Geylang Methodist School (Secondary)
Preliminary Examination 2024

Candidate Name	**ANSWER KEY**		
Class		**Index Number**	

MATHEMATICS (SYLLABUS A)

4045 / 01

Paper 1

4 Normal (Academic)

Candidates answer on the Question Paper.

2 hours

Setter: Ms Tan Kai Wei

Monday, 5 August 2024

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** the questions.
The number of marks is given in brackets [ ] at the end of each question or part question.

If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
The total of the marks for this paper is **70**.

The use of an approved scientific calculator is expected, where appropriate.
If the degree of accuracy is not specified in the question and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

For Examiner's Use
70

Mathematical Formulae

Compound Interest

$$\text{Total amount} = P\left(1+\frac{r}{100}\right)^n$$

Mensuration

$$\text{Curved Surface area of a cone} = \pi rl$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

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

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

$$\text{Area of triangle } ABC = \frac{1}{2}ab\sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2}r^2\theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

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

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

Statistics

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

$$\text{Standard deviation} = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \left(\frac{\Sigma fx}{\Sigma f}\right)^2}$$

Answer **all** the questions.

1 **(a)** Write $0.005\,625\,819$ correct to 4 significant figures.

Ans: 0.005626 (4sf)

Answer ……..……. [1]

(b) Express $3\frac{3}{8}$ as a percentage.

Ans: 337.5%

Answer ……..……% [1]

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2 Find the smallest integer satisfying the inequality $3x > -17$.

$3x > -17$

$x > -5\frac{2}{3}$ [M1]

Smallest integer = -5 [A1]

Answer ……..……. [2]

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3 **(a)** $\sin x° = 0.6$

Given that x is an obtuse angle, find x.

$\sin x° = 0.6$

$x = \sin^{-1} 0.6$

$= 36.9°$ or $143.1°$ (1dp)

Since x is an obtuse angle, $x = 143.1$. [B1]

Answer x = ……..……. [1]

(b) $\cos 135° = -\cos y°$

Given that y is an acute angle, find y.

