JAWAPAN

BAB 4 Poligon
Polygons

1.

Tak semua sisi sama panjang.
Not all sides are equal in length.

Sudut pedalaman sama saiz.
Interior angles are of the same size.

Semua sisi sama panjang.
All sides are equal in length.

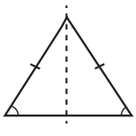
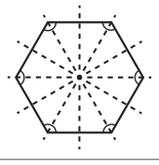
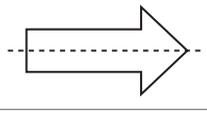
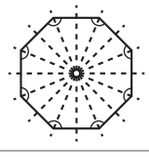
Poligon sekata
Regular polygon

Poligon tak sekata
Irregular polygon

Sudut pedalaman tidak sama saiz.
Interior angles are not the same size.

Bilangan paksi simetri = Bilangan sisi
Number of axis of symmetry = Number of sides

2.

Poligon *Polygon*	**Bilangan sisi** *Number of sides*	**Nama poligon** *Name of polygon*	**Bilangan paksi simetri** *Number of axis of symmetry*
(a) 	3	Segi tiga sama kaki *Isosceles triangle*	1
(b) 	6	Heksagon sekata *Regular hexagon*	6
(c) 	7	Heptagon tak sekata *Irregular heptagon*	1
(d) 	8	Oktagon sekata *Regular octagon*	8

Bagi sebuah poligon sekata, bilangan paksi simetri adalah sama dengan ___bilangan sisi___ poligon itu.

For a regular polygon, the number of axis of symmetry is the same as the ___*number of sides*___ *of the polygon.*

3. (a)

Bina sebuah bulatan dengan jejari 4 cm.

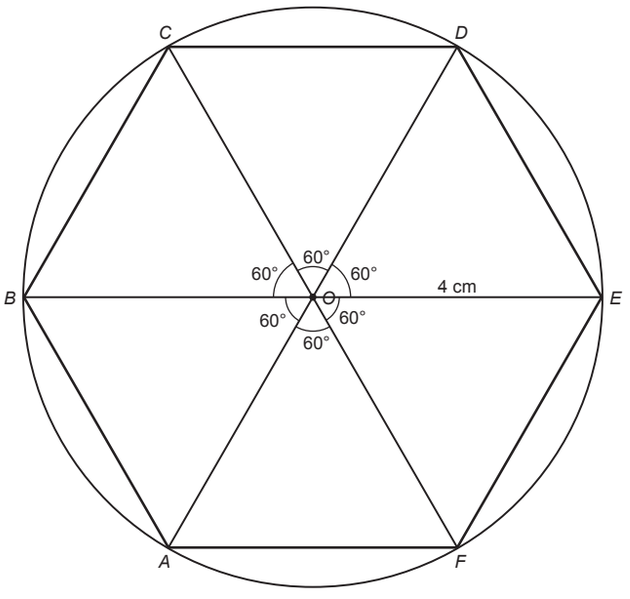
Construct a circle of radius 4 cm.

Bahagikan sama sudut pada pusat kepada enam sudut yang setiapnya bersudut 60° .

Divide equally the angle at centre into six angles of 60° *each.*

Sambungkan titik pada bulatan untuk membentuk sebuah heksagon sekata .

Join the points on the circle to form a regular hexagon .



(b)

Bina sebuah segi tiga sama kaki *OPQ* dengan
Construct an isosceles triangle OPQ with

- panjang tapak *PQ*/ *the length of base PQ* = 4 cm
- $\angle POQ$ = 72°
- $\angle OPQ = \angle OQP$ = 54°

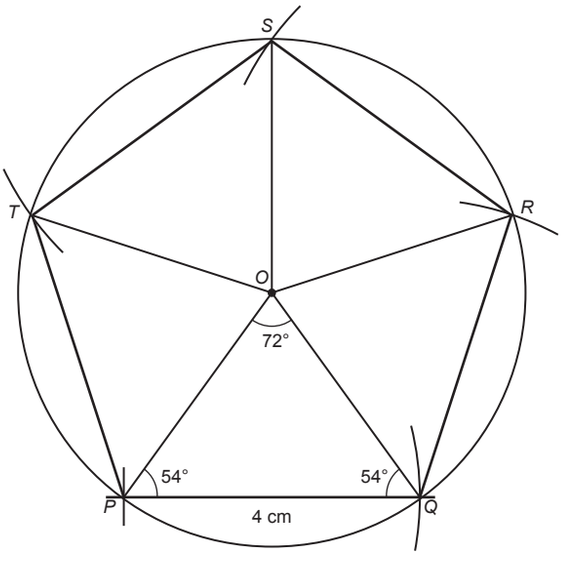
Pada pusat *O*, bina sebuah bulatan yang melalui titik *P* dan *Q*.
At the centre O, construct a circle passing through points P and Q.

