

RUMUS MATEMATIK
MATHEMATICAL FORMULAE

Rumus-rumus berikut boleh membantu anda menjawab soalan. Simbol-simbol yang diberi adalah yang biasa digunakan.

The following formulae may be helpful in answering the questions. The symbols given are the ones commonly used.

NOMBOR DAN OPERASI
NUMBERS AND OPERATIONS

- | | |
|---|---|
| 1 $a^m \times a^n = a^{m+n}$ | 2 $a^m \div a^n = a^{m-n}$ |
| 3 $(a^m)^n = a^{mn}$ | 4 $a^{\frac{m}{n}} = (a^{\frac{1}{n}})^m$ |
| 5 Faedah mudah / <i>Simple interest</i> , $I = Prt$ | |
| 6 Faedah kompaun / <i>Compound interest</i> , $MV = P\left(1 + \frac{r}{n}\right)^{nt}$ | |
| 7 Jumlah bayaran balik / <i>Total repayment</i> , $A = P + Prt$ | |

PERKAITAN DAN ALGEBRA
RELATIONSHIP AND ALGEBRA

- | | |
|---|--|
| 1 | Jarak / <i>Distance</i> = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ |
| 2 | Titik tengah / <i>Midpoint</i> , $(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ |
| 3 | Laju purata = $\frac{\text{Jumlah jarak}}{\text{Jumlah masa}}$

$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$ |
| 4 | $m = \frac{y_2 - y_1}{x_2 - x_1}$ |
| 5 | $m = -\frac{\text{pintasan-y}}{\text{pintasan-x}}$

$m = -\frac{\text{y-intercept}}{\text{x-intercept}}$ |
| 6 | $A^{-1} = \frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$ |

SUKATAN DAN GEOMETRI
MEASUREMENT AND GEOMETRY

- 1 Teorem Pythagoras / *Pythagoras Theorem*, $c^2 = a^2 + b^2$
- 2 Hasil tambah sudut pedalaman poligon / *Sum of interior angles of a polygon*
 $= (n - 2) \times 180^\circ$
- 3 Lilitan bulatan $= \pi d = 2\pi r$
Circumference of circle $= \pi d = 2\pi r$
- 4 Luas bulatan $= \pi r^2$
Area of circle $= \pi r^2$
- 5 $\frac{\text{Panjang lengkok}}{2\pi r} = \frac{\theta}{360^\circ}$
 $\frac{\text{Arc length}}{2\pi r} = \frac{\theta}{360^\circ}$
- 6 $\frac{\text{Luas sektor}}{\pi r^2} = \frac{\theta}{360^\circ}$
 $\frac{\text{Area of sector}}{\pi r^2} = \frac{\theta}{360^\circ}$
- 7 Luas layang-layang $= \frac{1}{2} \times$ hasil darab panjang dua pepenjuru
Area of kite $= \frac{1}{2} \times \text{product of two diagonals}$
- 8 Luas trapezium $= \frac{1}{2} \times$ hasil tambah dua sisi selari $\times$ tinggi
Area of trapezium $= \frac{1}{2} \times \text{sum of two parallel sides} \times \text{height}$
- 9 Luas permukaan silinder $= 2\pi r^2 + 2\pi rh$
Surface area of cylinder $= 2\pi r^2 + 2\pi rh$
- 10 Luas permukaan kon $= \pi r^2 + \pi rs$
Surface area of cone $= \pi r^2 + \pi rs$
- 11 Luas permukaan sfera $= 4\pi r^2$
Surface area of sphere $= 4\pi r^2$
- 12 Isi padu prisma $=$ luas keratan rentas $\times$ tinggi
Volume of prism $= \text{area of cross section} \times \text{height}$
- 13 Isi padu silinder $= \pi r^2 h$
Volume of cylinder $= \pi r^2 h$