$y = 180° - 135°$

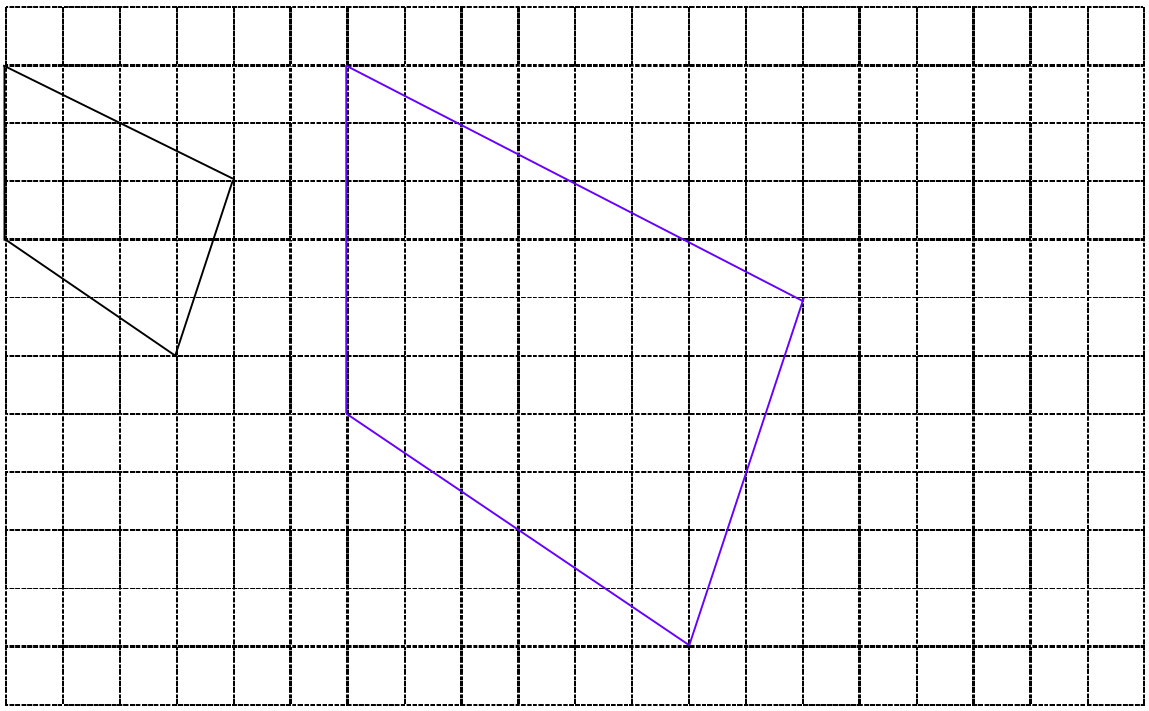
$= 45°$

$y = 45$ [B1]

Answer y = ……..……. [1]

[Turn Over

4



[B1 for 2 correct lines drawn x2]

Draw an enlargement of this pentagon using a scale factor of 2. [2]

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5 The first 5 terms of a number sequence are

5, 9, 13, 17, 21, …

(a) Find an expression for the *n*th term of the sequence.

*n*th term = $4n + 1$ [B1]

Answer ……..……. [1]

(b) Find the 30^{th} term.

30^{th} term = $4(30) + 1 = 121$ [B1]

Answer ……..……. [1]

(c) The *p*th term in the sequence is 249.

Find *p*.

$4n + 1 = 249$ [M1 – ECF from (a)]
$4n = 248$
$n = 62$ [A1]

Answer p = ……..……. [2]

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6 **(a)** Express $\frac{2}{x-3}-\frac{3}{x^2-9}$ as a single fraction in its simplest form.

$\frac{2}{x-3}-\frac{3}{x^2-9}$

$=\frac{2}{x-3}-\frac{3}{(x+3)(x-3)}$ [M1 for showing $(x+3)(x-3)$]

$=\frac{2(x+3)}{(x-3)(x+3)}-\frac{3}{(x+3)(x-3)}$

$=\frac{2x+6}{(x-3)(x+3)}-\frac{3}{(x+3)(x-3)}$ [M1 for showing $2x+6$]

$=\frac{2x+6-3}{(x-3)(x+3)}$

$=\frac{2x+3}{(x-3)(x+3)}$ [A1]

Answer ……..……. [3]

(b) Rearrange the formula to make *z* the subject.

$x=5y+2z^2$

$x=5y+2z^2$

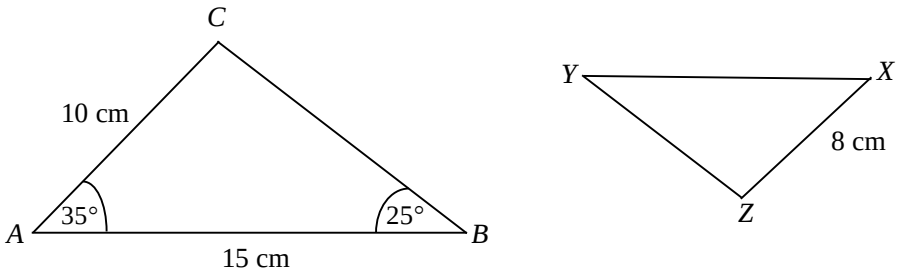
$2z^2=x-5y$ [M1 for having $2z^2$ on one side]

$z^2=\frac{x-5y}{2}$

$z=\pm\sqrt{\frac{x-5y}{2}}$ [A1 including $\pm$]

Answer z = ……..……. [2]

7 Triangle *ABC* is similar to triangle *XYZ*.



(a) Find the value of angle *XYZ*.

$\angle XYZ = \angle ABC = 25°$ [B1]

Answer Angle *XYZ* = ……...……. [1]

(b) Find the value of *XY*.

