

Rajah menunjukkan sektor AOB bagi sebuah bulatan dengan pusat O . Diberikan bahawa $\angle AOB = 40^\circ$, cari jejari, j .

The figure shows the sector AOB of a circle with the center O . Given that $\angle AOB = 40^\circ$, find the radius, r .



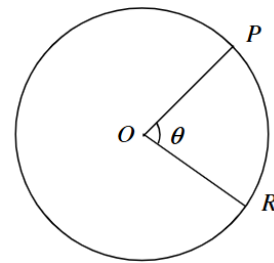
$$40^\circ = 40 \times \frac{\pi}{180} = 0.6982 \text{ rad}$$

Panjang lengkok AB / Length of the arc $AB = j\theta$

$$3.491 = j (0.6982)$$

$$j = 5 \text{ cm}$$

1. Rajah menunjukkan sebuah bulatan dengan pusat O . Panjang lengkok minor PR adalah 15 cm dan sudut sektor besar POR adalah 300° .
The diagram shows a circle with centre O . The length of the minor arc PR is 15 cm and the angle of the major sector AOB is 300° .



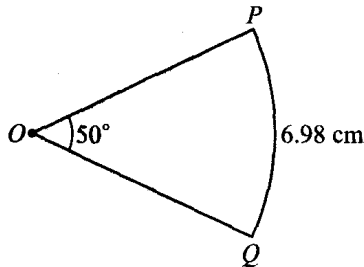
Guna $\pi = 3.142$, cari

Use $\pi = 3.142$, find

- (a) nilai θ dalam radian,
the value of θ in radians,
(b) jejari bulatan, dalam cm.
the radius, in cm, of the circle.

Latihan pengukuhan:
Enhancement Exercises:

1.



Rajah menunjukkan suatu sektor OPQ bagi sebuah bulatan berpusat di O . Diberi bahawa $\angle POQ = 50^\circ$ dan panjang lengkok PQ ialah 6.98 cm, cari perimeter sektor OPQ . [Guna $\pi = 3.142$]

The diagram shows a sector OPQ of a circle with centre O . Given that $\angle POQ = 50^\circ$ and the length of the arc PQ is 6.98 cm, find the perimeter of the sector OPQ . [Using $\pi = 3.142$]

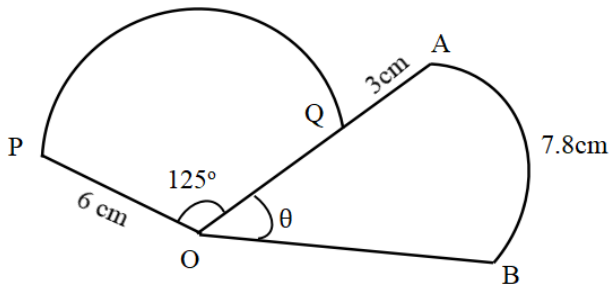
Aras 2

Penyelesaian / Solution:

2. Rajah di atas menunjukkan dua sektor bagi dua bulatan sepusat, OPQ dan OAB , kedua-duanya berpusat di O .

Diagram above shows two sectors of two concentric circles, OPQ and OAB , both with centre O .

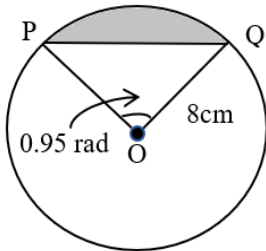
(a) **Aras 2**



Guna $\pi = 3.142$, hitung
Using $\pi = 3.142$, Calculate
(a) panjang lengkok PQ ,
length of arc PQ ,
(b) sudut θ dalam radian.
angle θ in radians.

Penyelesaian / Solution:

3.



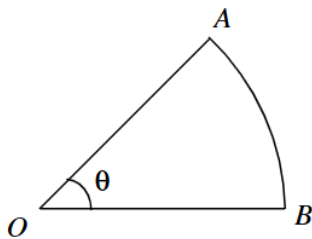
Rajah di bawah menunjukkan sebuah bulatan dengan pusat O dan jejari 8 cm. Cari perimeter, dalam cm, bagi rantau berlorek.

The diagram shows a circle with centre O and radius 8 cm. Find the perimeter, in cm, of the shaded region.

Aras 3

Penyelesaian / Solution:

4.



Rajah menunjukkan sektor AOB dengan pusat O . Panjang lengkok AB adalah 7.5 cm dan perimeter sektor AOB adalah 25 cm. Cari nilai θ , dalam radian.

Diagram shows a sector AOB with centre O . The length of the arc AB is 7.5 cm and the perimeter of the sector AOB is 25 cm. Find the value of θ , in radian.

Aras 3

Penyelesaian/Solution:

Penilaian:
Assessment:

1	Rajah ini menunjukkan suatu sektor bulatan OAB dengan pusat O. Diberi bahawa panjang lengkok AB ialah 15.76 cm. Cari panjang OB. [Guna $\pi = 3.142$] [3 markah] <i>The diagram shows a sector of the circle OAB with centre O. Given that the length of the arc AB is 15.76 cm. Find the length of OB. [Use $\pi = 3.142$] [3 marks]</i> Penyelesaian / Solution:
2	Rajah sebelah menunjukkan dua sektor OAD dan OBC yang berpusat di O. Diberi bahawa $OD = 4$ cm, $DC = 2$ cm dan $\angle AOD = 1.13$ radian. Cari perimeter kawasan berlorek. [3 markah] <i>The diagram shows two sectors OAD and OBC with centre O. Given that $OD = 4$ cm, $DC = 2$ cm and $\angle AOD = 1.13$ radians. Find the perimeter of the shaded region. [3 marks]</i> Penyelesaian / Solution:

SESI PEMBELAJARAN 2

TINGKATAN 5

BAB

1

SUKATAN MEMBULAT
CIRCULAR MEASURE

1.2

Luas Sektor Suatu Bulatan
Area of Sector of a Circle

Objektif Pembelajaran:

Learning objective:

- Menentukan luas sektor, jejari dan sudut terangkum di pusat bulatan
Determine the area of sector, radius and angle subtended at the centre of a circle

Konsep Penting / Rumus Penting:
Important Concepts / Important Formulae:

$L = \frac{1}{2}j^2\theta$ $A = \frac{1}{2}r^2\theta$			
Kes 1 / Case 1 : Mencari luas sektor apabila sudut dalam darjah diberi <i>Find the area of sector when an angle in degree is given</i>	Kes 2 / Case 2 : Mencari luas sektor apabila sudut dalam radian diberi <i>Find the area of sector when an angle in radians is given</i>	Kes 3 / Case 3 : Mencari jejari apabila luas sektor dan sudut sektor diberi <i>Find the radius when the area of sector and an angle are given</i>	Kes 4 / Case 4 : Mencari sudut sektor apabila luas sektor dan jejari diberi <i>Find the angle of sector when the area of sector and the radius are given</i>

Langkah- Langkah :

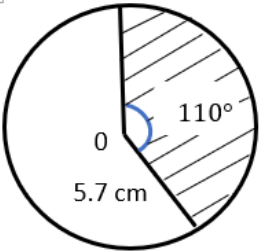
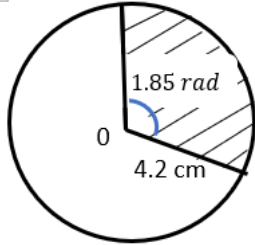
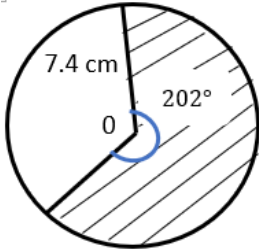
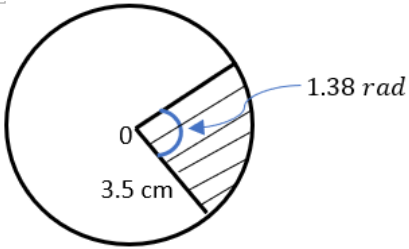
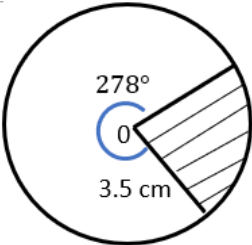
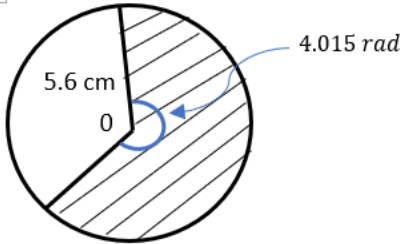
Step by Step:

- Tukar sudut ke unit radian jika sudut diberi dalam unit darjah.
Convert the angle to radians first if it is given in degree.
- Cari luas sektor dengan menggunakan formula $L = \frac{1}{2}j^2\theta$, di mana sudut dalam unit radian.
Find the area of sector by using formula, $A = \frac{1}{2}r^2\theta$ where angle is in radians.
- Guna formula $L = \frac{1}{2}j^2\theta$ dengan menggantikan nilai-nilai yang diberi bagi penyelesaian kes 3 dan kes 4.
Use formula $A = \frac{1}{2}r^2\theta$ by substituting the values given for case 3 and case 4.

1. Cari luas kawasan yang berlorek, dalam cm^2 . [Guna $\pi = 3.142$]

Aras 1

Find the area of the shaded region, in cm^2 . [Use $\pi = 3.142$]

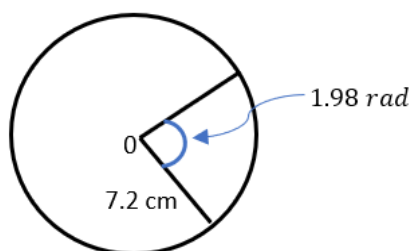
Contoh Example  Luas kawasan yang berlorek Area of the shaded region $= \frac{1}{2} (5.7)^2 (110^\circ \times \frac{3.142}{180^\circ})$ $= \frac{1}{2} (5.7)^2 (1.920)$ $= 31.19 \text{ cm}^2$	Contoh Example  Luas kawasan yang berlorek Area of the shaded region $= \frac{1}{2} (4.2)^2 (1.85)$ $= 16.32 \text{ cm}^2$
1. 	2. 
3. 	4. 

2. Cari luas bagi sektor major atau sektor minor, dalam cm^2 . [Guna $\pi = 3.142$]
Find the area of major sector or minor sector, in cm^2 . [Use $\pi = 3.142$]

Aras 2

**Contoh
Example**

Rajah di bawah menunjukkan sebuah bulatan yang berpusat O dan berjejari 7.2 cm. Hitung luas bagi sektor minor, dalam cm^2 . [Guna $\pi = 3.142$]
Diagram below shows a circle with centre O and a radius of 7.2 cm. Calculate the area of minor sector, in cm^2 . [Use $\pi = 3.142$]



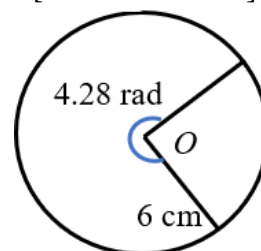
Luas kawasan bagi sektor minor

Area of minor sector

$$= \frac{1}{2} (7.2)^2 (1.98)$$

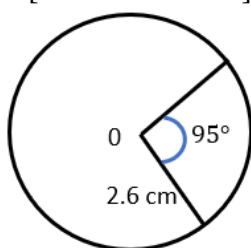
$$= 51.32 \text{ cm}^2$$

1. Rajah di bawah menunjukkan sebuah bulatan yang berpusat O dan berjejari 6 cm. Hitung luas bagi sektor major, dalam cm^2 .
[Guna $\pi = 3.142$]
Diagram below shows a circle with centre O and a radius of 6 cm. Calculate the area of major sector, in cm^2 . [Use $\pi = 3.142$]



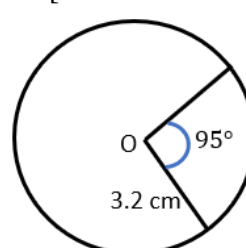
2. Rajah di bawah menunjukkan sebuah bulatan yang berpusat O dan berjejari 2.6 cm. Hitung luas bagi sektor minor, dalam cm^2 .
[Guna $\pi = 3.142$]

Diagram below shows a circle with centre O and radius of 2.6 cm. Calculate the area of minor sector, in cm^2 . [Use $\pi = 3.142$]



3. Rajah di bawah menunjukkan sebuah bulatan yang berpusat O dan berjejari 3.2 cm. Hitung luas bagi sektor major, dalam cm^2 .
[Guna $\pi = 3.142$]

Diagram below shows a circle with centre O and radius of 3.2 cm. Calculate the area of major sector, in cm^2 . [Use $\pi = 3.142$]



Aras 2

3. Mencari jejari, j atau sudut, θ jika luas kawasan diberi.

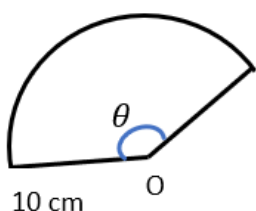
Find the radius, r or angle, θ if the area of region is given.

➤ Apabila nilai dua daripada tiga pemboleh ubah itu diketahui, nilai pemboleh ubah satu lagi dapat dicari.

When two of three variable values are given, value of another variable can be found.

**Contoh
Example**

Rajah di bawah menunjukkan sebuah sektor bulatan berpusat O yang mempunyai luas 128 cm^2 dan berjejari 10 cm. Cari sudut, θ dalam radian.
Diagram below shows a sector of circle with centre O, has area 128 cm^2 and a radius of 10 cm. Find the angle θ , in radians.

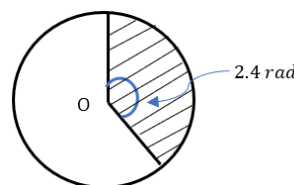


$$\begin{aligned}\frac{1}{2}(10)^2(\theta) &= 128 \\ \theta &= \frac{128 \times 2}{10^2} \\ \theta &= 2.56 \text{ rad}\end{aligned}$$

**Contoh
Example**

Rajah di bawah menunjukkan sebuah bulatan berpusat O yang mempunyai luas kawasan berlorek 50.7 cm^2 , mencangkumi sudut 2.4 radian pada pusat bulatan O. Hitung jejari, j bulatan itu.

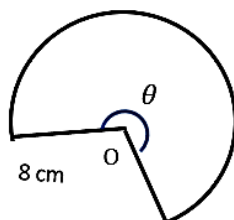
Diagram below shows a circle with centre O which has shaded region area of 50.7 cm^2 , subtended angle 2.4 rad at the centre O. Calculate the radius, r of the circle.



$$\begin{aligned}\frac{1}{2}(r)^2(2.4) &= 50.7 \\ j^2 &= \frac{50.7 \times 2}{2.4} \\ j^2 &= 42.25 \\ j &= \sqrt{42.25} \\ j &= 6.5 \text{ cm}\end{aligned}$$

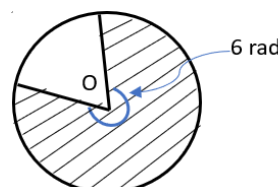
1. Rajah di bawah menunjukkan sebuah sektor bulatan yang berpusat O dan mempunyai luas 140 cm^2 . Jejari bulatan ialah 8 cm. Cari sudut, θ dalam radian.

Diagram below shows a sector of circle with centre O has an area of 140 cm^2 . The radius is 8 cm. Find the angle θ , in radians.



2. Rajah di bawah menunjukkan sebuah bulatan yang berpusat O. Diberi luas kawasan berlorek ialah 147 cm^2 dan mencangkumi sudut 6 radian pada pusat O. Hitung jejari, j bagi bulatan itu.

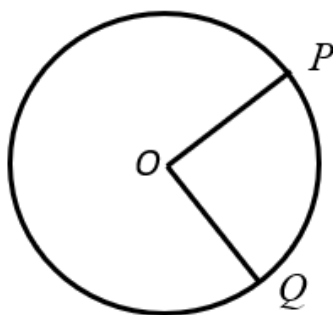
Diagram below shows a circle with centre O. Given the area of shaded region is 147 cm^2 and subtended angle of 6 rad at the centre O. Calculate the radius, r of the circle.



Latihan Pengukuhan :
Enhancement Exercises :

1. Rajah di bawah menunjukkan sebuah bulatan yang berpusat O dan berjejari 6 cm. Diberi luas sektor minor ialah 26.12 cm^2 , tunjukkan bahawa sudut minor POQ ialah 1.451 radians.
Diagram below shows a circle with the centre O and has a radius 6 cm. Given the area of the minor sector POQ is 26.12 cm^2 . Show that the minor angle POQ is 1.451 rad.

Aras 2

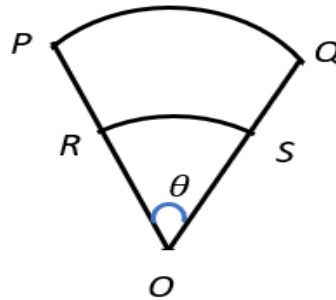


Penyelesaian / Solution :

2. Rajah di bawah menunjukkan dua sektor, OPQ dan ORS dengan pusat sepunya O . Diberi $OR : OP = 1 : 2$, $OR = 5$ cm dan luas bagi kawasan $PQSR$ ialah 18.75 cm^2 .

Diagram below shows two sectors with a common centre O . Given $OR : OP = 1 : 2$, $OR = 5$ cm and the area of the region $PQSR$ is 18.75 cm^2 .

Aras 3



Cari / Find

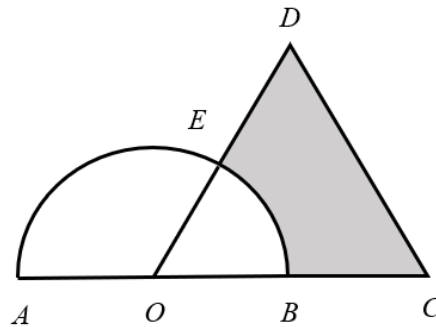
- luas dalam cm^2 , bagi sektor OPQ dalam sebutan θ ,
the area, in cm^2 , of sector OPQ , in terms of θ ,
- luas dalam cm^2 , bagi sektor ORS dalam sebutan θ ,
the area, in cm^2 , of sector ORS , in terms of θ ,
- nilai bagi θ , dalam radian.
the value of θ , in radians.

Penyelesaian / Solution:

Penilaian :

Assessment:

1. Rajah di bawah menunjukkan sebuah semi bulatan AOB yang berpusat di O dan berjejari 12.6 cm. ODC ialah sebuah segi tiga sama kaki dengan $OD = OC = 19.5$ cm dan $DC = 17.84$ cm. Diberi $AOBC$ dan OED adalah garis lurus dengan keadaan $\angle EOB = 0.95$ radian. Diagram below shows a semicircle with centre O and a radius of 12.6 cm. ODC is an isosceles triangle with $OD = OC = 19.5$ cm and $DC = 17.84$ cm. Given $AOBC$ and OED are straight lines such that $\angle EOB = 0.95$ radians.



Cari luas dalam cm^2 , bagi kawasan berlorek. [Guna $\pi = 3.142$]
Find the area, in cm^2 , of the shaded region. [Use $\pi = 3.142$]

[6 markah]

[6 marks]

Penyelesaian / Solution:

SESI PEMBELAJARAN 3

TINGKATAN 5

BAB

1

SUKATAN MEMBULAT
CIRCULAR MEASURE

1.3

Luas Tembereng Suatu Bulatan
Area of Segment of a Circle

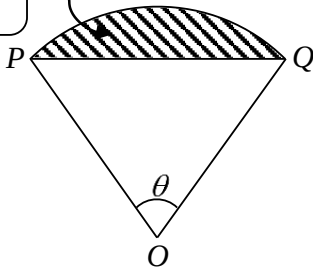
Objektif Pembelajaran:

Learning objective:

- Menentukan luas tembereng suatu bulatan
Determine the area of segment of a circle

Konsep Penting / Rumus Penting:
Important Concepts / Important Formulae:

Tembereng
Segment



$$\text{Luas tembereng suatu bulatan} = \frac{1}{2} r^2 \theta - \frac{1}{2} r^2 \sin \theta$$

$$\text{Area of segment of a circle} = \frac{1}{2} r^2 \theta - \frac{1}{2} r^2 \sin \theta$$

Langkah- Langkah:

Step by Step:

- Tukar sudut ke unit radian jika sudut diberi dalam unit darjah.
Convert the angle to radians first if it is given in degree.
- Cari luas sektor dengan menggunakan formula $L = \frac{1}{2} r^2 \theta$, di mana sudut dalam unit radian.
Find the area of sector using the formula, $A = \frac{1}{2} r^2 \theta$, where angle is in radians.
- Cari luas segi tiga dengan menggunakan formula $L = \frac{1}{2} r^2 \sin \theta$, di mana sudut adalah dalam unit darjah atau radian.
Find the area of triangle using the formula $A = \frac{1}{2} r^2 \sin \theta$, where angle is in degree or radians.
- Guna formula Luas tembereng suatu bulatan = Luas Sektor – Luas Segi tiga.
Use formula Area of segment of a circle = Area of Sector – Area of Triangle.

1. Cari luas tembereng yang berlorek, dalam cm^2 . [Guna $\pi = 3.142$]

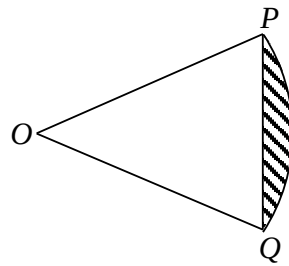
Aras 2

Find the area of the shaded segment, in cm^2 . [Use $\pi = 3.142$]

Contoh
Example

Rajah di bawah menunjukkan sebuah sektor yang mencangkumi sudut 60° di pusat O dan berjejari 5.8 cm. Cari luas tembereng yang berlorek, dalam cm^2 .

Diagram below shows a sector with subtended angle 60° and a radius of 5.8 cm at the centre O. Find the area of shaded segment, in cm^2 .



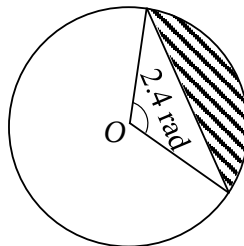
Luas tembereng yang berlorek

Area of shaded segment

$$\begin{aligned} &= \frac{1}{2} (5.8)^2 \left(60^\circ \times \frac{3.142}{180^\circ} \right) - \frac{1}{2} (5.8)(5.8)(\sin 60^\circ) \\ &= 17.62 \text{ cm}^2 - 14.57 \text{ cm}^2 \\ &= 3.050 \text{ cm}^2 \end{aligned}$$

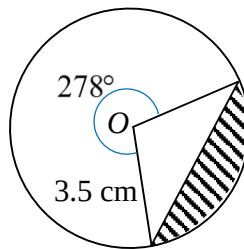
1. Rajah di bawah menunjukkan sebuah sektor dalam bulatan yang mencangkumi sudut 2.4 radian di pusat O dan berjejari 6.5 cm. Cari luas tembereng yang berlorek, dalam cm^2 .

Diagram below shows a sector in a circle with subtended angle 2.4 radians at the centre O and has a radius of 6.5 cm at the centre O. Find the area of shaded segment, in cm^2 .



2. Rajah di bawah menunjukkan sebuah bulatan yang berpusat O dan berjejari 3.5 cm.

Diagram below shows a circle with centre O and has a radius of 3.5 cm.

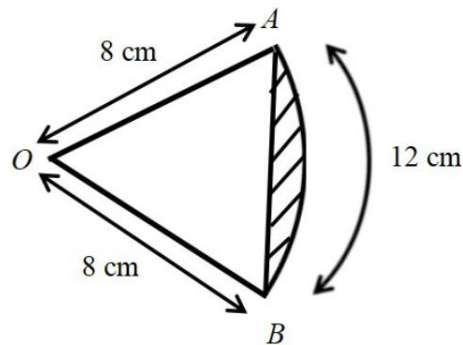


Cari luas tembereng yang berlorek, dalam cm^2 .

Find the area of shaded segment, in cm^2 .

3. Rajah di bawah menunjukkan sektor OAB bagi sebuah bulatan yang berpusat O dan berjejari 8 cm. Panjang lengkok AB ialah 12 cm.

Diagram below shows the sector OAB of a circle with centre O and has a radius 8 cm. The length of the arc AB is 12 cm.



[Guna $\pi = 3.142$]

[Use $\pi = 3.142$]

Cari / Find

- luas kawasan sektor AOB ,
the area of the sector AOB ,
- luas kawasan berlerek.
the area of the shaded region.

Latihan Pengukuhan:
Enhancement Exercises:

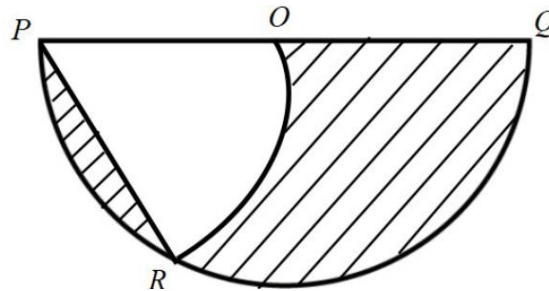
Kertas 1 / Kertas 2

Paper 1/ Paper 2

Aras 3

1. Rajah di bawah menunjukkan semibulatan $OPRQ$ berpusat O dengan diameter 14 cm. POR ialah sebuah sektor berpusat P .

Diagram below shows a semicircle $OPRQ$ with centre O and diameter 14 cm. POR is a sector with centre P .



Cari / Find

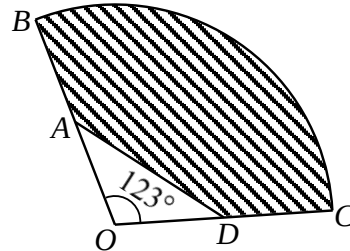
[Guna/ Use $\pi = 3.142$]

- $\angle OPR$, dalam radian,
 $\angle OPR$, in radians,
- perimeter, dalam cm, kawasan berlorek,
the perimeter, in cm, of the shaded region,
- luas, dalam cm^2 bagi rantau yang berlorek.
the area, in cm^2 , of the shaded region.

Penyelesaian / Solution:

2. Rajah di bawah menunjukkan sektor OBC bagi bulatan dengan pusat O .
Diagram below shows a sector OBC of a circle with centre O .

Aras 3



Diberi $AD = 12.6$ cm dan $AB = AO = OD = DC = 7$ cm.
Given $AD = 12.6$ cm and $AB = AO = OD = DC = 7$ cm.
[Guna/ Use $\pi = 3.142$]

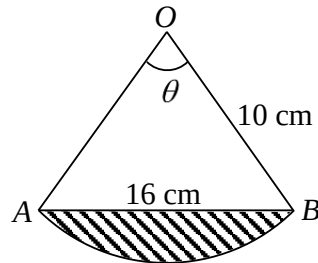
Cari / Find

- panjang lengkok BC , dalam cm,
the length of arc BC , in cm,
- luas rantau yang berlorek, dalam cm^2 .
the area of the shaded region, in cm^2 .

Penyelesaian / Solution:

Penilaian:
Assessment:

1. Rajah menunjukkan sektor OAB bagi sebuah bulatan berpusat O dengan jejari 10 cm.
The diagram shows a sector OAB of a circle with centre O and radius 10 cm.



Diberi bahawa $AB = 16$ cm. Cari

Given that $AB = 16$ cm. Find

[Guna/ Use $\pi = 3.142$]

- | | |
|---|-----------------------------|
| a) nilai θ dalam radian,
<i>the value of θ in radians,</i> | [3 markah]
[3 marks] |
| b) perimeter kawasan berlorek, dalam cm,
<i>the perimeter of the shaded region, in cm,</i> | [3 markah]
[3 marks] |
| c) luas kawasan berlorek, dalam cm^2 .
<i>the area of the shaded region, in cm^2.</i> | [4 markah]
[4 marks] |

Penyelesaian / *Solution:*

SESI PEMBELAJARAN 4

TINGKATAN 5

BAB

2

**PEMBEZAAN
DIFFERENTIATION**

2.2

Pembezaan Peringkat Pertama
The First Derivative

Objektif Pembelajaran:

Learning objective:

- Menentukan terbitan pertama bagi suatu fungsi algebra.
Determine the first derivative of an algebraic function.

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

- Terbitan pertama bagi fungsi $y = f(x)$ ditulis sebagai $\frac{dy}{dx}$ atau $f'(x)$.
The first derivative of a function $y = f(x)$ is written as $\frac{dy}{dx}$ or $f'(x)$.
- Jika $y = a$, maka $\frac{dy}{dx} = 0$, dengan keadaan a ialah pemalar.
If $y = a$, then $\frac{dy}{dx} = 0$, where a is a constant.
- Jika $y = ax$, maka $\frac{dy}{dx} = a$, dengan keadaan a ialah pemalar.
If $y = ax$, then $\frac{dy}{dx} = a$, where a is a constant.
- Jika $y = ax^n$, maka $\frac{dy}{dx} = anx^{n-1}$, dengan keadaan a dan n ialah pemalar.
If $y = ax^n$, then $\frac{dy}{dx} = anx^{n-1}$, where a and n are constants.
- Terbitan pertama bagi suatu fungsi algebra yang melibatkan penambahan dan penolakan boleh ditentukan dengan membezakan setiap sebutan secara berasingan.
The first derivative of an algebraic function involving addition and subtraction can be determined by differentiating each term separately.

$$\frac{d}{dx}[f(x) \pm g(x)] = \frac{d}{dx}[f(x)] \pm \frac{d}{dx}[g(x)]$$

1. Bezakan setiap fungsi yang berikut terhadap x .
Differentiate each of the following functions with respect to x .

Aras 1

**Contoh
Example**

(a) $8x$

$$\frac{d}{dx}(8x) = 8(1)x^{1-1}$$

$$= 8x^0$$

$$= 8$$

$$x^0 = 1$$

(b) $y = 5x^4$

$$\frac{dy}{dx} = 5(4)x^{4-1}$$

$$= 20x^3$$

(c) $f(x) = \frac{3}{x^3}$

$$f(x) = 3x^{-3}$$

$$f'(x) = 3(-3)x^{-3-1}$$

$$f'(x) = -9x^{-4}$$

$$f'(x) = -\frac{9}{x^4}$$

Tukarkan kepada bentuk ax^n .
Change to the form ax^n .

1. $\frac{1}{2}$

2. $y = -3x^6$

3. $\frac{x^6}{2}$

4. $y = \frac{5x^3}{x}$

5. $f(x) = \frac{-3}{x}$

6. $f(x) = 7\sqrt{x}$

2. Tentukan nilai $\frac{dy}{dx}$ atau $f'(x)$ bagi setiap yang berikut apabila nilai x diberi.

Aras 2

Determine the value of $\frac{dy}{dx}$ or $f'(x)$ for each of the following when the value of x is given.

Contoh Example $y = 3x^2, x = 5$ $\frac{dy}{dx} = 3(2)x^{2-1}$ $= 6x$ $x = 5, \frac{dy}{dx} = 6(5)$ $= 30$	1. $y = 2x^7, x = 1$
2. $f(x) = \frac{x^3}{6}, x = 4$	3. $f(x) = \frac{3x^4}{x^2}, x = -1$
4. $y = \frac{6}{x^3}, x = 3$	5. $f(x) = \frac{1}{5x^7}, x = -2$

3. Cari terbitan pertama bagi setiap fungsi yang berikut.
Find the first derivative of each of the following functions.

Aras 2

**Contoh
Example**

(a) $y = 2x^3 - 5x^2 + 6$

$$\begin{aligned}\frac{dy}{dx} &= \frac{d}{dx}(2x^3) - \frac{d}{dx}(5x^2) + \frac{d}{dx}(6) \\ &= 2(3)x^{3-1} - 5(2)x^{2-1} + 0 \\ &= 6x^2 - 10x\end{aligned}$$

Beza setiap sebutan
secara berasingan.
*Differentiate for each
term separately.*

1. $y = 12x^3 - 21x^2$

2. $f(x) = \frac{x^7}{8} - 2x + 9$

3. $f(x) = \frac{7}{x^2} + 4x$

4. $\frac{d}{dx}(6x - 4)$

5. $\frac{d}{dx}\left(4x^2 + \frac{3}{x} - 5x + \frac{1}{9}\right)$

4. Bezakan setiap fungsi yang berikut terhadap x .
Differentiate each of the following functions with respect to x .

Aras 3

**Contoh
Example**

(a) $y = \frac{(7-x)(3x-7)}{x}$

$$y = \frac{21x - 49 - 3x^2 + 7x}{x}$$

$$y = \frac{28x - 49 - 3x^2}{x}$$

$$y = 28 - 49x^{-1} - 3x$$

$$\frac{dy}{dx} = 0 - 49(-1)x^{-1-1} - 3(1)x^{1-1}$$

$$= 49x^{-2} - 3$$

$$= \frac{49}{x^2} - 3$$

Ringkaskan
supaya menjadi
sebutan
berasingan dan
dalam bentuk
 ax^n .
*Simplify to
become
separate terms
and in the form
of ax^n .*

1. $y = 2x(4 - x^2)$

2. $y = (2x+3)(1-x^3)$

3. $y = \frac{(x+1)^2}{x}$

4. $y = \frac{(x+2)(3x-1)}{2x}$

5. $y = \sqrt{x}(\sqrt{x} + 5x^2)$

Latihan Pengukuhan :
Enhancement Exercises:

1. Diberi $h(x) = mx^3 + 7x^2 - 5x$, cari
Given $h(x) = mx^3 + 7x^2 - 5x$, find
(a) $h'(x)$,
(b) nilai m jika $h'(2) = -1$.
the value of m if $h'(2) = -1$.
Penyelesaian / Solution:

-
2. Diberi $y = \frac{7x^2 - 2}{x}$ dan $\frac{dy}{dx} = 5h(x)$. Cari nilai-nilai x jika $h(x) = \frac{13}{9}$.
Given $y = \frac{7x^2 - 2}{x}$ and $\frac{dy}{dx} = 5h(x)$. Find the values of x if $h(x) = \frac{13}{9}$.
Penyelesaian / Solution:

Penilaian :

Assessment:

Kertas 1 / Kertas 2

Paper 1/ Paper 2

1. Diberi bahawa $m^2p = 108$, cari nilai $\frac{dp}{dm}$ apabila $m = 6$.

Given that $m^2p = 108$, find the value of $\frac{dp}{dm}$ when $m = 6$.

[3 markah/marks]

Penyelesaian / Solution:

2. Diberi $f(x) = x(2x - 3)(3x + 2)$, cari nilai bagi $f'(2)$.

Given that $f(x) = x(2x - 3)(3x + 2)$, find the value of $f'(2)$.

[3 markah/marks]

Penyelesaian / Solution:

SESI PEMBELAJARAN 5

TINGKATAN 5

BAB

2

PEMBEZAAN DIFFERENTIATION

2.2

Pembezaan Peringkat Pertama *The First Derivative*

Objektif Pembelajaran:

Learning objective :

- Menentukan terbitan pertama fungsi gubahan.
Determine the first derivative of composite function.

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

Fungsi gubahan ialah fungsi yang terbentuk daripada gabungan dua atau lebih fungsi. Jika $y = f(u)$ dan $u = g(x)$, maka fungsi gubahan ditulis sebagai:

A composite function is a function formed by combining two or more functions. If $y = f(u)$ and $u = g(x)$, then the composite function is written as:

$$y = f(g(x))$$

Ini bermaksud y adalah fungsi bagi u , dan u adalah fungsi bagi x .

This means that y is a function of u , and u is a function of x .

- Ungkapkan y dalam sebutan x .

Express y in terms of x .

Aras 1

Contoh Example

$y = 3u^7$ dan/and $u = 3x + 4$.

$y = 3u^7$
 $y = 3(3x + 4)^7$

Gantikan u dengan $3x+4$
Substitute u with $3x+4$

1. $y = 2u + 5$ dan/and $u = 3x - 1$.

2. $y = u^5$ dan/and $u = 3x^2 - 2$.	3. $y = \frac{2}{u^3}$ dan/and $u = x^2 - x$.
---------------------------------------	--

• **Petua Rantai/ The Chain Rule**

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

Petua rantai digunakan untuk membezakan fungsi gubahan. Ia menyatakan bahawa jika $y = f(u)$ dan $u = g(x)$, maka terbitan y terhadap x ialah

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

The chain rule is used to differentiate composite functions. It states that if $y = f(u)$ and $u = g(x)$, then the derivative of y with respect to x is:

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

Pembezaan fungsi gubahan $y = f(u)$ dengan $u = g(x)$ boleh dilakukan secara terus dengan menggunakan $\frac{dy}{dx} = nu^{n-1} \frac{du}{dx}$.