14 Isi padu kon $= \frac{1}{3} \pi j^2 t$

Volume of cone $= \frac{1}{3} \pi r^2 h$

15 Isi padu sfera $= \frac{4}{3} \pi j^3$

Volume of sphere $= \frac{4}{3} \pi r^3$

16 Isi padu piramid $= \frac{1}{3} \times \text{luas tapak} \times \text{tinggi}$

Volume of pyramid $= \frac{1}{3} \times \text{base area} \times \text{height}$

17 Faktor skala, $k = \frac{PA'}{PA}$

Scale factor, k $= \frac{PA'}{PA}$

18 Luas imej $= k^2 \times \text{luas objek}$

Area of image $= k^2 \times \text{area of object}$

STATISTIK DAN KEBARANGKALIAN

STATISTICS AND PROBABILITY

1 Min/ Mean, $\bar{x} = \frac{\sum x}{N}$

2 Min/ Mean, $\bar{x} = \frac{\sum fx}{f}$

3 Varians/ Variance, $\sigma^2 = \frac{\sum (x - \bar{x})^2}{N} = \frac{\sum x^2}{N} - \bar{x}^2$

4 Varians/ Variance, $\sigma^2 = \frac{\sum f(x - \bar{x})^2}{\sum f} = \frac{\sum fx^2}{\sum f} - \bar{x}^2$

5 Sisihan piawai/ Standard deviation, $\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{N}} = \sqrt{\frac{\sum x^2}{N} - \bar{x}^2}$

6 Sisihan piawai/ Standard deviation, $\sigma = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}} = \sqrt{\frac{\sum fx^2}{\sum f} - \bar{x}^2}$

7 $P(A) = \frac{n(A)}{n(S)}$

8 $P(A') = 1 - P(A)$

Jawab **semua** soalan di dalam kertas ini

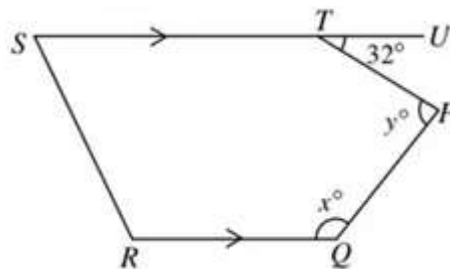
Answer **all** the questions in this paper

1. Seorang penyelam berada 45 m dibawah aras laut. Dia berenang naik 3 m setiap 6 saat. Hitung masa yang diambil , dalam saat untuk sampai ke aras laut
A diver is at 45 m below sea level. He swims up 3 m every 6 seconds. Calculate the time taken , in seconds, to reach sea level.

- A. 75
 B. 90
 C. 100
 D. 120

- 2 Dalam Rajah 2. PQIRST adalah sebuah pentagon. STU adalah garis lurus.

In Diagram 2, PQIRST is a pentagon. STU is a straight line.



Rajah 2/Diagram 2

Cari nilai $x + y$.

Find the value of $x + y$.

- | | |
|---------------|---------------|
| A 212° | C 384° |
| B 362° | D 392° |
3. Senaraikan semua integer x yang memuaskan kedua-dua ketaksamaan
 $3x - 8 < x \leq 5 + 4x$.
- | | |
|------------------|-------------------------|
| A 0, 1, 2, 3 | C -1, 0, 1, 2, 3, 4 |
| B -1, 0, 1, 2, 3 | D -2, -1, 0, 1, 2, 3, 4 |

4. Permudahkan $3(2x - 1) - 8 - 4x$.

Simplify $3(2x - 1) - 8 - 4x$.

A $2x - 8$

B $2x - 11$

C $3x - 8$

D $3x - 11$

5. Diberi $\frac{x+1}{5} = \frac{2x-1}{2}$, hitung nilai x

Given $\frac{x+1}{5} = \frac{2x-1}{2}$, calculate the value of x

A $\frac{1}{4}$

C $\frac{7}{9}$

B $\frac{3}{4}$

D $\frac{7}{8}$

- 6 Empat sebutan pertama bagi suatu jujukan ialah 11, x , -5 , -13 . Nyatakan sebutan ke-10, T_{10} .

The first four terms of a sequence are 11, x , -5 , -13 . State the 10th term, T_{10} .

A -71

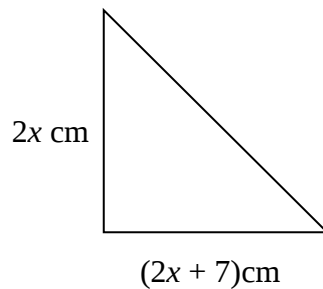
C -61

B -69

D -79

- 7 Rajah di bawah menunjukkan sebuah segi tiga PQR.

The diagram below shows a triangle PQR.



Rajah 7/Diagram 7

Cari luas, dalam cm^2 , segitiga itu.

Find the area, in cm^2 , of the triangle.

