VEDIC MATHS: IT'S MERIT IN MANAGEMENT OF COMPETITIVE EXAMINATIONS

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Abstract

Getting into prestigious colleges which offer applied science courses after training in India's 10+2 education system is most students' dream. Students aiming at Banking, Engineering, Business, Management programs, Administration, Hotel Management, Military, Railways, and Police etc. write specific competitive entrance Examinations**.** Quantitative Aptitude and skills in basic high school Mathematics play a major role in such time bounded pressurized situations. Arriving at the right answer in limited time is crucial to achieve higher ranks in any of the entrance exams to the above mentioned careers. Vedic maths methods can be a tool for students to manage time in such scenarios. Basic mathematical operations, squaring, cubing and some fundamental elimination techniques in calculus, coordinate geometry and algebra etc. appear in life-deciding competitive exams. Illustrative examples from different examinations and courses are presented here to compare Vedic Maths with existing, conventional mathematics methods. How Vedic Maths can be a possible tool for students to attain their dream career is discussed. Links between Vedic Maths and effective management of Entrance Exams are established. Thus skills such as pattern finding taught in Vedic Maths methods are potential teaching aids to nourish numerical mental ability and similar skills in students aspiring to high percentiles in competitive examinations.

Introduction

Every student dreams about their future career. Some think to choose police service, some army, banking, business, hotel management, railways, engineering, education department, architecture, research etc. Different fields require different skills: Bodily-kinesthetic, Linguistic, Logical-Mathematical, Musical, Visual-spatial, Naturalist, Interpersonal, Intrapersonal skills; all are well known (Mcfarlane, 2011; Gardner, 1999) and used to make educational experience happier at institutions like Aurobindo schools. Logical-Mathematical skill plays a major role in careers where systematic, organized approaches are required. In Gardner's words, this skill involves abilities to detect patterns, reason deductively and think logically. Patterns can be visual, full of colours, thoughts and numbers. Logical mathematical persons are inclined to think conceptually and abstractly. They effectively handle puzzles, experiments, classifications, categorizations and working with numbers and formulae. They are good at identifying relationships between different things. They can understand complex ideas and perform scientific investigations. On the other hand students with high visual-spatial intelligence are good at remembering images, and fine details. One study using brain imaging techniques found that logic and mathematics

emerge and evolve through visuospatial cognition and language (Houdé & Tzourio-Mazoyer, 2003). Links between these two skill sets have thus been established.

A possible way to nourish these skills is to introduce Vedic Mathematics (VM) methods (Bharati Krsna Tirthaji Maharaja, 1992) for problem solving. VM offers easier means to perform mental calculations, which in turn decreases duration of time spent on a problem. Time estimation experiments, using subtests of the Wechsler Adult Intelligence Scale (WAIS) intelligence test conclude that time estimation specifically predicts mathematical intelligence, and that both rely on spatial ability (Kramer, Bressan, & Grassi, 2011). VM methods are faster and pattern focused, and may positively impact visuospatial cognition, enhancing logico-mathematical skills.

According to Maharshi Mahesh Yogi, "Vedic Mathematics is that one field of knowledge which fulfills the purpose of education by developing the total creative genius of the individual, giving him or her the ability to be always spontaneously right, and automatically precise, so that his or her action, supported by natural Law, is always effortlessly fulfilling."

Research reports that VM methods are effective in management of Math Anxiety and cognitive skills in school students(Shastri, Hankey, Sharma, & Patra, 2016; Shastri, Hankey, Sharma, & Patra, 2017). They have also been found effective on mindfulness, aggression and emotional regulation (Shastri, Hankey, Sharma, & Patra, 2016). VM methods improve examination results (Shastri, et. al, submitted for publication). Their holistic approach speeds calculation processes.

All Indian time bounded examinations such as JEE Mains, JEE Advanced, K-CET, BITSAT, EAMCET, GATE, CAT, MAT, NDA, CDS, SSC etc. test speed of calculational and logical mathematical skills. Table 1 lists some of examinations and respective courses which decide student careers and where VM methods can reduce the duration compared to conventional mathematics methods.