Differentiation composite function $y = f(u)$ with $u = g(x)$ can be done directly by using

$$\frac{dy}{dx} = nu^{n-1} \frac{du}{dx}.$$

Contoh / Example:

$$\begin{aligned}
 y &= (3x^2 + 1)^3 \\
 \frac{dy}{dx} &= 3(3x^2 + 1)^2 (6x) \\
 &\quad \underbrace{\hspace{1.5cm}}_{\frac{dy}{du}} \quad \underbrace{\hspace{1.5cm}}_{\frac{du}{dx}} \\
 &= 18x(3x^2 + 1)^2
 \end{aligned}$$

2. Cari $\frac{dy}{du}$, $\frac{du}{dx}$ dan $\frac{dy}{dx}$ dalam sebutan x bagi setiap persamaan yang berikut.

Aras 1

Find $\frac{dy}{du}$, $\frac{du}{dx}$ and $\frac{dy}{dx}$ in terms of x for each of the following equations.

Contoh Example $y = u^3$ dan/and $u = x^3 - 3$ $y = u^3 \qquad u = x^3 - 3$ $\frac{dy}{du} = 3u^2 \qquad \frac{du}{dx} = 3x^2$ $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx} = 3u^2 \times 3x^2$ $\frac{dy}{dx} = 3(x^3 - 3)^2 \times 3x^2$ $= 9x^2 (x^3 - 3)^2$	1. $y = u^2$ dan/and $u = x^2 + 6x$
2. $y = \frac{1}{u}$ dan/and $u = 8x - 1$	4. $y = \sqrt{u}$ dan/and $u = x^2$

3. Bezakan setiap ungkapan yang berikut terhadap x dengan menggunakan Petua Rantai:
Differentiate each of the following expressions with respect to x by using The Chain Rule.

Aras 1

Contoh Example $y = (3x^2 + 5)^4$ Katakan / Let $u = 3x^2 + 5$ $y = u^4$ $\frac{dy}{du} = 4u^3$ ← Bezakan y terhadap u Differentiate y with respect to u $\frac{du}{dx} = 6x$ ← Bezakan u terhadap x Differentiate u with respect to x $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx} = 4u^3 \times 6x$ Gunakan petua rantai Apply the chain rule $\frac{dy}{dx} = 4(3x^2 + 5)^3 \times 6x$ Gantikan $u = 3x^2 + 5$ Substitute $u = 3x^2 + 5$ $= 24x(3x^2 + 5)^3$	1. $y = (7x^2 - 3)^6$
2. $y = \frac{1}{2 + 5x}$	3. $y = \sqrt{2x^3 - 7}$

4. Bezakan setiap ungkapan yang berikut terhadap x dengan menggunakan $\frac{dy}{dx} = nu^{n-1} \frac{du}{dx}$.
Differentiate each of the following expressions with respect to x by using $\frac{dy}{dx} = nu^{n-1} \frac{du}{dx}$.

Aras 1

Contoh

Example

$$y = (3 - 4x^7)^5$$

$$1. y = (5x^3 - 2x)^6$$

$$2. y = (x^2 - 5x + 1)^3$$

$$3. y = \frac{2}{(5x^2 + 3)^3}$$

5. Bezakan setiap ungkapan yang berikut terhadap x dan carikan nilai hasil terbitan apabila nilai x diberi.

Aras 2

Differentiate each of the following expressions with respect to x and find the value of the derivative when the value of x is given.

Contoh
Example

Diberi $f(x) = (3x - 5)^5$, cari $f'(1)$.

Given $f(x) = (3x - 5)^5$, find $f'(1)$.

1. Diberi $y = (x^3 - 5x^2 + 1)^2$, cari $\frac{dy}{dx}$ apabila $x = 2$.

Given $y = (x^3 - 5x^2 + 1)^2$, find $\frac{dy}{dx}$ when $x = 2$.

Latihan Pengukuhan :
Enhancement Exercises:

1. Diberi bahawa $y = \frac{2}{3}u^7$ dan $u = 3x - 5$. Cari $\frac{dy}{dx}$ dalam sebutan x .

It is given that $y = \frac{2}{3}u^7$ and $u = 3x - 5$. Find $\frac{dy}{dx}$ in terms of x .

Penyelesaian / Solution:

-
2. Diberi bahawa $y = (4x^2 - 1)^{10}$, cari $\frac{dy}{dx}$. Seterusnya, cari nilai-nilai x apabila nilai $\frac{dy}{dx}$ ialah sifar.

Given $y = (4x^2 - 1)^{10}$, find $\frac{dy}{dx}$. Hence, find the values of x when the value of $\frac{dy}{dx}$ is zero.

Penyelesaian / Solution:

Penilaian :
Assessment:

1. Diberi $y = 2t - t^2$ dan $x = 2t + 1$, cari $\frac{dy}{dx}$ dalam sebutan x . [2 markah]

Given $y = 2t - t^2$ and $x = 2t + 1$, find $\frac{dy}{dx}$ in terms of x . [2 marks]

Penyelesaian / Solution:

2. Satu lengkung ditakrifkan oleh persamaan $y = (2x^3 + 5)^2$. Cari kecerunan lengkung itu pada $x = 1$. [4 markah]

A curve is defined by the equation $y = (2x^3 + 5)^2$. Find the gradient of the curve at $x = 1$. [4 marks]

Penyelesaian / Solution:

Rujukan/ Reference

Kecerunan lengkung/ Gradient of the curve $= \frac{dy}{dx}$

SESI PEMBELAJARAN 6

TINGKATAN 5

BAB

2

PEMBEZAAN
DIFFERENTIATION

2.2

Pembezaan Peringkat Pertama
The First Derivative

Objektif Pembelajaran:

Learning objective:

- Menentukan terbitan pertama bagi suatu fungsi yang melibatkan hasil darab ungkapan algebra.
Determine the first derivative of a function involving product of algebraic expressions.

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

Jika $y = uv$, dengan keadaan $u = f(x)$ dan $v = g(x)$, maka $\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$.

If $y = uv$, where $u = f(x)$ and $v = g(x)$, then $\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$.

- Bezakan setiap yang berikut dengan menggunakan petua hasil darab.
Differentiate each of the following by using the product rule.

Aras 1

**Contoh
Example**

$$\begin{aligned} y &= x^2(x^3 + 4) \\ u &= x^2 & v &= x^3 + 4 \\ \frac{du}{dx} &= 2x & \frac{dv}{dx} &= 3x^2 \\ \frac{dy}{dx} &= u \frac{dv}{dx} + v \frac{du}{dx} \\ \frac{dy}{dx} &= x^2(3x^2) + (x^3 + 4)(2x) \\ &= 3x^4 + 2x^4 + 8x \\ &= 5x^4 + 8x \end{aligned}$$

$$1. \quad y = 2x^3(x^2 - 9)$$

2. $y = (3x - 1)(x + 7)$	3. $y = (x^2 + 2x)(4x^2 - 9)$
4. $y = (2x + 1)(x^2 + 4x - 1)$	5. $y = (x - 1)(x^2 - 2x + 15)$

2. Cari nilai $\frac{dy}{dx}$ bagi setiap fungsi yang berikut.

Aras 2

Find the value of $\frac{dy}{dx}$ for each of the following functions.

**Contoh
Example**

$$\begin{aligned}
 y &= (x^2 + 1)(x^3 - 2x), \quad x = 2 \\
 u &= x^2 + 1 & v &= x^3 - 2x \\
 \frac{du}{dx} &= 2x & \frac{dv}{dx} &= 3x^2 - 2 \\
 \frac{dy}{dx} &= (x^2 + 1)(3x^2 - 2) + (x^3 - 2x)(2x) \\
 &= 3x^4 - 2x^2 + 3x^2 - 2 + 2x^4 - 4x^2 \\
 &= 5x^4 - 3x^2 - 2 \\
 x = 2, \quad \frac{dy}{dx} &= 5(2)^4 - 3(2)^2 - 2 \\
 &= 66
 \end{aligned}$$

1. $y = (3x^2 + 2)(x^2 - 6x + 5), \quad x = -2$

2. $y = (7 + 4x^3)(2 + x^2)$, $x = -1$	3. $y = x^4(128 - x^2)$, $x = 1$
---	-----------------------------------

3. Bezakan setiap fungsi yang berikut terhadap x .
Differentiate each of the following function with respect to x .

Aras 3

Contoh Example $y = (x - 3)^2 (3 - x^2)^3$ $u = (x - 3)^2 \quad v = (3 - x^2)^3$ $\frac{du}{dx} = 2(x - 3)(1) \quad \frac{dv}{dx} = 3(3 - x^2)^2 (-2x)$ $= 2(x - 3) \quad = -6x(3 - x^2)^2$ $\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$ $\frac{dy}{dx} = (x - 3)^2 (-6x)(3 - x^2)^2 + (3 - x^2)^3 (2)(x - 3)$ $= 2(x - 3)(3 - x^2)^2 [(x - 3)(-3x) + (3 - x^2)]$  Ambil faktor yang sama. <i>Take the same factor.</i> $= 2(x - 3)(3 - x^2)^2 (-3x^2 + 9x + 3 - x^2)$ $= 2(x - 3)(3 - x^2)^2 (-4x^2 + 9x + 3)$	1. $y = x^3(5 - 2x)^2$
--	------------------------

2. $y = 5(x - 3)^2(2 - 3x)^3$

3. $y = 4x^2\sqrt{2x+1}$

Latihan Pengukuhan :
Enhancement Exercises:

1. Jika $f(x) = 7x^4(8 - 2x)^3$, cari $f'(x)$.
If $f(x) = 7x^4(8 - 2x)^3$, find $f'(x)$.
Penyelesaian / Solution:

2. Diberi kecerunan tangen kepada lengkung $y = mx(x^2 + 3)^3$ pada $x = 1$ ialah 5. Cari nilai m .
Given the gradient of the tangent to the curve $y = mx(x^2 + 3)^3$ at $x = 1$ is 5. Find the value of m .
Penyelesaian / Solution:

Penilaian :
Assessment:

Kertas 1 / Kertas 2

Paper 1 / Paper 2

1. Bezakan $(3-2x)^2(4x+1)^3$ terhadap x .

Differentiate $(3-2x)^2(4x+1)^3$ with respect to x .

[4 markah/marks]

Penyelesaian / Solution:

2. Diberi lengkung $y = px(5-x)^4$ mempunyai kecerunan tangen -15 pada $x = 2$, dengan keadaan p ialah pemalar. Cari nilai p .

Given the curve $y = px(5-x)^4$ has a gradient of the tangent -15 at $x = 2$, where p is a constant. Find the value of p .

[5 markah/marks]

Penyelesaian / Solution:

SESI PEMBELAJARAN 7

TINGKATAN 5

BAB

2

PEMBEZAAN
DIFFERENTIATION

2.2

Pembezaan Peringkat Pertama
The First Derivative

Objektif Pembelajaran:

Learning objective:

- Menentukan terbitan pertama bagi suatu fungsi yang melibatkan hasil bahagi ungkapan algebra.
Determine the first derivative of a function involving quotient of algebraic expressions.

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

1. Jika $y = \frac{u}{v}$, dengan keadaan $u = f(x)$ dan $v = g(x)$, maka $\frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$.

If $y = \frac{u}{v}$, where $u = f(x)$ and $v = g(x)$, then $\frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$.

1. Bezakan setiap yang berikut dengan menggunakan petua hasil bahagi.
Differentiate each of the following by using the quotient rule.

Aras 1

Contoh Example $y = \frac{x}{4 - x^2}$ $u = x \quad v = 4 - x^2$ $\frac{du}{dx} = 1 \quad \frac{dv}{dx} = -2x$ $\frac{dy}{dx} = \frac{(4 - x^2)(1) - (x)(-2x)}{(4 - x^2)^2}$ $= \frac{4 - x^2 + 2x^2}{(4 - x^2)^2}$ $= \frac{4 + x^2}{(4 - x^2)^2}$	1. $y = \frac{2x^3}{x^2 + 9}$
2. $y = \frac{2x + 3}{x^2 - 1}$	3. $y = \frac{1 + 2x}{x - 1}$

2. Cari nilai $\frac{dy}{dx}$ bagi setiap fungsi yang berikut.

Aras 2

Find the value of $\frac{dy}{dx}$ for each of the following functions.

Contoh Example $y = \frac{2x-3}{x^3+2}, \quad x=1$ $u = 2x-3 \quad v = x^3+2$ $\frac{du}{dx} = 2 \quad \frac{dv}{dx} = 3x^2$ $\frac{dy}{dx} = \frac{(x^3+2)(2) - (2x-3)(3x^2)}{(x^3+2)^2}$ $= \frac{2x^3+4-6x^3+9x^2}{(x^3+2)^2}$ $= \frac{-4x^3+9x^2+4}{(x^3+2)^2}$ $x=1, \quad \frac{dy}{dx} = \frac{-4(1)^3+9(1)^2+4}{((1)^3+2)^2}$ $= 1$	1. $y = \frac{(1-x)(1+x)}{(x-3)(x+3)}, \quad x=-2$
2. $y = \frac{2-x}{x^3+5}, \quad x=-1$	3. $y = \frac{2-x^2}{2+x}, \quad x=2$

3. Bezakan setiap fungsi yang berikut terhadap x .

Aras 3

Differentiate each of the following function with respect to x .

Contoh Example $y = \frac{(x+3)^2}{2x^2}$ $u = (x+3)^2 \quad v = 2x^2$ $\frac{du}{dx} = 2(x+3)(1) \quad \frac{dv}{dx} = 4x$ $= 2(x+3)$ $\frac{dy}{dx} = \frac{(2x^2)(2(x+3)) - (x+3)^2(4x)}{(2x^2)^2}$ $= \frac{4x(x+3)[x - (x+3)]}{4x^4}$ $= -\frac{3(x+3)}{x^3}$	1. $y = \frac{x}{x^2 + 1}$
2. $y = \frac{x^2 - 5}{x^2 + 3x}$	3. $y = \frac{(2x-1)^2}{x^2 + 4}$

Latihan Pengukuhan :
Enhancement Exercises:

1. Bezakan $\frac{t-2}{4t^2-5}$ terhadap t .
Differentiate $\frac{t-2}{4t^2-5}$ with respect to x .

-
2. Cari kecerunan tangen kepada lengkung $y = \frac{6-3x}{x^2}$ pada titik $(-1, 7)$.
Find the gradient of the tangent for the curve $y = \frac{6-3x}{x^2}$ at point $(-1, 7)$.

Penilaian :

Assessment:

Kertas 1 / Kertas 2

Paper 1/ Paper 2

1. Bezakan $y = \frac{2x+3}{x-1}$ terhadap x . [4 markah]

Differentiate $y = \frac{2x+3}{x-1}$ with respect to x . [4 marks]

2. Sebuah lengkung ditakrifkan oleh persamaan $y = \frac{x^2 + 1}{x + 2}$.

A curve is defined by the equation $y = \frac{x^2 + 1}{x + 2}$.

a) Cari kecerunan lengkung pada $x = 1$,

Find the gradient of the curve at $x = 1$,

b) Tentukan persamaan tangen kepada lengkung pada titik $x = 1$.

Determine the equation of the tangent to the curve at the point where $x = 1$.

[5 markah/marks]

SESI PEMBELAJARAN 8

TINGKATAN 5

BAB

3

PENGAMIRAN
INTEGRATION

3.2

KAMIRAN TAK TENTU
INDEFINITE INTEGRAL

Objektif Pembelajaran:

Learning objective:

- Menentukan kamiran tak tentu bagi fungsi algebra.
Determine indefinite integral for algebraic functions.
- Menentukan kamiran tak tentu bagi fungsi berbentuk $(ax+b)^n$, dengan keadaan a dan b ialah pemalar, n integer dan $n \neq -1$.
Determine indefinite integral for functions in the form of $(ax+b)^n$, where a and b are constants, n is an integer and $n \neq -1$.

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

1. Teknik asas pengamiran:

Basic techniques of integration:

(a, b, c dan n adalah pemalar dan $n \neq -1$ / a, b, c and n are constants and $n \neq -1$)

(a) $\int a \, dx = ax + c$

(b) $\int x^n \, dx = \frac{x^{n+1}}{n+1} + c$

(c) $\int ax^n \, dx = \frac{a}{n+1} x^{n+1} + c$

(d) $\int [f(x) \pm g(x)] \, dx = \int f(x) \, dx \pm \int g(x) \, dx + c$

(e) $\int (ax+b)^n \, dx = \frac{(ax+b)^{n+1}}{a(n+1)} + c$

2. Jika $y = f(x)$ dan $\frac{dy}{dx} = f'(x)$, maka $\int f'(x) \, dx = f(x) + c$

If $y = f(x)$ and $\frac{dy}{dx} = f'(x)$, then $\int f'(x) \, dx = f(x) + c$.

1. Cari kamiran tak tentu bagi setiap yang berikut.
Find the indefinite integral for each of the following.

Aras 1

Contoh Example $\int -8 \, dx = -8x + c$ $\int \frac{3}{4x^3} \, dx = \int \frac{3}{4} x^{-3} \, dx$ $= \frac{3x^{-3+1}}{4(-3+1)} + c$ $= -\frac{3}{8x^2} + c$	1. $\int -5 \, dx$
2. $\int x^5 \, dx$	3. $\int \pi \, dx$
4. $\int x^{-6} \, dx$	5. $\int -\frac{1}{2x^3} \, dx$

2. Cari kamiran tak tentu bagi setiap yang berikut.
Find the indefinite integral for each of the following.

Aras 2

Contoh

Example

$$\begin{aligned}\int (2x^2 + 3x - 5) dx &= \frac{2x^{2+1}}{2+1} + \frac{3x^{1+1}}{1+1} - 5x + c \\ &= \frac{2}{3}x^3 + \frac{3}{2}x^2 - 5x + c\end{aligned}$$

1. $\int \left(\frac{x^2}{3} - \frac{3}{x^3} \right) dx$

2. $\int x^3 \left(5 + \frac{10}{x^5} \right) dx$

3. $\int \frac{(2-x^2)(2+x^2)}{x^3} dx$

4. $\int \frac{2x^2 + x - 6}{x+2} dx$

5. $\int \frac{x^2 - 16}{4-x} dx$

3. Cari kamiran tak tentu bagi setiap yang berikut.
Find the indefinite integral for each of the following.

Aras 2

Contoh Example	Contoh Example
$\int 6(3x-2)^7 dx = \frac{6(3x-2)^{7+1}}{(3)(7+1)} + c$ $= \frac{(3x-2)^8}{4} + c$	$\int \frac{7}{8(5-6x)^4} dx = \frac{7}{8} \int (5-6x)^{-4} dx$ $= \frac{7}{8} \times \frac{(5-6x)^{-4+1}}{(-6)(-4+1)} + c$ $= \frac{7}{144(5-6x)^3} + c$
1. $\int (x+2)^5 dx$	2. $\int (4x-3)^7 dx$
3. $\int 7(1-9x)^6 dx$	4. $\int \frac{2}{(1-3x)^3} dx$

5. $\int \frac{5}{4(1-2x)^6} dx$

6. $\int \left(\frac{2}{2x+3} \right)^2 dx$

7. $\int \sqrt{4x+7} dx$

8. $\int \frac{3}{\sqrt{1-2x}} dx$

Latihan Pengukuhan :***Enhancement Exercises:***

1. Cari kamiran tak tentu bagi setiap yang berikut.

Find the indefinite integral for each of the following.

(a) $\int 5x^2 \, dx$

Penyelesaian / *Solution*:

(b) $\int \frac{1}{3x^4} \, dx$

Penyelesaian / *Solution*:

(c) $\int \frac{2x^3 - x}{x^3} \, dx$

Penyelesaian / *Solution*:

(d) $\int (1-v)(1+v) \, dv$

Penyelesaian / *Solution*:

(e) $\int 4(5-x)^{-2} \, dx$

Penyelesaian / *Solution*:

(f) $\int \frac{-2}{(2z-3)^2} \, dz$

Penyelesaian / *Solution*:

Penilaian :

Assessment:

Kertas 1 / Kertas 2

Paper 1/ Paper 2

1. Diberi bahawa $\int (5x^3 + 2) dx = kx^4 + 2x + c$, dengan keadaan k dan c adalah pemalar.

Given that $\int (5x^3 + 2) dx = kx^4 + 2x + c$, where k and c are constants.

Cari / Find

- (a) nilai k ,

the value of k ,

- (b) nilai c jika $\int (5x^3 + 2) dx = 30$ apabila $x = 2$.

the value of c if $\int (5x^3 + 2) dx = 30$ when $x = 2$.

[3 markah / marks]

Penyelesaian / Solution:

2. Cari setiap kamiran tak tentu yang berikut.

Find the indefinite integral for each of the following.

- (a) $\int x(2x - 3)^2 dx$

- (b) $\int u(u + 1)(u - 1) du$

[4 marks / markah]

Penyelesaian / Solution:

SESI PEMBELAJARAN 9

TINGKATAN 5

BAB

3

PENGAMIRAN
INTEGRATION

3.2

KAMIRAN TAK TENTU
INDEFINITE INTEGRAL

Objektif Pembelajaran:

Learning objective:

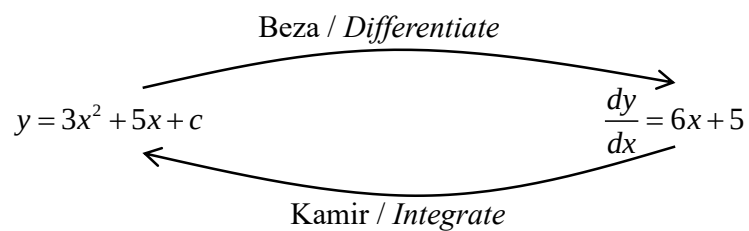
- Menentukan persamaan lengkung daripada fungsi kecerunan.
Determine the equation of curve from its gradient function.

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

- Jika fungsi kecerunan suatu lengkung ialah $\frac{dy}{dx} = f'(x)$, maka persamaan lengkung y boleh ditentukan dengan pengamiran.

If gradient function of a curve is $\frac{dy}{dx} = f'(x)$, then the equation of the curve y can be determined by integration.



1. Selesaikan masalah berikut.
Solve the following problems.

Aras 3

Contoh

Example

Diberi bahawa fungsi kecerunan bagi suatu lengkung ialah $6x(x-1)$. Cari persamaan lengkung itu jika lengkung itu melalui titik $(1, -5)$.

Given the gradient function of a curve is $6x(x-1)$. Find the equation of the curve if the curve passes through the point $(1, -5)$.

Penyelesaian / Solution:

$$y = \int 6x^2 - 6x \, dx$$

$$= \frac{6x^{2+1}}{2+1} - \frac{6x^{1+1}}{1+1} + c$$

$$y = 2x^3 - 3x^2 + c$$

Gantikan $(1, -5)$ dalam y

Substitute $(1, -5)$ into y

$$-5 = 2(1)^3 - 3(1)^2 + c$$

$$c = -5 - 2 + 3$$

$$c = -4$$

Persamaan lengkung ialah $y = 2x^3 - 3x^2 - 4$.

The equation is $y = 2x^3 - 3x^2 - 4$.

1. Fungsi kecerunan suatu lengkung ialah $(x-3)$. Diberi bahawa $P(2, 1)$ terletak pada lengkung itu.

The gradient function of a curve is $(x-3)$. Given that $P(2, 1)$ lies on the curve.

Cari / Find

- (a) kecerunan tangen pada titik P ,
the gradient of tangent at point P ,
(b) persamaan lengkung itu.
the equation of the curve.

2. Fungsi kecerunan suatu lengkung pada mana-mana titik $P(x, y)$ ialah $kx + 3$, dengan keadaan k ialah pemalar. Diberi bahawa lengkung itu melalui titik-titik $(0, 8)$ dan $(1, 15)$, cari nilai k. <i>The gradient function of a curve at any point $P(x, y)$ is $kx + 3$, where k is a constant. Given that the curve passes through the points $(0, 8)$ and $(1, 15)$, find the value of k.</i>	3. Kecerunan pada titik $P(1, 2)$ bagi lengkung dengan fungsi kecerunan $9x^2 + bx + 2$ ialah 1. <i>The gradient at point $P(1, 2)$ of the curve with gradient function $9x^2 + bx + 2$ is 1.</i> (a) Cari nilai b. <i>Find the value of b.</i> (b) Seterusnya, cari persamaan lengkung tersebut. <i>Hence, find the equation of the curve.</i>
--	--

Latihan Pengukuhan :

Enhancement Exercises:

1. Cari kamiran tak tentu bagi setiap yang berikut.

Find the indefinite integral for each of the following.

- (a) Cari persamaan lengkung yang fungsi kecerunannya ialah $3x+2$ dan melalui asalan.

Find the equation of the curve with gradient function $3x+2$ and passes through the origin.

Jawapan / Answer:

- (b) Suatu lengkung mempunyai fungsi kecerunan $\frac{15}{(5x-3)^2}$. Jika lengkung itu melalui titik (1, 2), cari persamaan lengkung itu.

A curve has the gradient function of $\frac{15}{(5x-3)^2}$. If the curve passes through the point (1, 2), find the equation of the curve.

Jawapan / Answer:

- (c) Diberi bahawa fungsi kecerunan suatu lengkung ialah $\frac{a}{(5x+2)^3}$ dan mempunyai kecerunan $-\frac{5}{12}$ pada $\left(2, \frac{3}{2}\right)$.

Given that the gradient function of a curve is $\frac{a}{(5x+2)^3}$ and has a gradient of $-\frac{5}{12}$ at $\left(2, \frac{3}{2}\right)$.

- (a) Cari nilai a .
Find the value of a .
- (b) Cari persamaan lengkung itu.
Find the equation of the curve.

Jawapan / Answer:

Penilaian :

Assessment:

Kertas 1 / Kertas 2

Paper 1/ Paper 2

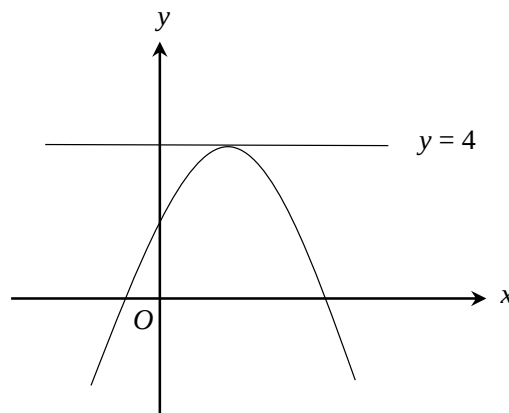
1. Diberi $\frac{dy}{dx} = 3x^2 - 4x + 3$ dan $y = 5$ apabila $x = 1$. Cari nilai y apabila $x = 0$.

Given $\frac{dy}{dx} = 3x^2 - 4x + 3$ and $y = 5$ when $x = 1$. Find the value of y when $x = 0$.

[4 markah / marks]

Penyelesaian / Solution:

2. Rajah di bawah menunjukkan lengkung $y = f(x)$. Garis lurus $y = 4$ ialah tangen kepada lengkung itu.
The diagram shows a curve $y = f(x)$. The straight line $y = 4$ is a tangent to the curve.



Diberi $f'(x) = -2x + 2$, cari persamaan lengkung itu.

Given $f'(x) = -2x + 2$, find the equation of the curve.

[4 markah / marks]

Penyelesaian / Solution:

SESI PEMBELAJARAN 10

TINGKATAN 5

BAB

3

PENGAMIRAN
INTEGRATION

3.3

KAMIRAN TENTU
DEFINITE INTEGRAL

Objektif Pembelajaran:

Learning objective:

- Menentukan nilai kamiran tentu bagi fungsi algebra.
Determine the value of definite integral for algebraic functions.

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

- Jika $\int f(x) dx = F(x) + c$, maka $\int_a^b F(x) dx = F(b) - F(a)$.
Let $\int f(x) dx = F(x) + c$, then $\int_a^b F(x) dx = F(b) - F(a)$.
- Hukum asas kamiran tentu:
Basic laws of definite integral:
 - $\int_a^a f(x) dx = 0$
 - $\int_a^b kf(x) dx = k \int_a^b f(x) dx$, dengan keadaan k ialah pemalar.
 $\int_a^b kf(x) dx = k \int_a^b f(x) dx$, such that k is a constant.
 - $\int_a^b f(x) dx = -\int_b^a f(x) dx$
 - $\int_a^c f(x) dx = \int_a^b f(x) dx + \int_b^c f(x) dx$, dengan keadaan $a < b < c$.
 $\int_a^c f(x) dx = \int_a^b f(x) dx + \int_b^c f(x) dx$, such that $a < b < c$.
 - $\int_a^b [f(x) \pm g(x)] dx = \int_a^b f(x) dx \pm \int_a^b g(x) dx$

1. Cari nilai kamiran-kamiran tentu yang berikut.
Find the values of the following definite integrals.

Contoh Example $\begin{aligned}\int_1^3 (2x+5) dx &= \left[\frac{2x^2}{2} + 5x \right]_1^3 \\ &= \left[x^2 + 5x \right]_1^3 \\ &= \left[3^2 + 5(3) \right] - \left[1^2 + 5(1) \right] \\ &= 18\end{aligned}$	Contoh Example $\begin{aligned}\int_{-1}^1 \frac{3}{(3t+1)^2} dt &= \int_{-1}^1 3(3t+1)^{-2} dt \\ &= \left[\frac{3(3t+1)^{-1}}{(3)(-1)} \right]_{-1}^1 \\ &= \left[-\frac{1}{3t+1} \right]_{-1}^1 \\ &= \left[-\frac{1}{3(1)+1} \right] - \left[-\frac{1}{3(-1)+1} \right] \\ &= -\frac{3}{4}\end{aligned}$
1. $\int_2^4 x^3 dx =$	2. $\int_1^3 \left(\frac{2}{x^3} \right) dx =$

3. $\int_1^2 \frac{3}{2x^2} dx =$	4. $\int_0^3 x(2x+1) dx =$
5. $\int_1^3 (3x-2)^4 dx =$	6. $\int_4^5 \frac{10}{(x-3)^2} dx =$
7. $\int_0^1 16(2+4x)^3 dx =$	8. $\int_2^3 \frac{24}{(3x-5)^3} dx =$

2. Diberi bahawa $\int_1^3 f(x) dx = 4$ dan $\int_1^3 g(x) dx = 6$, cari nilai bagi kamiran-kamiran tentu berikut.

Given that $\int_1^3 f(x) dx = 4$ and $\int_1^3 g(x) dx = 6$, find the values of the following definite integrals.

Contoh Example	Contoh Example
$\int_3^1 f(x) dx = -\int_1^3 f(x) dx$ $= -4$	$\int_1^3 \left[2g(x) + \frac{1}{2} f(x) \right] dx = 2 \int_1^3 g(x) dx + \frac{1}{2} \int_1^3 f(x) dx$ $= 2(6) + \frac{1}{2}(4)$ $= 14$
1. $\int_1^3 5g(x) dx =$	2. $\int_1^3 [f(x) - 4] dx =$
3. $\int_1^3 [3f(x) - 2g(x)] dx =$	4. $\int_1^3 \left[\frac{3}{2} f(x) + 2g(x) - 1 \right] dx =$

Latihan Pengukuhan :***Enhancement Exercises:***

1. Kirakan nilai-nilai kamiran tentu berikut:

Evaluate the values of the following definite integrals:

(a) $\int_0^3 (2x + 5) dx$

Penyelesaian / Solution:

(b) $\int_{-2}^2 (x^2 + 4x - 3) dx$

Penyelesaian / Solution:

(c) $\int_{-1}^1 \left(\frac{2v^4 - 1}{v^2} \right) dv$

Penyelesaian / Solution:

(d) $\int_1^2 (x + 2)(x - 2) dx$

Penyelesaian / Solution:

(e) $\int_1^4 (2-x)^3 dx$

Penyelesaian / *Solution*:

(f) $\int_{-1}^1 \frac{1}{(2-t)^3} dt$

Penyelesaian / *Solution*:

2. Diberi bahawa $\int_0^5 f(x) dx = 6$ dan $\int_0^5 g(x) dx = 5$, cari nilai-nilai bagi setiap yang berikut:

Given that $\int_0^5 f(x) dx = 6$ and $\int_0^5 g(x) dx = 5$, find the values of each of the following:

(a) $\int_5^0 g(x) dx$

Penyelesaian / Solution:

(b) $\int_0^3 [f(x) - g(x)] dx + \int_3^5 [f(x) - g(x)] dx$

Penyelesaian / Solution:

(c) $\int_0^5 \left[3g(x) - \frac{1}{2} f(x) \right] dx$

Penyelesaian / Solution:

(d) $\int_0^5 [4f(x) - 2x] dx$

Penyelesaian / Solution:

Penilaian :

Assessment:

Kertas 1 / Kertas 2

Paper 1/ Paper 2

1. Diberi bahawa $\int_p^5 (2x-3) dx = 6$, dengan keadaan $p < 5$, cari nilai-nilai yang mungkin bagi p .

Given that $\int_p^5 (2x-3) dx = 6$, where $p < 5$, find the possible values of p .

[4 markah / marks]

Penyelesaian / Solution:

2. Diberi bahawa $\frac{dy}{dx} = 6$ and $\int_0^4 y dx = 12$. Ungkapkan y dalam sebutan x .

Given that $\frac{dy}{dx} = 6$ and $\int_0^4 y dx = 12$. Express y in terms of x .

[3 markah / marks]

Penyelesaian / Solution:

SESI PEMBELAJARAN 11

TINGKATAN 5

BAB

3

PENGAMIRAN
INTEGRATION

3.3

KAMIRAN TENTU
DEFINITE INTEGRAL

Objektif Pembelajaran:

Learning objective:

- Menentukan luas suatu rantau.
Determine the area of a region.
- Menentukan isi padu janaan bagi suatu rantau yang dikisarkan pada paksi-x atau paksi-y.
Determine the generated volume of a region revolved at the x-axis or the y-axis.

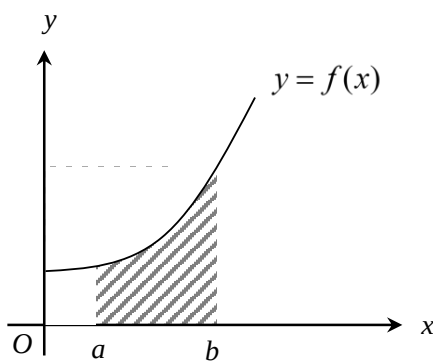
Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

1. Luas di bawah lengkung:

Area under the curve:

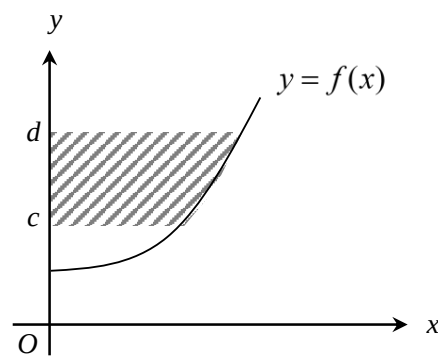
(a)



$$\text{Luas rantau berlorek} = \int_a^b y \, dx$$

$$\text{Shaded area} = \int_a^b y \, dx$$

(b)



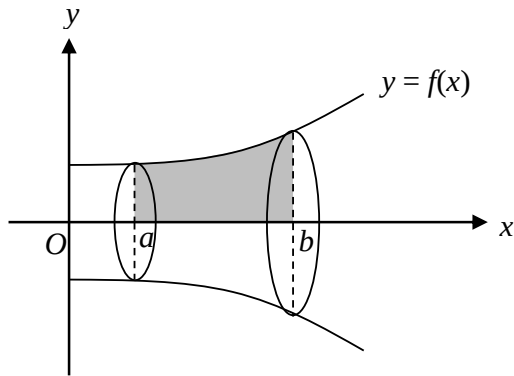
$$\text{Luas rantau berlorek} = \int_c^d x \, dy$$

$$\text{Shaded area} = \int_c^d x \, dy$$

2. Isi padu Janaan:

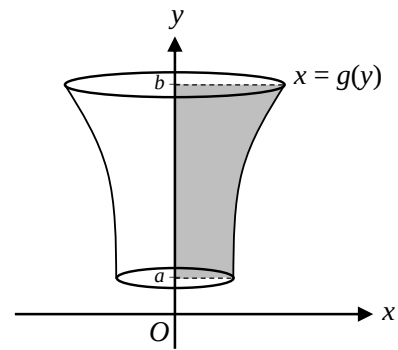
Generated Volume:

(a) Dikisarkan pada paksi-x
Revolved at the x-axis



$$V_x = \pi \int_a^b y^2 dx$$

(b) Dikisarkan pada paksi-y
Revolved at the y-axis

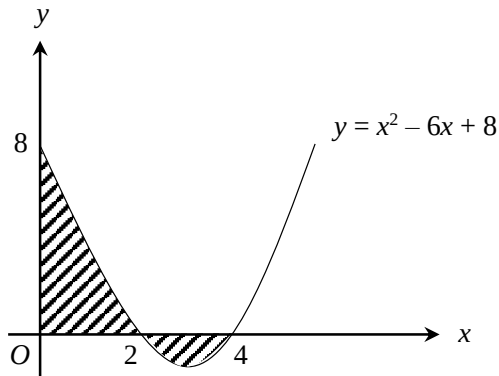


$$V_y = \pi \int_a^b x^2 dy$$

1. Cari luas rantau berlorek dalam setiap rajah berikut.

Find the area of shaded region in each of the following diagrams.