- A** $2x^2 + 7$
B $4x^2 + 14x$
C $4x^2 + 14$
D $2x^2 + 7x$
- 8 Rajah 8 menunjukkan satu oktagon sekata dalam sebuah bulatan yang berpusat di O dengan jejari 7 CM

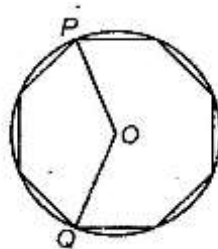
Hitung panjang minor, dalam cm, bagi lengkok PQ.

(Gunakan $\pi = \frac{22}{7}$)

Diagram 8 shows a regular octagon in a circle with centre O and radius of 7 cm.

Calculate the minor length, in cm, of the arc PQ.

(Use $\pi = \frac{22}{7}$)



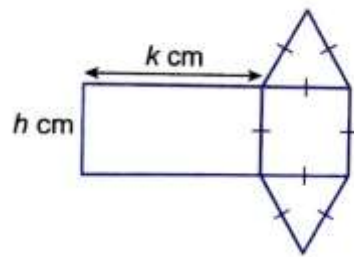
Rajah 8/Diagram 8

- | | |
|---------------|-------------|
| A 5.5 | C 17 |
| B 16.5 | D 22 |

- 9 Rajah 9 menunjukkan bentuk gabungan yang terdiri daripada segi empat tepat, segi empat sama dan segi tiga sama sisi. Diberi tinggi segi tiga sama sisi ialah 5 cm.

Ungkapkan luas, L bentuk gabungan tersebut dalam sebutan k dan h .

Diagram 9 shows a combination shape of rectangle, square and equilateral triangles. Given the height of the equilateral triangle is 5 cm. Express the area, L of the combination shape in terms of k and h .



Rajah 9/Diagram 9

A $L = hk + 5h + 25$

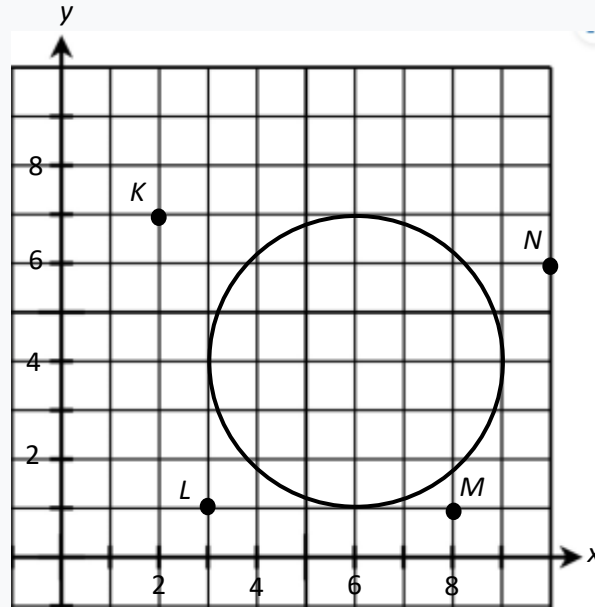
C $L = hk + h^2 + 5h$

B $L = 5k + 5h + 25$

D $L = 2k + h^2 + 5h$

- 10 Dalam Rajah 10, K , L , M dan N mewakili beberapa batang pokok yang terdapat di sekeliling sebuah pancutan air berbentuk bulatan.

In the Diagram 10, K , L , M and N represent several trees growing around a circular water fountain.



Rajah 10/Diagram 10

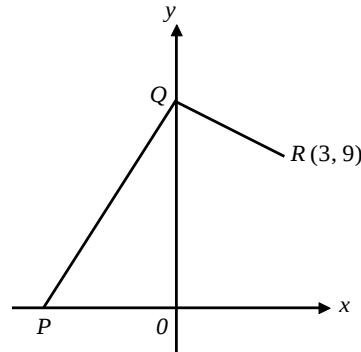
Pokok yang manakah berjarak 5 unit dari pusat pancutan air itu?

Which of the trees is 5 units from the centre of the fountain?

- A** K
- B** L
- C** M
- D** N

- 11 Rajah 11 menunjukkan dua garis lurus, PQ dan QR di atas suatu satah Cartes.

Diagram 11 shows two straight lines, PQ and QR on a Cartesian plane.