Dengan bukaan jangka lukis yang sama dengan jarak *PQ* , bina lengkok dari titik *Q* dan tandakan titik *R* pada bulatan.
With the distance on the compasses equals *PQ* *, construct an arc from point Q and mark point R on the circle.*

Teruskan menanda titik *S* dan *T* pada bulatan.
Continue to mark the points S and T on the circle.

Sambungkan titik *P*, *Q*, *R*, *S* dan *T* untuk membentuk sebuah pentagon sekata .

Connect the points P, Q, R, S and T to form a regular pentagon .



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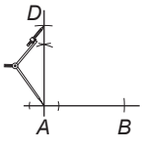

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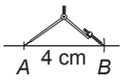

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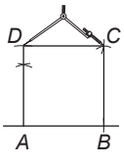

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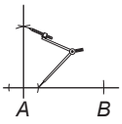
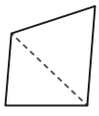
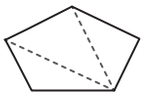
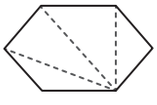
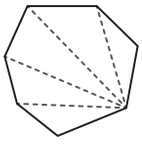
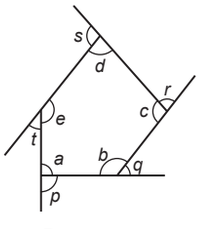


2

5.

Poligon *Polygon*	**Bilangan sisi** *Number of sides*	**Bilangan segi tiga yang dibentuk** *Number of triangles formed*	**Hasil tambah sudut pedalaman** *Sum of interior angles*
	4	2	$2 \times 180° = 360°$ $(4 - 2) \times 180° = 360°$
	5	3	$3 \times 180° = 540°$ $(5 - 2) \times 180° = 540°$
	6	4	$4 \times 180° = 720°$ $(6 - 2) \times 180° = 720°$
	7	5	$5 \times 180° = 900°$ $(7 - 2) \times 180° = 900°$
Poligon dengan *n* sisi *Polygon with n sides*	*n*	$n - 2$	$(n - 2) \times 180°$

6.



Pentagon
Pentagon

Hasil tambah sudut pedalaman = [*a*] + [*b*] + [*c*] + [*d*] + [*e*]
Sum of interior angles

= [540°]

Hasil tambah sudut peluaran = [*p*] + [*q*] + [*r*] + [*s*] + [*t*]
Sum of exterior angles

= [(180° – *a*)] + [(180° – *b*)] + [(180° – *c*)] +
[(180° – *d*)] + [(180° – *e*)]

= [900°] – [(*a* + *b* + *c* + *d* + *e*)]

= [900°] – [540°]

= [360°]

7. (a) Hasil tambah semua sudut pedalaman
Sum of all interior angles
$= (6 - 2) \times 180°$
$= 4 \times 180°$
$= 720°$

Maka / *Hence*,
$x + 115° + 98° + 164° + 90° + 107° = 720°$
$x + 574° = 720°$
$x = 720° - 574°$
$= 146°$

(b) Hasil tambah semua sudut pedalaman
Sum of all interior angles
$= (5 - 2) \times 180°$
$= 3 \times 180°$
$= 540°$

Maka / *Hence*,
$x + x + 90° + 90° + 50° = 540°$
$2x + 230° = 540°$
$2x = 540° - 230°$
$x = \frac{310°}{2}$
$= 155°$

(c) Hasil tambah semua sudut pedalaman
Sum of all interior angles
$= (6 - 2) \times 180°$
$= 4 \times 180°$
$= 720°$

Maka / *Hence*,
$x + x + 3x + 79° + 116° + 130° = 720°$
$5x + 325° = 720°$
$5x = 720° - 325°$
$x = \frac{395°}{5}$
$= 79°$

8. (a) Hasil tambah semua sudut pedalaman
Sum of all interior angles
$= (8 - 2) \times 180°$
$= 6 \times 180°$
$= 1\,080°$

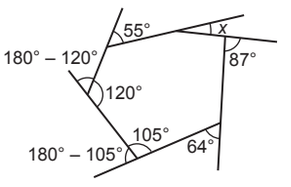
Sudut pedalaman
Interior angle
$= \frac{1\,080°}{8}$
$= 135°$