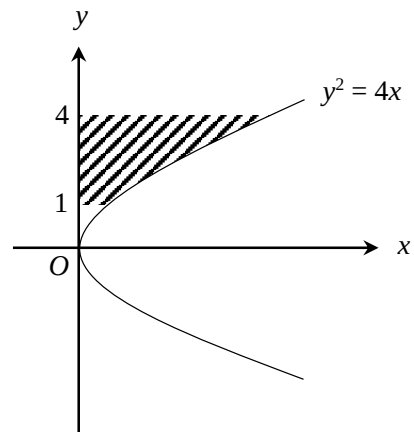
Contoh
Example



Luas rantau berlorek
Area of shaded region

$$\begin{aligned}
 &= \int_0^2 (x^2 - 6x + 8) dx + \left| \int_2^4 (x^2 - 6x + 8) dx \right| \\
 &= \left[\frac{x^{2+1}}{2+1} - \frac{6x^{1+1}}{1+1} + 8x \right]_0^2 + \left| \left[\frac{x^3}{3} - 3x^2 + 8x \right]_2^4 \right| \\
 &= \left[\frac{2^3}{3} - 3(2)^2 + 8(2) \right] - \left[\frac{0^3}{3} - 3(0)^2 + 8(0) \right] + \\
 &\quad \left| \left[\frac{4^3}{3} - 3(4)^2 + 8(4) \right] - \left[\frac{2^3}{3} - 3(2)^2 + 8(2) \right] \right| \\
 &= 8 \text{ unit}^2
 \end{aligned}$$

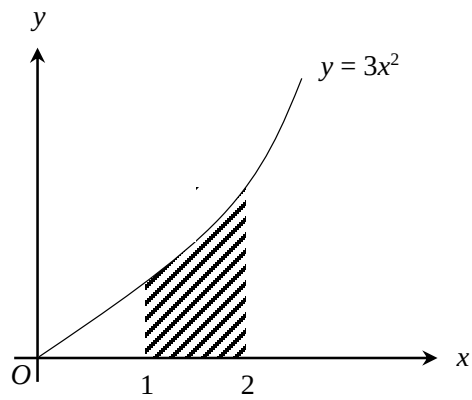
Contoh
Example



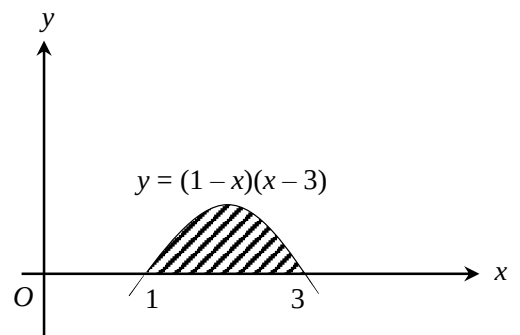
Luas rantau berlorek
Area of shaded region

$$\begin{aligned}
 &= \int_1^4 \frac{y^2}{4} dy \\
 &= \left[\frac{y^{2+1}}{4(2+1)} \right]_1^4 \\
 &= \left[\frac{4^3}{12} \right] - \left[\frac{1^3}{12} \right] \\
 &= \frac{21}{4} \text{ unit}^2
 \end{aligned}$$

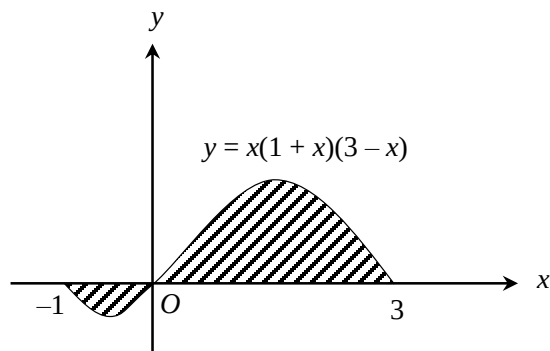
1.



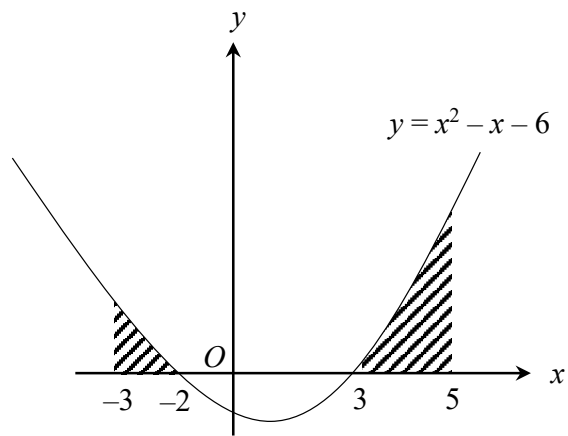
2.



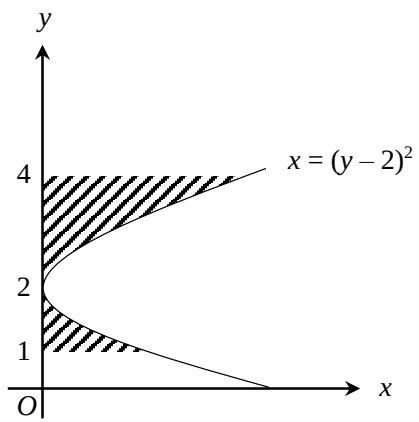
3.



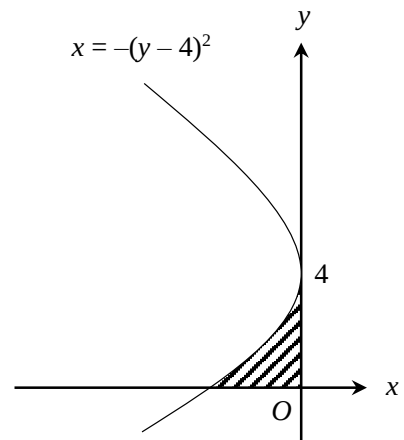
4.



5.



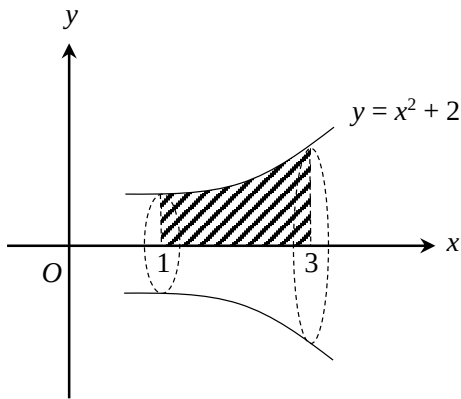
6.



2. Cari isi padu janaan, dalam sebutan π , apabila rantau berlorek bagi setiap lengkung berikut dikisarkan melalui 360° pada paksi-x atau paksi-y.

Find the volume generated, in terms of π , when the shaded region for each of the following curve is rotated 360° about the x-axis or the y-axis.

Contoh
Example

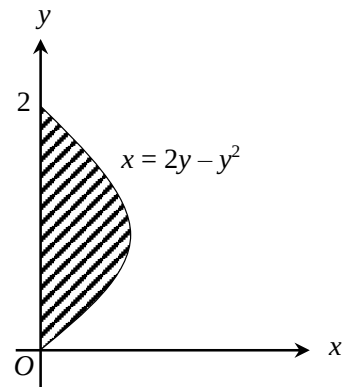


(dikisarkan pada paksi-x / rotated about the x-axis)

Isipadu janaan / The Generated Volume

$$\begin{aligned}
 &= \pi \int_1^3 (x^2 + 2)^2 dx \\
 &= \pi \int_1^3 (x^4 + 4x^2 + 4) dx \\
 &= \pi \left[\frac{x^{4+1}}{4+1} + \frac{4x^{2+1}}{2+1} + 4x \right]_1^3 \\
 &= \pi \left[\left(\frac{3^5}{5} + \frac{4(3)^3}{3} + 4(3) \right) - \left(\frac{1^5}{5} + \frac{4(1)^3}{3} + 4(1) \right) \right] \\
 &= \pi \left(\frac{483}{5} - \frac{83}{15} \right) \\
 &= \frac{1366}{15} \pi \text{ unit}^3
 \end{aligned}$$

Contoh
Example

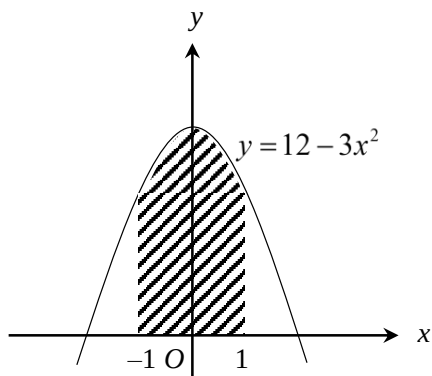


(dikisarkan pada paksi-y / rotated about the y-axis)

Isipadu janaan / The Generated Volume

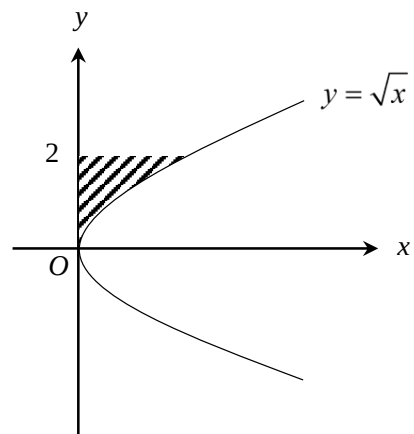
$$\begin{aligned}
 &= \pi \int_0^2 x^2 dy \\
 &= \pi \int_0^2 (2y - y^2)^2 dy \\
 &= \pi \int_0^2 (4y^2 - 4y^3 + y^4) dy \\
 &= \pi \left[\frac{4y^{2+1}}{2+1} - \frac{4y^{3+1}}{3+1} + \frac{y^{4+1}}{4+1} \right]_0^2 \\
 &= \pi \left[\left(\frac{4(2)^3}{3} - 2^4 + \frac{2^5}{5} \right) - \left(\frac{4(0)^3}{3} - 0^4 + \frac{0^5}{5} \right) \right] \\
 &= \frac{16}{15} \pi \text{ unit}^3
 \end{aligned}$$

1.



(dikisarkan pada paksi-x / rotated about the x-axis)

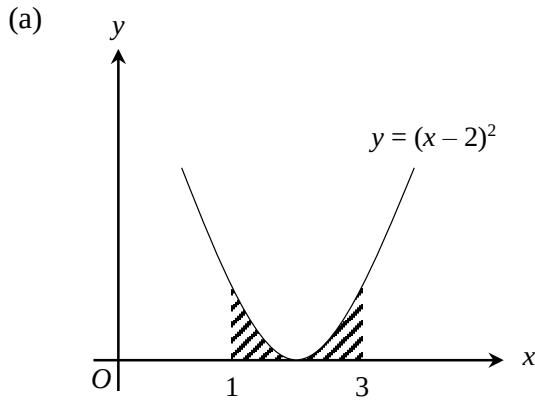
2.



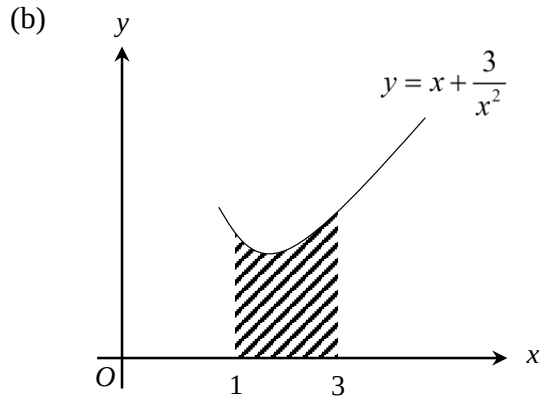
(dikisarkan pada paksi-y / rotated about the y-axis)

Latihan Pengukuhan :
Enhancement Exercises:

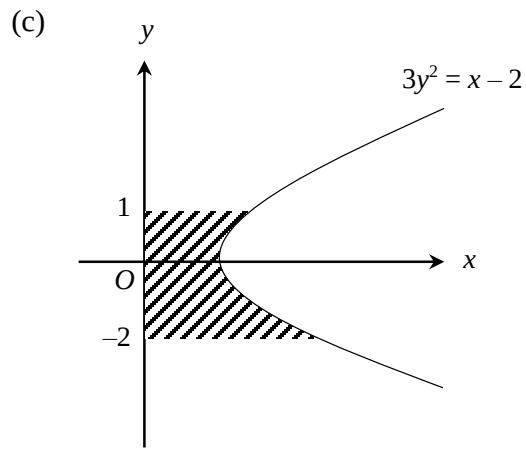
1. Cari luas rantau berlorek bagi setiap rajah yang berikut:
Find the area of shaded region for each of the following diagram:



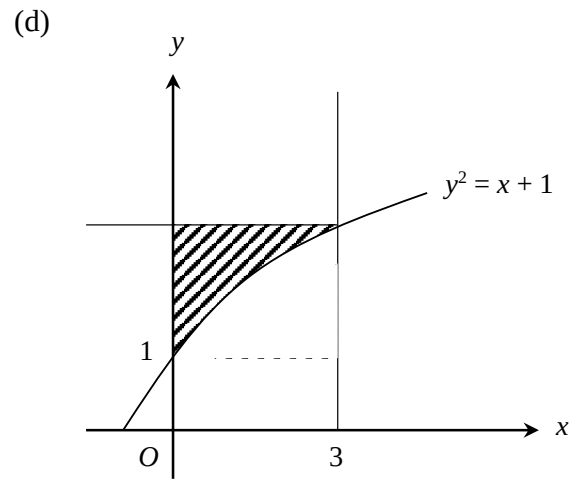
Penyelesaian / *Solution:*



Penyelesaian / *Solution:*



Penyelesaian / Solution:

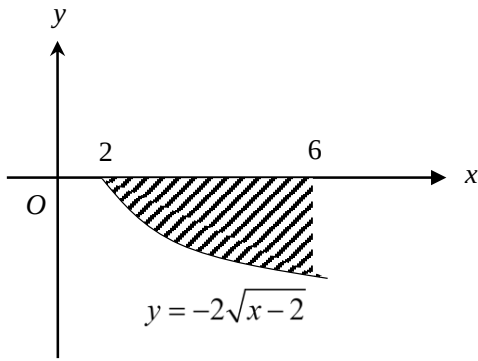


Penyelesaian / Solution:

2. Cari isi padu janaan, dalam sebutan π , apabila rantau berlorek bagi setiap lengkung berikut dikisarkan melalui 360° pada paksi- x atau paksi- y .

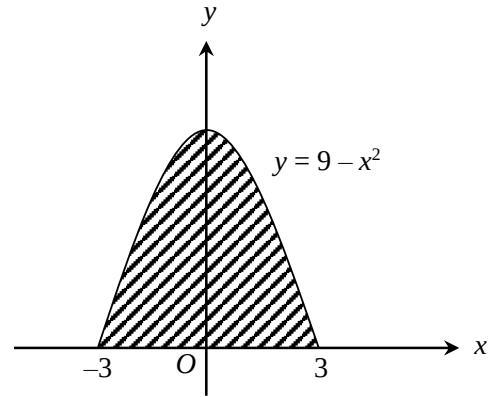
Find the volume generated, in terms of π , when the shaded region for each of the following curve is rotated 360° about the x -axis or y -axis.

(a)



Penyelesaian / Solution:

(b)



Penyelesaian / Solution:

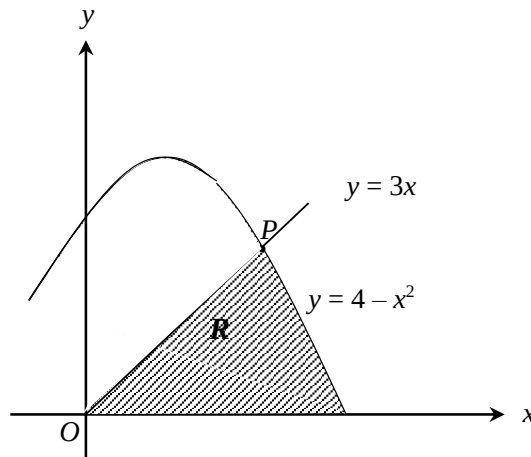
Penilaian :

Assessment:

Kertas 1 / Kertas 2

Paper 1/ Paper 2

1. Rajah di bawah menunjukkan garis lurus $y = 3x$ memotong lengkung $y = 4 - x^2$ pada titik P .
The diagram below shows a straight line $y = 3x$ intersects the curve $y = 4 - x^2$ pada titik P .



Cari / Find

- (a) koordinat P ,
the coordinates of P , [3 markah / marks]
- (b) luas rantau R yang dibatasi oleh garis lurus $y = 3x$, lengkung $y = 4 - x^2$ dan paksi- x .
the area of region R which is bounded by the line $y = 3x$, the curve $y = 4 - x^2$ and x -axis. [4 markah / marks]
- (c) isi padu janaan apabila luas yang dibatasi oleh lengkung, paksi- x dan paksi- y dikisarkan 360° atas paksi- y .
the volume generated by the region bounded by the curve, x -axis and y -axis is revolved 360° about the y -axis. [3 markah / marks]

Penyelesaian / Solution:

TINGKATAN 5

BAB

5

TABURAN KEBARANGKALIAN
PROBABILITY DISTRIBUTION

5.2

Taburan Binomial
Binomial Distribution

Objektif Pembelajaran:

Learning objective:

1. Menerangkan maksud taburan binomial.
Describe the meaning of binomial distribution.
2. Menentukan kebarangkalian suatu peristiwa bagi taburan binomial.
Determine the probability of an event for binomial distribution.

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

1. Dalam percubaan Bernoulli, hanya ada dua kesudahan yang mungkin, iaitu 'berjaya' atau 'gagal'.
In a Bernoulli trial, there are two possible outcomes, 'success' and 'failure'.
2. Peluang mendapatkan 'berjaya' adalah sentiasa sama dalam setiap percubaan.
The chances of getting 'success' are always the same in each trial.
3. Peluang untuk mendapatkan 'berjaya' diwakili dengan p dan peluang untuk mendapat 'gagal' diwakili dengan q dan $q = 1 - p$.
The chances of getting 'success' is represented by p and chances of getting 'failure' is represented by q and $q = 1 - p$.
4. Taburan binomial terbentuk apabila eksperimen Bernoulli yang sama diulang sebanyak n kali dan r mewakili bilangan percubaan yang mendapat kesudahan 'berjaya'.
Binomial distribution is formed when similar Bernoulli trials are repeated n times and r represent the number of trials that get 'success' outcome.
5. Formula: $P(X = r) = {}^nC_r p^r q^{n-r}$, $r = 0, 1, 2, \dots, n$
6. $P(X = 0) + P(X = 1) + P(X = 2) + \dots + P(X = n) = 1$
7. Min = np , varians = npq dan sisihan piawai = $\sqrt{npq}$
Mean = np , variance = npq and standard deviation = $\sqrt{npq}$

1. Tentukan kebarangkalian bagi setiap yang berikut.
Determine the probability of each of the following.

Aras 1

Contoh Example $n = 5, p = 0.3$, hitung $P(X = 2)$ $n = 5, p = 0.3$, calculate $P(X = 2)$ $q = 1 - (0.3) = 0.7$ $P(X = 2) = {}^5C_2 \times (0.3)^2 \times (0.7)^{(5-2)}$ $= 0.3087$	1. $n = 6, p = 0.4$, hitung $P(X = 3)$ $n = 6, p = 0.4$, calculate $P(X = 3)$
2. $n = 7, p = \frac{1}{4}$, hitung $P(X = 5)$ $n = 7, p = \frac{1}{4}$, calculate $P(X = 5)$	3. $n = 4, q = 0.8$, hitung $P(X = 1)$ $n = 4, q = 0.8$, calculate $P(X = 1)$

2. Tentukan kebarangkalian bagi setiap yang berikut.
Determine the probability of each of the following.

Aras 2

Contoh Example $n = 5, p = 0.35$, hitung $P(X > 2)$ $n = 5, p = 0.35$, calculate $P(X > 2)$ $q = 1 - (0.35) = 0.65$ $P(X > 2) = P(X = 3) + P(X = 4) + P(X = 5)$ $= {}^5C_3 \times (0.35)^3 \times (0.65)^{(5-3)} +$ ${}^5C_4 \times (0.35)^4 \times (0.65)^{(5-4)} +$ ${}^5C_5 \times (0.35)^5 \times (0.65)^{(5-5)}$ $= 0.2352$	1. $n = 7, p = 0.75$, hitung $P(X > 5)$ $n = 7, p = 0.75$, calculate $P(X > 5)$
--	---

2. $n = 8, p = 0.7$, hitung $P(X \geq 6)$ $n = 8, p = 0.7$, calculate $P(X \geq 6)$	3. $n = 6, p = 0.45$, hitung $P(X \leq 1)$ $n = 6, p = 0.45$, calculate $P(X \leq 1)$
4. $n = 6, p = 0.9$, hitung $P(X \leq 2)$ $n = 6, p = 0.9$, calculate $P(X \leq 2)$	5. $n = 6, p = \frac{2}{5}$, hitung $P(X < 2)$ $n = 6, p = \frac{2}{5}$, calculate $P(X < 2)$

3. Tentukan kebarangkalian bagi setiap yang berikut.
Determine the probability of each of the following.

Aras 3

Contoh Example $n = 8, p = 0.3$, hitung $P(X \geq 2)$ $n = 8, p = 0.3$, calculate $P(X \geq 2)$ $q = 1 - (0.3) = 0.7$ $P(X \geq 2) = 1 - (P(X = 0) + P(X = 1))$ $= 1 - ({}^8C_0 \times (0.3)^0 \times (0.7)^{(8-0)} + {}^8C_1 \times (0.3)^1 \times (0.7)^{(8-1)})$ $= 0.7447$	1. $n = 7, p = 0.75$, hitung $P(X \leq 6)$ $n = 7, p = 0.75$, calculate $P(X \leq 6)$
---	--

2. $n = 10, p = 0.25$, hitung $P(X < 8)$ $n = 10, p = 0.25$, calculate $P(X < 8)$	3. $n = 6, p = 0.45$, hitung $P(X \geq 1)$ $n = 6, p = 0.45$, calculate $P(X \geq 1)$
---	---

Latihan Pengukuhan : Enhancement Exercises:

1. Didapati bahawa 20% daripada murid di sebuah sekolah menengah menunggang motosikal ke sekolah.
It is found that 20% of the students in a secondary school ride motorcycle to school.
 - (a) Jika bilangan murid yang menunggang motorsikal ke sekolah ialah 80 orang, hitung jumlah bilangan murid di sekolah tersebut.
If the number of students riding motorcycles to school is 80, calculate the total number of students in the school.
 - (b) Jika 10 orang murid dipilih secara rawak, cari kebarangkalian bahawa sekurang-kurangnya tiga orang murid menunggang motosikal ke sekolah.
If 10 students are randomly selected, find the probability that at least three students ride motorcycles to school.
Penyelesaian / Solution:

2. Sebuah kilang pemprosesan makanan menghasilkan sejenis kari ayam dalam tin. Jisim setin kari ayam dalam julat 275 g hingga 285 g akan diterima untuk dipasarkan, manakala jisim setin kari ayam yang di luar julat itu akan ditolak untuk dipasarkan. Jadual menunjukkan jisim setin kari ayam dan bilangan tin dalam nisbah pada suatu masa tertentu.

A food processing factory produces a type of canned chicken curry. The mass of a can of chicken curry in the range of 275 g to 285 g will be accepted for marketing, while the mass of a can of chicken curry that is out of that range will be rejected for marketing. Table shows the mass of a can of chicken curry and the number of can produced in ratio at a particular time.

Jisim (g) Mass (g)	$x < 275$	$275 \leq x \leq 285$	$x > 285$
Bilangan tin dalam nisbah Number of can in ratio	2	95	3

- (a) Cari min bilangan tin kari ayam yang dipasarkan jika kilang itu menghasilkan 2000 kari ayam dalam tin.

Find the mean number of cans of chicken curry marketed if the factory produces 2000 canned chicken curry.

- (b) Jika 10 tin kari ayam dipilih secara rawak daripada kilang itu, cari kebarangkalian bahawa tepat 3 tin kari ayam ditolak untuk dipasarkan.

If 10 cans of chicken curry are randomly selected from that factory, find the probability that exactly 3 cans of chicken curry are rejected for marketing.

- (c) Jika pegawai penjaminan kualiti memilih 8 tin kari ayam secara rawak, cari kebarangkalian bahawa lebih daripada 2 tin kari ayam mempunyai jisim di bawah julat.

If the quality control officer chooses 8 cans of chicken curry at random, find the probability that more than 2 cans of chicken curry have a mass below the range.

Penyelesaian / Solution:

Kertas 1 / Kertas 2
Paper 1/ Paper 2

- l. Dalam sebuah institusi pendidikan, didapati 25% tidak bersarapan sebelum hadir ke sekolah.
In an educational institution, it was found that 25% did not have breakfast before attending school.
- (a) Diberi min pelajar yang tidak bersarapan sebelum hadir ke sekolah ialah 120.
Cari jumlah pelajar di institusi tersebut.
Given the mean of students who do not have breakfast before attending school is 120.
Find the total number of students in the institution.
- [2 markah/marks]
- Penyelesaian / Solution:
- (b) Jika 5 orang murid dipilih secara rawak, cari kebarangkalian bahawa sekurang-kurangnya 3 orang murid tidak bersarapan sebelum hadir ke sekolah.
If 5 students are randomly chosen, find the probability that at least 3 students do not have breakfast before attending school.
- [3 markah/marks]
- Penyelesaian / Solution:

SESI PEMBELAJARAN 13

TINGKATAN 5

BAB

5

TABURAN KEBARANGKALIAN
PROBABILITY DISTRIBUTION

5.3

Taburan Normal
Normal Distribution

Objektif Pembelajaran:

Learning objective:

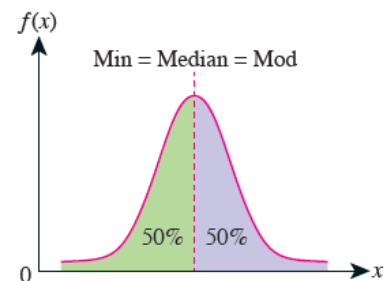
1. Menerangkan maksud taburan normal.
Describe the meaning of normal distribution.
2. Menentukan kebarangkalian suatu peristiwa bagi taburan normal.
Determine the probability of an event for normal distribution.

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

1. Kebarangkalian taburan normal diberi oleh luas di bawah lengkung. Jumlah luas di bawah lengkung itu ialah 1.
The probability of normal distribution is given by the area under the curve. The total area under the curve is 1.
2. Jumlah kebarangkalian di sebelah kiri min sama dengan jumlah kebarangkalian di sebelah kanan.
The sum of the probabilities at the left of the mean is equal to the sum of the probabilities at the right.
3. Taburan normal selanjar perlu ditukar kepada taburan normal piawai untuk memudahkan proses pengiraan kebarangkalian.
A normal distribution needs to be converted to standard normal distribution to ease the process of calculating the probability.
4. Skor-z bagi taburan normal piawai dihitung melalui formula berikut:
z-score of standard normal distribution is calculated by using the formula below:

$$Z = \frac{X - \mu}{\sigma}$$



1. Nyatakan min dan sisihan piawai bagi setiap yang berikut.
State the mean and standard deviation for each of the following. .

Aras 1

Contoh Example $X \sim N(15, 4)$ $\mu = 15$ $\sigma = \sqrt{4}$ $\sigma = 2$	1. $X \sim N(36, 9)$
2. $X \sim N(33, 12)$	3. $X \sim N(70, 24)$

2. Tentukan skor-Z bagi nilai X yang diberi untuk setiap pemboleh ubah rawak normal X .
Determine the score-Z for the given value of X for each normal random variable X .

Aras 1

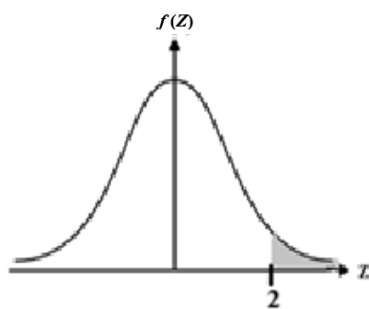
Contoh Example $X \sim N(19, 2^2), X = 21$ $Z = \frac{21-19}{\sqrt{2^2}}$ $Z = 1$	1. $X \sim N(56, 36), X = 54$
2. $X \sim N(5, 0.81), X = 6$	3. $X \sim N(136, 49), X = 120$

3. Tentukan kebarangkalian bagi setiap taburan normal yang berikut.
Determine the probability of each of the following normal distribution

Aras 2

Contoh
Example

$$\begin{aligned} X &\sim N(19, 2^2) \\ P(X > 23) \\ &= P\left(Z > \frac{23-19}{\sqrt{2^2}}\right) \\ &= P(Z > 2) \end{aligned}$$



Dari sifir taburan normal piawai, $P(Z > 2) = 0.0228$
From the standard normal distribution table,
 $P(Z > 2) = 0.0228$

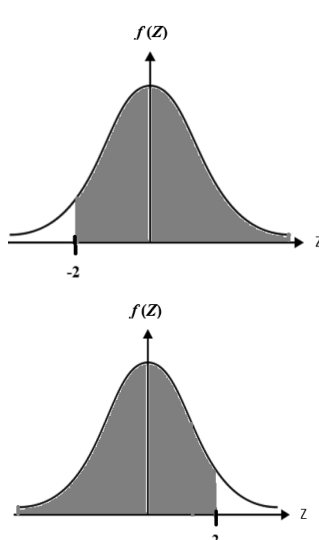
1. $X \sim N(25, 9)$
 $P(X \geq 30)$

2. $X \sim N(16, 8)$ $P(X > 20)$	3. $X \sim N(2, 0.25)$ $P(X < 1.5)$
-------------------------------------	--

4. $X \sim N(14, 10)$ $P(X \leq 12)$	5. $X \sim N(2.5, 0.36)$ $P(X < 0.9)$
---	---

4. Tentukan kebarangkalian bagi setiap taburan normal yang berikut.
Determine the probability of each of the following normal distribution.

Aras 3

Contoh Example $X \sim N(19, 2^2)$ $P(X > 15)$ $= P\left(Z > \frac{15-19}{\sqrt{2^2}}\right)$ $= P(Z > -2)$ $= 1 - P(Z \geq 2)$ $= 1 - 0.0228$ $= 0.9772$ 	1. $X \sim N(25, 9)$ $P(X \geq 22)$
--	--

2. $X \sim N(16, 8)$ $P(X > 12)$	3. $X \sim N(2, 0.25)$ $P(X < 2.5)$
-------------------------------------	--

4. $X \sim N(14, 10)$ $P(10 \leq X \leq 18)$	5. $X \sim N(2.5, 0.36)$ $P(1.9 < X < 3.1)$
--	---

Latihan Pengukuhan :
Enhancement Exercises:

- Tinggi murid di sebuah sekolah menengah bertaburan secara normal dengan min 165 cm dan varians 196 cm^2 .
The height of students in a secondary school is normally distributed with a mean of 165 cm and a variance of 196 cm^2 .

(a) Cari peratusan murid yang mempunyai ketinggian lebih daripada 180 cm.
Find the percentage of students who have a height more than 180 cm.

- (b) Cari peratusan murid yang mempunyai ketinggian less daripada 170 cm.
Find the percentage of students who have a height more than 170 cm.

2. Markah ujian Matematik bagi sekumpulan murid adalah bertaburan secara normal dengan min 52 markah dan sisihan piawai 12 markah. Seorang murid dipilih secara rawak daripada kumpulan itu. Cari kebarangkalian bahawa markah bagi murid yang terpilih itu adalah
The Mathematics test scores for a group of students are normally distributed with a mean of 52 marks and a standard deviation of 12 marks. One student was randomly selected from the group. Find the probability that the score for the selected student is

- (a) melebihi 80 markah.
more than 80 marks

- (b) kurang daripada 40 markah
less than 40 marks

- (c) di antara 46 markah dan 58 markah.
between 46 marks and 58 marks.

Penilaian :
Assessment:

Kertas 1 / Kertas 2

Paper 1/ Paper 2

1. Berat pekerja di sebuah kilang elektronik bertaburan secara normal dengan min 60 kg dan sisihan piawai 10 kg.

The weight of workers in an electronics factory is normally distributed with a mean of 60 kg and a standard deviation of 10 kg.

- (a) Cari kebarangkalian pekerja yang beratnya lebih daripada 65 kg

Find the probability of a worker weighing more than 65 kg.

[2 markah/marks]

- (b) Cari kebarangkalian pekerja yang beratnya antara 60 hingga 71 kg.

Find the probability of a worker weighing between 60 to 71 kg.

[3 markah/marks]

SESI PEMBELAJARAN 14

TINGKATAN 5

BAB

5

TABURAN KEBARANGKALIAN
PROBABILITY DISTRIBUTION

5.3

Taburan Normal
Normal Distribution

Objektif Pembelajaran:

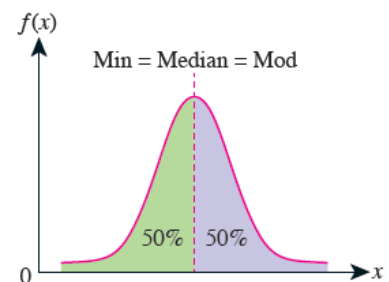
Learning objective:

- Menentukan kebarangkalian suatu peristiwa bagi taburan normal.
Determine the probability of an event for normal distribution.

Konsep Penting / Rumus Penting:

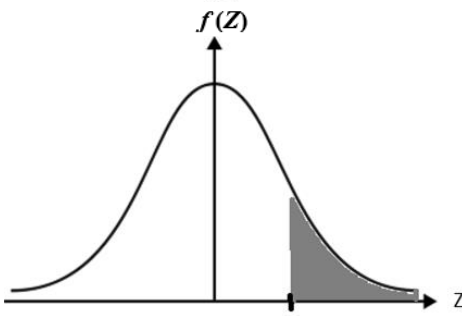
Important Concepts / Important Formulae:

1. Kebarangkalian taburan normal diberi oleh luas di bawah lengkung.
Jumlah luas di bawah lengkung itu ialah 1.
The probability of normal distribution is given by the area under the curve. The total area under the curve is 1.
2. Jumlah kebarangkalian di sebelah kiri min sama dengan jumlah kebarangkalian di sebelah kanan.
The sum of the probabilities at the left of the min is equal to the sum of the probabilities at the right.



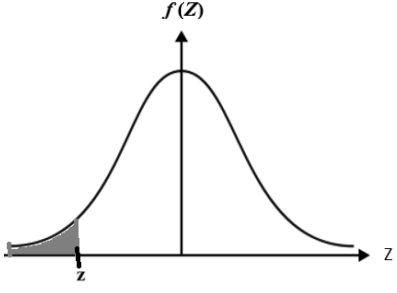
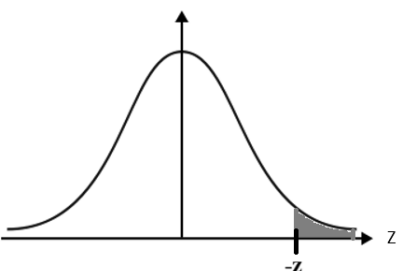
1. Tentukan nilai skor-z bagi setiap yang berikut.
Determine z-score for each of the following.