Rajah 11/Diagram 11

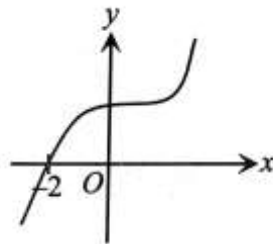
Diberi bahawa jarak bagi PQ ialah 13 unit dan kecerunan QR ialah -1 . Cari pintasan- x bagi PQ.

Given that the distance of PQ is 13 units and the gradient of QR is -1 . Find the x -intercept of PQ.

- | | |
|---------------|---------------|
| A -3 | C -5 |
| B -4 | D -6 |

- 12 Rajah 12 menunjukkan graf bagi satu fungsi kuadratik. Persamaan manakah yang mewakili graf tersebut?

Diagram 12 shows a graph of a quadratic function. Which equation represents the graph?



Rajah 12/Diagram 12

- | | |
|------------------------|--------------------------|
| A $y = -2x + 3$ | C $y = x^3 + 6$ |
| B $y = x^3 + 8$ | D $y = -2x^3 + 8$ |

- Table 13 shows the scores obtained by a group of students in a Mathematics Test.

Markah <i>Marks</i>	0-19	20-39	40-59	60-79	80-100
Bilangan murid <i>Number of students</i>	3	8	15	14	10

Cari kekerapan markah yang melebihi 39 diperolehi.

Find the frequency of marks above 39 occurring.

- | | | | |
|----------|----|----------|----|
| A | 11 | C | 39 |
| B | 26 | D | 47 |

- 14 Antara situasi berikut, yang manakah menunjukkan laju tak seragam?
Which of the following situations shows non-uniform speed?

- A** Pergerakan jarum minit dan saat pada suatu jam.
The movement of the minute and second hands on a clock.
- B** Pergerakan sebuah eskalator di sebuah pasaraya
The movement of an escalator in a supermarket.
- C** Pergerakan sebuah teksi di bandar.
Movement of a taxi in the city.
- D** Pergerakan sebuah ladung dalam jam dinding.
The movement of a charge in a wall clock.

- 15 Diberi $\sin x = \frac{4}{5}$ dan $\cos x = \frac{3}{5}$, cari nilai $\tan x$.

Given $\sin x = \frac{4}{5}$ and $\cos x = \frac{3}{5}$, find the value of $\tan x$

- | | | | |
|----------|---------------|----------|---------------|
| A | $\frac{3}{5}$ | C | $\frac{4}{5}$ |
| B | $\frac{3}{4}$ | D | $\frac{4}{3}$ |

16 Permudahkan:
 Simplify:

$$\left[\frac{p^{10} \times (4q^8)^{\frac{1}{2}}}{(p^{16}q^{24})^{\frac{1}{4}}} \right]^3$$

- | | | | |
|----------|--------------------|----------|------------------------|
| A | $\frac{4q^6}{p^2}$ | C | $\frac{8p^{18}}{q^6}$ |
| B | $\frac{8p^6}{q^6}$ | D | $\frac{64}{p^{18}q^6}$ |

- 17 Muaz menggunakan RM5000.00 untuk membeli amanah saham Q. Dalam tempoh dia memegang unit itu, dia telah mendapat dividen sebanyak RM200.00. Selepas setahun, dia menjual semua unit amanah saham itu dan mendapat RM5200.00. Hitung nilai pulangan pelaburan itu.

Muaz used RM5000.00 to buy unit trust Q. During the unit holding period, he received dividend of RM200.00. After a year, he sold all the units and received RM5200.00. Calculate the return of investment.

- | | | | |
|----------|----|----------|------|
| A | 8% | C | 8.2% |
| B | 4% | D | 4.2% |

- 18 Dalam suatu pertandingan kuiz didapati hasil tambah bagi enam nombor ialah 90 dan variansnya ialah 15. Hitung hasil tambah kuasa dua bagi enam nombor tersebut.

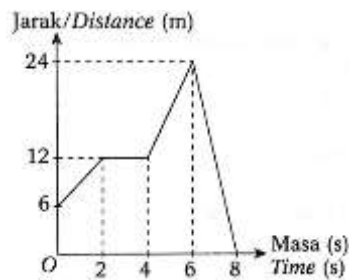
In a quiz competition it was found that the sum of six numbers is 90 and its variance is 15. Calculate the sum of square of the six numbers.

