MATHEMATICS TOPICS FOR THE ENTRANCE TEST

(Only for BSc **HEALTH PSYCHOLOGY)**

Derivatives; Definite Integrals (application of integrals); Percentages, probability (definition, formulas of sum and multiplication of probabilities, mean (mathematical expectation), median and mode).

Systems of linear equations, quadratic equations, simplification of algebraic expressions; Simplification of trigonometric expressions, arithmetic, and geometric progressions; Ratios, analysis of functions.

LIST of FORMULAS

$a^2 - b^2 = (a - b)\cdot(a + b)$; $(a \pm b)^2 = a^2 \pm 2ab + b^2$; $a^3 \pm b^3 = (a \pm b)\cdot(a^2 \mp a\cdot b + b^2)$; $(a \pm b)^3 = a^3 \pm 3 \cdot a^2 \cdot b + 3 \cdot a \cdot b^2 \pm b^3$

$ax^2 + bx + c = 0 \rightarrow x_{1,2} = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$; $x_1 + x_2 = -\frac{b}{a}$; $x_1 \cdot x_2 = \frac{c}{a}$

Progressions:

Aritmetic progression	**Geometric progression**
$a_n = a_1 + (n-1)\cdot d$; $S_n = \frac{1}{2}\cdot(a_1 + a_n)\cdot n = \frac{1}{2}\cdot(2a_1 + (n-1)\cdot d)\cdot n$ a_1 – first number, a_n – n-th number; d – difference	$b_n = b_1 \cdot q^{n-1}$ $S_n = \frac{b_1 \cdot (q^n - 1)}{q - 1}$ b_1 – first number, b_n – n-th number; q – common ratio

Trigonometry

$\sin 2x = 2\cdot\sin x\cdot\cos x$; $\cos 2x = \cos^2 x - \sin^2 x$; $\sin^2 x + \cos^2 x = 1$; $\operatorname{tg} 2x = \frac{\sin 2x}{\cos 2x}$

Derivatives

$c' = 0.\ (cu)' = c\cdot u'.\ \left(\frac{u}{c}\right)' = \frac{u'}{c}$ if $c \neq 0.\ (u \pm v)' = u' \pm v'.$

$(u\cdot v)' = u'\cdot v + u\cdot v'.\ \left(\frac{u}{v}\right)' = \frac{u'\cdot v - u\cdot v'}{v^2}$ if $v \neq 0.\ g(f(x)) = g'(f(x))\cdot f(x)$

$(x^\alpha)' = \alpha\, x^{\alpha-1};\ (e^x)' = e^x;\ (a^x)' = a^x \ln a;\ (\ln x)' = \frac{1}{x};\ (\sin x)' = \cos x;\ (\cos x)' = -\sin x.$

Integrals

$$\int cf(x)dx = c\int f(x)dx;\ \int (f(x)\pm g(x))dx = \int f(x)dx \pm \int g(x)dx;$$

$$\int dx = x + C; \qquad \int x^{\alpha}dx = \frac{x^{\alpha+1}}{\alpha+1} + C \quad (\alpha \neq -1); \qquad \int \frac{dx}{x} = \ln|x| + C; \qquad \int e^{x}dx = e^{x} + C; \qquad ;$$

$$\int_a^b f(x)dx = F(x)\Big|_a^b = F(b) - F(a).$$

Area under a curve of f(x) in interval (a;b) Area $= \int_a^b f(x)dx$

Probability:

Definition: $P(A) = \frac{m}{n}$

Multiplication rule of probabilities for independent events: $P(A \cap B) = P(A) \cdot P(B)$.
Addition rule of probabilities for mutually exclusive events: $P(A \cup B) = P(A) + P(B)$.

Mathematical expectation or mean (EX):

$EX = \frac{x_1 \cdot m_1 + x_2 \cdot m_2 + \cdots + x_n \cdot m_n}{n}$ or $EX = x_1 \cdot p_1 + x_2 \cdot p_2 + \cdots + x_n \cdot p_n$