(b) Hasil tambah semua sudut pedalaman
Sum of all interior angles
$= (9 - 2) \times 180°$
$= 7 \times 180°$
$= 1\,260°$

Sudut pedalaman
Interior angle
$= \frac{1\,260°}{9}$
$= 140°$

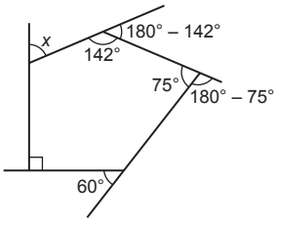
9. (a) $x + 90° + 90° + 60° + 85° = 360°$
$x + 325° = 360°$
$x = 360° - 325°$
$= 35°$

(b)



$x + 55° + (180° - 120°) + (180° - 105°) + 64° + 87° = 360°$
$x + 55° + 60° + 75° + 64° + 87° = 360°$
$x + 341° = 360°$
$x = 360° - 341°$
$= 19°$

(c)



$x + (180° - 142°) + (180° - 75°) + 60° + 90° = 360°$
$x + 38° + 105° + 60° + 90° = 360°$
$x + 293° = 360°$
$x = 360° - 293°$
$= 67°$

10.

Poligon sekata ***Regular polygon***	**Bilangan sisi, *n*** ***Number of sides, n***	**Nilai sudut peluaran** ***Value of an exterior angle***
(a) Oktagon *Octagon*	8	$= \frac{360°}{8} = 45°$
(b) Nonagon *Nonagon*	9	$= \frac{360°}{9} = 40°$
(c) Dekagon *Decagon*	10	$= \frac{360°}{10} = 36°$
(d) Heksagon *Hexagon*	6	$= \frac{360°}{6} = 60°$

11. (a) Sudut peluaran / *Exterior angle*
$= 180° - 150°$
$= 30°$

Bilangan sisi / *Number of sides*
$n = \frac{360°}{30°}$
$= 12$

(b) Sudut peluaran / *Exterior angle*
$= 180° - 156°$
$= 24°$

Bilangan sisi / *Number of sides*
$n = \frac{360°}{24°}$
$= 15$

(c) Sudut peluaran/ *Exterior angle*
$= 180° - 135°$
$= 45°$

Bilangan sisi, *n*
Number of sides, n
$= \frac{360°}{45°}$
$= 8$

(d) Sudut peluaran/ *Exterior angle*
$= 180° - 162°$
$= 18°$

Bilangan sisi, *n*
Number of sides, n
$= \frac{360°}{18°}$
$= 20$

12. (a) Bilangan sisi / *Number of sides*
$= \frac{360°}{40°}$
$= 9$

Nonagon/ *Nonagon*

(b) Bilangan sisi / *Number of sides*
$= \frac{360°}{36°}$
$= 10$

Dekagon/ *Decagon*

(c) Bilangan sisi, *n*
Number of sides, n
$= \frac{360°}{60°}$
$= 6$

Heksagon/ *Hexagon*

(d) Bilangan sisi, *n*
Number of sides, n
$= \frac{360°}{30°}$
$= 12$

Dodekagon/ *Dodecagon*

13. (a) Bagi sebuah segi empat selari,
For a parallelogram,

$\angle ABG = \angle AMG$,
$\angle BGM = \angle BAM$

$\angle BGM = \frac{360° - 2(82°)}{2}$
$= \frac{196°}{2} = 98°$

Sudut pedalaman heksagon sekata
Interior angle of regular hexagon
$= \frac{(6 - 2) \times 180°}{6}$
$= \frac{720°}{6} = 120°$

Maka/ *Thus*,
$\angle BGF = \angle MGH = 120°$

$x = 360° - \angle BGM - \angle BGF - \angle MGH$
$= 360° - 98° - 2(120°)$
$= 22°$

(b) Sudut peluaran / *Exterior angle*

$= \frac{360°}{12}$

$= 30°$

Sudut pedalaman / *Interior angle*

$= 180° - 30°$

$= 150°$

Poligon dengan 12 sisi boleh dibahagikan kepada 10 segi tiga.
A 12-sided polygon can be divided into 10 triangles.

Maka / *Therefore*,

$x = \frac{150°}{10} \times 4$

$= 60°$

(c) Sudut pedalaman segi tiga sama sisi
Interior angle of the equilateral triangle

$= 180° \div 3 = 60°$

Sudut pedalaman segi empat sama
Interior angle of the square

$= 360° \div 4 = 90°$

$p = 360° - 2(60°) - 90°$

$= 150°$

p ialah sudut pedalaman bagi poligon sekata yang akan terbentuk.
p is the interior angle of the regular polygon that will be formed.