Aras 1

Contoh Example $P(Z > z) = 0.2090$  Dari sifir taburan normal piawai, $z = 0.81$ <i>From the standard normal distribution table,</i> $z = 0.81$	1. $P(Z > z) = 0.4673$
2. $P(Z > z) = 0.3579$	3. $P(Z > z) = 0.0236$

2. Tentukan nilai skor-z bagi setiap yang berikut.
Determine z-score for each of the following.

Aras 1

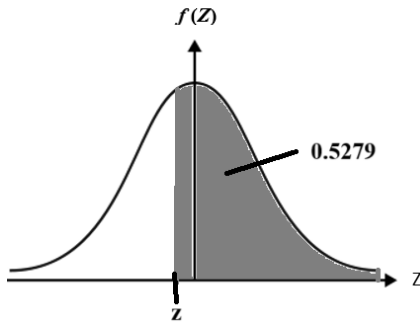
Contoh Example $P(Z < z) = 0.1611$  $f(z)$ z  $f(z)$ $-z$ $z = -0.99$	1. $P(Z < z) = 0.0418$
2. $P(Z < z) = 0.0833$	3. $P(Z < z) = 0.3257$

3. Tentukan nilai skor-z bagi setiap yang berikut.
Determine z-score for each of the following.

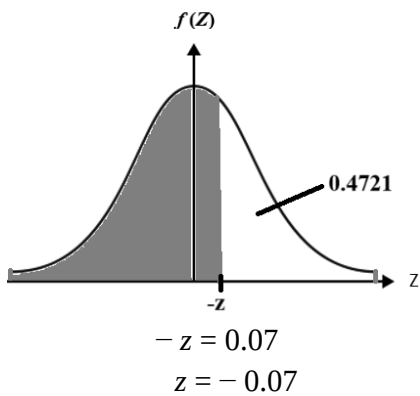
Aras 2

Contoh
Example

$$P(Z > z) = 0.5279$$



$$1 - 0.5279 = 0.4721$$

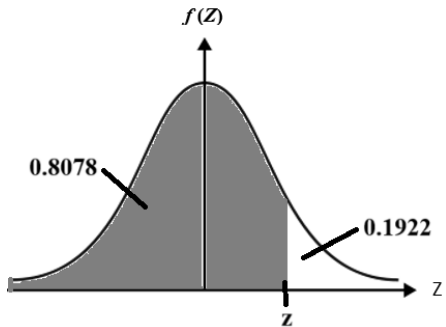


1. $P(Z > z) = 0.8345$

2. $P(Z > z) = 0.9803$	3. $P(Z > z) = 0.9254$
------------------------	------------------------

4. Tentukan nilai skor-z bagi setiap yang berikut.
Determine z-score for each of the following.

Aras 2

Contoh Example $P(Z < z) = 0.8078$ $1 - 0.8078 = 0.1922$  $z = 0.87$	1. $P(Z < z) = 0.5371$
2. $P(Z < z) = 0.8599$	3. $P(Z < z) = 0.8399$

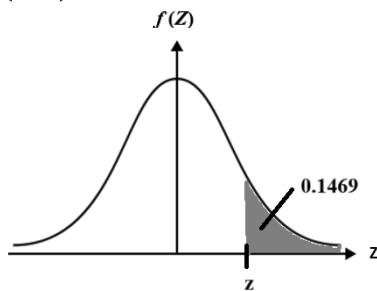
5. Tentukan nilai k bagi setiap yang berikut.
Determine the value of k for each of the following.

Aras 3

Contoh
Example

$$P(X > k) = 0.1469$$

$$X \sim N(5, 9)$$



$$P(Z > z) = 0.1469$$

Dari sifir taburan normal piawai, $z = 1.05$

From the standard normal distribution table,

$$z = 1.05$$

$$1.05 = \frac{k-5}{\sqrt{9}}$$

$$k = 8.05$$

$$1. P(Z > z) = 0.0594$$

2. $P(X < k) = 0.2448$
 $X \sim N(100, 16)$

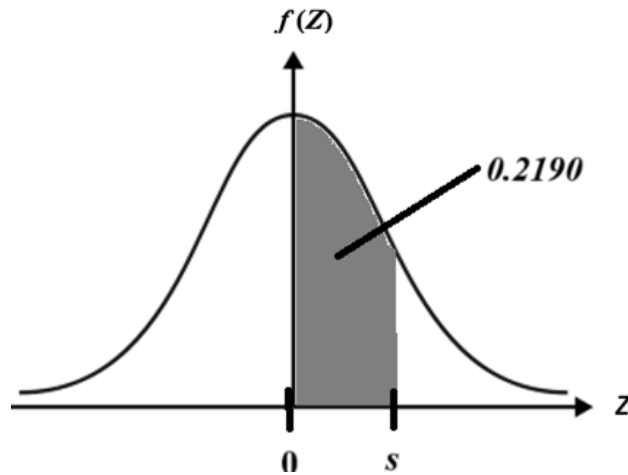
3. $P(X < k) = 0.7829$
 $X \sim N(20, 5)$

Latihan Pengukuhan :
Enhancement Exercises:

1. Markah ujian matematik bagi sekumpulan besar murid bertaburan secara normal dengan min 55 markah dan sisihan piawai 10 markah.
The scores of mathematics test of a large group of students are normally distributed with a mean of 55 marks and a standard deviation of 10 marks.
 - (a) Jika 10% murid yang mendapat markah tertinggi akan diberikan hadiah. Hitung markah minimum untuk melayakkan murid tersebut menerima anugerah.
If 10% of students with the highest score will be given a prize. Calculate the minimum score to qualify the student for the award.
Penyelesaian / Solution:

 - (b) 20% murid yang mendapat markah terendah perlu menyertai program intervensi. Hitung markah paling tinggi murid yang perlu menyertai program intervensi.
20% of the students with the lowest scores had to participate in the intervention programme. Calculate the highest score of students who need to participate in the intervention programme.
Penyelesaian / Solution:

2. Rajah di bawah menunjukkan satu graf bagi taburan normal piawai.
Diagram below shows a graph of the standard normal distribution.



- (a) Mencari nilai s .
Find the value of s .
Penyelesaian / Solution:

- (b) X ialah pemboleh ubah rawak selang yang bertaburan secara normal dengan min 50 dan sisihan piawai 9. Hitung nilai x apabila skor z ialah s .
 X is a continuous random variable that is normally distributed with a mean of 50 and a standard deviation of 9. Calculate the value of x when the score z is s .
Penyelesaian / Solution:

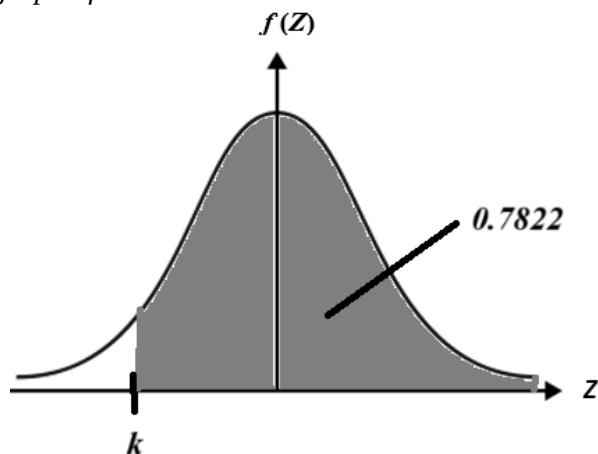
Penilaian :

Assessment:

Kertas 1 / Kertas 2

Paper 1/ Paper 2

1. Rajah di bawah menunjukkan satu graf bagi taburan normal piawai.
Diagram below shows a graph of the standard normal distribution.



- (a) mencari nilai k .
Find the value of k .

[3 markah/marks]

Penyelesaian / *Solution:*

- (b) X ialah pemboleh ubah rawak selang yang bertaburan secara normal dengan min 160 dan sisihan piawai 16. Hitung nilai x apabila skor z ialah k .
 X is a continuous random variable that is normally distributed with a mean of 160 and a standard deviation of 16. Calculate the value of x when the score z is k .

[2 markah/marks]

Penyelesaian / *Solution*:

SESI PEMBELAJARAN 15

TINGKATAN 5

BAB

6

FUNGSI TRIGONOMETRI
TRIGONOMETRIC FUNCTIONS

6.3

Graf Fungsi Sinus, Kosinus dan Tangen
Graph of Sine, Cosine and Tangent Functions

Objektif Pembelajaran:

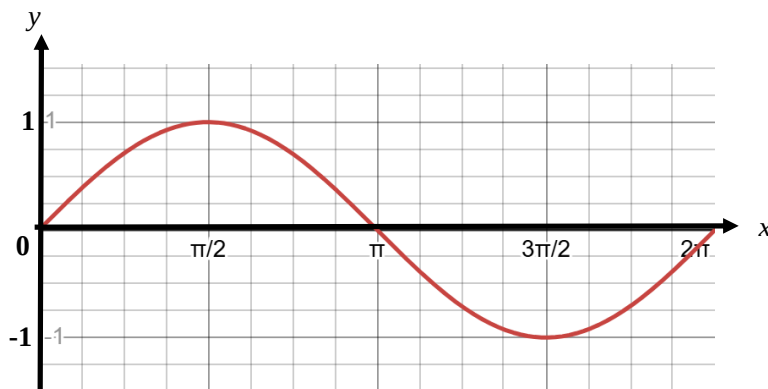
Learning objective:

- Melukis dan mengenal pasti ciri – ciri graf fungsi sinus, kosinus dan tangen.
Draw and determine the properties of sine, cosine and tangent graphs.
- Menyelesaikan persamaan trigonometri dengan kaedah graf.
Solve trigonometric equations using graphical method

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

1. Graf sinus
Sine graph

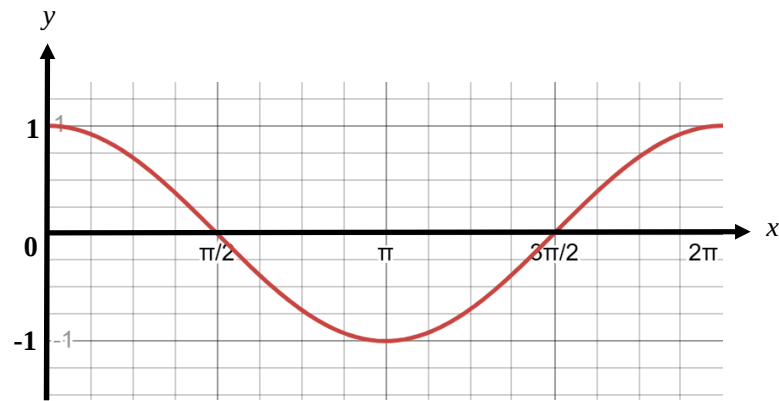


Graf $y = \sin x$ untuk $0 \leq x \leq 2\pi$

Graph $y = \sin x$ for $0 \leq x \leq 2\pi$

- (a) Amplitud = 1
Amplitude = 1
- (i) Nilai maksimum $y = 1$
The maximum value $y = 1$
- (ii) Nilai minimum $y = -1$
The minimum value $y = -1$
- (b) Kala = 360° atau 2π
Period = 360° or 2π
- (c) Pintasan $-x$: 0, π , 2π
 x -intercept : 0, π , 2π
- (d) Pintasan $-y$: 0
 y -intercept : 0

2. Graf kosinus
Cosine graph



Graf $y = \cos x$ untuk $0 \leq x \leq 2\pi$

Graph $y = \cos x$ for $0 \leq x \leq 2\pi$

(a) Amplitud = 1

Amplitude = 1

(i) Nilai maksimum $y = 1$

The maximum value $y = 1$

(ii) Nilai minimum $y = -1$

The minimum value $y = -1$

(b) Kala = 360° atau 2π

Period = 360° or 2π

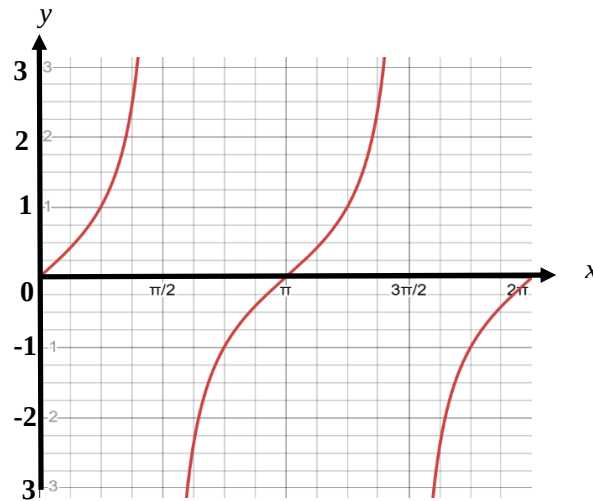
(c) Pintasan -x : $\frac{\pi}{2}, \frac{3\pi}{2}$

x-intercept : $\frac{\pi}{2}, \frac{3\pi}{2}$

(d) Pintasan -y : 1

y-intercept : 1

3. Graf tangen
Tangent graph



Graf $y = \tan x$ untuk $0 \leq x \leq 2\pi$

Graph $y = \tan x$ for $0 \leq x \leq 2\pi$

(a) Tiada amplitud

No amplitude

(i) Tiada nilai maksimum y

There is no maximum value of y

(ii) Tiada nilai minimum y

There is no minimum value of y .

(b) Kala = 180° atau π

Period = 180° or π

(c) Asimptot- x : $\frac{\pi}{2}, \frac{3\pi}{2}$

x -asymptotes : $\frac{\pi}{2}, \frac{3\pi}{2}$

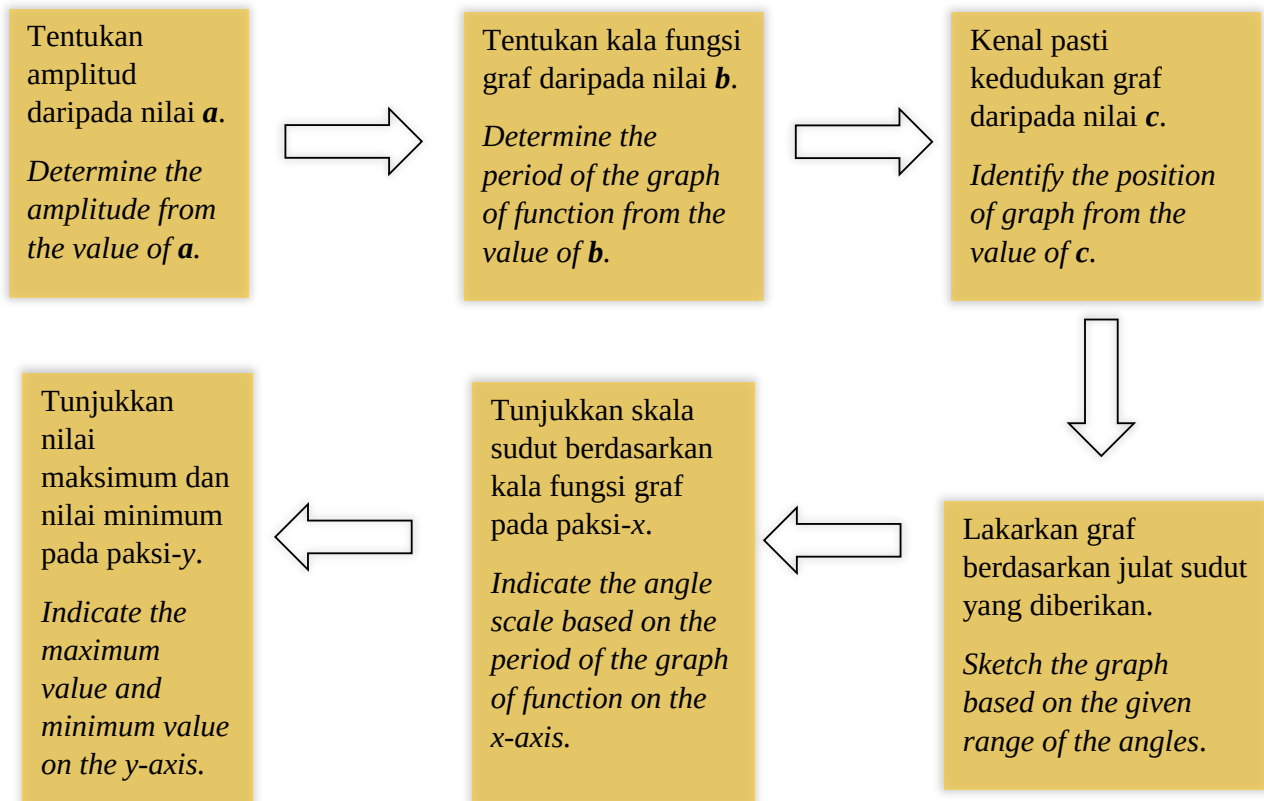
(d) Pintasan - x : $0, \pi, 2\pi$

x -intercept : $0, \pi, 2\pi$

(e) Pintasan - y : 0

y -intercept : 0

3. Carta alir di bawah menunjukkan langkah-langkah untuk melakar graf fungsi trigonometri.
The flow map below shows the steps to sketch the graph of trigonometric function.



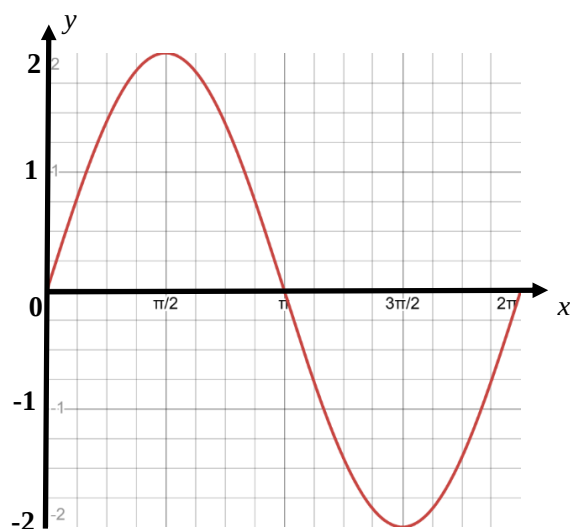
4. Penyelesaian bagi persamaan trigonometri adalah nilai-nilai koordinat-x bagi titik-titik persilangan antara dua graf fungsi yang diperolehi daripada persamaan trigonometri tersebut.
The solution of a trigonometric equation are the values of x-coordinate of the intersection points between two graphs of functions obtained from the trigonometric equation.

Lakar graf bagi setiap fungsi trigonometri untuk $0 \leq x \leq 2\pi$.
 Sketch the graph of each trigonometric function for $0 \leq x \leq 2\pi$.

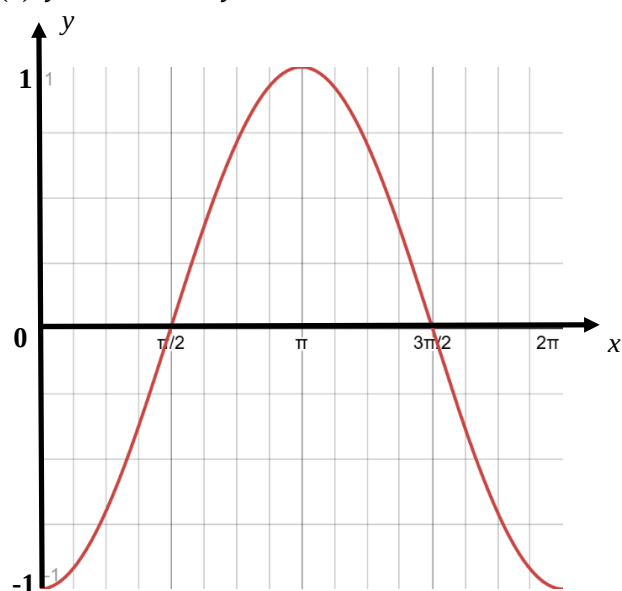
Aras 1

Contoh
Example

(a) $y = 2 \sin x$



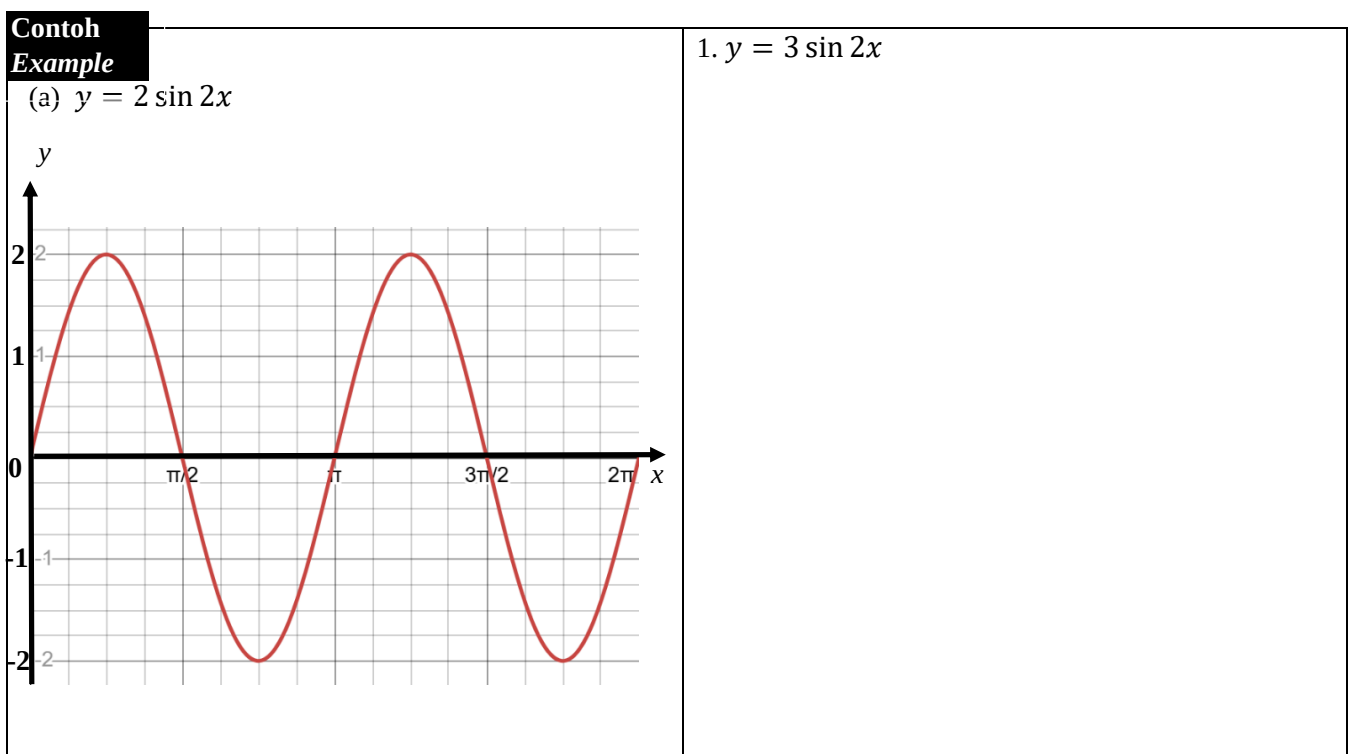
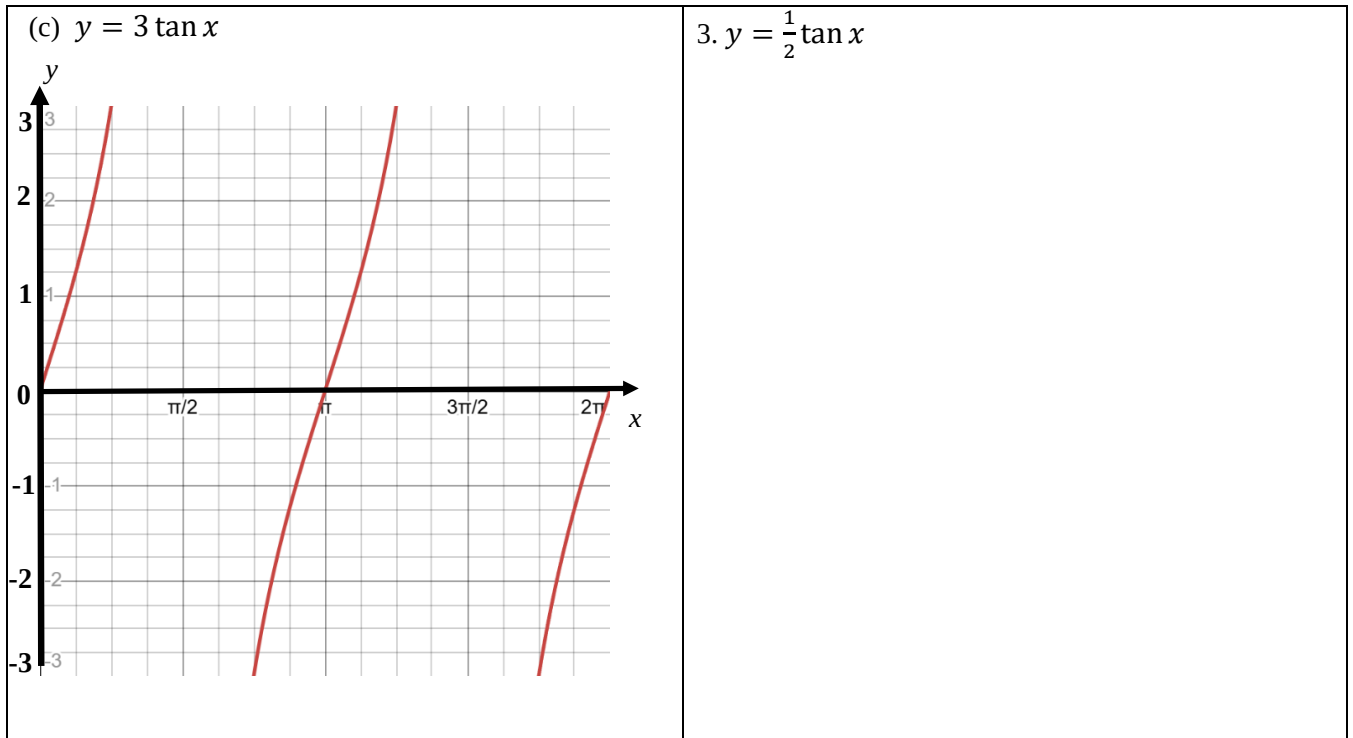
(b) $y = -\cos x$ / $y = -\cos x$



1. $y = 3 \sin x$

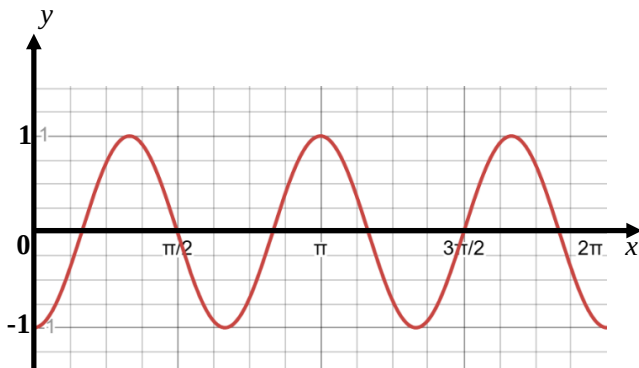
2. $y = -2 \cos x$ / $y = -2 \cos x$

MATEMATIK TAMBAHAN TINGKATAN 5



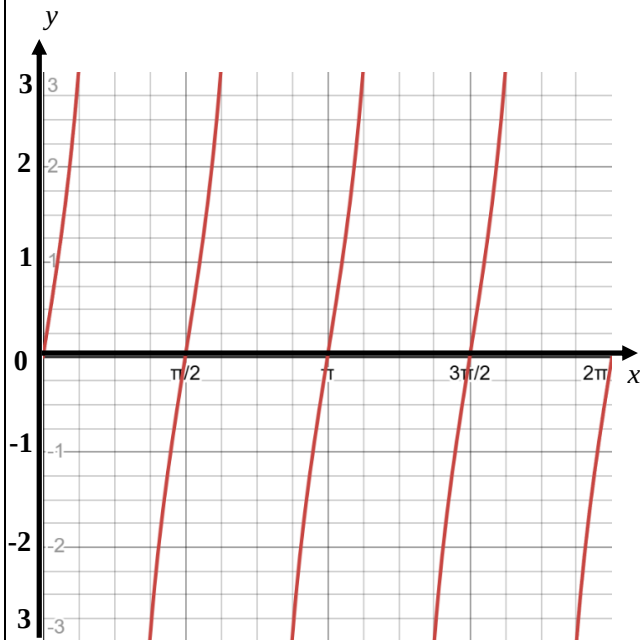
MATEMATIK TAMBAHAN TINGKATAN 5

(b) $y = -\cos 3x$ / $y = -\cos 3x$



2. $y = -2 \cos 3x$ / $y = -2 \cos 3x$

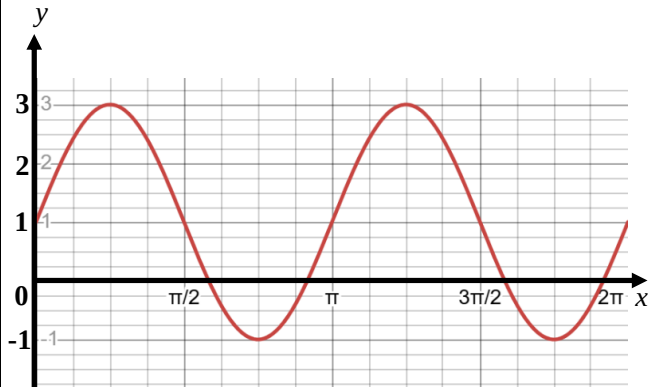
(c) $y = 3 \tan 2x$



3. $y = \frac{1}{2} \tan 2x$

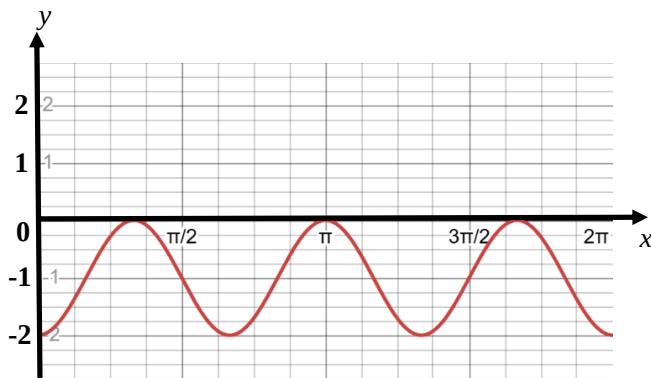
Contoh
Example

(a) $y = 2 \sin 2x + 1$



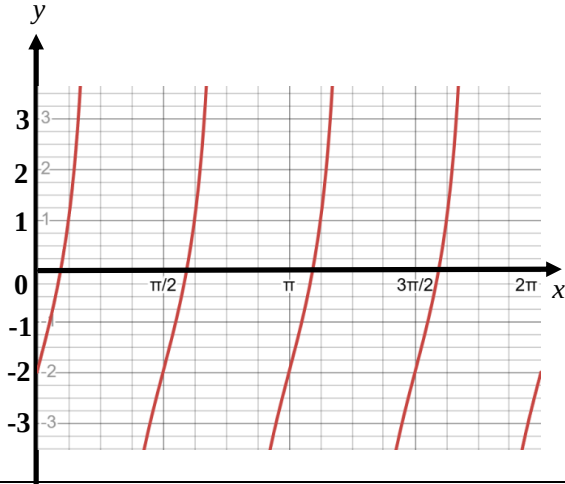
1. $y = 3 \sin 2x + 1$

(b) $y = -\cos 3x - 1$ / $y = -\cos 3x - 1$



2. $y = -2 \cos 3x + 2$ / $y = -2 \cos 3x + 2$

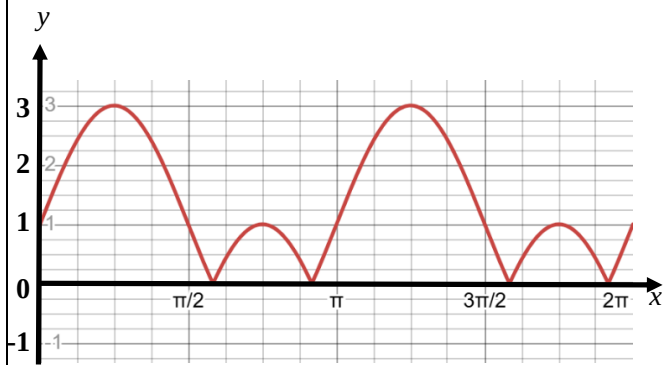
(c) $y = 3 \tan 2x - 2$



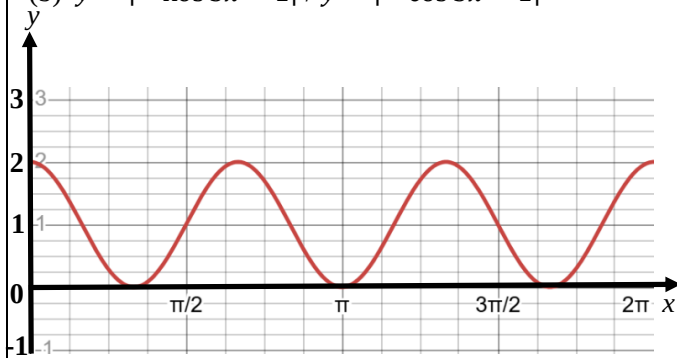
3. $y = \frac{1}{2} \tan 2x - 1$

**Contoh
Example**

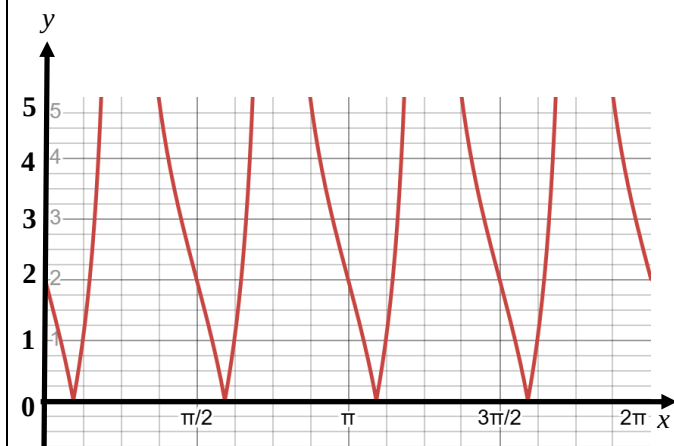
(a) $y = |2 \sin 2x + 1|$



(b) $y = |-\cos 3x - 1|$ / $y = |-\cos 3x - 1|$



(c) $y = |3 \tan 2x - 2|$



1. $y = |3 \sin 2x + 1|$

2. $y = |-2 \cos 3x + 2|$ / $y = |-2 \cos 3x + 2|$

3. $y = \left| \frac{1}{2} \tan 2x - 1 \right|$

Latihan Pengukuhan :
Enhancement Exercises:

Lakar graf bagi setiap fungsi trigonometric untuk $0 \leq x \leq 2\pi$.
Sketch the graph of each trigonometric function for $0 \leq x \leq 2\pi$.

1. $y = 3 - \sin \frac{1}{2}x$

Penyelesaian / *Solution:*

2. $y = 2 \cos \frac{3}{2}x - 3$

Penyelesaian / *Solution:*

3. $y = 2 \tan x - 1$

Penyelesaian / *Solution*:

4. $y = |2 \sin 2x + 1|$

Penyelesaian / *Solution*:

5. $y = |2 \cos x - 1| / y = |2 \cos x - 1|$

Penyelesaian / *Solution*:

6. $y = \left| \tan \frac{1}{2}x + 1 \right|$

Penyelesaian / *Solution*:

Penilaian :

Assessment:

Dengan menggunakan skala yang sesuai, lakar graf bagi setiap fungsi trigonometric untuk $0 \leq x \leq 2\pi$.

By using appropriate scales, sketch the graph of each trigonometric function for $0 \leq x \leq 2\pi$.

1. $y = 2 - \sin 2x$

Penyelesaian / *Solution*:

2. $y = \frac{1}{2} |\cos 2x| + 1$

Penyelesaian / *Solution*:

3. $y = 2|\tan x| + 1$

Penyelesaian / *Solution*:

SESI PEMBELAJARAN 16

TINGKATAN 5

BAB

6

FUNGSI TRIGONOMETRI
TRIGONOMETRIC FUNCTIONS

6.3

Menyelesaikan Persamaan Trigonometric Dengan Kaedah Graf
Solving Trigonometric Equations Using Graphical Method

Objektif Pembelajaran:

Learning objective:

- Menyelesaikan persamaan trigonometri dengan kaedah graf.

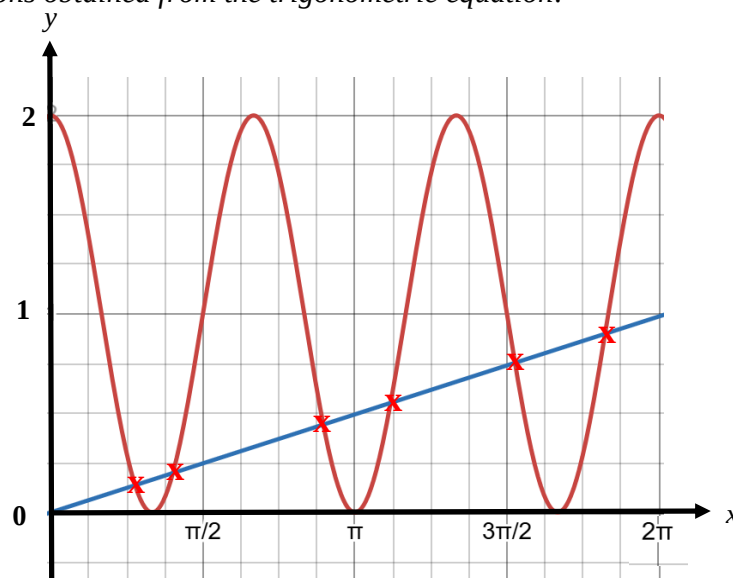
Solve trigonometric equations using graphical method

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

- Penyelesaian persamaan trigonometri ialah nilai koordinat x titik persilangan antara dua fungsi graf yang diperoleh daripada persamaan trigonometri.

