INTERNATIONAL UNIVERSITY OF EAST AFRICA
'Learning to Succeed'

HIGHER EDUCATION CERTIFICATE

END OF SEMESTER EXAMINATIONS - DECEMBER 2025

PROGRAMME: HEC
YEAR/SEM: YEAR 1/SEMESTER 1
COURSE CODE: FDN 1101
NAME: FONDATION MATHEMATICS ONE

DATE:
TIME:

INSTRUCTIONS TO CANDIDATES:

SECTION A

Attempt ALL Questions (Each question carries 4 marks)

Question 1:

If the 15^{th} term of an AP is -4 and the 10^{th} term is 16, find the first term and the common difference.

Question 2:

A circle which passes through point P(3 ,4) is centered at the origin. Show that the diameter of this circle equals to 10 units.

Question 3:

A football team played 35 games last season. The team receives 3 points for a win, 1 point for a draw and no points for a loss. The team lost 9 games and ended the season with 58 points. Find how many wins and draws the team had last season.

Question 4:

In a GP, the sum of the first and the third term equals to 90 and the sum of the second and the fourth term equals to 30. Find the sum of the first 8 term.

Question 5:

$$b = \frac{a+c}{2}$$

If a, b and c are three consecutive numbers in a certain AP, prove that

Question 6:

If one root of $4x^2 - 3x + K = 0$ is 3 times the other, find the value of "K".

Question 7:

Solve the quadratic equation below by factorization Method

$$\frac{1}{2x - 5} + \frac{5}{2x - 1} = 2$$

Question 8:

Solve the simultaneous equations:

5x – 3y = 24

3x + 2y = 3

Question 9:

$$S = ut + \frac{1}{2}xt^2$$

Make x the subject of the formula in

Question 10:

A body moves on a straight line such that its displacement (S) from a fixed point after time (t) is given by the relation: $S=t^2-2t + 5$. Calculate it's average velocity when the time changes from t=1s to t=3s.

Question 11:

Express $\frac{5+\sqrt{7}}{3-\sqrt{7}}$ in the form $m + n\sqrt{7}$ where m and n are integers

Question 12:

Simplify the given expressions

i) $(3x + 4)(2x - 9) + (4x - 7)(7x - 5)$

ii) $(2x^3 + 6)(5x^2 - 6x)$

Question 13:

Apply the remainder theorem to determine the remainder in the following case.
$(5x^3 - 4x^2 - 3x - 6) \div (x - 3)$.

Question 14:

Simplify each of the following by collecting like terms and factorizing:

i) $3rst - 10str + 8ts - 5rt + 2st$

ii) $2pq - 4pr + qr - 2rq + 3qp$

Question 15:

Find the value of each of the following:

i) $16 - 12 \times 4 + 8 \div 2$

ii) $9 - 3(17 + 5[5 - 7])$

Question 16:

Factorize the given expression $y^2 - 6y + 9$

Question 17:

Find the tenth term of the series 5, 10, 20,40, …

Question 18:

If the midpoint of the line AB is (3, 5), point A = (1, -2) and point B = (5, y). Find the value of y?

Question 19:

If y=f(x) where $y=x^2 + 3x$, find the average relative change when x changes from 1 to 3

Question 20:

Show that $\frac{6(x+7)}{(5x-1)(2x+5)}$ can be written in the form

$\frac{A}{5x-1}+\frac{B}{2x+5}$ Find the values of the constants A and B.

SECTION B

Attempt any three question (Each question carries 20 marks)

Question 1:

a) The line joining A (K,3) to point B (2-3) is perpendicular to the line joining point C (10,1) to point B. Find the value of K

b) Find the equation of the straight line that: Passes through (1, 9) and has gradient of 3

c) Find the equation of the line which passes through (1, 7) and perpendicular to the line 2y=3x-1

d) Find the equation of the straight line that passes through the points L and M where L is the midpoint of the straight-line joining A (−2, 6) to B (8, 4) and M is the midpoint of the line joining C (−3, −1) to D (7, 9)

Question 2:

a) The sum of ages of 5 children born at the intervals of 3 years each is 50 years. What is the age of the youngest child?

b) If 2x, x+10, 3x+2 are in an arithmetic progression, then x is equal to

c) Find the equation of the line passing through (1, 3) and parallel to the line joining the points (7, 13) and (3, 5).

d) Find the perpendicular distance of the point 1,2 from the line 3x+4y+9=0

e) Find the solution to the equation 4(x - 2) - 2(x - 6) = 3(x + 1)

Question 3:

a)

a) Find the coordinates of the mid points of the lines joining each of the following points:

(i) $A(3,2)\ , B(-3,4)$

(ii) $R((3b-c),(2a-b/2)),\ S((c+b),(b/2+4a))$

b) Given the two points P $(a, -b)$ and Q $(-a, b)$ where a and b are constants. Prove, that the point of origin is the mid-point of any line joining these two points.

c) A circle which passes through point P (3, 4) is centered at the origin. Show that the diameter of this circle equals to 10 units.

d) The line which makes an angle θ with the positive direction of the x-axis is parallel to the line which passes through point of origin and the point (3 , 7). Find the value of θ.

e) Find the value of a which makes the line $x - y/3 - 9 = 0$ be parallel to the line joining P (0, a) to $(-1, -9)$. What would the value of a be, if these two lines are perpendicular?