Table 1

Name of the Entrance Exam	Details of the Exam	Related Courses/Career
JEE Mains and Advanced	Joint Engineering Entrance Examination	Engineering/ Architecture /Research and Development IIT/NIT/IIIT/CFTI
WB JEE	West Bengal Joint Engineering Entrance Examination	Engineering
K-CET	Karnataka Common Entrance Test	Engineering, Agriculture, Medicine
EAMCET	Engineering Agricultural and Medical Common Entrance Test	Engineer, Agriculture, Medicine

Rajasthan PET	Rajasthan Pre-Engineering Test	Engineering
MP PET	Madhya Pradesh Pre-Engineering Test	Engineering
J&K CET	Jammu and Kashmir Common Entrance Test	Engineering
Kerala CET	Kerala Common Entrance Test	Engineering
OJEE	Orissa Joint Engineering Entrance	Engineering
BITSAT	Birla Institute of Technology and Science Aptitude Test	Integrated 1st degree Engineering, Pharmacy and MSc Programs
DCE	Delhi College of Engineering	Engineering
BCECE	Bihar Combined Entrance Competitive Examination	Engineer, Agriculture, Medicine
AMU	Aligarh Muslim University	Engineering
NDA	National Defence Academy	Army, Navy, Airforce
CDS	Combined Defence Service	Army, Navy, Airforce
CAT	Common Admission Test	Post Graduate Programmes in Management
MAT	Management Aptitude Test	Post Graduate Programmes in Management
GATE	Graduate Aptitude Test Engineering	Post Graduate Programmes in Engineering
SSC	Staff Selection Commission	Lower Division Clerk / Junior Secretariat Assistant, Postal Assistant / Sorting Assistant & Data Entry Operator etc.
RRB	Railway Recruitment Board	Indian Railways
RBI	Reserve Bank of India	Bank Assistant, Grade B Officer
Income Tax	Income Tax Exam	IT Inspector, AO,PS Cadre posts
MT and AM exam	Management Trainees and Assistant Managers	Management Trainee, Assistant Manager
LIC/GIC (AAOs)	Life Insurance Corporation/ General Insurance Corporation Assistant Administrative Officer	Administrative Officer
CBI, Clerk	Central Bank of India, Clerk	Clerks

IBO, Clerk	Indian Overseas Bank, Clerk	Clerks
Canara Bank PO	Canara Bank Probationary Officers	Probationary Officers
Dena Bank Clerk	Dena Bank Probationary Officers	Probationary Officers
SBI	State Bank Probationary Officers	Probationary Officers
LDC	Lower Divisional Clerk	Lower Divisional Clerks
IDBI (officers)	Industrial Development Bank of India	Officers
NCERT CBSE (12)	The National Council of Educational Research and Training Central Board of Secondary Education	Any courses after 12
NCERT CBSE (10)	The National Council of Educational Research and Training Central Board of Secondary Education	Any courses after 10
NTSE	National Talent Search Exam	Scholarship

JEE Mains and Advanced - Joint Engineering Entrance Examination:

This exam is conducted after the 10+2 education system. Candidates appearing for paper 1 answer 90 questions in 3 hours from Physics, Chemistry and Mathematics. Equal weight is given to all three subjects. 4 marks are given for the correct response and 1 mark is deducted for a wrong response. All questions are multiple answer type with one correct answer.

Example: The locus of the image of the point (2, 3) in the line (2x-3y+4) + k(x-2y+3)=0, k∈R,

is a,

(a) Straight line parallel to *x*-axis (b) Straight line parallel to *y*-axis

(c) Circle of radius $\sqrt{2}$ (d) Circle of radius $\sqrt{3}$

Answer: 2*x* - 3*y* = -4 $x = \frac{9-8}{-3-(-4)} = 1, \quad y = \frac{1+3}{2} = 2$

x - 2y=-3 Find *x* and *y* then proceed to find the required locus.

Sutra used: Urdhwa Tiryakbhyam (Vertically and crosswise)

(2015)

Examples from other engineering entrance examinations are given.