$\frac{XY}{AB} = \frac{XZ}{AC}$

$\frac{XY}{15} = \frac{8}{10}$ [M1 or M1 awarded for finding scale factor]

$10XY = 120$

$XY = 12$ [A1]

Answer XY = ……...……. [2]

8 Given that $a : b = 7 : 5$ and $b : c = \frac{1}{3} : \frac{1}{2}$, find $a : c$.

$b : c = \frac{1}{3} : \frac{1}{2}$
$= 2 : 3$ [M1 – converting ratio in fraction to integer]
$= 10 : 15$

$a : b = 7 : 5 = 14 : 10$

$a : c = 14 : 15$ [A1]

Answer …… : ..…….. [2]

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9 Factorise.

(a) $15x^3 + 3x$

$15x^3 + 3x$
$= 3x(5x^2 + 1)$ [B1]

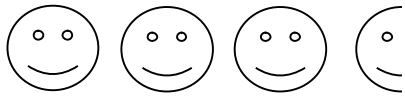
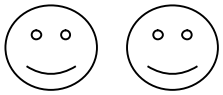
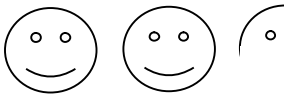
Answer ……..…….. [1]

(b) $2y^2 + y - 6$

$2y^2 + y - 6$
$= (2y - 3)(y + 2)$ [B1 for each bracket x2]

Answer ……..…….. [2]

10 The chart below shows the number of books read by each student in a year.

Jane	
Alex	
Revo	
Faris	
Hayd	

Key:  represents 20 books.

(a) Who reads the most number of books?

Faris [B1]

Answer ……..……. [1]

(b) Express the number of books Alex read, as a fraction of the number of books Faris read.

$\frac{2}{7}$ [B1]

Answer ……..……. [1]

(c) Explain one limitation of using pictogram to represent data.

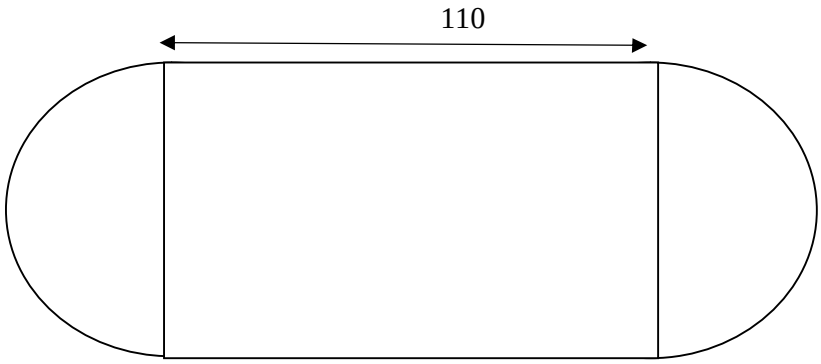
Answer

It may lead to misinterpretation of data as it is difficult to represent data which are not multiples of 20. [B1]

[1]

11 A stadium is made up of one rectangle and two semi-circles as shown.
The ratio of the length to the breadth of the rectangle is 5 : 3.
The length of rectangle is 110 m.

Calculate the area of the stadium.



Breadth = $\frac{110}{5} \times 3$ = 66m [M1]

Radius = 33m

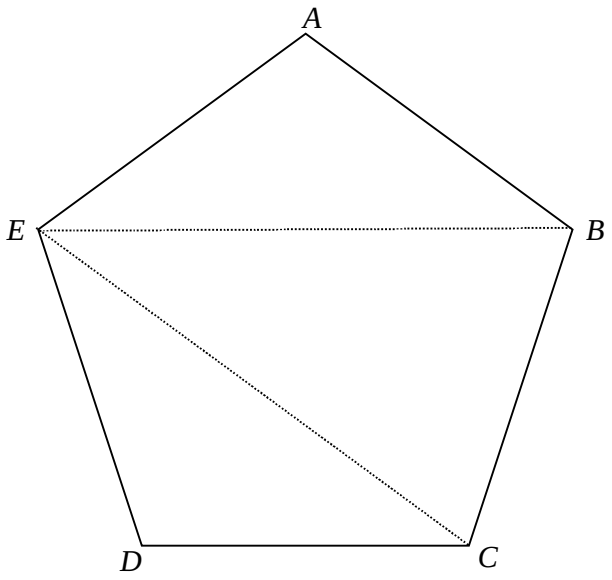
Area of 2 semi-circles = $2 \times \frac{1}{2} \times \pi \times (33)^2$ = 1089π m^2 [M1]