Question 4:

a) What is the nth term of the AP 15 , 9 , 3 , ... , and hence find the 30th term

b) If the 15th term of an AP is -4 and the 10th term is 16, find the first term and the common difference.

c) c) A ball rolls down a slope so that it travels 4 cm in the 1st second, 7 cm in the 2nd second, 10 cm in the 3rd second and so on. How does it travel in

(i) The 7th second

(ii) The nth second

d) d) The first term of an AP is 1 and the last term equals to 28. Find the sum of the terms of this AP, if the number of terms equals to 10.

e) e) A water container poured water into 250 m^3 in the first day, then everyday it is poured 4/5 the amount of the previous day. If the container is filled after 5 days, find the internal volume of the container

Question 5:

a) Find the value of a which makes the line be parallel to the line joining $P\ (0, a)$ to $(-1, -9)$. What would the value of a be, if these two lines are parallel?

b) The line which makes an angle θ with the positive direction of the x- axis is parallel to the line which passes through point of origin and the point (3, 7). Find the value of θ.

c) With brief justification, tell if the line is parallel or perpendicular to the x-axis.

d) Which of the following lines joining the points given have upslope and downslope gradients. Why:

i) A (2, -3), B (0, -1)

ii) A (0, 0), B (-2, -5)

Question 6:

a)

a) $L\ (8, 2)$ is the midpoint of the straight-line joining point $C\ (p, -3)$ to point $D\ (-3, q)$. Find p and q.

b) M is the midpoint of the straight-line joining point A (3, 1) to point B. If M has coordinates (7, 3), find the coordinates of B.

c) A circle which passes through point $P\ (3, 4)$ is centered at the origin. Show that the diameter of this circle equals to 10 units.

d) Find the value of a if the gradient of the line passing through the points (-2, 1) and (a, 9) is 1.

e) The sum of two numbers is 9. The sum of the squares of the numbers is 41. Find the numbers.

Question 7:

a) Perform the given multiplication and simplify your result

$$(2x + 3)(5x^3 + 3x - 4)$$

b) Perform the given division

$$\frac{2y^3+5y^2-4y-3}{y^2+2y-3}$$

c) Express $\frac{4x-16}{x^2-2x-3}$ into partial fractions

Make $y = \frac{m}{1-m}$ the subject of the formulae

For what value of K the roots of the following equation are equal: $Kx^2 + 4x + 3 = 0$

Question 8:

a) Evaluate the expression $\frac{3a+2b-3c}{a-b+c}$ where $a = -3, b = -4, c = 2.$

b) Write the fraction in its lowest form $\frac{36a^3bc^2}{24ab^4c^2}$

c) Solve the given quadratic equation $7x^2 + 14x - 21 = 0$

d) Solve the given pair of simultaneous equations $\begin{cases} 7x + 2y = 33 \\ 4x + 2y = 24 \end{cases}$

e) Expand and collect like terms

i) $(2m + 5n)(3m + 5n - 3)$

ii) $(t + s + 10)(t + 2s - 3)$

Question 9:

a) $f(x)=\dfrac{4x^2+x-23}{(x-3)(4-x)(x+5)},\ x>4$ Given that $f(x)$ can be expressed in the form $\dfrac{A}{x-3}+\dfrac{B}{4-x}+\dfrac{C}{x+5}$ find the values of A, B and C.

b)

$\dfrac{x^3+8x^2-9x+12}{x+6}=Ax^2+Bx+C+\dfrac{D}{x+6}$ Find the values of the constants A, B, C and D.

c) Express $\dfrac{6}{4x^2+8x-5}+\dfrac{3x+1}{2x-1}$ as a single fraction in its simplest form.

d) Resolve $\dfrac{2x+3}{(x-2)^2}$ into partial fractions.

Question 10:

a) An oil company bores a hole 120m deep. Estimate the cost of boring if the cost is £70 for drilling the first meter with an increase in cost of £3per meter for each succeeding meter.

b) b) A hire tool firm finds that their net return from hiring tools is decreasing by 10% per annum. If their net gain on a certain tool this year is £400, find the possible total of all future profits from this tool.(assuming the tool works for eight years)

c) c) If the 5th term of an arithmetic sequence is 20 and the 10th term is 45, what is the first term?

d) d)If the first term of a geometric sequence is 3 and the fourth term is 81, what is the common ratio?

e) e) Given the arithmetic sequence where the first term a = 5 and the common difference d = 3, find the sum of the first 50 terms.