WB JEE (West Bengal Joint Engineering Entrance)

Example: $\int \frac{dx}{x(x+1)} =$ **(2009)**

(a) $log\ \left|\frac{x+1}{x}\right| + c$ (b) $log\ \left|\frac{x}{x+1}\right| + c$ (c) $log\ \left|\frac{x-1}{x}\right| + c$ (d) $log\ \left|\frac{x-1}{x+1}\right| + c$

Answer: $\int \frac{dx}{x(x+1)} = A\log x + B\log(x+1) + c = \log x - \log(x+1) + c$

Procedure: Consider $\frac{1}{x(x+1)} = \frac{A}{x} + \frac{B}{(x+1)}$

Put x = 0 to find A and put x+1= 0 to find B in $\frac{1}{x(x+1)}$. $A = \frac{1}{(0+1)}, B = \frac{1}{-1}$.

Sutra Used: Lopanasthapanabhyam (By Elimination and Retention)

K-CET (Karnataka Common Entrance Test)

Example: $\int \frac{dx}{x^2+2x+2} =$ **(2004)**

(a) $\sin^{-1}(x+2) + c$ (b) $\sinh^{-1}(x+1) + c$

(c) $\tanh^{-1}(x+1) + c$ (d) $\tan^{-1}(x+1) + c$

Answer: (d) $\int \frac{dx}{x^2+2x+2} = = \frac{2}{\sqrt{|-4|}}\tan^{-1}\left(\frac{2x+2}{\sqrt{|-4|}}\right), a > 0, D < 0$

Procedure: Observe the sign of discriminant $D = b^2 - 4ac$ and a mentally.

$$Use\ I = \int \frac{dx}{ax^2+bx+c} = \begin{cases} \frac{1}{\sqrt{D}} \log\left[\frac{f'-\sqrt{D}}{f'+\sqrt{D}}\right], & a>0, D>0 \\ \frac{1}{\sqrt{D}} \log\left[\frac{\sqrt{D}-f'}{\sqrt{D}+f'}\right], & a<0, D>0 \\ \frac{2}{\sqrt{|D|}} \tan^{-1}\left(\frac{f'}{\sqrt{|D|}}\right), & a>0, D<0 \\ \frac{2}{f'}, & D=0 \end{cases}$$

Sutra Used: Chalana Kalanabhyam (Differential Calculus), Vilokanam (Mere Observation)

EAMCET (Engineering Agricultural and Medical Common Entrance Test)

Example 1: The diameters of a circle are along 2x + y - 7 = 0 and x + 3y -11 = 0. Then, the equation of this circle, which also passes through (5, 7) is

(a) $x^2 + y^2 - 4x - 6y - 16 = 0$ (b) $x^2 + y^2 - 4x - 6y - 20 = 0$

(c) $x^2 + y^2 - 4x - 6y - 12 = 0$ (d) $x^2 + y^2 + 4x + 6y - 12 = 0$

Answer: 2x + y = 7

x + 3y =11 $x = \frac{1.11-7.3}{1.1-2.3} = \frac{-10}{-5} = 2$

Putting the value of x in 2x + y = 7 we get y = 3. Centre is (2, 3). Now (5, 7) lies on Option (c).

Sutra Used: Paravartya Yojayet (Transpose and Apply), Vilokanam (Mere Observation)

Example 2: $\int \frac{3}{2x^2-x-1} dx =$ **(1999)**

(a) $log\ \left(\frac{x-1}{x+1}\right) + c$ (b) $log\ \left(\frac{x+1}{2x+1}\right) + c$

(c) $log\ \left(\frac{x-1}{2x-1}\right) + c$ (d) $log\ \left(\frac{x-1}{2x+1}\right) + c$

Answer: (d) $\int \frac{3}{2x^2-x-1} dx = 3 \times \frac{1}{\sqrt{9}} \log\left[\frac{4x-1-\sqrt{9}}{4x-1+\sqrt{9}}\right],\ a>0, D>0$

Procedure: Observe the sign of discriminant $D = b^2 - 4ac$ and a mentally.