The solution of a trigonometric equation are the values of x -coordinate of the intersection points between two graphs of functions obtained from the trigonometric equation.



Bilangan penyelesaian = 6

Number of solutions = 6

Aras 2

Tentukan bilangan penyelesaian bagi setiap persamaan trigonometri dalam domain $0 \leq x \leq 2\pi$ dengan melakarkan satu graf fungsi trigonometri dan satu graf fungsi algebra.

Determine the number of solutions for each trigonometric equation in the domain $0 \leq x \leq 2\pi$ by the graphs of a trigonometric function and an algebraic function.

**Contoh
Example**

$$y = 3 \cos 2x$$

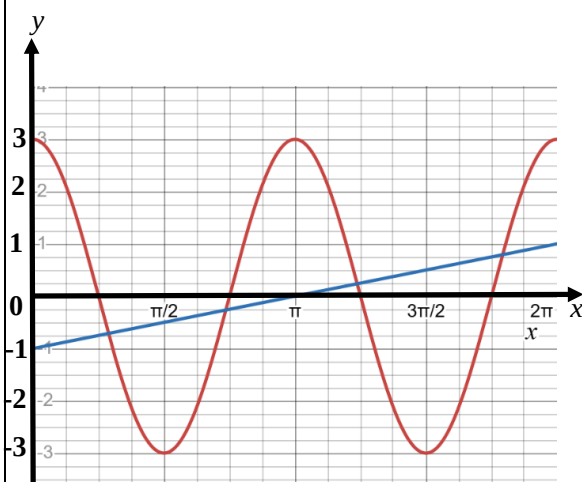
$$3 \cos 2x + 1 = \frac{x}{\pi}$$

Penyelesaian:

Solution:

$$3 \cos 2x = \frac{x}{\pi} - 1 \quad / \quad 3 \cos 2x = \frac{x}{\pi} - 1$$

$$y = \frac{x}{\pi} - 1$$



Bilangan penyelesaian = 4

Number of solutions = 4

$$1. \quad y = \sin 2x$$

$$2 \sin 2x + 3 = \frac{8x}{3\pi}$$

x

2. $y = 3 \cos 2x / y = 3 \cos 2x $ $x = 4\pi - 2\pi 3 \cos 2x $ $x = 4\pi - 2\pi 3 \cos 2x $	3. $y = 2 \tan x$ $2x \tan x = \pi$
--	--

Latihan Pengukuhan :
Enhancement Exercises:

1. Lakarkan graf $y = 3 \sin 2x + 2$ untuk $0 \leq x \leq \pi$. Seterusnya, tentukan bilangan penyelesaian kepada persamaan trigonometri berikut.

Sketch the graph $y = 3 \sin 2x + 2$ for $0 \leq x \leq \pi$. Hence, determine the number of solutions to following trigonometric equations.

(a) $3x \sin 2x = \pi - 2x$

(b) $3\pi \sin 2x = 4x - \pi$

Penyelesaian / *Solution:*

2. Lakarkan graf $y = 1 - 3|\cos x|$ untuk $0 \leq x \leq 2\pi$. Seterusnya, tentukan bilangan penyelesaian bagi persamaan trigonometri berikut.

Sketch the graph $y = 1 - 3|\cos x|$ for $0 \leq x \leq 2\pi$. Hence, determine the number of solutions to following trigonometric equations.

(a) $3|\cos x| + 1 - \frac{2x}{\pi} = 0$ / $3|\cos x| + 1 - \frac{2x}{\pi} = 0$

(b) $2x - 3x|\cos x| = \pi$ / $2x - 3x|\cos x| = \pi$

Penyelesaian / Solution:

3. Lakarkan graf $y = -\tan 2x$ untuk $0 \leq x \leq \pi$. Seterusnya, dengan menggunakan paksi yang sama, lakarkan satu satu garis lurus yang sesuai untuk menyelesaikan persamaan

$$\frac{3x}{\pi} - 2 \tan 2x = 0. \text{ Nyatakan bilangan penyelesaian itu.}$$

Sketch the graph $y = -\tan 2x$ for $0 \leq x \leq \pi$. Hence, using the same axes, sketch a suitable straight line graph to solve the equation $\frac{3x}{\pi} - 2 \tan 2x = 0$. State the number of solutions.

Penyelesaian / Solution:

Penilaian :
Assessment:

1. Pada paksi yang sama, lakarkan graf fungsi $y = \frac{3}{2} \sin 3x + 1$ untuk $0 \leq x \leq \pi$. Seterusnya, nyatakan bilangan penyelesaian bagi $3 \sin 3x = \frac{2x}{\pi} - 2$.

[5 markah]

On the same axes, sketch the graphs of function $y = \frac{3}{2} \sin 3x + 1$ for $0 \leq x \leq \pi$. Hence, state the number of solutions for $3 \sin 3x = \frac{2x}{\pi} - 2$.

[5 marks]

Penyelesaian / Solution:

2. Lakarkan graf $y = -2 \left| \cos \frac{3x}{2} \right| + 1$ untuk $0 \leq x \leq 2\pi$. Dengan menggunakan paksi yang sama, lakarkan graf yang sesuai untuk menyelesaikan persamaan $2 \left| \cos \frac{3x}{2} \right| + \frac{2x}{\pi} = 1$. Nyatakan bilangan penyelesaian.

[6 markah]

Sketch the graph $y = -2 \left| \cos \frac{3x}{2} \right| + 1$ for $0 \leq x \leq 2\pi$. By using same axes, sketch a suitable graph to solve the equation $2 \left| \cos \frac{3x}{2} \right| + \frac{2x}{\pi} = 1$. State the number of solutions.

[6 marks]

Penyelesaian / *Solution*:

3. Lakarkan graf $y = 3|\tan 2x| - 1$ untuk $0 \leq x \leq \pi$. Oleh itu, pada paksi yang sama, lakarkan satu garis lurus untuk mencari bilangan penyelesaian bagi persamaan $3\pi|\tan 2x| = 2\pi - 3x$.

[6 markah]

Sketch the graph $y = 3|\tan 2x| - 1$ for $0 \leq x \leq \pi$. Hence, on the same axes, sketch a straight line to find the number of solutions for the equation $3\pi|\tan 2x| = 2\pi - 3x$.

[6 marks]

Penyelesaian / Solution:

SESI PEMBELAJARAN 17

TINGKATAN 5

BAB

7

**PENGATURCARAAN LINEAR
LINEAR PROGRAMMING**

7.1

**Model Pengaturcaraan Linear
Linear Programming Model**

Objektif Pembelajaran:

Learning objective:

- Membentuk model matematik bagi suatu situasi berdasarkan kekangan yang diberi dan mewakili model tersebut secara grafik.
Form a mathematical model for a situation based on the constraints given and represent the model graphically.

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

Jadual di bawah menunjukkan ungkapan matematik bagi ketidaksamaan yang digunakan.

The table below shows the mathematical expressions for the inequalities used.

	Ungkapan Matematik <i>Mathematical Expressions</i>	Ketidaksamaan <i>Inequality</i>
1.	y melebihi x. <i>y greater than x.</i>	$y > x$
2.	y kurang daripada x. <i>y less than x.</i>	$y < x$
3.	y tidak lebih daripada x. <i>y is not more than x.</i>	$y \leq x$
4.	y tidak kurang daripada x. <i>y is not less than x</i>	$y \geq x$
5.	Jumlah x dan y tidak melebihi k. <i>The sum of x and y is not more than k</i>	$x + y \leq k$
6.	Nilai minimum y ialah k. <i>The minimum value of y is k</i>	$y \geq k$
7.	Nilai maksimum y ialah k. <i>The maximum value of y is k</i>	$y \leq k$
8.	y melebihi x sekurang-kurangnya k. <i>y is at least k times the value of x.</i>	$y \geq kx$
9.	Nisbah x kepada y sekurang-kurangnya 2 : 3. <i>The ratio of x to y is at least 2 : 3.</i>	$\frac{x}{y} \geq \frac{2}{3} @ y \leq \frac{3}{2}x$

Contoh Example	Jenama <i>Brand</i>	Harga sebatang pen <i>Price per pen</i>		Penyelesaian / Solution: Jumlah duit yang ada pada Mazlin adalah RM50.00. Oleh itu, jumlah perbelanjaan Mazlin tidak boleh melebihi RM50.00. <i>The total amount of money Mazlin has is RM50.00. So, the total expenditure must not be more than RM50.00.</i> Jadi / So, $2.50x + 5y \leq 50$ I: $x + y \geq 8$ II: $y < 2x$
	Fast	RM2.50		
	Smooth	RM5.00		

Jadual di atas menunjukkan harga dua jenis jenama pen. Maslin ada RM50.00 dan ingin membeli dua jenama pen mengikut syarat berikut:
The table shows the prices of two brands of pens. Mazlin has RM50.00 and wants to buy these two brands of pens subject to the following conditions:

I : Jumlah pen yang dibeli sekurang-kurangnya 8 batang.
The total number of pens bought must be at least 8.

II : Bilangan pen jenama Smooth mesti kurang daripada dua kali ganda bilangan pen jenama Fast.
The number of Smooth pens bought must be less than twice the number of Fast pens bought.

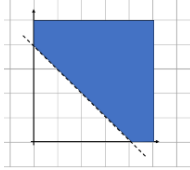
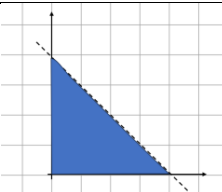
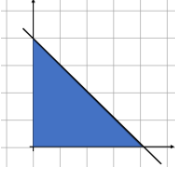
Jika Mazlin membeli x batang pen jenama Fast dan y batang pen jenama Smooth, tulis tiga ketaksamaan selain daripada $x \geq 0$ dan $y \geq 0$ yang memuaskan syarat di atas.
If Mazlin bought x Fast pens and y Smooth pens, write down three inequalities, other than $x \geq 0$ and $y \geq 0$, that must be satisfied by x and y .

Soalan 1 / Question 1:

Aras 1

Harga sebuah buku adalah 50 sen dan sebatang pen adalah RM1.30. Seorang murid ingin membeli x buah buku dan y batang pen mengikut syarat berikut: <i>The cost of a book is 50 cents and a pen is RM 1.30. A student wants to buy x books and y pens with the following conditions.</i> I : Sekurang-kurangnya 3 batang pen dibeli. <i>At least 3 pens are bought.</i> II : Jumlah buku dan pen yang dibeli tidak melebihi 12. <i>The total number of books and pens bought are not more than 12.</i> III : Jumlah perbelanjaan selebih-lebihnya RM10. <i>The amount of money spent is at most RM10.</i> Tulis tiga ketaksamaan selain daripada $x \geq 0$ dan $y \geq 0$ yang memenuhi semua kekangan yang diberi. <i>Write down the three inequalities other than $x \geq 0$ and $y \geq 0$ that satisfy all the above conditions.</i>	
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7.1 Lorek rantau yang memenuhi beberapa ketaksamaan linear.
To shade a region satisfied by a few linear inequalities.

Simbol ketaksamaan <i>Inequality sign</i> (pekali bagi y pada sebelah KIRI adalah positif) <i>(the coefficient of y on the LEFT hand side is positive)</i>	Graf <i>Graph</i>	Penerangan <i>Description</i>
$>$		Lorekkan rantau di sebelah ATAS garis putus. <i>Dashed line and shade the region ABOVE the line.</i>
$<$		Lorekkan rantau di sebelah BAWAH garis putus. <i>Dashed line and shade the region BELOW the line.</i>
$\geq$		Lorekkan rantau di sebelah ATAS garis penuh. <i>Solid line and shade the region ABOVE the line.</i>
$\leq$		Lorekkan rantau di sebelah BAWAH garis penuh. <i>Solid line and shade the region BELOW the line.</i>

Untuk menentukan rantau yang memenuhi beberapa ketaksamaan linear, lorek rantau yang masing-masing memuaskan ketaksamaan diberi. Tentukan rantau yang bertindih dan tandakan R.

To determine the region that satisfies several linear inequalities, the region that satisfies each inequality is identified first. The common region R (overlapping region) of all these regions is the region that satisfies all the inequalities.

Contoh

Example

Lorekkan kawasan yang memenuhi ketaksamaan $2.5x + 5y \leq 50$.
Shade the region which satisfies the inequality $2.5x + 5y \leq 50$.

Penyelesaian / *Solution:*

Tentukan pintasan-x dan pintasan-y. Kemudian, lukis garis lurus $2.5x + 5y = 50$.

(Cari dua titik)

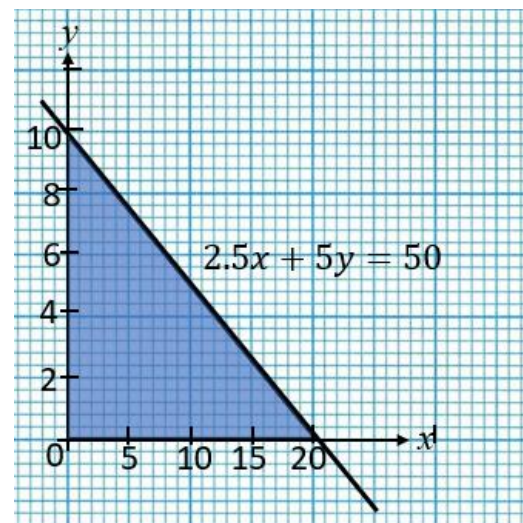
Determine the x-intercept and y-intercept. Then, draw the line $2.5x + 5y = 50$.

(Find two points)

x	0	20
y	10	0

Oleh kerana simbol ketidaksamaan $\leq$ diguna, maka garis penuh dilukis dan rantau di bawah garis ini dilorek.

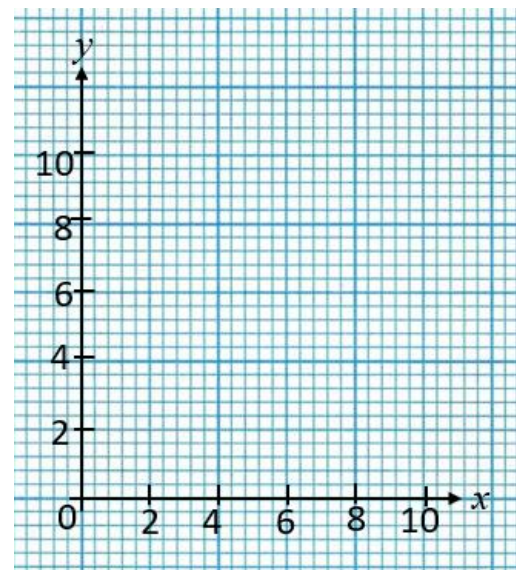
Since the inequality symbol is $\leq$, a solid line is drawn and the region below this line is shaded.



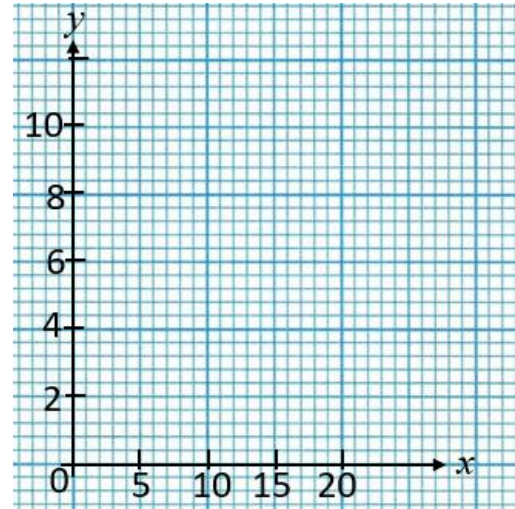
Soalan 2 / Question 2:

Aras 2

- (a) Lorekkan kawasan yang memenuhi ketaksamaan $x + y \geq 8$.
Shade the region which satisfies the inequality $x + y \geq 8$.



(b) Lorekkan kawasan yang memenuhi ketaksamaan $y < 2x$.
Shade the region which satisfies the inequality $y < 2x$.



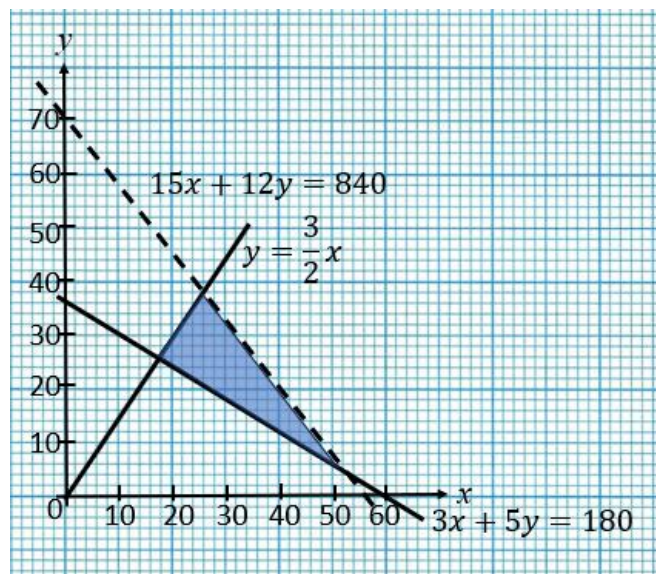
Contoh
Example

Lukis dan lorek rantau R yang memenuhi ketaksamaan berikut
Draw and shade the region R which satisfies the following inequalities.

I: $15x + 12y < 840$

II: $3x + 5y \geq 180$

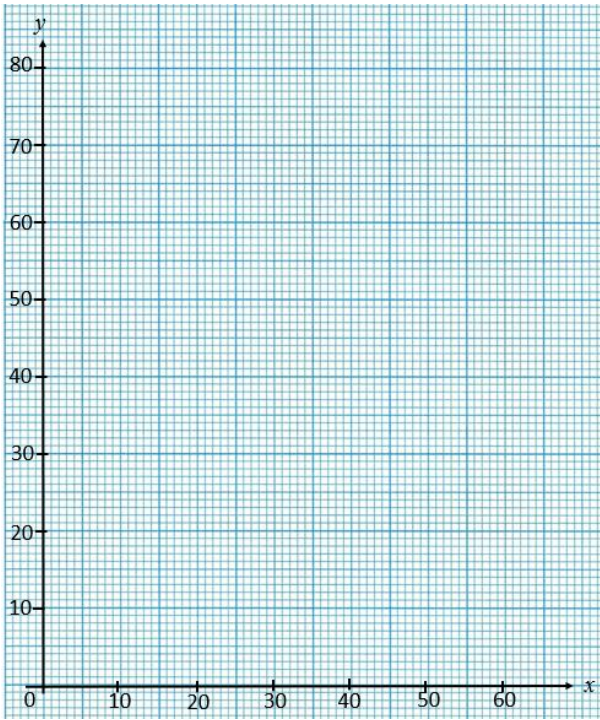
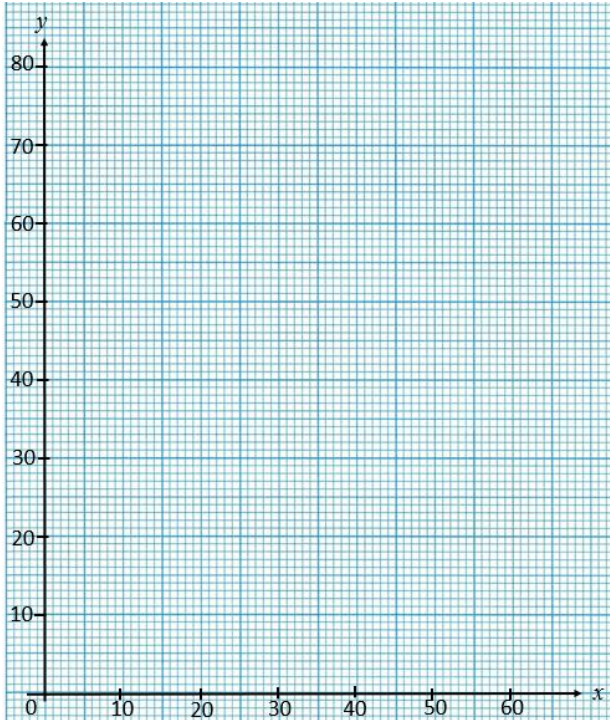
III: $y \leq \frac{3}{2}x$



Soalan 3 / Question 3:

Aras 3

Lukis dan lorek rantau R yang memenuhi ketaksamaan berikut:
Draw and shade the region R which satisfies the following inequalities.

(a) $x + y > 45$ $5x + 8y \leq 480$ $x - y \leq 15$	
(b) $9x + 5y \leq 400$ $y - x \geq 10$ $10x \geq y$	

7.2

Aplikasi Pengaturcaraan Linear *Linear Programming Applications*

Objektif Pembelajaran:

Learning objective:

- Menyelesaikan masalah yang melibatkan pengaturcaraan linear secara graf.
Solve problems involving linear programming graphically.

Untuk $x + by = c$, biar $c = ab$

For $ax + by = c$, let $c = ab$.

Langkah 1 : Lukis garis dalam graf dengan mencari dua titik.

Step 1 : Draw the line in the graph by finding two points.

Langkah 2 : Letakkan pembaris anda selari dengan garisan.

Step 2 : Place your ruler parallel to the line.

Langkah 3 : Gerakkan pembaris (kekalkan kecerunan) dan cari kawasan yang berkaitan dalam R.

Step 3 : Move the ruler (maintain the gradient) and find the relevant region within R.

Langkah 4 : Untuk nilai maksimum, cari titik paling KANAN dalam rantau R. Untuk nilai minimum, cari titik paling KIRI dalam rantau R.

Step 4 : For maximum value, find the RIGHTMOST point of R. For minimum value, find the LEFTMOST point of R.

Contoh
Example

Aras 2

Diberi x dan y memenuhi ketaksamaan linear berikut.

Given x and y satisfy the following linear inequalities.

$$y \geq 5x - 4, 2y \geq x + 1 \text{ dan/and } x + y \leq 8$$

- (a) Lukis dan lorekkan rantau R yang memenuhi semua ketaksamaan linear yang diberi.

Draw and shade the region R that satisfies the given inequalities.

- (b) Cari nilai maksimum

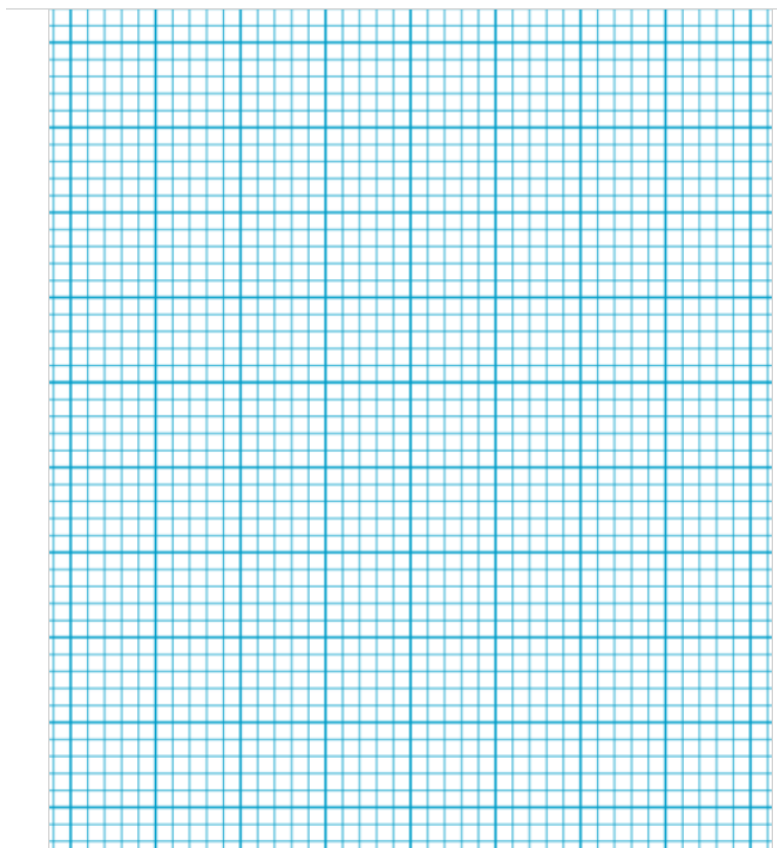
Find the maximum value of

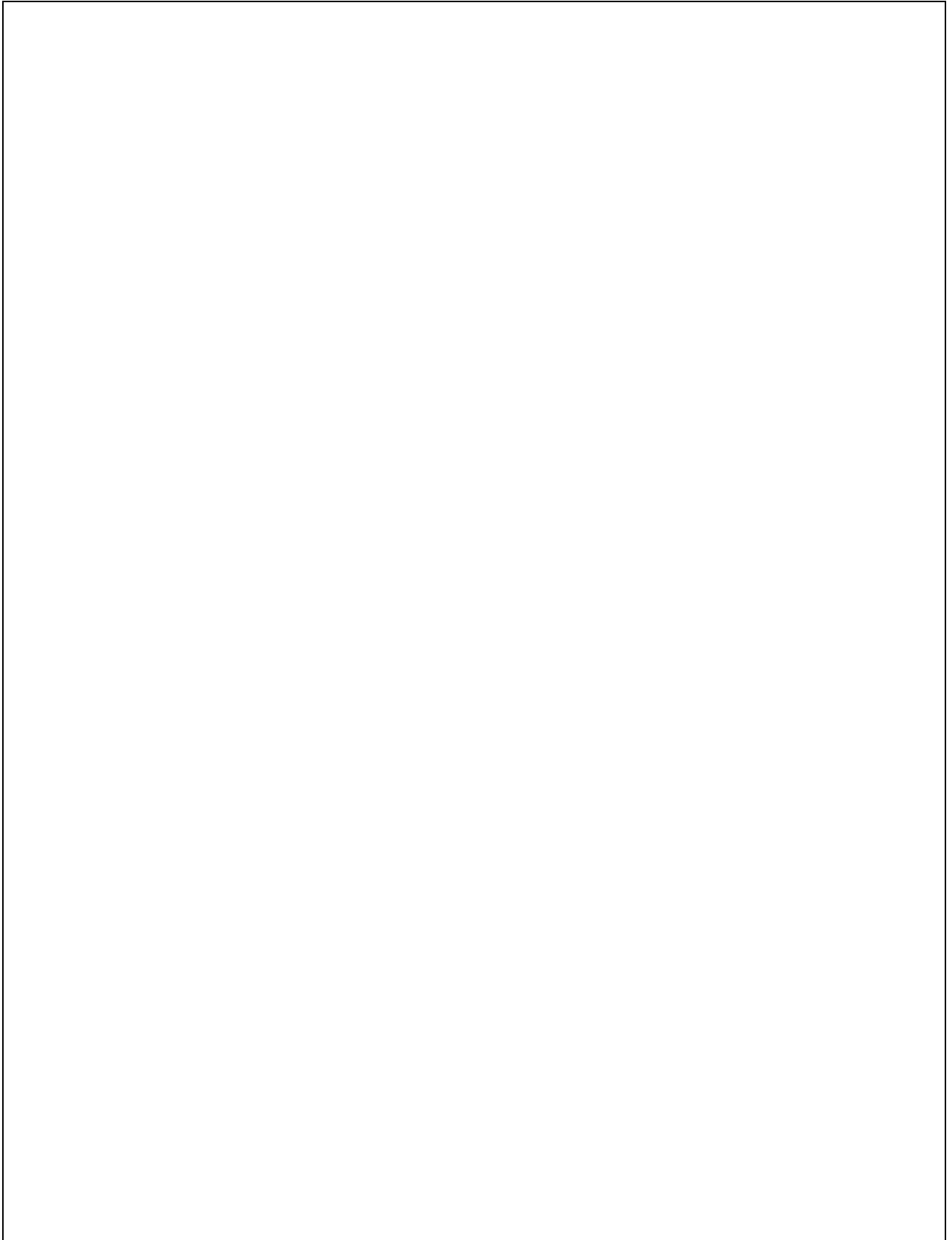
(i) $x + 2y$

(ii) $2x + y$

Penyelesaian / *SolutionS:*

(a)





Latihan Pengukuhan :
Enhancement Exercises:

1. Diberi x dan y memenuhi ketaksamaan linear berikut.

Given x and y satisfy the following linear inequalities.

$$x - y \geq 2, 2x + 3y \geq 12 \text{ dan/and } 2x + 3y \leq 27$$

- (a) Lukis dan lorek rantau R yang memenuhi ketaksamaan linear yang diberi.

Draw and shade the region R that satisfies the given inequalities.

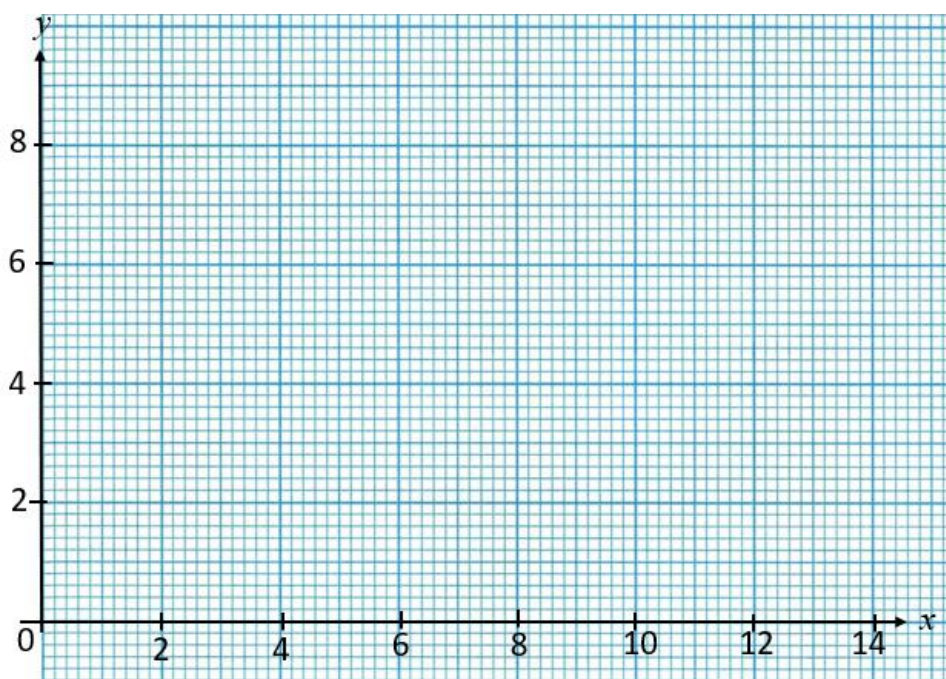
- (b) Cari nilai minimum $x + y$.

Find the minimum value of $x + y$.

- (c) Cari nilai maksimum $4x + 8y$.

Find the maximum value of $4x + 8y$.

Penyelesaian / Solutions:



2. Diberi x dan y memenuhi ketaksamaan linear berikut.

Given x and y satisfy the following linear inequalities.

$$4x + 3y \geq 12, y \leq 2x \text{ dan/and } 2x + y \leq 20$$

(a) Lukis dan lorek rantau R yang memenuhi ketaksamaan linear yang diberi.

Draw and shade the region R that satisfies the given inequalities.

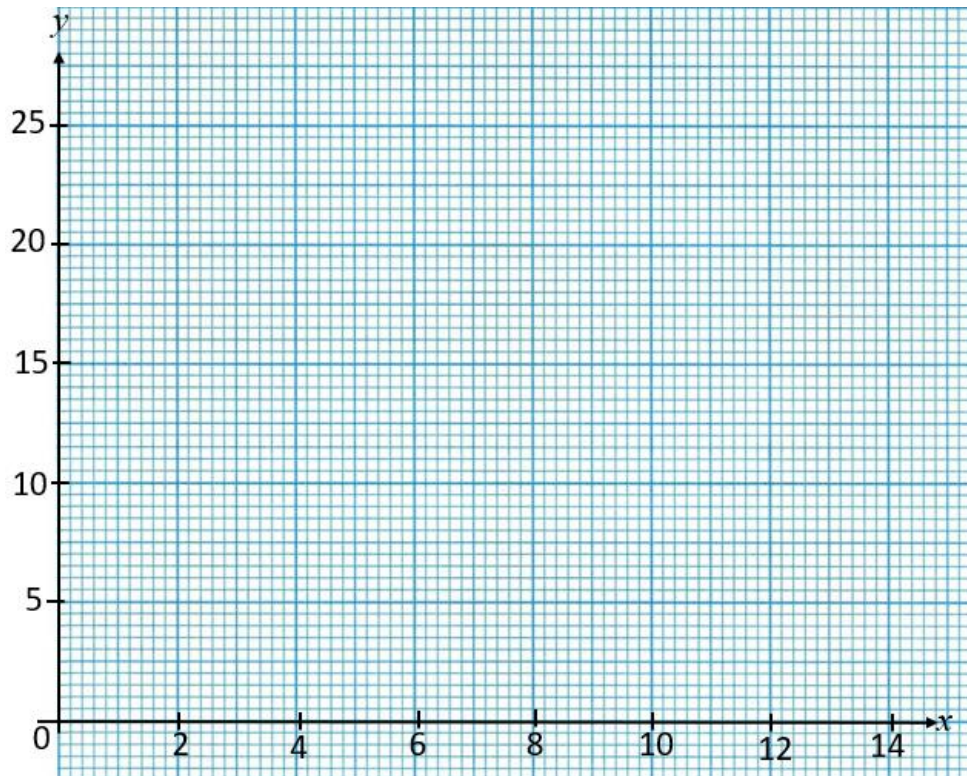
(b) Cari nilai minimum y apabila $x = 8$.

Find the minimum value of y when $x = 8$.

(c) Cari nilai maksimum $3x + 2y$.

Find the maximum value of $3x + 2y$.

Penyelesaian / *Solutions:*



Penilaian :
Assessment:

Satu pertandingan disertai oleh x orang pelajar dan y orang guru. Yuran penyertaan untuk seorang pelajar ialah RM120 dan untuk seorang guru ialah RM60. Penyertaan pertandingan itu adalah berdasarkan kekangan berikut.

A competition is participated by x students and y teachers. The entry fees for a student is RM120 and a teacher is RM60. The participation is based on the following constraints.

- I : Jumlah peserta tidak lebih daripada 80 orang.
The total number of participants is not more than 80.
- II: Bilangan pelajar tidak boleh melebihi daripada 3 kali ganda bilangan guru.
The number of students cannot be more than 3 times the number of teachers.
- III: Jumlah yuran yang dikutip mestilah melebihi RM3 600.
The total fees collected must be more than RM3 600.

- (a) Tulis tiga ketaksamaan, selain daripada $x \geq 0$ dan $y \geq 0$, yang memenuhi semua kekangan di atas.

Write three inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy all the above constraints.

[3 markah / marks]

- (b) Dengan menggunakan skala 2 cm kepada 10 peserta pada kedua-dua paksi, bina dan lorek rantau R yang memenuhi semua kekangan di atas.

Using a scale of 2 cm to 10 participants on both axes, construct and shade the region R which satisfies all the above constraints.