- A** 140
B 260
C 1440
D 2440

- 19 Terdapat 8 biji epal, 18 biji oren dan beberapa biji lemon di dalam sebuah kotak. Sebiji buah-buahan dipilih secara rawak daripada kotak itu. Kebarangkalian untuk memilih sebiji oren ialah $\frac{9}{25}$. Cari jumlah buah-buahan di dalam kotak itu.

There are 8 apples, 18 oranges and some lemons in a box. A fruit is chosen at random from the box. The probability of choosing an orange is $\frac{9}{25}$. Find the total of fruits in the box.

- A 24
B 42
C 50
D 68
20. Graf jarak-masa dalam Rajah 2 menunjukkan gerakan satu zarah dalam tempoh 8 saat.
The distance-time graph in Diagram 2 shows the motion of a particle for a period of 8 seconds.



Rajah 2 / Diagram 2

Antara berikut, yang manakah **tidak** benar?

*Which of the following is **not** true?*

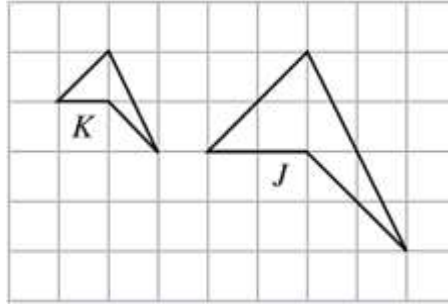
- A Laju dalam 2 saat pertama ialah 3 m s^{-1} .
The speed for the first 2 seconds is 3 m s^{-1} .
- B Laju dalam 2 saat terakhir ialah 12 m s^{-1} .
The speed for the last 2 seconds is 12 m s^{-1} .
- C Laju purata dalam tempoh 8 saat ialah 3 m s^{-1} .
The average speed for the period of 8 seconds is 3 m s^{-1} .
- D Laju dari saat ke-2 hingga saat ke-4 ialah 0 m s^{-1} .
Speed from 2nd second till 4th second is 0 m s^{-1} .

21. Rajah 21 menunjukkan 2 segi empat K dan J yang dilukis di atas grid segi empat sama. Diberi J ialah imej bagi objek K.

Tentukan skala yang digunakan

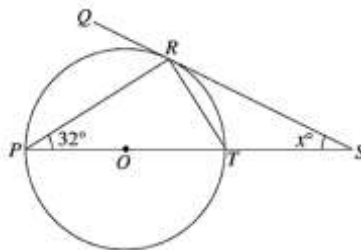
Diagram 21 shows 2 quadrilaterals K and J drawn on the square grids. Given J is an image of object K

Determine the scale used



Rajah 21/Diagram 21

- A $1 : \frac{1}{3}$
 B $1 : \frac{1}{2}$
 C $1 : 2$
 D $1 : 3$
22. Dalam Rajah 22 menunjukkan sebuah bulatan yang berpusat di O. Diberi QRS ialah tangen kepada bulatan di titik R. POTS ialah garis lurus.
- In Diagram 22 shows a circle with centre O, QRS is a tangent to the circle at point R. POTS is a straight line.*



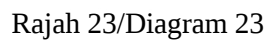
Rajah 22/Diagram 22

Cari nilai x.

Find the value of x.

- | | | | |
|---|----|---|----|
| A | 22 | C | 32 |
| B | 26 | D | 36 |

- Diagram 23 shows a combination plan of a cuboid and a cylinder. If the height of the cuboid and cylinder is 5 cm, calculate the combined volume, in cm^3 , of the solid.



- Diagram 24 shows a Venn diagram of set G , set M and set S .



It is given that $\xi = G \cup M \cup S$ and $n(M \cap S) = n(G)$. Find the value of x .

- | | |
|----------|----|
| A | 6 |
| B | 7 |
| C | 9 |
| D | 11 |

- 25 Cari persamaan paksi simetri bagi graf fungsi kuadratik $f(x) = -2x^2 + 4x + 2$.

Find the equation of axis of symmetry for the graph of the quadratic equation $f(x) = -2x^2 + 4x + 2$.

- A** $x = -1$
- B** $x = -4$
- C** $x = 1$
- D** $x = 4$

- 26 Alia telah membuat langkah keselamatan dengan memasang kunci keselamatan tambahan. Untuk membuka kunci itu, kod rahsianya yang mempunyai angka 0-4. Alia telah mencatat nombor kod rahsianya sebagai 58 dalam buku memo. Bolehkah anda meneka nombor yang dipilih oleh Alia untuk membuka kunci keselamatan tambahannya?

