This is a Class 1 exam

Lebanon Evangelical School for Boys and Girls

Lebanon Evangelical School
for Boys and Girls
Loueizeh - Baabda

Stage Exam 02

26MAR2025

Do NOT write in this box. Your MARK will be placed here.

Subject :	Maths
Class :	12E
Teacher :	Bechara Kordahi
Duration :	1 hour
You are to answer the questions to this exam on : Squared paper	

Your name :		*Time taken to complete exam*
Your Class :		
Exam Room :		
How many sheets, including cover sheet :		

- Do not open this paper until the teacher in charge instructs you to do so.
- The most important thing to remember in taking an exam is NEVER PANIC.
- If you are caught cheating in this exam, you will be awarded zero for ALL exams that are taken on this day.

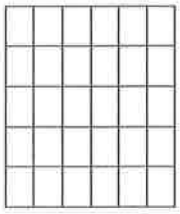
Question I-(70 points)

1) Find the value of the following sum : $S = {}_{100}C_0 + {}_{100}C_1 + {}_{100}C_2 + ... + {}_{100}C_{100}$.
Give your answer in the form m^n where m and n are 2 natural integers to be found

2) Determine the constant term in the expansion of $\left(4x - \frac{1}{2x}\right)^{20}$.

3) Consider an n-sided convex polygon . Knowing that the number of diagonals of this polygon is 44 , determine the number of sides of this polygon .

4) How many different rectangles can be formed from the grid in the adjacent figure ? Explain .



5) In how many ways 3 balls of the same color can be drawn from a box that contains 6 red balls , 5 white balls and 3 yellow balls ? Explain .

6) Solve for x : $3x^2 - 3x = x({}_xC_3) + {}_xC_2$.

7) Find the 10^{th} term in the expansion of $\left(2x - 4x^2\right)^{10}$.
Express your answer in form ax^b where a and b are integers to be found .

Question II-(30 points)

Determine the following anti-derivatives :

a) $\int \frac{xdx}{\sqrt{1+x^2}}$ b) $\int xLn(x)dx$ c) $\int \left(\frac{2}{2x+1} - \frac{1}{1-x}\right)dx$

(Write all your answers in their simplest form)

12E

SEO2 Mathematics

(1) $S = {}_{100}C_0 + {}_{100}C_1 + \cdots + {}_{100}C_{100} = (1+1)^{100} = \boxed{2^{100}}$ 10

Since $(1+1)^{100} = \sum_{r=0}^{100} {}_{100}C_r (1)^{100-r} (1)^r$

(2) $\left(4x - \frac{1}{2x}\right)^{20} = \sum_{r=0}^{20} {}_{20}C_r (4x)^{20-r} \left(\frac{-1}{2x}\right)^r$ $\quad 20-r = r$, $2r = 20$, $r = 10$

Then ${}_{20}C_{10} (4x)^{10} \left(\frac{-1}{2x}\right)^{10} = \boxed{\text{[illegible]}\ 184,756}$ 10

(3) $\frac{n(n-3)}{2} = 44$, $n^2 - 3n - 88 = 0 \rightarrow \boxed{n = 11}$ 10

(4) $N = {}_7C_2 \times {}_6C_2 = \boxed{315 \text{ rectangles}}$ 10

(5) $N = {}_6C_3 + {}_5C_3 + {}_3C_3 = \boxed{31 \text{ ways}}$ 10

(6) $3x^2 - 3x = x\left(\frac{x!}{3!(x-3)!}\right) + \frac{x!}{2!(x-2)!}$ $\quad x \geq 3$

$3x(x-1) = \frac{x \cdot x(x-1)(x-2)}{6} + \frac{x(x-1)}{2}$ $\quad x \neq 0$, $x \neq 1$

$3 = \frac{x(x-2)}{6} + \frac{1}{2} \rightarrow \frac{x^2 - 2x}{6} = \frac{5}{2} \rightarrow x^2 - 2x - 15 = 0$

Then $\boxed{x = 5}$ 10

(7) $(2x - 4x^2)^{10} = \sum_{r=0}^{10} {}_{10}C_r (2x)^{10-r} (-4x^2)^r$ $\quad 10^{\text{th}}$ term $\rightarrow r = 9$

Then ${}_{10}C_9 (2x)(-4x^2)^9 = \boxed{-5,242,880x^{19}}$ 10

a) $\int \frac{x\,dx}{\sqrt{1+x^2}} = \int du$ $\quad u = \sqrt{1+x^2}$, $du = \frac{2x}{2\sqrt{1+x^2}}\,dx$

$= u + C = \boxed{\sqrt{1+x^2} + C}$ 10

b) $\int x \ln x\,dx$ $\quad u = \ln x$, $du = \frac{dx}{x}$

$dv = x\,dx$, $v = \frac{x^2}{2}$

$= \frac{x^2}{2}\ln x - \int \frac{x}{2}\,dx$

$= \boxed{\frac{x^2}{2}\ln x - \frac{x^2}{4} + C}$ 10

c) $\int \left(\frac{2}{2x+1} - \frac{1}{1-x}\right) dx = \int \left(\frac{2}{2x+1} + \frac{1}{x-1}\right) dx$ 10

$= \frac{2\ln|2x+1|}{2} + \ln|x-1| + C = \boxed{\ln|2x^2 - x - 1| + C}$