[3 markah / marks]

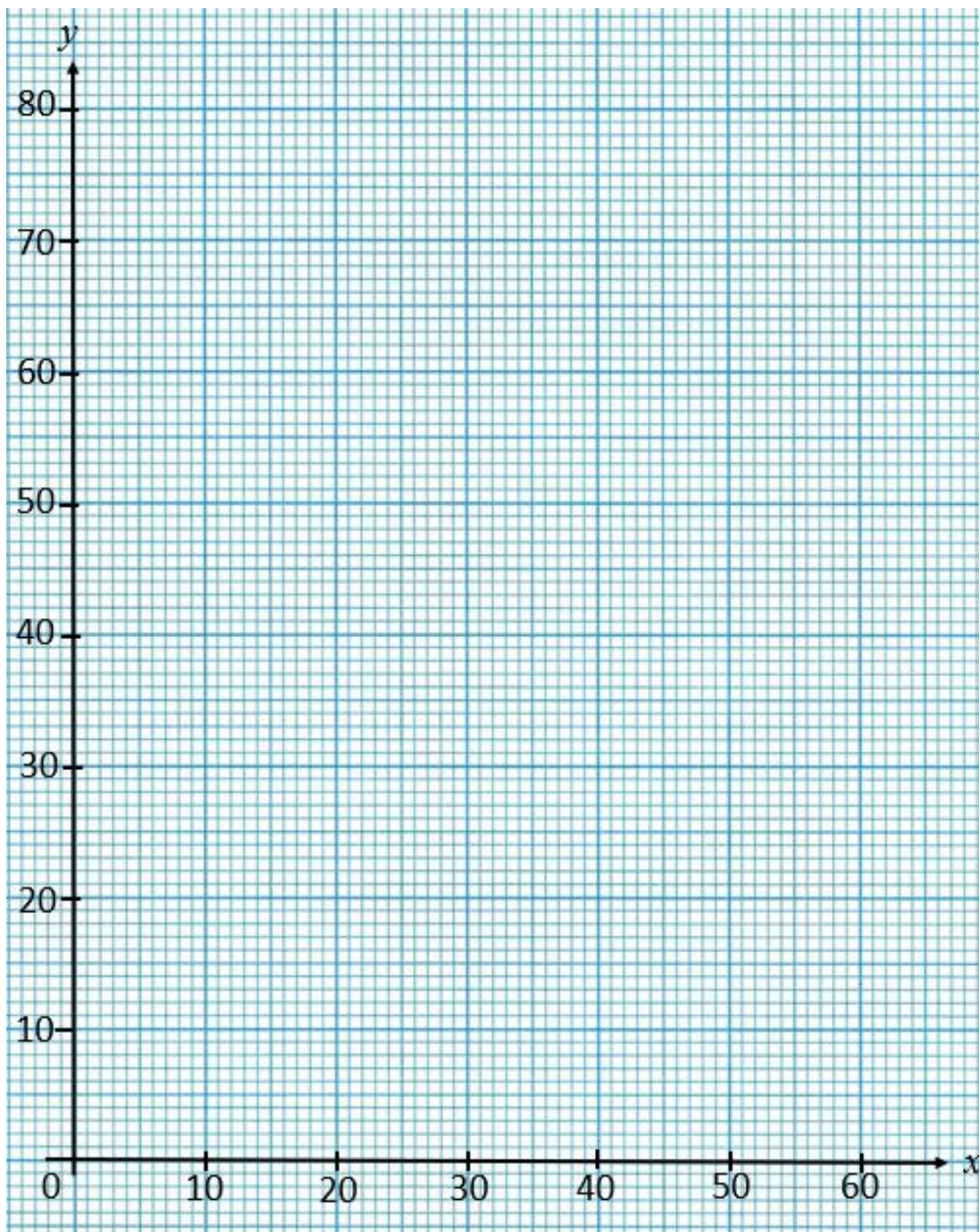
- (c) Dengan menggunakan graf yang dilukis dalam (b), cari

Using the graph constructed in (b), find

- (i) cari bilangan maksimum dan minimum guru jika bilangan pelajar yang menyertai pertandingan ini ialah 30 orang.
the maximum and minimum number of teachers if the number of students participated in the competition is 30.
- (ii) jumlah yuran maksimum yang boleh dikutip.
the maximum total fees that can be collected.

[4 markah / marks]

MATEMATIK TAMBAHAN TINGKATAN 5



SESI PEMBELAJARAN 18

TINGKATAN 5

BAB

7

PENGATURCARAAN LINEAR
LINEAR PROGRAMMING

7.2

Menyelesaikan masalah yang melibatkan pengaturcaraan linear secara graf

Solving problems involving linear programming graphically

Objektif Pembelajaran:

Learning objective:

- Wakilkan semua kekangan bagi suatu situasi dalam bentuk ketaksamaan linear.
Represent all the constraints for the situation in linear inequalities.
- Tentukan fungsi objektif $ax + by = k$ dan lukis graf bagi fungsi objektif itu.
Determine the objective function $ax + by = k$ and draw a graph for that objective function.
- Tentukan nilai optimum dengan menggantikan titik maksimum atau titik minimum ke dalam fungsi objektif.
Determine the optimal value by substituting the coordinates of the maximum point or the minimum point into the objective function.

Aras 3

1. Sebuah kedai roti menghasilkan dua jenis kek, P dan Q. Pengeluaran kek melibatkan dua proses, iaitu pembuatan dan pembungkusan. Jadual di bawah menunjukkan masa yang diambil untuk membuat dan membungkus kek.

A bakery shop produces two types of cakes, P and Q. The production of cakes involves two processes, which is making and packaging. Table below shows the time taken to make and pack the cakes.

Produk product	Masa yang diambil (minit) Time taken (minutes)	
	Pembuatan Making	Pembungkusan Packaging
Kek P Cake P	60	20
Kek Q Cake Q	40	10

Kedai roti menghasilkan x biji kek P dan y biji kek Q setiap hari. Pengeluaran kek adalah berdasarkan kekangan berikut:

MATEMATIK TAMBAHAN TINGKATAN 5

The bakery shop produces x cake type P and y cake type Q every day. The production of cakes is based on the following constraints:

- I : Jumlah minimum masa untuk membuat kek P dan kek Q ialah 600 minit.
The minimum total time for making cake P and cake Q is 600 minutes.
- II : Jumlah masa untuk membungkus kek P dan kek Q selebih-lebihnya 240 minit.
The total time for packaging cake P and cake Q is at most 240 minutes.
- III: Nisbah bilangan kek P kepada bilangan kek Q adalah sekurang-kurangnya 1 : 2.
The ratio of the number of cake P to the number of cake Q is at least 1 : 2.

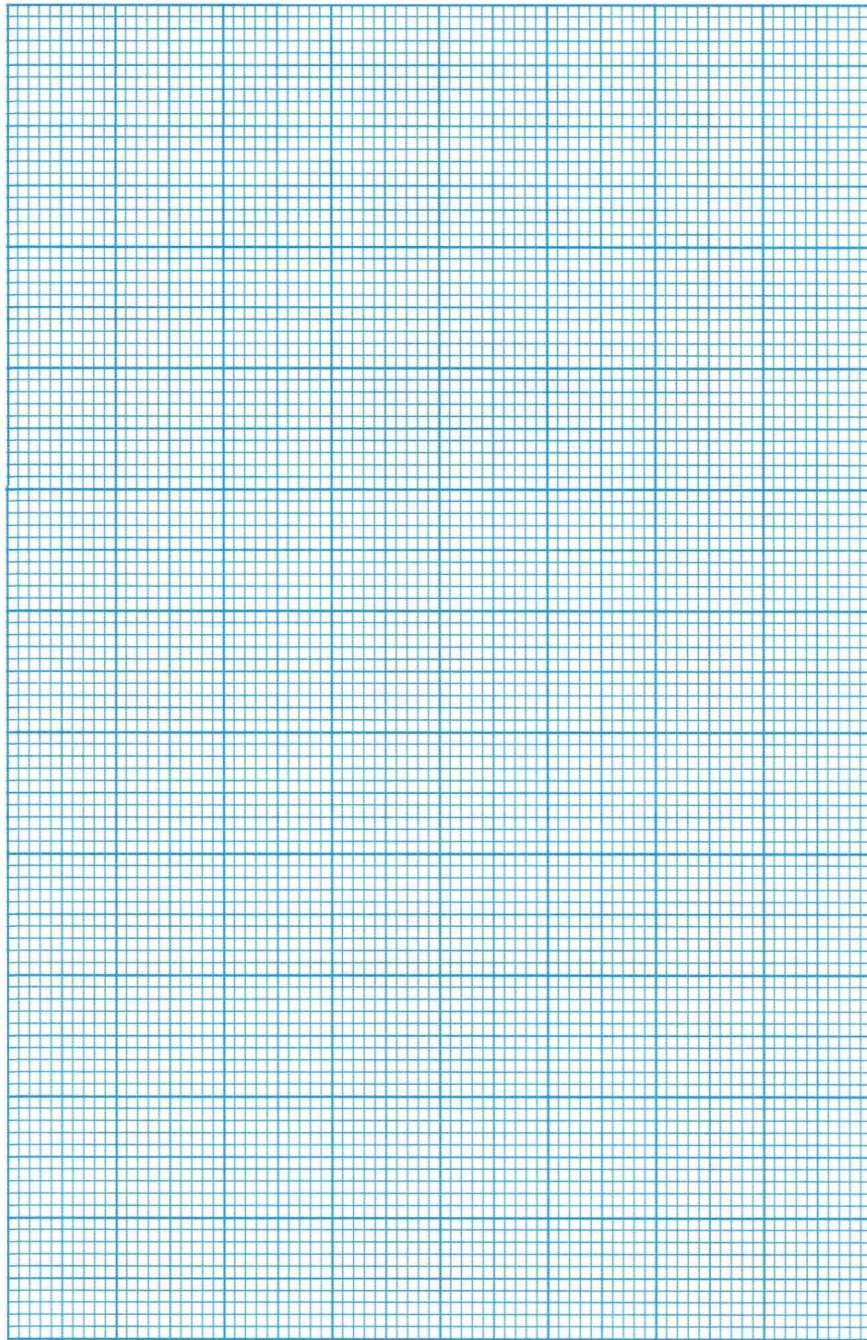
- (a) Tulis tiga ketaksamaan linear yang memenuhi semua kekangan di atas selain daripada $x \geq 0$ dan $y \geq 0$.
Write three inequalities which satisfy all the above constraints other than $x \geq 0$ and $y \geq 0$.
[3 markah/marks]

- (b) Dengan menggunakan skala 2 cm kepada 2 biji kek pada kedua-dua paksi, bina dan lorek rantau R yang memuaskan semua syarat di atas.
By using a scale of 2 cm to 2 units of cake products on both axes, construct and shade the region R which satisfies all the above constraints.
[3 markah/marks]

- (c) Menggunakan graf yang dilukis dalam 1(b), cari
Using the graph constructed in 1(b), find
- (i) Bilangan maksimum kek Q dibuat jika 8 kek P dibuat.
The maximum number of cake Q made if 8 cakes P are made.
- (ii) Keuntungan harian maksimum jika keuntungan satu kek P ialah RM30 dan satu kek Q ialah RM20.
The maximum daily profit if the profit of one unit of cake P is RM30 and one unit of cake Q is RM20.
[4 markah/marks]

Penyelesaian / Solutions:

MATEMATIK TAMBAHAN TINGKATAN 5



MATEMATIK TAMBAHAN TINGKATAN 5

2. Sebuah pusat tuisyen menawarkan dua pakej pelajaran, pakej elektif dan pakej teras.

Pendaftaran pelajar adalah berdasarkan kekangan berikut:

A tuition center offers two package of courses, elective and basic packages. The enrolment of students is based on the following constraints.

- I : Jumlah pelajar tidak lebih daripada 120 orang.

The total number of students is not more than 120.

- II : Bilangan pelajar yang berdaftar dalam pakej teras tidak melebihi 4 kali ganda bilangan pelajar yang berdaftar dalam pakej elektif.

The number of students enrolled in basic package is not more than 4 times the number of students enrolled in elective package.

- III : Bilangan pelajar yang mendaftar pakej teras melebihi bilangan pelajar yang mendaftar pakej elektif sekurang-kurangnya 20 orang.

The number of students enrolled for basic package exceeds the number of students enrolled for elective packages by at least 20 students.

Diberi bahawa terdapat x pelajar yang mendaftar pakej elektif dan y pelajar yang mendaftar pakej teras.

Given that there are x students enrolled for elective package and y students enrolled for basic package.

- (a) Tulis tiga ketaksamaan linear yang memenuhi semua kekangan di atas selain daripada $x \geq 0$ dan $y \geq 0$.

Write three inequalities which satisfy all the above constraints other than $x \geq 0$ and $y \geq 0$.

[3 markah/marks]

- (b) Dengan menggunakan skala 2 cm kepada 10 orang pelajar pada paksi- x dan 2 cm kepada 20 orang pelajar pada paksi- y , bina dan lorek rantau R yang memuaskan semua kekangan di atas.

By using a scale of 2 cm to 10 students on x -axis and 2 cm to 20 students on y -axis, construct and shade the region R which satisfies all the above constraints.

[3 markah/marks]

- (c) Dengan menggunakan graf yang dilukis dalam 2(b), cari

By using the graph constructed in 2(b), find

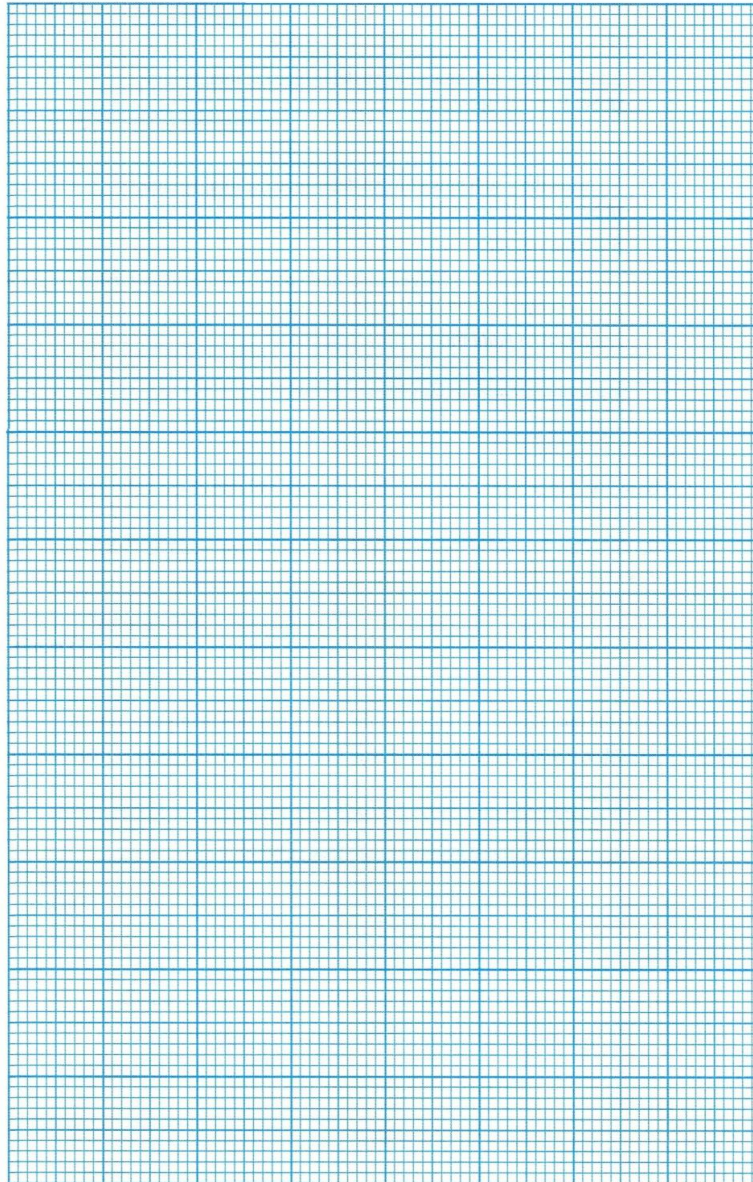
- (i) jumlah yuran maksimum yang dikutip setiap bulan jika yuran bulanan untuk pakej elektif ialah RM60 dan pakej teras ialah RM70.

the maximum amount of fees collected per month if the monthly fees for elective package is RM60 and basic package is RM70.

- (ii) julat bilangan pelajar yang mendaftar pakej teras jika bilangan pelajar yang mendaftar pakej elektif ialah 20 orang.

the range of the number of students enrolled for the basic package if the number of students enrolled for the elective package is 20 people.

Penyelesaian/ *Solutions*:



MATEMATIK TAMBAHAN TINGKATAN 5

3. Kelab koperasi sekolah SMK Telang merancang untuk menganjurkan lawatan sambil belajar. Kelab memutuskan untuk menyewa x van dan y bas. Sebuah van boleh memuatkan 30 penumpang dan sebuah bas boleh memuatkan 50 penumpang. Bayaran sewa untuk sebuah van ialah RM70 dan bayaran sewa untuk sebuah bas ialah RM80. Penyewaan van dan bas untuk perjalanan adalah berdasarkan kekangan berikut.

The school cooperative club of SMK Telang plans to organise a study trip. The club decided to rent x vans and y buses. A van can accommodate 30 passengers and a bus can accommodate 50 passengers. The rental of a van is RM70 and the rental of a bus is RM80. The rental of the vans and buses for the trip is based on the following constraints.

- I: Bilangan minimum pelajar dan guru yang mengambil bahagian dalam lawatan ini ialah 240.

The minimum number of students and teachers participated in the trip is 240.

- II: Bilangan van yang disewa tidak kurang daripada separuh bilangan bas yang disewa.

The number of vans rented must not less than half the number of buses rented.

- III: Bajet untuk sewaan pengangkutan tidak melebihi RM560.

The budget for the transport rental is at most RM560.

- (a) Tulis tiga ketaksamaan linear yang memenuhi semua kekangan di atas selain daripada $x \geq 0$ dan $y \geq 0$.

Write three inequalities which satisfy all the above constraints other than $x \geq 0$ and $y \geq 0$.

[3 markah/marks]

- (b) Dengan menggunakan skala 2 cm kepada 1 kenderaan pada kedua-dua paksi, bina dan lorek rantau R yang memenuhi semua kekangan di atas.

By using a scale of 2 cm to 1 vehicle on both axes, construct and shade the region R which satisfies all the above constraints.

[3 markah/marks]

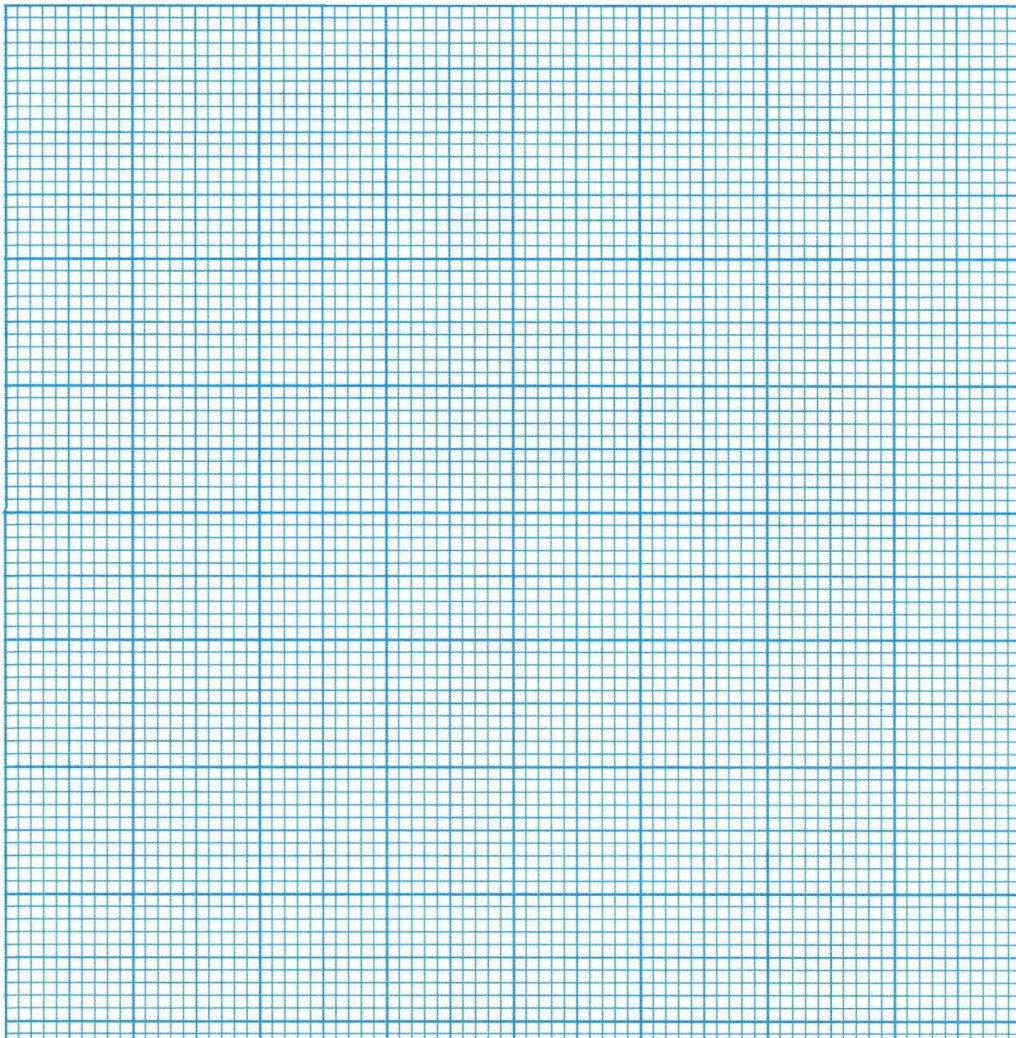
- (c) Dengan menggunakan graf yang dilukis dalam 3(b), cari

Using the graph constructed in 3(b), find

- bilangan minimum dan maksimum bas yang boleh disewa jika 3 van disewa.
the minimum and maximum number of buses that can be rented if 3 vans is rented.
- kos minimum untuk menyewa van dan bas.
the minimum cost to rent the vans and buses.

[4 markah/marks]

Penyelesaian / *Solutions*:



Penilaian :
Assessment:

Pejabat pendidikan daerah berhasrat untuk menganjurkan kursus pengajaran Matematik dan Sains dalam bahasa Inggeris. Kursus ini akan dihadiri oleh x peserta Matematik dan y peserta Sains.

A district education office intends to organize a course on the teaching of Mathematics and Science in English. The course will be attended by x Mathematics participants and y Science participants.

Pemilihan peserta adalah berdasarkan kekangan berikut:

The selection of participants is based on the following constraints:

I : Jumlah peserta adalah sekurang-kurangnya 40 orang.

The total number of participants is at least 40.

II : Bilangan peserta Sains selebih-lebihnya dua kali ganda bilangan peserta Matematik.

The number of Science participants is at most twice the number of Mathematics participants.

III : Peruntukan maksimum untuk kursus ini ialah RM7 200. Perbelanjaan untuk seorang peserta Matematik ialah RM120 dan untuk seorang peserta Sains ialah RM80.

The maximum allocation for the course is RM7 200. The expenditure for a Mathematics participant is RM120 and for a Science participant is RM80.

(a) Tulis tiga ketaksamaan linear yang memenuhi semua kekangan di atas selain daripada $x \geq 0$ dan $y \geq 0$.

Write three linear inequalities which satisfy all the above constraints other than $x \geq 0$ and $y \geq 0$.

[3 markah/marks]

(b) Dengan menggunakan skala 2 cm kepada 10 orang peserta pada kedua-dua paksi, bina dan lorek rantau R yang memenuhi semua kekangan di atas.

By using a scale of 2 cm to 10 participants on both axes, construct and shade the region R which satisfies all the above constraints.

[3 markah/marks]

(c) Dengan menggunakan graf yang dilukis dalam (b), cari

By using the graph constructed from (b), find

(i) bilangan maksimum dan minimum peserta Matematik apabila bilangan peserta Sains ialah 10.

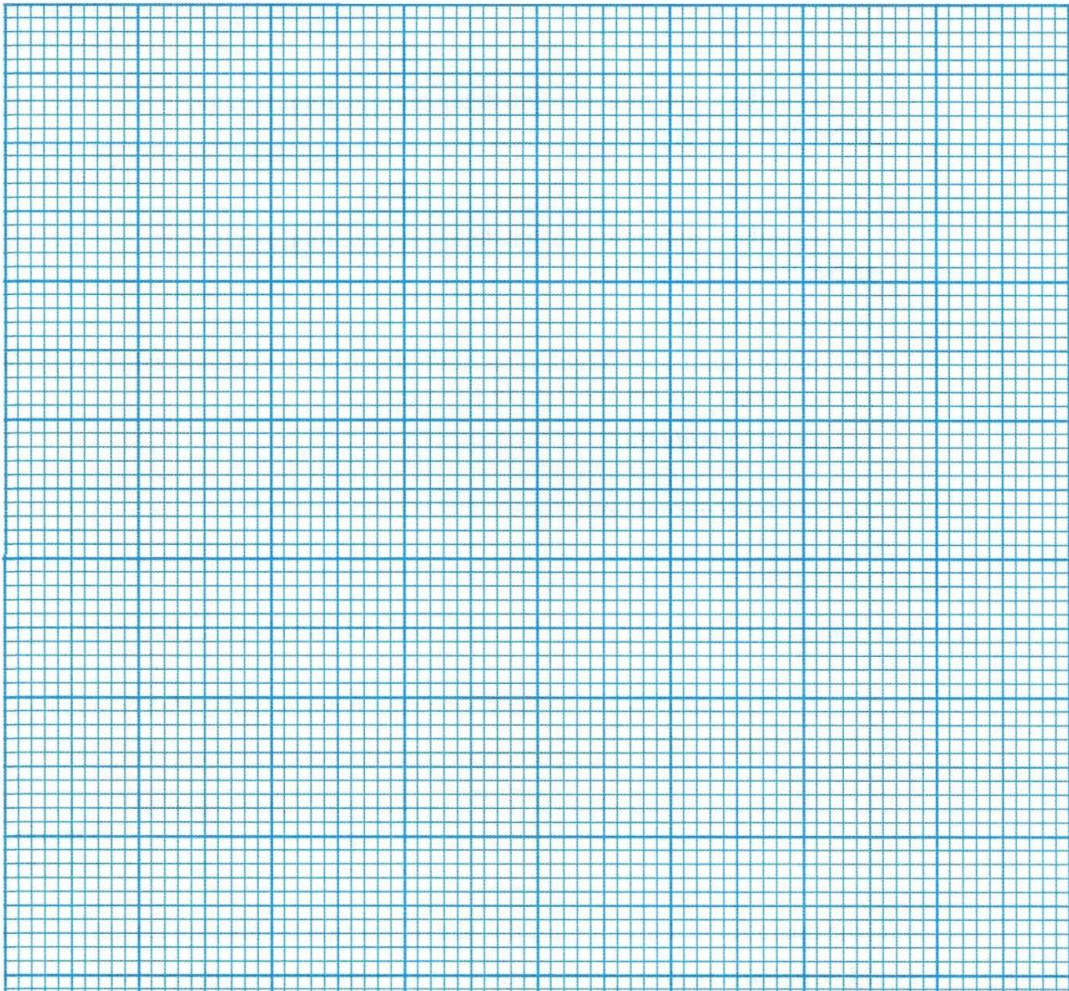
the maximum and minimum number of Mathematics participants when the number of Science participants is 10.

(ii) kos minimum untuk menjalankan kursus.

the minimum cost to run the courses.

[4 markah/marks]

Penyelesaian / *Solutions*:



SESI PEMBELAJARAN 19

TINGKATAN 4

BAB

9

PENYELESAIAN SEGI TIGA
SOLUTION OF TRIANGLES

9.1

Petua Sinus dan Petua Kosinus
Sine Rule and Cosine Rule

Objektif Pembelajaran:

Learning objective:

- Menyelesaikan segi tiga yang melibatkan petua sinus,
Solve triangles involving sine rule
- Menyelesaikan segi tiga yang melibatkan petua kosinus
Solve triangles involving cosine rule

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

1.
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

2.
$$a^2 = b^2 + c^2 - 2bc \cos A$$
$$a^2 = b^2 + c^2 - 2bc \cos A$$

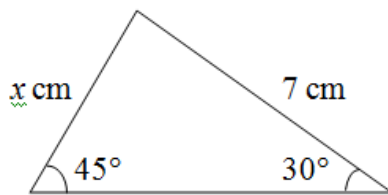
Petua Sinus

Sine Rule

1. Hitung panjang x bagi setiap segi tiga yang berikut..
Calculate the length of x in each of the following triangles.

Aras 1

Contoh Example

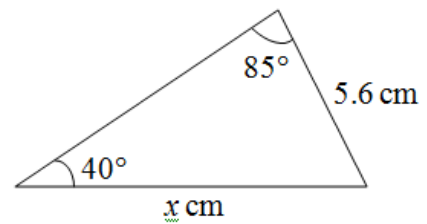


$$\frac{x}{\sin 30^\circ} = \frac{7}{\sin 45^\circ}$$

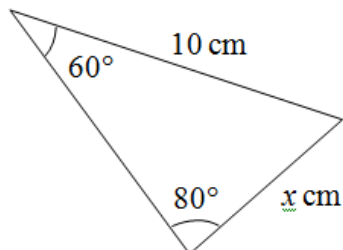
$$x = \frac{7 \times \sin 30^\circ}{\sin 45^\circ}$$

$$x = 4.950$$

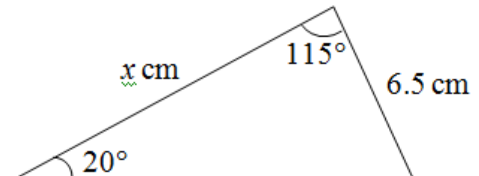
1.



2.



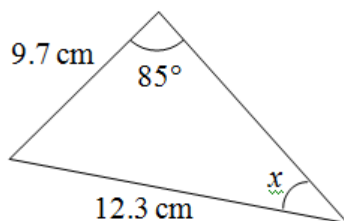
3.



2. Hitung nilai x bagi setiap segitiga yang berikut.
Calculate the value of x in each of the following triangles.

Aras1

Contoh
Example

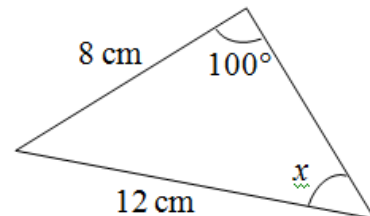


$$\frac{9.7}{\sin x} = \frac{12.3}{\sin 85^\circ}$$

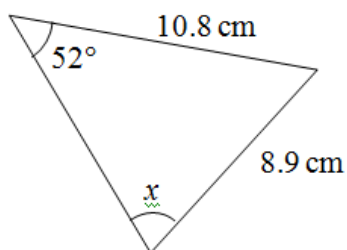
$$\sin x = \frac{9.7 \times \sin 85^\circ}{12.3}$$

$$x = 51.78^\circ$$

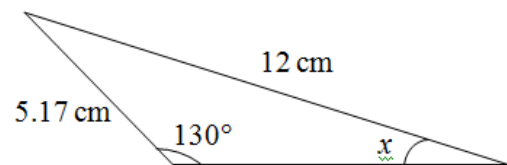
1.



2.



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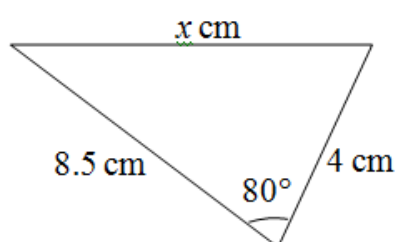


Petua Kosinus Cosine Rule

- Hitung nilai x bagi setiap segitiga yang berikut.
Calculate the value of x in each of the following triangles.

Aras 1

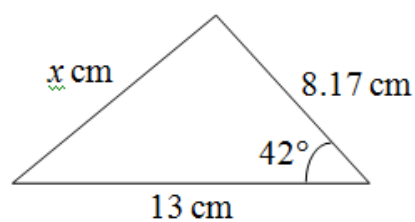
Contoh Example



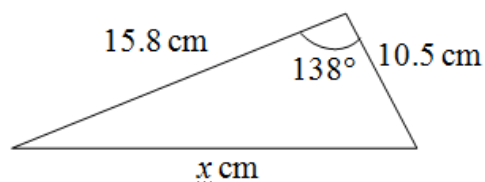
$$x^2 = 8.5^2 + 4^2 - 2(8.5)(4) \cos 80^\circ$$

$$x = 8.743$$

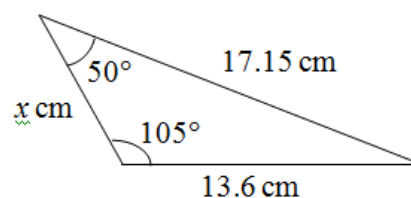
1.



2.



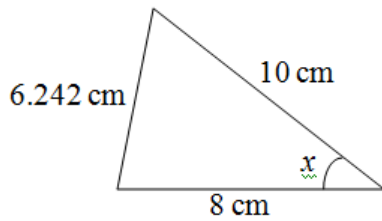
3.



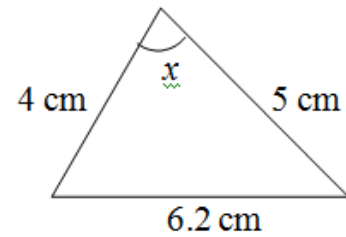
2. Tentukan nilai x dalam setiap segitiga yang berikut.
Determine the value of x in each of the following triangles.

Aras1

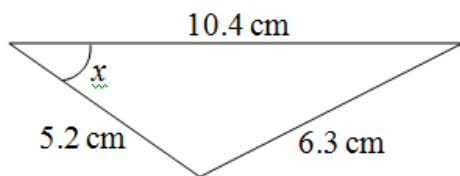
Contoh
Example



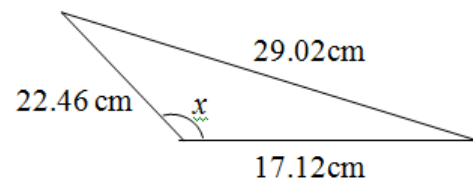
1.



2.



3.

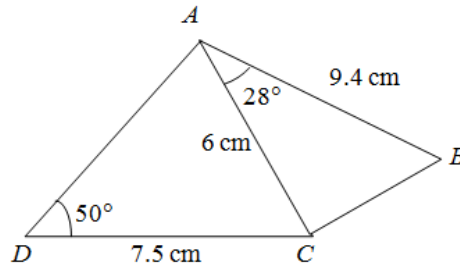


Latihan Pengukuhan:
Enhancement Exercises:

1. Rajah di bawah menunjukkan dua buah segi tiga ABC dan ACD .

Aras 2

The diagram below shows two triangles ABC and ACD .



Diberi $AB = 9.4$ cm, $AC = 6$ cm, $CD = 7.5$ cm, $\angle BAC = 28^\circ$, $\angle ADC = 50^\circ$ dan $\angle CAD$ adalah sudut tirus. Hitung

Given that $AB = 9.4$ cm, $AC = 6$ cm, $CD = 7.5$ cm, $\angle BAC = 28^\circ$, $\angle ADC = 50^\circ$ and $\angle CAD$ is an obtuse angle. Calculate

- (a) Panjang BC ,
the length of BC ,

[2 markah/marks]

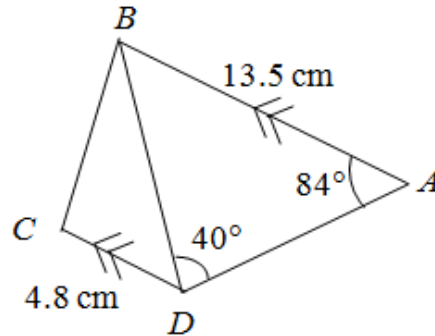
- (b) $\angle ACD$.

[3 markah/marks]

Penyelesaian/ Solutions:

2. Rajah 2 menunjukkan sebuah trapezium $ABCD$. AB adalah selari dengan DC dan $\angle BCD$ ialah sudut cakah. Aras3

Diagram 2 shows a trapezium $ABCD$. AB is parallel to DC and $\angle BCD$ is an obtuse angle.



Rajah 2
Diagram 2

Cari
Find

- (a) panjang, dalam cm, bagi BD ,
the length, in cm, of BD ,

[2 markah/marks]

- (b) panjang, dalam cm, bagi BC ,
the length, in cm, of BC ,

[3 markah/marks]

- (c) $\angle BCD$

[2 markah/marks]

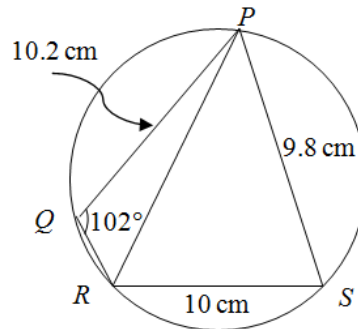
Penyelesaian / Solutions:

Penilaian :
Assessment:

Kertas 2

Paper 2

1. Rajah 1 menunjukkan sisi empat kitaran $PQRS$.
Diagram 1 shows a cyclic quadrilateral $PQRS$.



Rajah 1
Diagram 1

Hitung
Calculate

- (a) panjang, dalam cm, bagi PR ,
the length, in cm, of PR ,
(b) $\angle QPR$.