$\frac{(n-2) \times 180°}{n} = 150°$

$180°n - 360° = 150°n$

$30°n = 360°$

$n = 12$

Maka, poligon dengan 12 sisi akan terbentuk.
Thus, polygon with 12 sides will be formed.

(d) Sudut pedalaman poligon sekata
Interior angle of the regular polygon

$= 90° + 45° = 135°$

Bilangan sisi poligon sekata
Number of sides of the regular polygon

$\frac{(n-2) \times 180°}{n} = 135°$

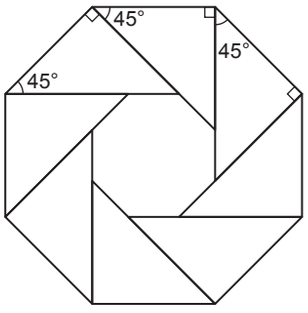
$180°n - 360° = 135°n$

$45°n = 360°$

$n = \frac{360°}{45°}$

$= 8$

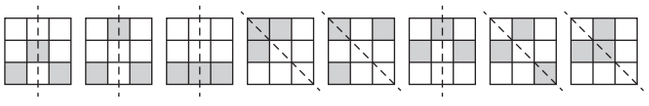
Pereka grafik itu memerlukan 8 buah segi tiga bersudut tegak supaya membentuk sebuah oktagon sekata. Maka, bentuk poligon yang terbentuk di tengah-tengah susunan itu juga adalah oktagon sekata.
The graphic designer needs 8 right-angled triangles to form a regular octagon. Thus, the polygon formed in the middle of the arrangement is also a regular octagon.



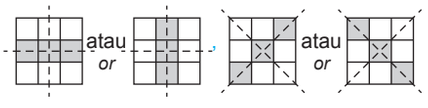
14. Aktiviti PAK-21

(a) 32

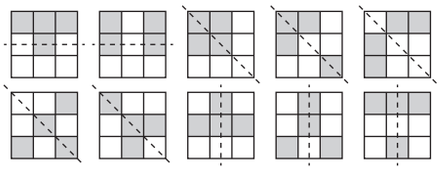
Setiap daripada bentuk berikut boleh dipusingkan untuk menghasilkan 4 segi empat sama yang berlainan dengan hanya mempunyai satu paksi simetri.
Each of the following patterns can be rotated to give 4 different squares with only one axis of symmetry.



(b) 4 kemungkinan/ 4 *possibilities*:



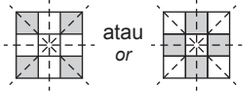
(c) (i) 10 kemungkinan/ 10 *possibilities*:



(ii) tiada/ *none*

(iii) tiada/ *none*

(iv) 2 kemungkinan/ 2 *possibilities*:



Power PT3

Bahagian A

1. Bilangan sisi
Number of sides

$= 10$

Jawapan / *Answer*: **D**

2. Sudut pedalaman / *Interior angle*

$$\frac{(n-2)\times 180^\circ}{5} = 108^\circ$$
$$(n-2)\times 180^\circ = 5(108^\circ)$$
$$n-2 = \frac{540^\circ}{180^\circ}$$
$$n = 3+2$$
$$= 5$$

Jawapan / *Answer*: **A**

3. Hasil tambah sudut pedalaman oktagon
Sum of interior angles of octagon
$= (8-2)\times 180^\circ$
$= 6\times 180^\circ$
$= 1\,080^\circ$

Jawapan / *Answer*: **C**

4. Hasil tambah sudut pedalaman pentagon = 540°
Sum of interior angles of pentagon = 540°

$107^\circ + 85^\circ + 123^\circ + a + b = 540^\circ$
$a + b = 540^\circ - 315^\circ$
$a + b = 225^\circ$

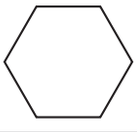
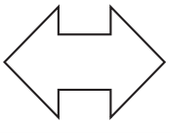
$c = 180^\circ - 85^\circ$
$= 95^\circ$

$a + b + c = 225^\circ + 95^\circ$
$= 320^\circ$

Jawapan / *Answer*: **C**

Bahagian B

5.

Poligon ***Polygon***	**Nama** ***Name***	**Bilangan paksi simetri** ***Number of axis of symmetry***
	Heksagon *Hexagon*	6
	Dekagon *Decagon*	2

6. (a) (i) Heptagon — 7

(ii) Nonagon — 9

(b) (i) Dekagon / *Decagon* — 8

(ii) Oktagon / *Octagon* — 6

7.