Alia has made safety precautions by installing additional security keys. To unlock it, the secret code has a number 0-4. Alia has posted her secret code number as 58 in the memo book. Can you guess the number chosen by Alia to unlock its extra security?

- A** 123 **C** 312
- B** 213 **D** 321

27

Jika $x+3 > 2$, maka $x > -1$.

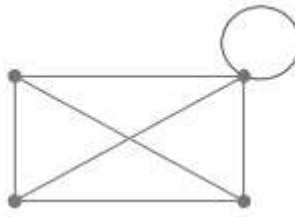
If $x+3 > 2$, then $x > -1$.

Nyatakan kontrapositif bagi implikasi di atas.

State the contrapositive of the above implication.

- A** Jika $x > -1$, maka $x+3 > 2$.
If $x > -1$, then $x+3 > 2$.
- B** Jika $x \geq -1$, maka $x+3 \geq 2$.
If $x \geq -1$, then $x+3 \geq 2$.
- C** Jika $x+3 \leq 2$, maka $x \leq -1$.
If $x+3 \leq 2$, then $x \leq -1$.
- D** Jika $x \leq -1$, maka $x+3 \leq 2$.
If $x \leq -1$, then $x+3 \leq 2$.

- 28 Rajah 28 menunjukkan suatu graf.
Diagram 28 shows a graph.



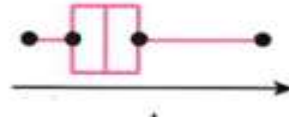
Rajah 28
Diagram 28

Hitung bilangan darjah.
Calculate the sum of degrees.

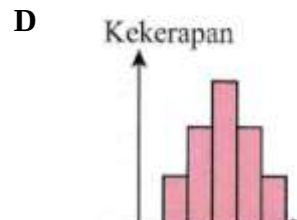
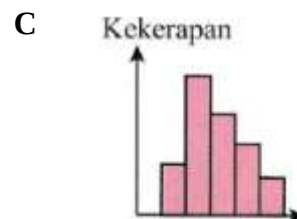
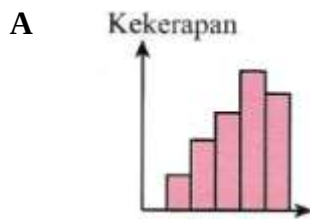
- | | |
|-------------|-------------|
| A 9 | C 14 |
| B 12 | D 20 |
- 29 Titik manakah yang memuaskan ketaksamaan linear $y > 4 - x$ dan $y > \frac{1}{2}x + 3$.
Which point satisfies the linear inequalities $y > 4 - x$ and $y > \frac{1}{2}x + 3$.
- | | |
|-----------------|------------------|
| A (1, 2) | C (3, 0) |
| B (2, 5) | D (4, -1) |

- 30 Plot kotak di bawah menunjukkan satu bentuk taburan data. Tentukan histogram yang sepadan dengan plot kotak berkenaan.

Box plot below shows a type of data dispersion. Determine the matched histogram for the box plot.



Rajah 30/Diagram 30



- 31 Jadual 31 menunjukkan beberapa nilai bagi pembolehubah r dan s .

Table 31 shows some values of the variables r and s .

s	1	2	3	4
r	2	8	18	32

Jadual 31 / Table 31

Nyatakan hubungan di antara r dan s .

Find the relation between r and s .

A $r \propto s^2$

B $r \propto \sqrt{s}$

C $r \propto s^{-2}$

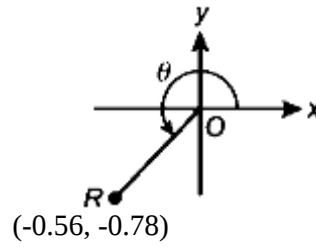
D $r \propto s^3$

- | | |
|--|---------|
| Gaji / <i>Salary</i> | RM 3500 |
| Elaun / <i>Allowance</i> | RM 800 |
| Sewa diterima / <i>Rental received</i> | RM 600 |
| Dividen / <i>Divident</i> | RM 250 |

Peperiksaan Gempur SPM 2022

- 35 Rajah 35 di bawah menunjukkan titik R diplotkan pada suatu satah Cartes.

Diagram 35 below shows point R plotted on a Cartesian plane.



Rajah 35/Diagram 35

Cari nilai θ .

