



FINAL EXAMINATION

JULY 2022

COURSE TITLE	BASIC MATHEMATICS
COURSE CODE	FMAT0114
DATE/DAY	17 OCTOBER 2022 / MONDAY
TIME/DURATION	09:00 AM - 12:00 PM / 03 Hour(s) 00 Minute(s)

INSTRUCTIONS TO CANDIDATES:

1. Please read the instruction under each section carefully.
2. Candidates are reminded not to bring into examination hall/room any form of written materials or electronic gadget except for stationery that is permitted by the Invigilator.
3. Students who are caught breaching the Examination Rules and Regulation will be charged with an academic dishonesty and if found guilty of the offence, the maximum penalty is expulsion from the University.

(This Question Paper consists of **6** Printed Pages including front page)

This paper consists of TEN (10) questions. Answer ALL questions in the answer booklet. (100 Marks)

1. Solve the following to find x or the range of x .

a) $5^{(x-2)} = 2^{(x+3)}$ (5 marks)

b) $x^2 - 2x - 5 \geq 3$ (5 marks)

c) $|6x - 5| \leq 2$ (5 marks)

(15 marks)

2. A senior tax officer is paid RM 60 per hour while a tax assistant is paid RM 20 per hour. A firm received a bill of RM 540 for the tax advising service used a few days ago. Suppose that the assistant worked 5 hours less than the senior tax officer, how much each of them are charging the firm? **(5 marks)**

3. Khadeeja started a savings account with RM 1000 deposit in the first year. In the second year, she deposits RM 3000 and followed by RM 5000 in the third year. Every year, she will add RM 2000 into her savings account. Assuming there is no interest payment on saving, what will be the total amount of her savings after 20 years? **(5 marks)**

4. Given that $f(x) = x^2 - 3$ and $f[g(x)] = 4x^2 - 4x - 2$

a) Find $g(x)$ (5 marks)

b) Evaluate $g(-4)$ (3 marks)

c) If $h[f(x)] = -x^2 + 7$, find $h(x)$ (7 marks)

(15 marks)

5. Hana, Fathiah and Safiyyah crave for cakes. One day, they all went to a bakery selling various types of cakes. Safiyyah bought 2 slices of chocolate cake and 1 slice of strawberry cake and paid RM 19 while Fathiah bought 1 slice of cheesecake, 2 slices of chocolate cake and 2 slices of strawberry cake and paid RM 35. Hana bought 1 slice of cheesecake, 1 slice of chocolate cake and 2 slices of strawberry cake and paid RM 29.

Assume that the price of a slice of chocolate cake, cheesecake and strawberry cake are represented by x , y and z respectively.

Based on the information above,

- a) write the system of linear equation to explain the scenario (3 marks)
- b) based on your answer in (a), write the equation in the form of matrices equation (2 marks)
- c) solve for x , y and z using matrices operation (10 marks)

(15 marks)

6. The polynomial $f(x) = x^4 + 4x^3 + ax^2 + bx - 12$ has $(x + 2)$ as its factor and a remainder of 120 when divided by $(x - 3)$. Find the value of a and b . (10 marks)

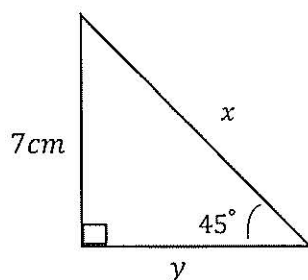
7. Decompose the fraction below into its partial fraction.

$$\frac{3x^2 - 2x - 7}{(x^2 - x - 2)}$$

(10 marks)

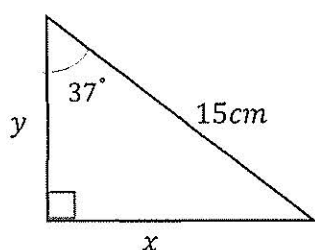
8. Find the exact values of x and y given the triangles below.

a)



(4 marks)

b)



(4 marks)

(8 marks)

9. An industrial ceiling fan has a diameter of 6.2m. The distance between two points A and B is measured along the circle when the blades rotate with centre C located at the centre of the fan.

a) Find the distance between A and B if the angle ACB is 120° . (4 marks)

b) Find the area of the sector ACB. (3 marks)

(7 marks)

10. Determine the continuity of $f(x)$ for each of the following.

a) $f(x) = \frac{2}{x^2-1}$ at $x = 2$ (5 marks)

b) $f(x) = \frac{2x-3}{x-2}$ at $x = 2$ (5 marks)

(10 marks)

END OF QUESTION PAPER

Formula

$$x^a \times x^b = x^{a+b}$$

$$\frac{x^a}{x^b} = x^{a-b}$$

$$(x^a)^b = x^{ab}$$

$$(xy)^a = x^a y^a$$

$$\left(\frac{x}{y}\right)^a = \frac{x^a}{y^a}$$

$$\frac{1}{x^a} = x^{-a}$$

$$\sqrt{x} = x^{\frac{1}{2}}$$

$$\sqrt[n]{x} = x^{\frac{1}{n}}$$

Properties of logarithms

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

$$\log_a x^n = n \log_a x$$

$$\log_a(\sqrt[n]{x}) = \frac{1}{n} (\log_a x)$$

$$\log_b a = \frac{\log_c a}{\log_c b}$$

Properties of equations and inequalities involving $|ax + b|$

$$|ax + b| = p \text{ is equivalent to } ax + b = p \text{ or } ax + b = -p$$

$$|ax + b| < p \text{ is equivalent to } -p < ax + b < p$$

$$|ax + b| > p \text{ is equivalent to } ax + b < -p \text{ or } ax + b > p$$

Arithmetic progression

$$T_n = a + (n - 1)d$$

$$S_n = \frac{n}{2} [2a + (n - 1)d]$$

Geometric progression

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(1 - r^n)}{1 - r}$$

Matrices

$$AX = B$$

$$A^{-1} = \frac{1}{|A|} \text{Adj}(A)$$

$$\text{Adj}(A) = [C_{ij}]^T$$

$$C_{ij} = (-1)^{i+j} M_{ij}$$

$$X = A^{-1}B$$

Partial fraction

If $Q(x)$ has a form of $(ax + b)$, then

$$\frac{P(x)}{Q(x)} = \frac{P(x)}{(x + a)(x + b)} = \frac{A}{(x + a)} + \frac{B}{(x + b)}$$

If $Q(x)$ has a form of $(ax + b)^k$ then

$$\frac{P(x)}{Q(x)} = \frac{P(x)}{(ax + b)^2} = \frac{A}{(ax + b)} + \frac{B}{(ax + b)^2}$$

If $Q(x)$ has a form of $(ax^2 + bx + c)$ then

$$\begin{aligned} \frac{P(x)}{Q(x)} &= \frac{P(x)}{(x - d)(ax^2 + bx + c)} \\ &= \frac{C}{(x - d)} + \frac{Ax + B}{(ax^2 + bx + c)} \end{aligned}$$

If $Q(x)$ has a form of $(ax^2 + bx + c)^k$ then

$$\begin{aligned} \frac{P(x)}{Q(x)} &= \frac{P(x)}{(ax^2 + bx + c)^2} \\ &= \frac{Ax + B}{(ax^2 + bx + c)} + \frac{Cx + D}{(ax^2 + bx + c)^2} \end{aligned}$$

Trigonometry

$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

Angle to radian

$$x \times \frac{\pi}{180}$$

Length of arc

$$S = r\theta$$

Area of a sector

$$A = \frac{1}{2}r^2\theta$$

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