[6 markah/marks]

Penyelesaian / *Solutions:*

SESI PEMBELAJARAN 20

TINGKATAN 4

BAB

9

PENYELESAIAN SEGI TIGA
SOLUTION OF TRIANGLES

9.2

Luas segi tiga dan Kes ambiguiti suatu segi tiga
Area of triangle and Ambiguous case of a triangle,

Objektif Pembelajaran:

Learning objective:

- Hitung luas segi tiga (termasuk rumus Heron)
Calculate the area of triangle (including Heron's Formula)
- Menyelesaikan segi tiga yang melibatkan kes berambiguiti, dan seterusnya mengenal pasti keadaan untuk kes-kes tersebut.
Determine the existence of ambiguous cases of a triangle, and hence identify the conditions for such cases

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

- Luas segi tiga / Area of triangle = $\frac{1}{2}ab \sin C$
atau / or

$$\sqrt{s(s-a)(s-b)(s-c)} \text{ (Rumus Heron / Heron's Formula)}$$

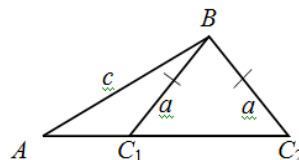
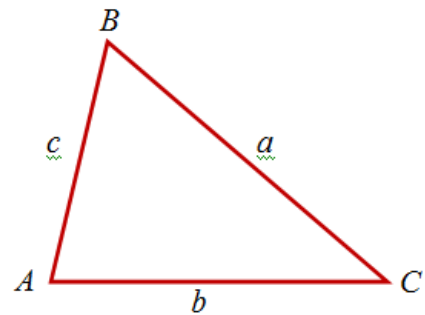
di mana semiperimeter / where semi perimeter, $s = \frac{a+b+c}{2}$

- Kes Berambiguiti
Ambiguous Case

1. Dalam segi tiga seperti yang ditunjukkan di bawah, apabila panjang dua sisi, a dan c , dan sudut bukan kandung, $\angle A$, diberi. Kes berambiguiti mungkin berlaku jika

In the triangle as shown below, the lengths of two sides, a and c , and an included angle, $\angle A$, are given. An ambiguous case may occur if

- (a) $a < c$,
- (b) $\angle A$ merupakan sudut tirus
 $\angle A$ is an acute angle

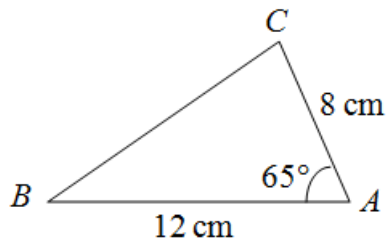


Luas Segi Tiga Area of Triangle

1. Hitung luas setiap segi tiga yang berikut.
Calculate the area of each of the following triangles.

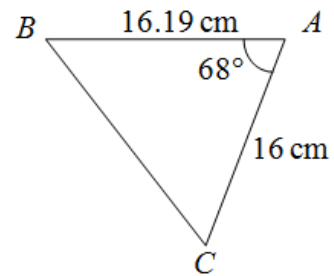
Aras 1

Contoh Example

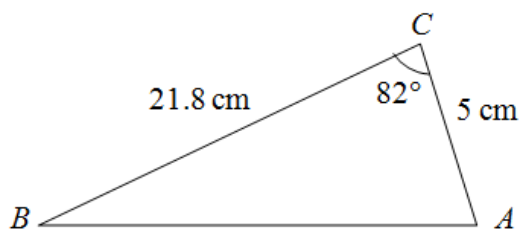


$$\begin{aligned}\text{Luas / Area of } \triangle ABC &= \frac{1}{2} \times 8 \times 12 \times \sin 65^\circ \\ &= 43.50 \text{ cm}^2\end{aligned}$$

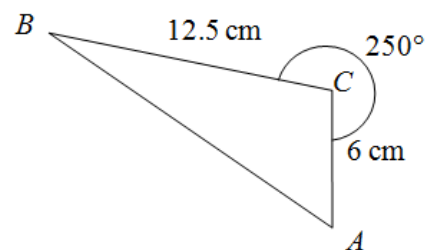
1.



2.



3.

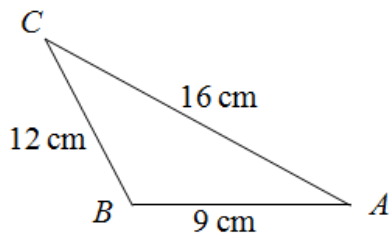


2. Hitung luas setiap segi tiga yang berikut dengan menggunakan rumus Heron.

Aras 1

Calculate the area of each of the following triangles by using the Heron's formula.

**Contoh
Example**



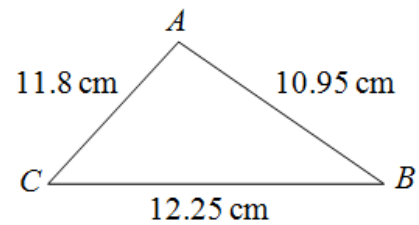
$$s = \frac{16 + 12 + 9}{2} = 18.5$$

Luas / Area of ABC =

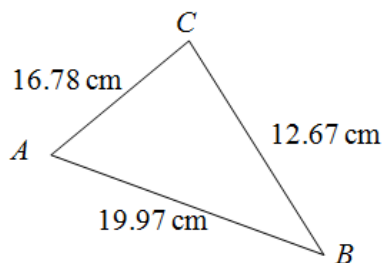
$$\sqrt{18.5(18.5 - 16)(18.5 - 12)(18.5 - 9)}$$

$$= 53.44 \text{ cm}^2$$

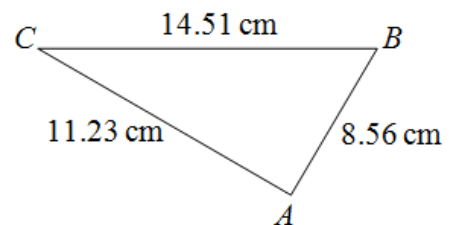
1.



2.



3.



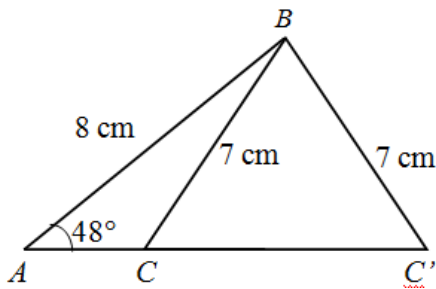
Kes Berambiguiti Ambiguous Cases

- Lakar dan kenal pasti kes berambiguiti.
Sketch and identify the ambiguous cases.

Aras 2

Contoh Example

$AB = 8 \text{ cm}$, $BC = 7 \text{ cm}$, $\angle A = 48^\circ$



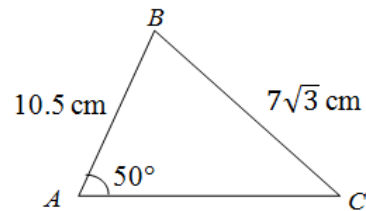
Kes berambiguiti berlaku

Dua sisi dan satu sudut bukan kandung diberi dengan keadaan sudut itu ialah sudut tirus **dan** bertentangan dengan sisi yang lebih pendek antara dua sisi yang diberi itu.

Ambiguous case arises

*Two sides and a non-included angle are given, where the non-included angle is acute **and** is opposite to the shorter side of the two given sides.*

$AB = 10.5 \text{ cm}$, $BC = 7\sqrt{3} \text{ cm}$, $\angle A = 50^\circ$



Kes berambiguiti tidak berlaku

$a > c$, dan

$\angle A$ bertentangan dengan sisi lebih panjang

Maka, sebuah segi tiga terbentuk

Ambiguous case does not arise

$a > c$, and

$\angle A$ is opposite to the longer side.

Thus, one triangle is formed.

1. $AB = 12 \text{ cm}$, $BC = 9.5 \text{ cm}$, $\angle A = 50^\circ$

2. $AB = 15 \text{ cm}$, $AC = 10 \text{ cm}$, $\angle B = 35^\circ$

3. $AB = 12 \text{ cm}$, $BC = 9 \text{ cm}$, $\angle C = 35^\circ$

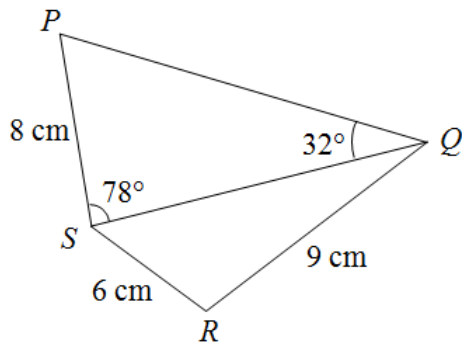
4. $AB = 13 \text{ cm}$, $AC = 22 \text{ cm}$, $\angle B = 98^\circ$

2. Menyelesaikan masalah yang melibatkan kes berambiguiti
Solving a triangle involving ambiguous cases.

Aras 3

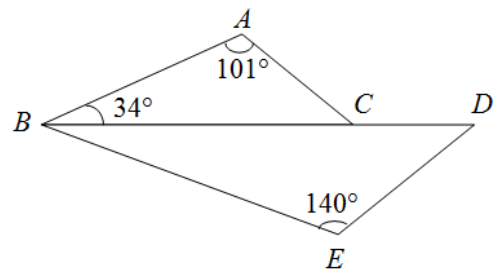
**Contoh
Example**

$SQ = 14.19 \text{ cm}$, $\angle QRS = 141.36^\circ$



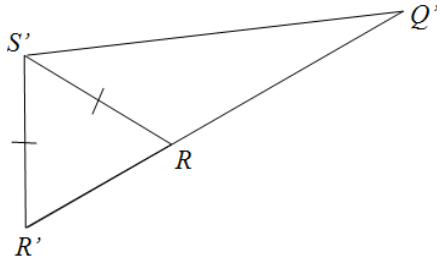
- (a) Lakar sebuah segi tiga $S'Q'R'$ yang mempunyai bentuk berbeza daripada segi tiga SQR dengan keadaan $S'R' = SR$, $S'Q' = SQ$ dan $\angle S'Q'R' = \angle SQR$.
Sketch a triangle $S'Q'R'$ which has a different shape from triangle SQR such that $S'R' = SR$, $S'Q' = SQ$ and $\angle S'Q'R' = \angle SQR$.
- (b) Seterusnya, nyatakan $\angle S'R'Q'$.
Hence, state $\angle S'R'Q'$.

1. $AC = 5.8 \text{ cm}$, $BC = 10.18 \text{ cm}$



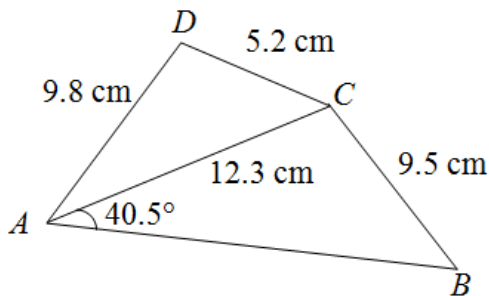
- (a) Lakar sebuah $\Delta A'B'C'$ yang mempunyai bentuk berbeza daripada ΔABC dengan keadaan $A'B' = AB$, $A'C' = AC$ dan $\angle A'B'C' = \angle ABC$.
Sketch a $\Delta A'B'C'$ which has a different shape from triangle ABC such that $A'B' = AB$, $A'C' = AC$ and $\angle A'B'C' = \angle ABC$.
- (b) Seterusnya, nyatakan saiz $\angle B'A'C'$.
Hence, state the size of $\angle B'A'C'$.

(a)



(b) $\angle S'R'Q' = 180^\circ - 141.36^\circ = 38.64^\circ$

2.

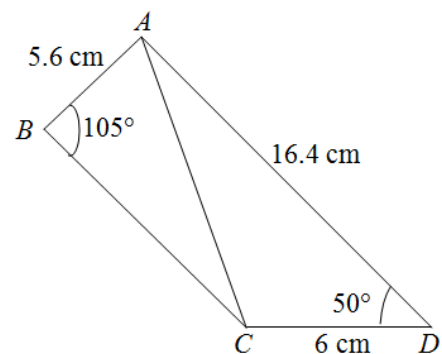


Sebuah segi tiga $A'B'C'$ yang mempunyai ukuran yang sama seperti yang diberikan untuk segi tiga ABC , iaitu $A'C' = 12.3$ cm, $C'B' = 9.5$ cm dan $\angle B'A'C' = 40.5^\circ$, tetapi bentuk yang berbeza daripada segi tiga ABC .

A triangle $A'B'C'$ has the same measurements as those given for triangle ABC , that is, $A'C' = 12.3$ cm, $C'B' = 9.5$ cm and $\angle B'A'C' = 40.5^\circ$, but which is different is shape to triangle ABC

- (i) Lakarkan segi tiga $A'B'C'$,
Sketch the triangle $A'B'C'$,
- (ii) Nyatakan saiz $\angle A'B'C'$.
State the size of $\angle A'B'C'$.

3. $AC = 13.36$ cm



Titik A' terletak di atas AC dengan keadaan $A'B = AB$

A' lies on AC such that $A'B = AB$

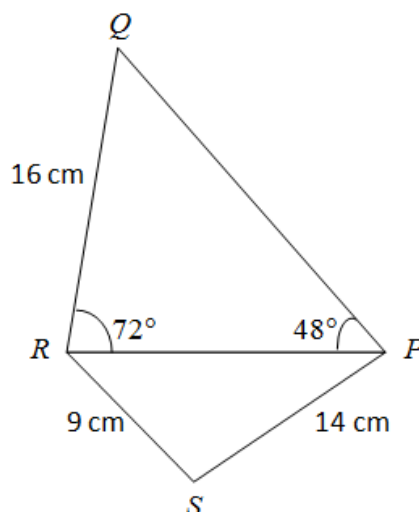
- (i) Lakar $\Delta A'BC$,
Sketch $\Delta A'BC$,
- (ii) Hitung luas, dalam cm^2 , bagi $\Delta A'BC$.
Calculate the area, in cm^2 , of $\Delta A'BC$.

--	--

Latihan Pengukuhan:
Enhancement Exercises:

1. Rajah menunjukkan sebuah sisi empat PQRS.
Diagram shows a quadrilateral PQRS.

Aras 3

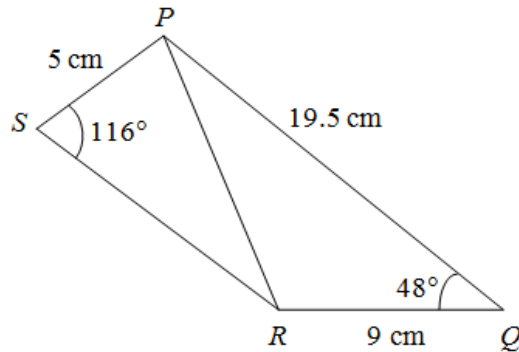


- (a) Cari
Find
- (i) Panjang, dalam cm, PR ,
The length, in cm, of PR ,
 - (ii) $\angle PSR$,
 - (iii) Luas, dalam cm^2 , sisi empat PQRS.
The area, in cm^2 , of a quadrilateral PQRS.
- (b) (i) Lakarkan sebuah segi tiga $P'S'R'$ yang mempunyai bentuk yang berbeza daripada segi tiga PSR dengan keadaan $S'R' = SR$, $R'P' = RP$ dan $\angle R'P'S' = \angle RPS$.
Sketch a triangle $P'S'R'$ which has a different shape from triangle PSR such that $S'R' = SR$, $R'P' = RP$ and $\angle R'P'S' = \angle RPS$.
- (ii) Seterunya, nyatakan saiz $\angle P'S'R'$.
Hence, state the size of $\angle P'S'R'$.

Penyelesaian / *Solution*:

2. Rajah 2 menunjukkan sebuah sisi empat PQRS.
Diagram 2 shows a quadrilateral PQRS.

Aras 3



Rajah 2
Diagram2

- (a) Hitung
Calculate
- Panjang, dalam cm, bagi PR,
The length, in cm, of PR,
 - $\angle PRS$.
- (b) Sebuah segi tiga $P'S'R'$ yang mempunyai bentuk berbeza daripada segi tiga PRS dengan keadaan $P'S' = PS$, $R'S' = RS$ dan $\angle P'R'S' = \angle PRS$.
A triangle $P'S'R'$ which has a different shape from triangle PRS such that $P'S' = PS$, $R'S' = RS$ dan $\angle P'R'S' = \angle PRS$
- Lakarkan $\Delta P'S'R'$.
Sketch the $\Delta P'S'R'$.
 - Hitung luas, dalam cm^2 , bagi $\Delta P'S'R'$.
Calculate the area, in cm^2 , of $\Delta P'S'R'$.

Penyelesaian / *Solution*:

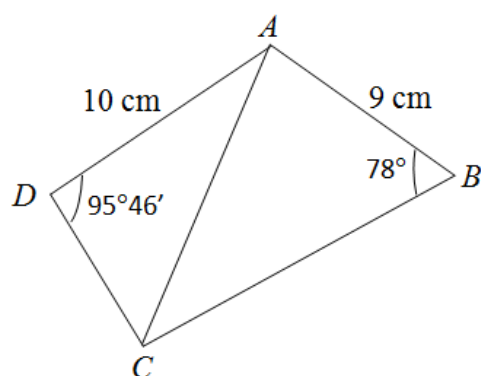
Penilaian:
Assessment:

Kertas 2

Paper 2

1. Rajah 1 menunjukkan sisi empat $ABCD$. Diberi $AB = 9$ cm, $AD = 10$ cm dan luas segi tiga ABC ialah 52.83 cm².

Diagram 1 shows a quadrilateral $ABCD$. Given $AB = 9$ cm, $AD = 10$ cm and the area of triangle ABC is 52.83 cm².



Rajah 1
Diagram 1

- (a) Cari panjang, dalam cm, bagi BC dan AC .

Find the length, in cm, of BC and AC .

[4 markah/marks]

- (b) Hitung $\angle ACD$.

Calculate $\angle ACD$.

[2 markah/marks]

- (c) Titik A' terletak pada AC dengan keadaan $A'B = AB$.

Point A' lies on AC such that $A'B = AB$.

- (i) Lakar segi tiga $BA'C$.

Sketch the triangle $BA'C$.

[1 markah/mark]

- (ii) Hitung $\angle BA'C$.

Calculate $\angle BA'C$.

[3markah/marks]

Penyelesaian / *Solution*:

SESI PEMBELAJARAN 21

TINGKATAN 4

BAB

9

PENYELESAIAN SEGI TIGA
SOLUTION OF TRIANGLES

7.3

Aplikasi Petua Sinus, Petua Kosinus dan Luas Segi Tiga
Application of Sine Rule, Cosine Rule and Area of a Triangle

Objektif Pembelajaran:

Learning objective:

Menyelesaikan masalah yang melibatkan segi tiga (Bentuk tiga dimensi).

Solve problems involving triangles (Three-dimensional shapes)

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

1. $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

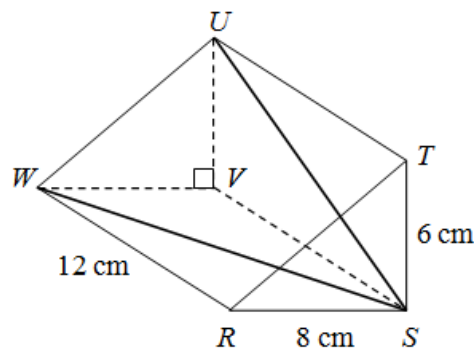
2. $a^2 = b^2 + c^2 - 2bc \cos A$
 $a^2 = b^2 + c^2 - 2bc \cos A$

3. Area of triangle / *Luas segitiga*
 $= \frac{1}{2} ab \sin C$
 $= \sqrt{s(s-a)(s-b)(s-c)}$

Aras 2

1. Menyelesaian masalah yang melibatkan segi tiga.
Solve Problems involving triangles.

**Contoh
Example**



Rajah di atas menunjukkan sebuah prisma tegak.

The diagram above shows a right prism.

Cari

Find

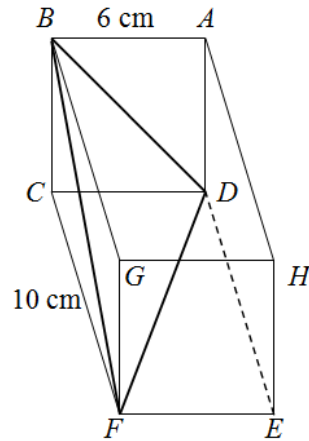
- (a) $\angle WSU$
(b) Luas segi tiga, dalam cm^2 , bagi $\triangle WSU$,
The area of triangle, in cm^2 , of $\triangle WSU$

Penyelesaian / Solution:

$$\begin{aligned} \text{(a) } SU &= \sqrt{6^2 + 12^2} = 13.42 \\ WS &= \sqrt{12^2 + 8^2} = 14.42 \\ WU &= \sqrt{6^2 + 8^2} = 10 \\ 10^2 &= 13.42^2 + 14.42^2 - 2(13.42)(14.42) \cos \angle WSU \\ \cos \angle WSU &= \frac{13.42^2 + 14.42^2 - 10^2}{2(13.42)(14.42)} \\ \angle WSU &= 41.91^\circ \end{aligned}$$

$$\begin{aligned} \text{(b) Luas segitiga } WSU / \text{Area of triangle } WSU &= \frac{1}{2} \times 13.42 \times 14.42 \times \sin 41.91^\circ \\ &= 64.63 \text{ cm}^2 \end{aligned}$$

1. Rajah di bawah menunjukkan satu prisma $ABCDEFGH$ dengan keratan rentas segi empat sama $EFGH$.
The diagram below shows a prism $ABCDEFGH$ with square $EFGH$ as its cross section.

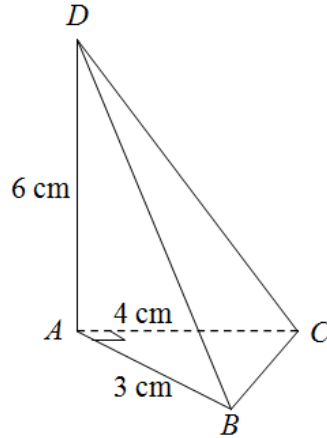


Hitung luas satah BDF .
Calculate the area of plane BDF .

Penyelesaian / *Solution*:

2. Rajah di bawah menunjukkan sebuah piramid dengan $\triangle ABC$ sebagai tapak mengufuk.

The diagram below shows a pyramid with $\triangle ABC$ as a horizontal base.



Diberi bahawa $AB = 3$ cm, $AC = 4$ cm dan $\angle BAC = 90^\circ$. Puncak D adalah 6 cm tegak di atas A . Cari

It is given that $AB = 3$ cm, $AC = 4$ cm and $\angle BAC = 90^\circ$. The vertex D is 6 cm vertically above A . Find

- (a) luas, dalam cm^2 , satah condong BCD ,
the area, in cm^2 , of the inclined plane BCD ,
- (b) jarak terpendek, dalam cm, dari D ke BC .
the shortest distance, in cm, from D to BC .

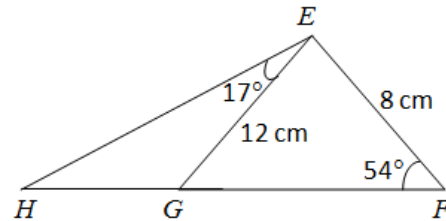
Penyelesaian / *Solution:*

Latihan Pengukuhan:
Enhancement Exercises:

1. (a) Rajah 1 menunjukkan dua buah segi tiga, EFG dan EGH .

Aras 3

Diagram 1 shows two triangles, EFG and EGH .



Rajah 1

Diagram1

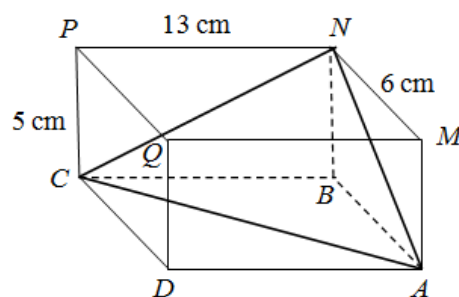
Diberi bahawa FGH ialah garis lurus dan $\angle EGF$ ialah sudut tirus. Hitung

It is given that FGH is a straight line and $\angle EGF$ is an acute angle. Calculate

- $\angle EGH$,
- panjang, dalam cm, bagi EH .
the length, in cm, of EH ,

- (b) Rajah 2 menunjukkan sebuah kuboid bertapak segi empat tepat, $ABCD$.

Diagram 2 shows a cuboid with a rectangular base, $ABCD$.



Rajah 2

Diagram2

Hitung

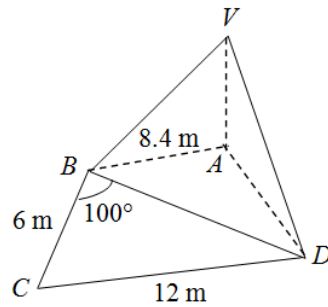
Calculate

- (i) $\angle NAC$,
- (ii) luas, dalam cm^2 , bagi $\triangle NAC$,
area, in cm^2 , of $\triangle NAC$,
- (iii) jarak terpendek, dalam cm , dari A ke NC .
the shortest distance, in cm , from A to NC .

Penyelesaian / *Solution*:

2. Rajah menunjukkan sisi empat $ABCD$ pada satah mengufuk. $VBDA$ ialah sebuah piramid dengan keadaan $AD = 6.22$ m dan V adalah 8 m tegak di atas A . Aras 3

The diagram shows a quadrilateral $ABCD$ on a horizontal plane. $VBDA$ is a pyramid such that $AD = 6.22$ m and V is 8 m vertically above A .



Cari

Find

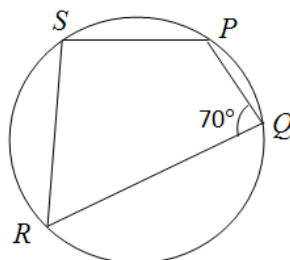
- (a) $\angle BDC$,
- (b) panjang, dalam m, bagi BD ,
the length, in m, of BD ,
- (c) luas, dalam m^2 , bagi satah condong BVD
the area, in m^2 , of the inclined plane BVD .

Penyelesaian / *Solution*:

Penilaian :
Assessment:

Kertas 2
Paper 2

1. (a)



Rajah 1
Diagram 1

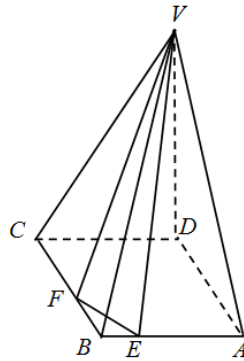
Rajah 1 menunjukkan sebuah sisi empat kitaran PQRS dalam bulatan. Diberi $\angle PQR = 70^\circ$, $PS = 7.1$ cm, $PQ = 9.6$ cm and $RS = 12.3$ cm, cari panjang QR .

Diagram 1 shows a cyclic quadrilateral PQRS in a circle. Given that $\angle PQR = 70^\circ$, $PS = 7.1$ cm, $PQ = 9.6$ cm and $RS = 12.3$ cm, find the length of QR .

[4 markah/marks]

Penyelesaian / Solution:

(b)



Rajah 2

Diagram 2

Rajah 2 menunjukkan sebuah piramid $VABCD$ dengan tapak mengufuk berbentuk segi empat sama dan V adalah tegak di atas D . Diberi bahawa $AD = 8$ cm, $VD = 10$ cm dan $BE = BF = 3$ cm, hitung

Diagram 2 shows a pyramid $VABCD$ with a horizontal squared base $ABCD$ and V is vertically above D . Given that $AD = 8$ cm, $VD = 10$ cm and $BE = BF = 3$ cm, calculate

- (i) $\angle VEF$,
- (ii) luas satah VEF ,
the area of the plane VEF .

[6 markah/marks]

Penyelesaian / Solution:

SESI PEMBELAJARAN 22

TINGKATAN 4

BAB

10

NOMBOR INDEKS
INDEX NUMBER

10.1

Nombor Indeks
Index Number

Objektif Pembelajaran:

Learning objective:

- Mentakrifkan nombor indeks dan memerihalkan kegunaannya.
Defining index numbers and describing the use of it.
- Menentukan dan mentafsir nombor indeks.
Determining and interpreting index numbers.
- Menyelesaikan masalah yang melibatkan nombor indeks
Solve problems involving index numbers

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

1. Nombor Indeks $I = \frac{Q_1}{Q_0} \times 100$ di mana Q_1 = kuantiti pada masa tertentu
 Q_0 = kuantiti pada masa asas
*Index Number, $I = \frac{Q_1}{Q_0} \times 100$ where Q_1 = Quantity at specified time
 Q_0 = Quantity at base time*
2. Meningkatkan $k\%$, nombor indeks. $I = 100 + k$
Contoh: meningkat 10% , $I = 100 + 10 = 110$
*Increase $k\%$. index number, $I = 100 + k$,
Example; increase by 10% , $I = 100 + 10 = 110$*
3. Menurun $h\%$, nombor indeks, $I = 100 - h$
Contoh: menurun 20% , $I = 100 - 20 = 80$
*Decrease $h\%$ index number, $I = 100 - h$,
Example: decrease by 20% , $I = 100 - 20 = 80$*

MATEMATIK TAMBAHAN TINGKATAN 4

1. Cari indeks harga bagi bahan berikut pada tahun 2025 berasaskan tahun 2024.
Find the price index of the following items for the year 2025 based on the year 2024.

Aras 1

**Contoh
Example**

Tahun Year	Harga bahan (RM) Price of item (RM)
2024	8.00
2025	10.00

$$\begin{aligned}
 I &= \frac{Q_1}{Q_0} \times 100 \\
 &= \frac{10.00}{8.00} \times 100 \\
 &= 125
 \end{aligned}$$

a.

Tahun Year	Harga bahan (RM) Price of item (RM)
2024	50
2025	80

b.

Tahun Year	Harga bahan (RM) Price of item (RM)
2024	0.65
2025	0.70

c.

Tahun Year	Harga bahan (RM) Price of item (RM)
2024	10.40
2025	7.60

d.

Tahun Year	Harga bahan (RM) Price of item (RM)
2024	24.00
2025	27.60

e.

Tahun Year	Harga bahan (RM) Price of item (RM)
2024	1800
2025	2350

2. Cari indeks harga.
Find the price index.

Aras 1

**Contoh
Example**

Harga suatu bahan meningkat sebanyak 10% dari tahun 2023 ke tahun 2024. Cari indeks harga bahan itu pada tahun 2024 berdasarkan tahun 2023.
The price of an item increases by 10% from the year 2023 to 2024. Find the price index of the item in the year 2024 based on the year 2023.

$$I_{2024/2023} = 100 + 10 \\ = 110$$

- a. Harga sejenis losyen badan meningkat sebanyak 15% dari tahun 2023 ke tahun 2024. Cari indeks harga losyen badan itu pada tahun 2024 berdasarkan tahun 2023.
The price of a body lotion increases by 15% from the year 2023 to 2024. Find the price index of the body lotion in the year 2024 based on the year 2023.

- b. Harga sejenis buah menokok sebanyak 50% dari tahun 2020 ke tahun 2022. Cari indeks harga buah itu pada tahun 2022 berdasarkan tahun 2020.
The price of a fruit increases by 50% from the year 2020 to 2022. Find the price index of the fruit in the year 2022 based on the year 2020.

- c. Harga suatu bahan menurun sebanyak 5% dari tahun 2023 ke tahun 2024. Cari indeks harga bahan itu pada tahun 2024 berdasarkan tahun 2023.
The price of an item decreases by 5% from the year 2023 to 2024. Find the price index of the item in the year 2024 based on the year 2023.

3. Cari nilai p bagi setiap yang berikut.
Find the value of p for each of the following.

Aras 1

**Contoh
Example**

Harga / Price (RM)		Indeks harga Price Index
2024	2025	
50	p	120

$$I = 120 \\ \frac{p}{50} \times 100 = 120 \\ p = \frac{120 \times 50}{100} \\ p = 60$$

a.

Harga / Price (RM)		Indeks harga Price Index
2024	2025	
3.00	p	140

MATEMATIK TAMBAHAN TINGKATAN 4

b.	<table><tr><th colspan="2">Harga/Price (RM)</th><th rowspan="2">Indeks harga Price Index</th></tr><tr><td>2024</td><td>2025</td></tr><tr><td>4.90</td><td>p</td><td>155.10</td></tr></table>	Harga/Price (RM)		Indeks harga Price Index	2024	2025	4.90	p	155.10
Harga/Price (RM)		Indeks harga Price Index							
2024	2025								
4.90	p	155.10							
c.	<table><tr><th colspan="2">Harga/Price (RM)</th><th rowspan="2">Indeks harga Price Index</th></tr><tr><td>2024</td><td>2025</td></tr><tr><td>p</td><td>3.60</td><td>150</td></tr></table>	Harga/Price (RM)		Indeks harga Price Index	2024	2025	p	3.60	150
Harga/Price (RM)		Indeks harga Price Index							
2024	2025								
p	3.60	150							
d.	<table><tr><th colspan="2">Harga/Price (RM)</th><th rowspan="2">Indeks harga Price Index</th></tr><tr><td>2024</td><td>2025</td></tr><tr><td>p</td><td>8.40</td><td>120</td></tr></table>	Harga/Price (RM)		Indeks harga Price Index	2024	2025	p	8.40	120
Harga/Price (RM)		Indeks harga Price Index							
2024	2025								
p	8.40	120							
e.	<table><tr><th colspan="2">Harga/Price (RM)</th><th rowspan="2">Indeks harga Price Index</th></tr><tr><td>2024</td><td>2025</td></tr><tr><td>p</td><td>2.20</td><td>116</td></tr></table>	Harga/Price (RM)		Indeks harga Price Index	2024	2025	p	2.20	116
Harga/Price (RM)		Indeks harga Price Index							
2024	2025								
p	2.20	116							
f.	<table><tr><th colspan="2">Harga/Price (RM)</th><th rowspan="2">Indeks harga Price Index</th></tr><tr><td>2023</td><td>2024</td></tr><tr><td>70.00</td><td>p</td><td>108</td></tr></table>	Harga/Price (RM)		Indeks harga Price Index	2023	2024	70.00	p	108
Harga/Price (RM)		Indeks harga Price Index							
2023	2024								
70.00	p	108							
g.	<table><tr><th colspan="2">Harga/Price (RM)</th><th rowspan="2">Indeks harga Price Index</th></tr><tr><td>2023</td><td>2024</td></tr><tr><td>p</td><td>44.10</td><td>126</td></tr></table>	Harga/Price (RM)		Indeks harga Price Index	2023	2024	p	44.10	126
Harga/Price (RM)		Indeks harga Price Index							
2023	2024								
p	44.10	126							

4. Selesaikan setiap masalah berikut yang melibatkan 3 tahun.

Aras 2

Solve the following problem which involves 3 years.

Contoh Example Indeks harga bagi 1 kg ikan pada tahun 2022 berasaskan tahun 2021 dan 2020 masing-masing ialah 150 dan 180. Cari indeks harga 1 kg ikan pada tahun 2021 berasaskan tahun 2020. <i>The price index of 1 kg of fish in the year 2022 based on the year 2021 and 2020 are 150 and 180 respectively. Find the price index of 1 kg of fish in the year 2021 based on the year 2020.</i> $I_{2022/2021} = 150 \quad I_{2022/2020} = 180$ $I_{2021/2020} = \frac{180}{150} \times 100$ $= 120$	a. Indeks harga bagi sebiji epal pada tahun 2019 berasaskan tahun 2018 dan 2017 masing-masing ialah 120 dan 150. Cari indeks harga epal pada tahun 2018 berasaskan tahun 2017. <i>The price index of an apple in the year 2019 based on the year 2018 and 2017 are 120 and 150 respectively. Find the price index of the apple in the year 2018 based on the year 2017.</i>
b. Diberi indeks harga gula pada tahun 2017 berasaskan tahun 2015 ialah 115 dan indeks harga gula pada tahun 2019 berasaskan tahun 2015 ialah 120. Cari indeks harga gula pada tahun 2019 berasaskan 2017. <i>Given the price index for sugar in the year 2017 based on the year 2015 was 115 and the price index for sugar in the year 2019 based on the year 2015 was 120. Find the price index for the sugar in the year 2019 based on the year 2017.</i>	c. Diberi indeks harga tepung pada tahun 2017 berasaskan tahun 2015 ialah 110 dan indeks harga tepung pada tahun 2019 berasaskan tahun 2015 ialah 115. Cari indeks harga tepung pada tahun 2019 berasaskan 2017. <i>Given the price index for the flour in the year 2017 based on the year 2015 was 110 and the price index for the flour in the year 2019 based on the year 2015 was 115. Find the price index for the flour in the year 2019 based on the year 2017.</i>
d. Diberi indeks harga emas pada tahun 2020 berasaskan tahun 2016 ialah 190 dan indeks harga emas pada tahun 2016 berasaskan tahun 2013 ialah 120. Cari indeks harga emas pada tahun 2020 berasaskan tahun 2013. <i>Given the price index for gold in the year 2020 based on the year 2016 was 190 and the price index for gold in the year 2016 based on the year 2013 was 120. Find the price index for the gold in the year 2020 based on the year 2013.</i>	e. Diberi indeks harga bagi bahan P pada tahun 2020 berasaskan 2018 ialah 116.8. Cari indeks harga bagi bahan P pada tahun 2022 berasaskan 2018 jika harga bahan P meningkat sebanyak 14% dari tahun 2020 ke 2022. <i>Given the price index for material P in the year 2020 based on the year 2018 was 116.8. Find the price index for material P in the year 2022 based on the year 2018 if the price of material P increased 14% from year 2020 to 2022.</i>

Latihan Pengukuhan : Enhancement Exercises:

1. Jadual 1 menunjukkan harga, indeks harga dan peratusan penggunaan bagi empat komponen P , Q dan R dalam penghasilan satu unit barang elektronik.