Poligon sekata ***Regular polygon***	**Sudut pedalaman** ***Interior angle***
Dekagon *Decagon*	120°
Nonagon *Nonagon*	144°
Oktagon *Octagon*	140°
Heksagon *Hexagon*	135°

Sudut pedalaman dekagon
Interior angle of decagon

$$= \frac{(10-2)\times 180^\circ}{10}$$
$$= \frac{1\,440^\circ}{10}$$
$$= 144^\circ$$

Sudut pedalaman nonagon
Interior angle of nonagon

$$= \frac{(9-2)\times 180^\circ}{9}$$
$$= \frac{1\,260^\circ}{9}$$
$$= 140^\circ$$

Sudut pedalaman oktagon
Interior angle of actagon

$$= \frac{(8-2)\times 180^\circ}{8}$$
$$= \frac{1\,080^\circ}{8}$$
$$= 135^\circ$$

Sudut pedalaman heksagon
Interior angle of hexagon

$$= \frac{(6-2)\times 180^\circ}{6}$$
$$= \frac{720^\circ}{6}$$
$$= 120^\circ$$

Bahagian C

8. (a) Bilangan sisi / *Number of sides* = 6

Nilai sudut peluaran / *The value of the exterior angle*

$$= \frac{360^\circ}{6}$$
$= 60^\circ$

Bilangan segi tiga yang terbentuk
The number of triangles formed
$= 6 - 2$
$= 4$

(b) $y = 180° - 150°$ $\quad x = 180° - 35° - 30°$
$= 30°$ $\quad = 115°$

(c) (i) $7x + 150° + 134° + 212° = 720°$
$7x + 496° = 720°$
$7x = 224°$
$x = \frac{224°}{7}$
$= 32°$

(ii) $y = 180° - 2(32°)$
$= 180° - 64°$
$= 116°$

9. (a) $\angle TQP = 180° \div 3$
$= 60°$

$\angle TQR = 180° - 60°$
$= 120°$

$\angle TSR = 360° - 90° - 120° - 43°$
$= 107°$

(b) $\angle AED = 180° - 110°$
$= 70°$

Hasil tambah sudut pedalaman
Sum of interior angles
$= (5 - 2) \times 180°$
$= 3 \times 180°$
$= 540°$

$110° + 2k + 140° + 3k + 70° = 540°$
$5k + 320° = 540°$
$5k = 540° - 320°$
$= 220°$
$k = 44°$

$\angle ABC = 2k$
$= 2(44°)$
$= 88°$

$\angle CDE = 3k$
$= 3(44°)$
$= 132°$

(c) Sudut pedalaman *RSUVW*
Interior angle of RSUVW
$= \frac{(5 - 2) \times 180°}{5}$
$= 108°$

$\angle QRW = 180° - (2 \times 39°)$
$= 102°$

Sudut pedalaman poligon tidak lengkap
Interior angle of the incomplete polygon
$= 360° - 108° - 102°$
$= 150°$

Bilangan sisi poligon
Number of sides of the polygon
$= \frac{360°}{180° - 150°}$
$= \frac{360°}{30°}$
$= 12$

Power KBAT

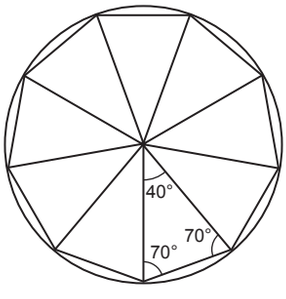
(a) Sudut pedalaman heksagon *ABCDJH*
Interior angle of hexagon ABCDJH
$= \frac{(6 - 2) \times 180°}{6}$
$= 120°$

Maka, $\angle ECG = \frac{120°}{2}$
Hence,
$= 60°$

Hasil tambah sudut pedalaman sisi empat *CEFG*
$= 360°$
The sum of interior angles of quadrilateral CEFG = 360°

$x + y + 90° + 60° = 360°$
$x + y = 360° - 90° - 60°$
$= 210°$

(b) (i)



Bilangan sudut yang dibahagikan pada pusat
Number of angles divided at the centre
$= \frac{360°}{40°}$
$= 9$

Terdapat 9 sektor yang sama dengan setiap sudutnya 40° pada pusat. Maka, 9 keping kadbod segi tiga diperlukan untuk membentuk poligon sekata itu.
There are 9 equal sectors with angles of 40° each at the centre. Therefore, 9 triangular cardboards are required to form the regular polygon.

(ii) Nonagon sekata / *Regular nonagon*