Area of rectangle = 110×66 = 7260 m^2

Total area = 1089π + 7260 = 10681.1944 = 10700 m^2 [A1]

Answer ……..……m^2 [3]

12



ABCDE is a regular pentagon. Calculate angle *BEC*.

Regular pentagon → all sides equal & all interior angles equal

Each interior angle
$= [(5-2)\times 180°] \div 5$
$= 108°$ [M1]

Triangle ABE and DEC are exactly the same and both are isosceles triangles.
angle *ABE*
= angle *DEC*
$= (180-108) \div 2$
$= 36°$ [M1]

angle *BEC*
$= 108 - 36 - 36$
$= 36°$ [A1]

Answer Angle *BEC* = ……..…… [3]

13 **(a)** Andy invests \$12000 for 5 years.
His investment offers an annual interest rate of 1.8% compounded half-yearly.
How much is the investment worth at the end of the five years?

Total amount
$= 12000\left(1+\frac{0.9}{100}\right)^{10}$ [M1]
$= 13124.81$ (2dp) [A1]

To accept \$13100 (to 3sf) as well.

Answer \$……..……. [2]

(b) Betty sold her car for \$82 000 and made a loss of 36%.
How much did she buy her car for?

Original price of car
$= 82000 \div \frac{64}{100}$ [M1]
= \$128125 [A1]

Answer \$……..……. [2]

(c) The price of an oven is \$1800.
Cindy decides to pay by hire purchase.
She pays a 20% deposit and then 12 equal payments of \$135.
How much does she pay in total?

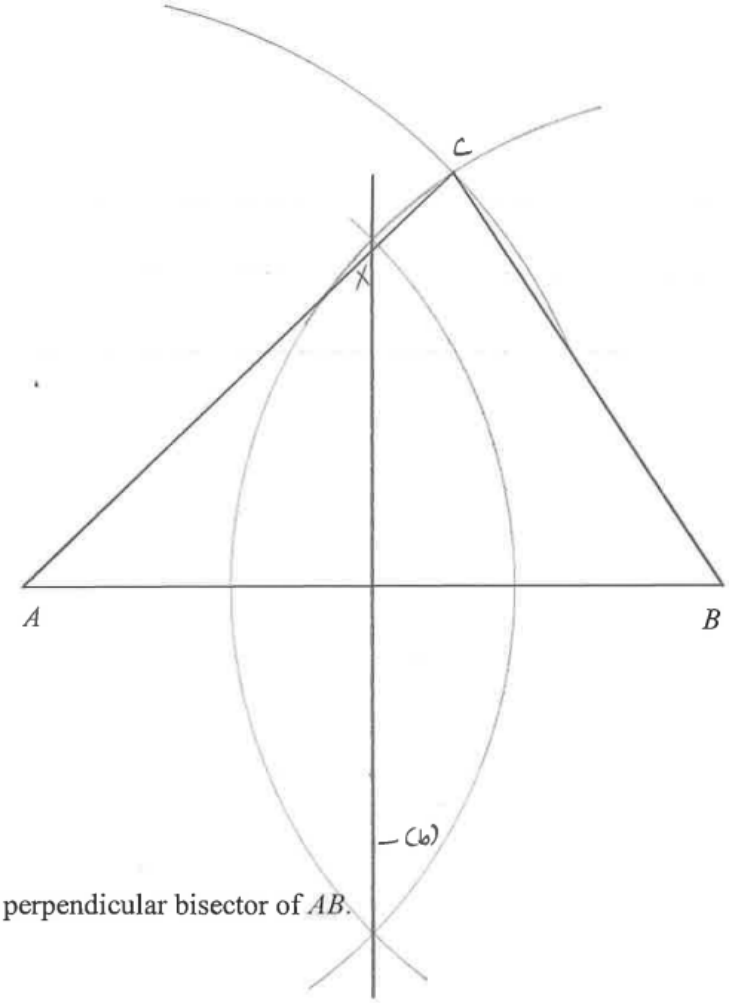
Total payments made
$= 20\% \times 1800 + 12 \times 135$ [M1 – 12 equal payments]
= \$1980 [A1]

Answer \$……..……. [2]

[Turn Over

14 In triangle *ABC*, *AC* = 8.5 cm and *BC* = 7 cm.

(a) Construct triangle *ABC*.
AB has been drawn for you.



[2]

(b) Construct the perpendicular bisector of *AB*. [1]

(c) *X* is the point where the perpendicular bisector of *AB* crosses *AC*.
Measure *XB*.

Answer *XB* = 6.9 ± 0.1 cm [1]

[Turn over

15 $x^2 + 8x - 3 = (x + a)^2 + b$

(a) Find the value of a and the value of b.

$x^2 + 8x - 3$
$= x^2 + 8x + 4^2 - 4^2 - 3$
$= (x + 4)^2 - 19$

$a = 4$ [B1]
$b = -19$ [B1]

Answer a = …….

b = ……. [2]

(b) Hence solve $x^2 + 8x - 3 = 0$.
Give your answers correct to 2 decimal places.

$(x + 4)^2 - 19 = 0$
$(x + 4)^2 = 19$
$x + 4 = \pm\sqrt{19}$ [M1 with ± written]
$x = \pm\sqrt{19} - 4$
$x = 0.36$ (2dp) or -8.36 (2dp) [A1 for both correct]

[ECF1 awarded if all workings correct using the wrong answer from (a)]

Answer x = …… or x = …… [2]

16 John has a map drawn to the scale of 1 : 400 000.

(a) The distance of a road drawn on the map is 8 cm.
Calculate the actual distance, in kilometres, the length of the road.

Map	Actual		Map	Actual	
1 cm	400000 cm		1 cm	400000 cm	
8 cm	3200000 cm	[M1]	1 cm	4 km	[M1]
8 cm	32 km	[A1]	8 cm	32 km	[A1]

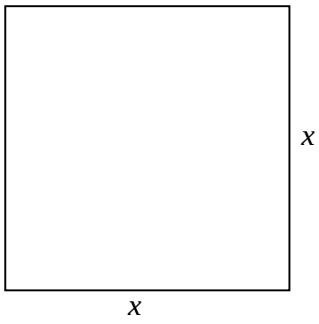
Answer ……..……. km [2]

(b) The area of the forest is 136 km^2.
Calculate the area, in cm^2, of the forest on the map.

Map		Actual		Map		Actual	
1 cm		4 km		1 cm		16 0000000000 cm^2	
1 cm^2		16 km^2	[M1]	1 cm^2		16 km^2	[M1]
8.5 cm^2	[A1]	136 km^2		8.5 cm^2	[A1]	136 km^2	

Answer ……..……. cm^2 [2]

17



The length of each side of a square is increased by 25%.
Will the percentage increase in area be 25% too? Explain your answers with workings.

Answer

New length of square = $1.25x$
New area of square = $1.25x \times 1.25x = 1.5625x^2$ [M1]
Change in area of square $= 1.5625x^2 - x^2$
$= 0.5625x^2$ [M1]
Percentage increase in area of square
$= \frac{0.5625x^2}{x^2} \times 100\%$
= 56.25% (shown) [A1]
The percentage increase in area is not 25%.

Alternative solution:
Let length be 4 cm,
New length = 5 cm [M1]
New area = 25 cm^2 [M1]
Percentage increase in area
$= \frac{25-16}{16} \times 100\%$
= 56.25% [A1]
The percentage increase in area is not 25%.