Table 1 shows the price, price index and percentage of the usage of four components P , Q and R in producing an electronic item.

Komponen <i>Component</i>	Harga seunit (RM) <i>Price per unit</i>		Harga Indeks pada tahun 2019 berasaskan tahun 2017 <i>Price Index in the year 2019 based on the year 2017</i>
	Tahun/Year 2017	Tahun/Year 2019	
P	5.00	6.00	x
Q	2.00	y	140
R	z	8.80	110

Jadual/Table 1

Cari nilai x , y dan z .

Find the values of x , y and z .

2. Jadual 2 menunjukkan harga dan indeks harga bagi 3 bahan untuk menghasilkan sejenis biskut.
Table 2 show the price and the price index of three ingredients to produce a type of biscuit.

Bahan <i>Ingredient</i>	Harga pada 2000 <i>Price in the year 2000 (RM)</i>	Harga pada 2025 <i>Price in the year 2025 (RM)</i>	Indeks harga pada tahun 2025 berasaskan tahun 2020 <i>Price index in the year 2025 based on the year 2020</i>
P	x	0.70	175
Q	4.00	5.50	y
R	2.50	z	120

Cari nilai

Find the value of

(a) x , (b) y , (c) z .

MATEMATIK TAMBAHAN TINGKATAN 4

3. Jadual 3 menunjukkan harga dan indeks harga bagi bahan Q yang digunakan dalam penghasilan minuman detox.

Table 3 shows the price and the price index for ingredient Q, used in the production of a detox drink.

Bahan <i>Ingredient</i>	Harga per liter <i>Price per liter (RM)</i>		Indeks harga pada tahun 2017 berasaskan tahun 2015 <i>Price Index in the year 2017 based on the year 2015</i>
	2015	2017	
Q	y	3.00	x

Jadual / Table 3

Harga bahan Q meningkat sebanyak 20% dari tahun 2015 ke tahun 2017.

The price of ingredient Q increased by 20% from 2015 to 2017

- (a) Cari nilai bagi x.
Find the value of x.
- (b) Cari nilai bagi y.
Find the value of y.

MATEMATIK TAMBAHAN TINGKATAN 4

4. Jadual 4 menunjukkan indeks harga dan perubahan indeks harga bagi empat bahan mentah A, B, C dan D, yang digunakan untuk membuat sejenis biskut di sebuah kilang.

Table 4 shows the price index and price index changes for four raw materials A, B, C and D used to make a type of biscuit in a factory.

Bahan mentah <i>Raw Material</i>	Indeks harga pada tahun 2011 berasaskan tahun 2008 <i>Price Index in the year 2011 based on the year 2008</i>	Perubahan indeks harga dari tahun 2011 ke tahun 2015 <i>Change in price index from the year 2011 to the year 2015</i>
A	140	Menokok 15% <i>Increased by 15%</i>
B	120	Menokok 5% <i>Increased by 5%</i>
C	160	Tidak berubah <i>No change</i>
D	150	Menyusut 10% <i>Decreased by 10%</i>

Jadual / Table 4

- (a) Harga bahan mentah A pada tahun 2011 ialah RM70.
Cari harga yang sepadan pada tahun 2008.
*The price of raw material A in the year 2011 was RM70.
Find the corresponding price in the year 2008.*
- (b) Cari indeks harga bagi kesemua empat bahan mentah itu pada tahun 2015 berasaskan tahun 2008.
Find the price index for all the four raw materials in the year 2015 based on the year 2008.

MATEMATIK TAMBAHAN TINGKATAN 4

5. Jadual 5 menunjukkan maklumat berkaitan dua bahan *J* dan *K* yang digunakan oleh seorang pembuat keropok dalam perniagaannya.
Table 5 shows information related to two ingredients J and K used by a crackers maker in his business.

Bahan <i>Ingredient</i>	Indeks harga pada tahun 2018 berasaskan tahun 2016 <i>Price index in the year 2018 based on the year 2016</i>	Perubahan indeks harga dari tahun 2018 ke tahun 2020 <i>Change in price index from the year 2018 to the year 2020</i>	Indeks harga pada tahun 2020 berasaskan tahun 2016 <i>Price index in the year 2020 based on the year 2016</i>
<i>J</i>	115	Menokok 40% <i>Increased by 40%</i>	<i>x</i>
<i>K</i>	140	Menyusut 10% <i>Decreased by 10%</i>	<i>y</i>

Jadual/Table 5

- (a) Cari nilai *x* dan nilai *y*.
Find the values of x and y.
- (b) Hitung harga bagi bahan *K* pada tahun 2016 jika harga pada tahun 2020 ialah RM6.30.
Calculate the price of ingredient K in the year 2016 if its price in the year 2020 was RM6.30.

Penilaian :
Assessment:

Kertas/Paper 2

1. Jadual 1 menunjukkan harga, indeks harga dan pemberat bagi lima komponen A, B, C, D dan E yang digunakan dalam penghasilan sejenis komputer.

Table 1 shows the price, price index and the weightage for five components, A, B, C, D and E used in the production of a type of computer.

Komponen Component	Harga / Price (RM)		Indeks harga pada tahun 2017 berasaskan tahun 2015 Price Index in the year 2017 based on the year 2015
	Tahun Year 2015	Tahun Year 2017	
A	2.00	p	135
B	4.00	4.40	110
C	q	1.35	90
D	0.50	0.64	128
E	1.80	2.25	r

Jadual/Table 1

- (a) Hitung nilai p , q dan r .
Calculate the values of p , q and r . [4 markah/marks]
- (a) (i) Diberi kos komponen A meningkat sebanyak 20% dari tahun 2017 ke tahun 2020.
Cari indeks harga komponen A pada tahun 2020 berasaskan tahun 2017.
*Given the cost of component A increased by 20% from the year 2017 to 2020.
Find the price index component A in the year 2020 based on the year 2017.* [1 markah/marks]
- (ii) Seterusnya, cari indeks harga komponen A pada tahun 2020 berasaskan tahun 2015.
Hence, find the price index of component A in the year 2020 based on the year 2015. [2 markah/marks]
- (c) Cari indeks harga komponen D pada tahun 2018 berasaskan tahun 2017 jika indeks harganya pada tahun 2018 berasaskan tahun 2015 ialah 122.
Find the price index of component D in the year 2018 based on the year 2017 if the price index in the year 2018 based on the year 2015 was 122. [2 markah/marks]
- (d) Cari peratus perubahan komponen C dari tahun 2015 ke tahun 2017.
Find the percentage changes of component C from the year 2015 to 2017. [1 markah/mark]

SESI PEMBELAJARAN 23

TINGKATAN 4

BAB

10

NOMBOR INDEKS
INDEX NUMBER

10.2

Indeks Gubahan
Composite Index

Objektif Pembelajaran:

Learning objective:

- Menentukan dan mentafsir indeks gubahan tanpa pemberat dan dengan pemberat.
Determining and interpreting composite index with weightage and without the weightage.
- Menyelesaikan masalah yang melibatkan nombor indeks dan indeks gubahan.
Solving problem involving index numbers and composite index.

Konsep Penting / Rumus Penting:

Important Concepts / Important Formulae:

- Indeks Gubahan, $\bar{I} = \frac{\sum I_i w_i}{\sum w_i}$ di mana I_i = nombor indeks dan w_i = pemberat
Composite Index, $\bar{I} = \frac{\sum I_i w_i}{\sum w_i}$ where I_i = Index Number and w_i = weightage

- Cari indeks gubahan yang berikut.
Find the following composite index.

Aras 1

Contoh
Example

Bahan Items	Harga Indeks Price index (I)	Pemberat Weightage (w)
A	130	2
B	150	3
C	120	1

$$\bar{I} = \frac{\sum I_i w_i}{\sum w_i} = \frac{130(2) + 150(3) + 120(1)}{2 + 3 + 1}$$

$$= 138.33$$

a.

Bahan Items	Harga Indeks Price index (I)	Pemberat Weightage (w)
A	110	4
B	108	5
C	120	1

MATEMATIK TAMBAHAN TINGKATAN 4

b.

Bahan Items	Harga Indeks Price index (<i>I</i>)	Pemberat Weightage (<i>w</i>)
<i>P</i>	120	3
<i>Q</i>	140	2
<i>R</i>	110	2

c.

Bahan Items	Harga Indeks Price index (<i>I</i>)	Pemberat Weightage (<i>w</i>)
<i>P</i>	130	3
<i>Q</i>	90	1
<i>R</i>	124	2

2. Cari nilai *n* bagi setiap yang berikut.
Find the value of n for each of the following.

Aras 1

**Contoh
Example**

Diberi indeks gubahan = 118
Given the composite index = 118

Bahan Items	Harga Indeks Price index (<i>I</i>)	Pemberat Weightage (<i>w</i>)
<i>A</i>	115	3
<i>B</i>	105	<i>n</i>
<i>C</i>	130	6
<i>D</i>	121	5

$$\frac{\sum I_i w_i}{\sum w_i} = 118$$

$$\frac{115(3)+105(n)+130(6)+121(5)}{3+n+6+5} = 118$$

$$\frac{1730+105n}{14+n} = 118$$

$$1730 + 105n = 118(14 + n)$$

$$1730 + 105n = 1652 + 118n$$

$$13n = 78$$

$$n = \frac{78}{13}$$

$$n = 6$$

- a. Diberi indeks gubahan = 120
Given the composite index = 120

Bahan Items	Harga Indeks Price index (<i>I</i>)	Pemberat Weightage (<i>w</i>)
<i>A</i>	125	6
<i>B</i>	135	2
<i>C</i>	100	<i>n</i>
<i>D</i>	120	4

MATEMATIK TAMBAHAN TINGKATAN 4

- b. Diberi indeks gubahan = 116
Given the composite index = 116

Bahan Items	Harga Indeks Price index (I)	Pemberat Weightage (w)
P	125	n
Q	100	3
R	105	6
S	140	4

- c. Diberi indeks gubahan = 120
Given the composite index = 120

Bahan Items	Harga Indeks Price index (I)	Pemberat Weightage (w)
P	125	6
Q	135	2
R	n	5
S	120	4

3. Selesaikan setiap masalah yang berikut.
Solve the following problem.

Aras 2

Contoh Example Diberi indeks gubahan pada tahun 2020 berasaskan tahun 2016 ialah 131.11.
Hitung jumlah perbelanjaan yang sepadan dalam tahun 2020 jika jumlah perbelanjaan pada tahun 2016 ialah RM3000.
Given the composite index for the year 2020 based on the year 2016 is 131.11. Calculate the corresponding total expenditure for the year 2020 if the total expenditure in the year 2016 is RM3000.

$$\frac{P_{2020}}{3000} \times 100 = 131.11$$

$$P_{2020} = \frac{131.11 \times 3000}{100}$$

$$= \text{RM}3933.30$$

- a. Diberi indeks gubahan pada tahun 2020 berasaskan tahun 2018 ialah 129.90.
Hitung kos yang sepadan dalam tahun 2020 jika kos pada tahun 2018 ialah RM40.
Given the composite index for the year 2020 based on the year 2018 is 129.90. Calculate the corresponding cost for the year 2020 if the cost in the year 2018 is RM40.

MATEMATIK TAMBAHAN TINGKATAN 4

b. Diberi indeks gubahan pada tahun 2020 berasaskan tahun 2016 ialah 113.75 Hitung kos yang sepadan dalam tahun 2016 jika kos pada tahun 2020 ialah RM60. <i>Given the composite index for the year 2020 based on the year 2016 is 113.75. Calculate the corresponding cost for the year 2016 if the cost in the year 2020 is RM60.</i>	c. Diberi indeks gubahan pada tahun 2020 berasaskan tahun 2016 ialah 129.44. Hitung kos yang sepadan dalam tahun 2016 jika kos pada tahun 2020 ialah RM2985. <i>Given the composite index for the year 2020 based on the year 2016 is 129.44. Calculate the corresponding cost for the year 2016 if the cost in the year 2020 is RM2985.</i>
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4. Selesaikan setiap masalah yang berikut yang melibatkan 3 tahun.
Solve the following problem which involves 3 years.

Aras 2

Contoh Example Indeks gubahan keuntungan sebuah syarikat pada tahun 2024 berasaskan tahun 2023 ialah 124. Indeks gubahan pada tahun 2025 berasaskan tahun 2024 pula ialah 140. Hitung indeks gubahan bagi keuntungan syarikat itu pada tahun 2025 berasaskan tahun 2023. <i>The composite index of the profit of a company in the year 2024 based on the year 2023 is 124. The composite index in the year 2025 based on the year 2024 is 140. Calculate the composite index of the profit of the company in the year 2025 based on the year 2023.</i> $\begin{aligned}\bar{I}_{2025/2023} &= \frac{\bar{I}_{2024/2023} \times \bar{I}_{2025/2024}}{100} \\ &= \frac{124 \times 140}{100} \\ &= 173.60\end{aligned}$	a. Indeks gubahan keuntungan sebuah syarikat pada tahun 2024 berasaskan tahun 2023 ialah 132. Indeks gubahan pada tahun 2025 berasaskan tahun 2024 pula ialah 150. Hitung indeks gubahan bagi keuntungan syarikat itu pada tahun 2025 berasaskan tahun 2023. <i>The composite index of the profit of a company in the year 2024 based on the year 2023 is 124. The composite index in the year 2025 based on the year 2024 is 140. Calculate the composite index of the profit of the company in the year 2025 based on the year 2023.</i>
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Latihan Pengukuhan : Enhancement Exercises:

1. Pembuatan suatu barang komersial memerlukan lima jenis bahan mentah A, B, C, D dan E.

Jadual 1 menunjukkan harga dan indeks harga bagi bahan itu.

Carta pai menunjukkan peratusan kuantiti bahan mentah yang digunakan.

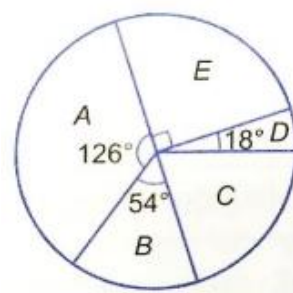
The production of a commercial product requires five types of raw materials: A, B, C, D and E.

Table 1 shows the price and the price index for these materials.

The pie chart shows the percentage of the quantity of raw materials used.

Bahan Mentah Raw Material	Harga (RM) pada tahun Price in Year		Indeks harga pada tahun 2019 berasaskan tahun 2017 Price Index in the year 2019 based on the year 2017
	2017	2019	
A	x	24.00	120
B	16.00	20.80	130
C	18.00	22.50	125
D	12.50	17.50	y
E	24.00	36.00	150

Jadual/Table 1



- (a) Hitung nilai x dan y .

Calculate the values of x and y .

- (b) Hitung indeks gubahan bagi kos pembuatan barang komersial itu pada tahun 2019 berasaskan tahun 2017.

Calculate the composite index for the manufacturing cost of the commercial product in the 2019 based on the year 2017.

- (c) Harga setiap bahan mentah dijangka akan meningkat sebanyak 20% dari tahun 2019 kepada tahun 2021. Diberi kos pembuatan seunit barang komersial itu pada tahun 2017 ialah RM200, hitung kos sepadan pada tahun 2021.

The price of each raw material is expected to increase by 20% from the year 2019 to the year 2021. Given that the manufacturing cost per unit of the commercial product in 2017 was RM200, calculate the corresponding cost in 2021.

MATEMATIK TAMBAHAN TINGKATAN 4

2. Jadual 2 menunjukkan harga dan indeks harga bagi tiga jenis bahan P, Q dan R yang digunakan dalam penghasilan minuman detox.

Table 2 shows the price and the price index for three types of ingredients, P, Q and R, used in the production of a detox drink.

Bahan <i>Ingredient</i>	Harga per liter <i>Price per liter (RM)</i>		Indeks harga pada tahun 2017 berdasarkan tahun 2015 <i>Price Index in the year 2017 based on the year 2015</i>	Pemberat <i>Weightage</i>
	2015	2017		
P	5.00	6.64	132.8	50
Q	y	3.00	x	20
R	0.50	0.95	190	1

Jadual/Table 2

- (a) Harga bahan Q meningkat sebanyak 20% dari tahun 2015 ke tahun 2017.
The price of ingredient Q increased by 20% from 2015 to 2017.
- (i) Cari nilai bagi x.
Find the value of x.
- (ii) Cari nilai bagi y.
Find the value of y.
- (b) Hitung indeks gubahan bagi kos penghasilan minuman pada tahun 2017 berdasarkan tahun 2015.
Calculate the composite index for the cost of producing the detox drink in the year 2017 based on the year 2015.
- (c) Diberi bahawa indeks gubahan bagi kos penghasilan minuman detox meningkat sebanyak 40% dari tahun 2013 ke tahun 2017.
Given that the composite index for the production cost of detox drink increased by 40% from the year 2013 to the year 2017.
- (i) Hitung indeks gubahan bagi kos penghasilan minuman detox pada tahun 2015 berdasarkan tahun 2013.
Calculate the composite index for the cost of production of detox drink in the year 2015 based on the year 2013.
- (ii) Kos bagi menghasilkan minuman detox ialah RM1.60 pada tahun 2013. Cari jumlah maksimum minuman yang dapat dihasilkan dengan peruntukan RM80 pada tahun 2017.
The cost of producing the detox drink was RM1.60 in 2013. Find the maximum amount of drink that can be produced with RM80 in the year 2017.

MATEMATIK TAMBAHAN TINGKATAN 4

3. Jadual 3 menunjukkan indeks harga dan perubahan indeks harga bagi empat bahan mentah A, B, C dan D, yang digunakan untuk membuat sejenis biskut di sebuah kilang.

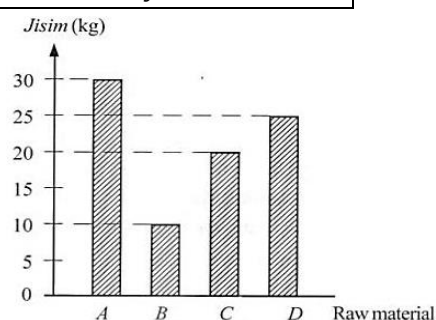
Table 3 shows the price index and price index changes for four raw materials A, B, C and D used to make a type of biscuit in a factory.

Bahan mentah <i>Raw Material</i>	Indeks harga pada tahun 2011 berasaskan tahun 2008 <i>Price Index in the year 2011 based on the year 2008</i>	Perubahan indeks harga dari tahun 2011 ke tahun 2015 <i>Change in the price index from the year 2011 to the year 2015</i>
A	140	Menokok 15% <i>Increased by 15%</i>
B	120	Menokok 5% <i>Increased by 5%</i>
C	160	Tidak berubah <i>No change</i>
D	150	Menyusut 10% <i>Decreased by 10%</i>

Jadual/Table 3

Rajah 4 adalah carta palang yang mewakili jisim bahan mentah yang digunakan untuk membuat biskut itu pada tahun 2008.

Diagram 4 is a bar chart represents the mass of raw materials used to produce the biscuits in the year 2008.



Rajah/Diagram 3

- (a) Harga bahan mentah A pada tahun 2011 ialah RM70.

Cari harga yang sepadan pada tahun 2008.

The price of raw material A in the year 2011 was RM70.

Find the corresponding price in the year 2008.

- (b) Cari indeks harga bagi kesemua empat bahan mentah itu pada tahun 2015 berasaskan tahun 2008.

Find the price index for all the four raw materials in the year 2015 based on the year 2008.

- (i) Hitung indeks gubahan bagi kos menghasilkan biskut itu pada tahun 2015 berasaskan tahun 2008.

Calculate the composite index for the cost of producing the biscuits in the year 2015 based on the year 2008.

- (ii) Seterusnya, cari kos bagi menghasilkan biskut itu pada tahun 2008 jika kos sepadan pada tahun 2015 ialah RM268.20.

Hence, find the cost of producing the biscuits in the year 2008 if the corresponding cost in the year 2015 was RM268.20.

MATEMATIK TAMBAHAN TINGKATAN 4

4. Jadual 4 menunjukkan maklumat berkaitan lima bahan J , K , L , M dan N yang digunakan untuk menghasilkan sejenis keropok di sebuah kilang.

Table 4 shows information related to five ingredients J , K , L , M and N used to produce a type of cracker in the factory..

Bahan <i>Ingredient</i>	Indeks harga pada tahun 2018 berasaskan tahun 2016 <i>Price Index in the year 2018 based on the year 2016</i>	Perubahan indeks harga dari tahun 2018 ke tahun 2020 <i>Change in Price Index from the year 2018 to the year 2020</i>	Indeks harga pada tahun 2020 berasaskan tahun 2016 <i>Price Index in the year 2020 based on the year 2016</i>	Pemberat <i>Weightage</i>
J	124	Tidak berubah <i>No change</i>	124	5
K	115	Menokok 40% <i>Increased by 40%</i>	x	6
L	130	Tidak berubah <i>No change</i>	130	p
M	140	Menyusut 10% <i>Decreased by 10%</i>	y	4
N	120	Tidak berubah <i>No change</i>	120	2

Jadual/Table 4

Indeks gubahan bagi kos menghasilkan sebungkus keropok itu pada tahun 2020 berasaskan tahun 2016 ialah 136.

The composite index for the cost of making a packet of cracker in the year 2020 based on the year 2016 is 136.

- (a) (i) Cari nilai x dan nilai y .

Find the values of x and y .

- (ii) Hitung harga bagi bahan M pada tahun 2016 jika harga pada tahun 2020 ialah RM6.30.

Calculate the price of ingredient M in the year 2016 if its price in the year 2020 was RM6.30.

- (b) Hitung nilai p .

Calculate the value of p .

- (c) Kos untuk membuat sebungkus keropok pada tahun 2016 ialah RM25. Cari harga jualan sebungkus keropok yang dibuat pada tahun 2020 jika pembuat keropok itu ingin mendapatkan keuntungan 80%.

The cost to make a packet of cracker in the year 2016 was RM25. Find the selling price of a packet of cracker in the year 2020 if the biscuit maker wants to earn an 80% profit.

Penilaian/Assessment:

Kertas/Paper 2

1. Jadual 1 menunjukkan perubahan indeks harga empat bahan P, Q, R dan S yang digunakan untuk membuat sejenis biskut.
Table 1 shows the price index changes and percentage usage of four ingredients P, Q, R and S used to produce a type of biscuit.

Bahan <i>Ingredient</i>	Perubahan indeks harga dari tahun 2019 ke tahun 2023 <i>Change in Price Index from the year 2019 to the year 2023</i>	Peratus penggunaan <i>Percentage Usage</i> (%)
P	Menokok 60% <i>Increased by 60%</i>	15
Q	Menokok 20% <i>Increased by 20%</i>	
R	Tidak berubah <i>No change</i>	20
S	Menyusut 10% <i>Decreased by 10%</i>	40

Jadual/Table 1

Kos pengeluaran bagi sebungkus biskut ini ialah RM35.50 pada tahun 2023.

The total production cost for a packet of biscuits in the year 2023 is RM35.50.

- (a) Jika harga bagi bahan S pada tahun 2019 ialah RM2.20, cari harganya pada tahun 2023.

If the price of ingredient S in the year 2019 was RM2.20, find its price in the year 2023.

[2 markah/marks]

- (b) (i) Hitung indeks gubahan bagi kos pengeluaran biskut itu pada tahun 2023 berasaskan tahun 2019.

Calculate the composite index for the biscuit production cost in the year 2023 based on the year 2019.

- (ii) Hitung kos pengeluaran yang sepadan pada tahun 2019.

Find the corresponding production cost in the year 2019.

[5 markah/marks]

- (c) Kos pengeluaran dijangka meningkat sebanyak 50% dari tahun 2023 ke tahun 2026.

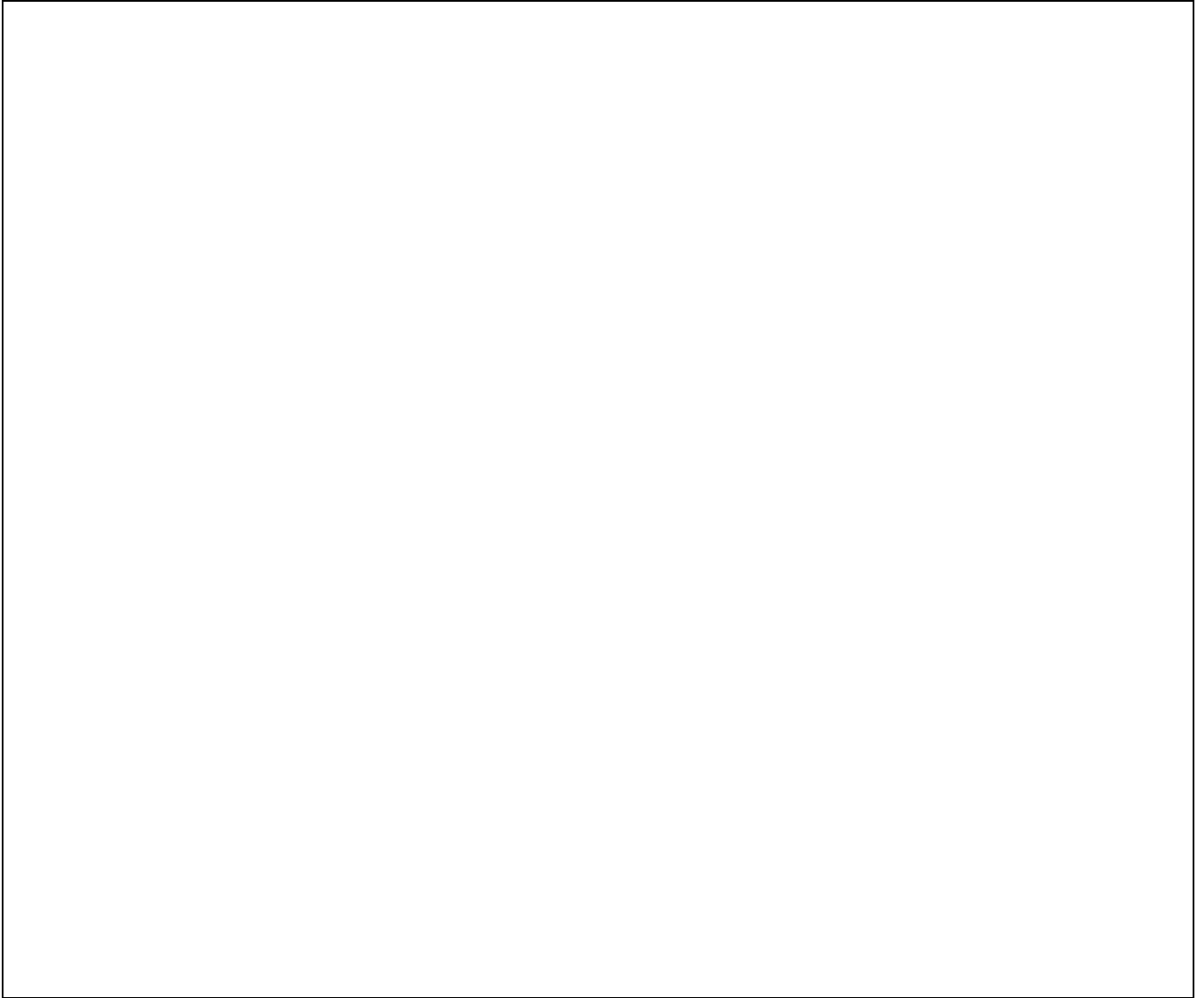
Hitung indeks gubahan bagi kos pengeluaran biskut pada tahun 2026 berasaskan tahun 2019.

The production cost is expected to increase by 50% from the year 2023 to 2026.

Calculate the composite index for the biscuit production cost in the year 2026 based on the year 2019.

[3 markah/marks]

MATEMATIK TAMBAHAN TINGKATAN 4



SESI PEMBELAJARAN 24

TINGKATAN 4

BAB

10

**NOMBOR INDEKS
INDEX NUMBER**

10.2

**Indeks Gubahan
Composite Index**

Objektif Pembelajaran:

Learning objective:

- Menyelesaikan masalah yang melibatkan nombor indeks dan indeks gubahan.
Solving problem involving index numbers and composite numbers

**Konsep Penting / Rumus Penting:
Important Concepts / Important Formulae:**

Langkah-langkah:

Step by step:

1. Mengaplikasikan nombor indeks dan formula indeks harga.
Apply the index numbers and formula for price index.
2. Mengaplikasikan formula indeks gubahan.
Apply the formula for composite index
3. Menyelesaikan masalah yang melibatkan indeks harga dan indeks gubahan.
Solve the problems involving price index and composite index

Latihan Pengukuhan:
Enhancement Exercises:

Aras 3

1. Jadual di bawah menunjukkan indeks harga dan peratus penggunaan empat barangan, P, Q, R dan S, yang menjadi bahan utama dalam penghasilan sejenis biskut.
Table below shows the price index and the percentage usage of four items P, Q, R and S which are the main ingredients in producing a type of biscuit.

Barangan Item	Indeks harga tahun 1995 berasaskan tahun 1993 <i>Price Index in the year 1995 based on the year 1993</i>	Peratus penggunaan <i>Percentage of Usage</i> (%)
P	135	40
Q	x	30
R	105	
S	130	20

(a) Hitung/ *Calculate*

- (i) harga S pada tahun 1993 jika harganya pada tahun 1995 ialah RM37.70.
the price of S in the year 1993 if its price in the year 1995 was RM37.70.
- (ii) indeks harga P pada tahun 1995 berasaskan tahun 1991 jika indeks harganya pada tahun 1993 berasaskan tahun 1991 ialah 120.
the price index of P in the year 1995 based on the year 1991 if its price index in the year 1993 base on the year 1991 was 120.

- (b) Nombor indeks gubahan kos penghasilan biskut itu pada tahun 1995 berasaskan tahun 1993 ialah 128. Hitung
The composite index of total production of the biscuit in the year 1995 based on the year 1993 was 128. Calculate

- (i) nilai x
value of x
- (ii) harga sekotak biskut itu pada tahun 1993 jika harga yang sepadan pada tahun 1995 ialah RM32.00.
the price of a box of biscuit in the year 1993 if its corresponding price in the year 1995 was RM32.00.

Penyelesaian / *Solutions*:

MATEMATIK TAMBAHAN TINGKATAN 5

2. Jadual di bawah menunjukkan maklumat berkaitan empat bahan P , Q , R dan S yang digunakan dalam pembuatan satu jenis mi. **Aras 3**

Table below shows the information related to four types of ingredients P , Q , R and S which being using to produce a type of noodle.

Bahan <i>Ingredient</i>	Perubahan indeks harga dari tahun 2013 ke tahun 2017 <i>The changes of the price index from 2013 to 2017</i>	Peratus penggunaan (%) <i>Percentage of usage</i>
P	Menokok/increase 40%	10
Q	Menokok/increase 20%	10
R	Menokok/increase 60%	
S	Menyusut/decrease 10%	50

Kos pengeluaran bagi mi ini ialah RM47 600 pada tahun 2017.

The production cost for this noodle is RM47 600 in the year 2017.

- (a) Jika harga bahan Q pada tahun 2013 ialah RM4.20, cari harganya pada tahun 2017.
If the price of ingredient Q in the year 2013 is RM4.20, find its price in the year 2017.
- (b) Peratus penggunaan bagi beberapa bahan diberikan dalam Jadual 2.
Hitung kos pengeluaran yang sepadan pada tahun 2013.
*Percentage of usage for several ingredients were given in Table 2.
Calculate the corresponding production cost in the year 2013.*
- (c) Kos pengeluaran dijangka meningkat sebanyak 40% dari tahun 2017 ke tahun 2019.
Hitung peratus perubahan dalam kos pengeluaran dari tahun 2013 ke tahun 2019.
*The production cost is expected to increase by 40% from the year 2017 to 2019.
Calculate the percentage of changes in production cost from the year 2013 to the year 2019.*

Penyelesaian / *Solutions:*

3. Jadual di bawah menunjukkan maklumat tentang empat bahan yang digunakan untuk membuat sejenis kek.

Aras 3

Table below shows information about four ingredients used to make a type of cake.

Bahan Ingredient	Harga (RM) per kg pada tahun Price (RM) per kg in the year		Indeks harga pada tahun 2023 dengan 2021 sebagai tahun asas Price index for the year 2023 with 2021 as the base year
	2021	2023	
A	25.00	27.50	x
B	16.00	18.00	112.5
C	y	22.50	150
D	7.50	9.00	120

- (a) Cari nilai x dan nilai y .
Find the value of x and of y .
- (b) Indeks gubahan untuk kos membuat kek itu pada tahun 2023 dengan 2021 sebagai tahun asas ialah 127.5. Nisbah bagi bahan-bahan A, B, C dan D yang digunakan ialah $3 : 2 : m : 4$.
Cari nilai m .
The composite index for the cost of making the cake in the year 2023 with 2021 as the base year is 127.5. The ratio of the ingredients A, B, C and D used is $3 : 2 : m : 4$. Find the value of m .
- (c) Harga kek dijangka akan meningkat sebanyak 20% dari tahun 2023 ke tahun 2025.
It is expected that the price of the cake will increase by 20% from the year 2023 to the year 2025.
- (i) Cari indeks gubahan untuk kos membuat kek itu pada tahun 2025 dengan 2021 sebagai tahun asas.
Find the composite index for the cost of making the cake in the year 2025 with 2021 as the base year.
- (ii) Nyatakan harga kek itu pada tahun 2025, jika harganya pada tahun 2021 ialah RM100 per kg.
State the price of the cake in the year 2025, if the price in the year 2021 is RM100 per kg.
- (iii) Cari peratus kenaikan harga bahan C dari tahun 2021 ke tahun 2025 jika harga bahan lain tidak berubah dari tahun 2023 ke tahun 2025.
Find the percentage increase of ingredient C from the year 2021 to the year 2025 if the price of other ingredients remains unchanged from the year 2023 to the year 2025.

Penyelesaian / *Solutions*:

**Penilaian :
Assessment:**

Kertas/Paper 2

1. Jadual di bawah menunjukkan maklumat berkaitan tiga bahan yang digunakan dalam penghasilan sejenis keropok.

Table below shows the information of three items used in producing a type of cracker.

Bahan Item	Harga (RM) per kg pada tahun <i>Price (RM) per kg in the year</i>		Indeks harga pada tahun 2020 berasaskan tahun 2018 <i>Price Index in the year 2020 based on the year 2018</i>	Peratus penggunaan <i>Percentage of Usage</i>
	2018	2020		
A	20.00	21.60	108	60
B	12.50	13.00	104	
C	y	2.00	x	5

Jadual / Table

- (a) Harga bahan C menyusut sebanyak 20% dari tahun 2018 ke tahun 2020.
The price of item C decreased by 20% from the year 2018 to the year 2020.
- (i) Nyatakan nilai x.
State the value of x.
- (ii) Cari nilai y.
Find the value of y. [3 markah / marks]
- (b) Peratus penggunaan bagi beberapa bahan tersebut diberikan dalam Jadual.
Hitung indeks gubahan bagi kos pembuatan keropok itu pada tahun 2020 berasaskan tahun 2018.
The percentage of usage for the items are given in Table above. Calculate the composite index for the production cost of the cracker in the year 2020 based on the year 2018. [3 markah/marks]
- (c) Kos untuk membuat sebungkus keropok itu meningkat sebanyak 40% dari tahun 2020 ke tahun 2021.
Harga jualan sebungkus keropok itu ialah RM43 dengan keuntungan sebanyak RM5 pada tahun 2021. Hitung kos untuk membuat sebungkus keropok itu pada tahun 2018.
The cost to produce a packet of cracker has increased by 40% from the year 2020 to the year 2021. The selling price of a packet of cracker was RM43 with the profit of RM5 in the year 2021. Calculate the production cost of a packet of cracker in the year 2018. [4 markah/marks]

Penyelesaian / Solutions:

