

**CARIBBEAN ADVANCED PROFICIENCY EXAMINATION**

**SCHOOL BASED ASSESSMENT**

**PURE MATHEMATICS**

**UNIT II TEST 3 (PREVIEW)**

**Time: 1 Hour & 20 minutes**

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1. Candidates applying for jobs in a large company take a test, as a result of which they are either accepted, rejected or retested, with probabilities 0.2, 0.5 and 0.3 respectively. When a candidate is retested for the first time, the three possible outcomes and their probabilities remain the same as for the original test. When a candidate is retested for the second time there are just two possible outcomes, accepted or rejected with probabilities 0.4 and 0.6 respectively.
- (i) Draw a probability tree diagram to illustrate the outcomes.
  - (ii) Find the probability that a randomly selected candidate is accepted.
  - (iii) Find the probability that a randomly selected candidate is re-tested at least once, given that this candidate is accepted.

2. A car park has spaces for 18 cars, arranged in a line. On one day there are 5 cars, of different makes, parked in randomly chosen positions and empty spaces.

- (i) Find the number of possible arrangements of the cars in the car park.
- (ii) Find the probability that the 5 cars are not all next to each other.

On another day, 12 cars of different makes are parked in the car park. 5 of these cars are red, 4 are white and 3 are black. Elizabeth selects 3 of these cars.

- (iii) Find the number of selections Elizabeth can make that include cars of at least 2 different colours.

3. (a) Use an integrating factor to find the solution of the differential equation

$$\frac{dy}{dx} - \frac{3}{x}y = 2x^4 e^{2x}$$

- (b) Find the general solution of the differential equation

$$\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 5x^2 + 3$$

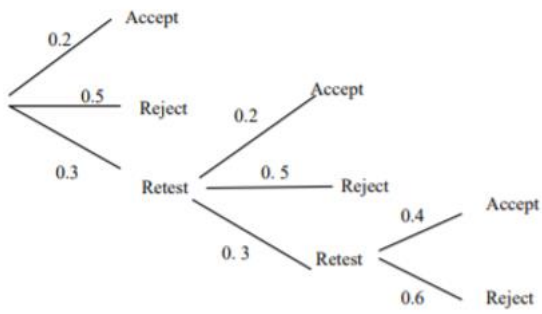
4. A nursery sells three brands of grass – seed mix,  $P$ ,  $Q$  and  $R$ . Each brand is made from three types of grass,  $C$ ,  $Z$  and  $B$ . The number of kilograms of each type of grass in a bag of each brand is summarized in the table below.

Grass Seed Mix	Type of Grass (Kilograms)		
	$C$ - grass	$Z$ - grass	$B$ - grass
Brand $P$	2	2	6
Brand $Q$	4	2	4
Brand $R$	0	6	4
Blend	$c$	$z$	$b$

A blend is produced by mixing  $p$  bags of Brand  $P$ ,  $q$  bags of Brand  $Q$  and  $r$  bags of Brand  $R$ .

- (i) Write down an expression in terms of  $p$ ,  $q$  and  $r$  for the number of kilograms of  $Z$  - grass in the blend.
- (ii) Let  $c$ ,  $z$  and  $b$  represent the number of kilograms of  $C$  - grass,  $Z$  - grass and  $B$  - grass respectively in the blend. Write down a set of THREE equations in  $p$ ,  $q$  and  $r$  to represent the number of kilograms of EACH type of grass in the blend.
- (iii) Rewrite the set of THREE equations in (b) (ii) above in the matrix form  $MX = D$  where  $M$  is a 3 by 3 matrix,  $X$  and  $D$  are column matrices.
- (iv) Determine  $M^{-1}$ .
- (v) Hence, calculate how many bags of EACH blend,  $P$ ,  $Q$  and  $R$  are required to produce a blend containing 30 kilograms of  $C$  - grass, 30 kilograms of  $Z$  - grass and 50 kilograms of  $B$  - grass.

ANSWERS



1. (i) (ii) 0.296 (iii) 0.324

2. (i) 1,028,160 (ii) 0.998 (iii) 205

3. (a)  $y = cx^3 + e^{2x}x^4 - \frac{1}{2}e^{2x}x^3$  (b)  $y = Ae^{2x} + Be^{3x} + \frac{5}{6}x^2 + \frac{25}{18}x + \frac{149}{108}$

4. (i)  $2p + 2q + 6r$  (ii)  $2p + 4q = c, 2p + 2q + 6r = z, 6p + 4q + 4r = b$  (iii)  $\begin{pmatrix} 2 & 4 & 0 \\ 2 & 2 & 6 \\ 6 & 4 & 4 \end{pmatrix} \begin{pmatrix} p \\ q \\ r \end{pmatrix} = \begin{pmatrix} c \\ z \\ b \end{pmatrix}$

(iv)  $\frac{1}{20} \begin{pmatrix} -4 & -4 & 6 \\ 2 & 2 & 6 \\ 6 & 4 & 4 \end{pmatrix}$  (v)  $\begin{pmatrix} 3 \\ 6 \\ 2 \end{pmatrix}$