[3]

18 Amy went on a holiday trip to South Korea.
The exchange rate between Singapore dollars (SGD) and Korean won (KRW) is 1 SGD = 1020 KRW.

She decides to exchange SGD 1500 for her holiday trip. During the vacation, she spent 60% of the money she brought along.

(a) Calculate the remaining amount of money in KRW.

Since S$1 = 1020 KRW,
S$1500 = 1020 KRW × 1500 = 1530000 KRW [M1]

Since she spent 60% of the money, she has 40% leftover.
Amount leftover = $40\% \times 1530000$
= 612000 KRW [A1]

Answer ……..…….. KRW [2]

(b) When Amy returned back to Singapore, she checked that the exchange rate is 1 SGD = 1035 KRW.

Would you recommend that Amy change her remaining money to Singapore dollars at this rate? Explain your answer clearly with workings.

Answer

Since S$1 = 1020 KRW, 1 KRW = S$$\frac{1}{1020}$$
By using the exchange rate before she went to Korea,
612000 KRW = $\frac{1}{1020} \times 612000$
= S$ 600 [M1]

Since S$1 = 1035 KRW, 1 KRW = S$$\frac{1}{1035}$$
By using the exchange rate after she came back from Korea,
612000 KRW = $\frac{1}{1035} \times 612000$
= S$ 591.30 (2dp) [M1]
[ECF1 for either working shown]

I would recommend Amy not to change her remaining money to Singapore dollars as the amount of money she will get when she return to Singapore is lesser than the amount of money she changed before she went to South Korea. [A1 – qualitative reasoning]
[ECF1 for comparison made]

[3]

19 A solid cone with a volume of 1232 cm^3 has a circular base of radius 7 cm.

(a) Using $\pi = \frac{22}{7}$, show that the height of the cone is 24 cm.

Answer

$\frac{1}{3} \times \frac{22}{7} \times 7^2 \times h = 1232$ [M1 – applying volume of cone formula]

$h = 1232 \div \frac{1}{3} \div \frac{22}{7} \div 7^2$

$h = 24$ [A1 – showing h = 24]

Cannot assume h = 24 and find volume

[2]

(b) Calculate its total surface area.

Slant height of cone

$= \sqrt{7^2 + 24^2}$

= 25 cm [M1 for finding slant height]

Total surface area

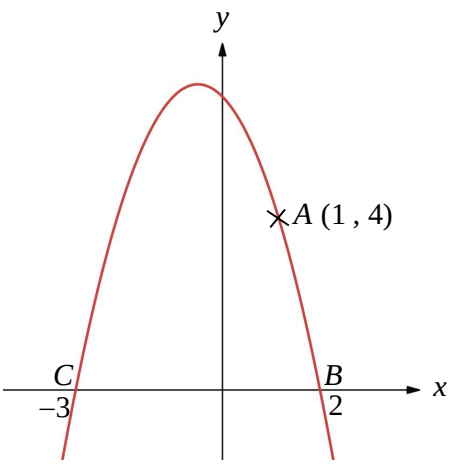
$= \left(\frac{22}{7}\right)(7)(25) + \left(\frac{22}{7}\right)(7)^2$ [M1 – for finding curved surface area πrl]

= 704 cm^2 [A1]

Answer ……..…….. cm^2 [3]

[Turn Over

20 The sketch below shows a quadratic curve.



(a) Write down the equation of the curve in the form $y = (x-a)(x-b)$.

$y = (x-2)(x+3)$ [B1]

Answer ……..……..…….. [1]

(b) Write down the line of symmetry.

$x = -0.5$ [B1]

Answer ……..……..…….. [1]

Point *A* (1,4) lies on the curve. A straight line is drawn from *A* to *B*.

(c) Find the equation of the line *AB*.

Gradient
$= \dfrac{4-0}{1-2}$
$= -4$ [M1]
$y = -4x + c$
$4 = -4(1) + c$
$c = 8$ [M1]
$y = -4x + 8$ [A1]

Answer ……..……..…….. [3]

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