S.5 TOPICAL TRIAL ASSESSMENT 2025

Topic: Equations and Inequalities.

Item 1

A textile manufacturing company as just bought a new technological system which process curtains. The system was set to produce only same number of colour curtains (repeated) in the first and second run in a single command to ensure uniform production. The system operator commanded the machine to produce Blue and black curtains and the system displayed an operation in form an equation $\frac{x^2-x+1}{x-1} = k$ where *x* represented blue curtains in the first and second run, *k* represented black curtains.

The system operator wants to know the number of blue and black curtains that would be produced following the command.

Task;

As a mathematics student, help the system operator know how many blue and black curtains that are most likely to be produced by the command.

Item 2

Sumaiah sells photographs at art fairs with small, medium, and large sizes. She sells 3 more small photos than twice the difference between the large from the medium photos. It's also noted that when she sells 2 times small photos and 3 times medium photos, their sum is equivalent to 11 minus number of large photos sold. She knows; small photos cost \$10, medium \$30, and large \$40. She wants to determine how many of each size to sell to cover her booth rental cost, which is \$150.

Additionally, she monitors her stock by an equation $y = \frac{x+1}{x^2+3}$, then considers the discriminant of a suitable quadratic equation to determine the range of the possible values of y which would give real stock value of *x*.

Task:

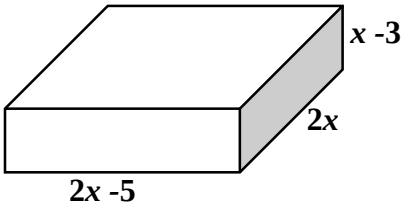
As a mathematics student Help Sumaiah determine;

(a) how many of each size to sell to cover her booth rental cost
(b) the range of the possible values of y which would give real stock value of *x*.

Item 3

Amoni is given a ground plan of two square rooms of different dimensions wrapped in a gift box. From the plan, a summary defines that the sum of the perimeters of these two square rooms is 40m while the sum of their areas is $58m^2$. He wants to determine the length of the sides of the square rooms so as to plan accordingly.

The gift box has dimensions indicated as shown below with a defined volume of 24 $units^3$



He intend to reuse the top and bottom large surface to design a door mat that would cover an area of 48 units^2 , but he is not sure whether surfaces would be enough to accomplish his goal.

Task:

As a mathematics student;

(a) Determine the length of the sides of the square rooms.
(b) Prove whether the two surfaces would accomplish Amoni's goal.

Item 4

Abitex organized a show at Theater Laboniter which filled to capacity of 350. The theater charges $4.50 for children, $7.50 for students, and $12.50 of adults. There are half as many adults as there are students. The total ticket sales was $2415, Abitex wants to know how many children, students, and adults attended.

Task:

(a) Explain to Abitex on how he can know the number of children, students and adults attended
(b) Based on your explanation, determine how many children, students and adults attended

Items 5

A chemist has three different acid solutions. The first acid solution containing 10% acid, the second contains 40% acid and the third 60% acid. The chemist wants to use all three solutions to obtain a mixture of 100 liters containing 45% acid. The supply of 40% acid is low so twice as much 10% solution as 40% solution must be used.

Task:

Determine how many liters of each solution should be used?

Item 6

Your classmate missed a lesson on discriminant of roots, and the Teacher said that curve C with equation $y = 1 - \frac{3x}{x^2-2x+4}$, has two coordinates of the stationary points. The teacher requests you to explain to your classmate what discriminant mean, and also find the coordinates of the stationary point of C

Task:

Help your classmate know what discriminant mean, and use a non-differentiation method to find the coordinates of the stationary point of C.