Find the value of θ .

- | | | | |
|----------|-----------------|----------|-----------------|
| A | $215^\circ 40'$ | C | $234^\circ 19'$ |
| B | $224^\circ 19'$ | D | $254^\circ 19'$ |

36. Antara berikut, yang manakah dikategorikan sebagai pengecualian cukai?

Which of the following, are categorized as an exemption tax?

I) Hadiah kepada pelbagai organisasi.

Gift to various organizations.

II) Derma kepada perpustakaan negeri.

Donation to state libraries.

III) Rebat cukai.

Tax rebate.

IV) Zakat atau fitrah.

Zakat or fitrah.

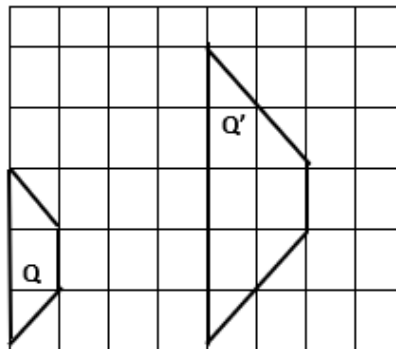
- | | | | |
|----------|---|----------|---|
| A | I dan II sahaja.
<i>I and II only.</i> | C | I, II dan III sahaja.
<i>I, II and III only.</i> |
| B | II dan III sahaja.
<i>II and III only.</i> | D | I, II, III dan IV.
<i>I, II, III and IV.</i> |

- 37 Seorang penjual buah-buahan telah menjual buah tembikai dengan purata RM13 000 sebulan pada bulan Mei, Jun dan Julai. Pada bulan Mei, tembikai yang dijual ialah RM10 500 dan penjualan pada bulan Jun adalah dua kali ganda daripada bulan Julai. Hitung jumlah jualan tembikai pada bulan Julai. Ungkapkan jawapan anda dalam bentuk piawai.

A fruit seller sold an average of RM13 000 watermelon per month in May, June and July. Given that the watermelon sold in May is RM10 500 and the sale in June is twice compared to July.

Calculate the total watermelons sold in July. Express your answer in a standard form.

- A** 9.5×10^4
B 9.5×10^3
C 1.05×10^4
D 1.9×10^4
- 38 Rajah 38 menunjukkan Q' ialah imej Q di bawah satu pembesaran.
Diagram 38 shows Q' is the image of Q under an enlargement.



Rajah 38/Diagram 38

Faktor skala pembesaran itu ialah

The scale factor of the enlargement is

- | | | | |
|----------|-------|----------|-----|
| A | -2 | C | 0.5 |
| B | - 0.5 | D | 2 |

- 39 En Jamil telah membeli sebuah rumah baru yang bernilai RM179 800. Oleh kerana pertumbuhan ekonomi pesat membangun di kawasan itu, maka nilai rumahnya meningkat dalam kadar purata 8% setahun untuk 5 tahun.

Andaian manakah yang boleh dinyatakan berdasar situasi di atas?

Mr. Jamil has bought a new house worth RM179 800. Due to the rapid economic growth in the area, the value of his house increased at an average rate of 8% per year for 5 years.

Which assumption can be stated based on the above situation?

- A** Kadar purata faedah rumahnya berubah 8% daripada 5 tahun.

The average interest rate on his house changes 8% over 5 years

- B** Nilai rumahnya meningkat 8% pada tahun ke-5.

The value of his house increased by 8% in the 5th year.

- C** Kadar purata rumahnya setiap 5 tahun adalah 8% melebihi daripada nilai sebenar

The average rate of his house every 5 years is 8% more than the actual value.

- D** Kadar purata 8% setahun sehingga tahun ke-5 nilainya semakin meningkat.

Average rate of 8% per year until the 5th year the value is increasing.

40. Diberi set $P = \{2, 3, 5, 7, 11\}$ dan set $Q = \{2, 3, 5, 7, 9, 11\}$, pernyataan yang manakah adalah **benar**?

*Given set $P = \{2, 3, 5, 7, 11\}$ and set $Q = \{2, 3, 4, 5, 6\}$, which statement is **true**?*

- A** $Q \subset P \neq \emptyset$

- B** $P \subset Q \neq \emptyset$

- C** $\{2, 3, 9, 11\} \notin \text{set } Q$

- D** $\{2, 3, 9, 11\} \in \text{set } P$