$$Use\ I = \int \frac{dx}{ax^2 + bx + c} = \begin{cases} \frac{1}{\sqrt{D}} \log\left[\frac{f' - \sqrt{D}}{f' + \sqrt{D}}\right], & a > 0, D > 0 \\ \frac{1}{\sqrt{D}} \log\left[\frac{\sqrt{D} - f'}{\sqrt{D} + f'}\right], & a < 0, D > 0 \\ \frac{2}{\sqrt{|D|}} \tan^{-1}\left(\frac{f'}{\sqrt{|D|}}\right), & a > 0, D < 0 \\ \frac{2}{f'}, & D = 0 \end{cases}$$

Sutra Used: Chalana Kalanabhyam (Differential Calculus), Vilokanam (Mere Observation)

Rajasthan PET (Rajasthan Pre-Engineering Test)

Example: $\int \frac{3x+2}{(x-2)^2(x-3)} dx =$ **(2008)**

(a) $11log\ \left(\frac{x-3}{x-2}\right) - \frac{8}{x-2} + c$ (b) $11log\ \left(\frac{x+3}{x+2}\right) - \frac{8}{x-2} + c$

(c)$11log\ \left(\frac{x-3}{x-2}\right) + \frac{8}{x-2} + c$ (d) $11log\ \left(\frac{x+3}{x+2}\right) + \frac{8}{x-2} + c$

Answer: $(c) \int \frac{3x+2}{(x-2)^2(x-3)} dx = A\left(\frac{-1}{x-2}\right) + B\log(x-2) + C\log(x-3)$

$$= 11log\ \left(\frac{x-3}{x-2}\right) + \frac{8}{x-2} + c$$

Procedure: Consider $\frac{3x+2}{(x-2)^2(x-3)} = \frac{A}{(x-2)^2} + \frac{B}{(x-2)} + \frac{C}{(x-3)}$

Put x-2=0 to find A and put x-3= 0 to find C in $\frac{3x+2}{(x-2)^2(x-3)}$.

$A = \frac{3(2)+2}{(2-3)} = -8, C = \frac{3(3)+2}{(3-2)^2} = 11$. Option (c) correct answer by observation.

Sutra Used: Paravartya Yojayet (Transpose and Apply), Vilokanam (Mere Observation)

MP PET (Madhya Pradesh Pre-Engineering Test)

Example 1: $\int \frac{e^x}{(2+e^x)(e^x+1)}dx =$ **(2005)**

(a) $log\ \left(\frac{e^x+1}{e^x+2}\right)+c$ (b) $log\ \left(\frac{e^x+2}{e^x+1}\right)+c+c$

(c)$\left(\frac{e^x+1}{e^x+2}\right)+c$ (d) $\left(\frac{e^x+2}{e^x+1}\right)+c$

Answer:$(c)\ \int \frac{e^x}{(2+e^x)(e^x+1)}dx = \mathrm{A}\log(2+e^x)+B\ log(e^x+1))+c$

$$= -\log(2+e^x)+1\ log(e^x+1))+c$$

Procedure: Consider $\frac{1}{(2+t)(t+1)} = \frac{A}{(2+t)} + \frac{B}{(t+1)}$ (Taking $e^x = t$ and $e^x dx = dt$)

Put t= -2 to find A and put t= -1 to find B in $\frac{1}{(2+t)(t+1)}$. $A = \frac{1}{(-2+1)}, B = \frac{1}{(2-1)}$.

Sutra Used: Paravartya Yojayet (Transpose and Apply), Vilokanam (Mere Observation)

Example 2: $\int_2^3 \frac{x+1}{x^2(x-1)}dx$ **(2004)**

(a) $log\ \left(\frac{16}{9}\right)+\frac{1}{6}$ (b) $log\ \left(\frac{16}{9}\right)-\frac{1}{6}$

(c)$2log\ (2)-\frac{1}{6}$ (d) $log\ \left(\frac{4}{3}\right)-\frac{1}{6}$

Answer: Let $\frac{x+1}{x^2(x-1)} = \frac{A}{x}+\frac{B}{x^2}+\frac{C}{x-1}$ Put x=1 and x=0 in $\frac{x+1}{x^2(x-1)}$ to find C and B.

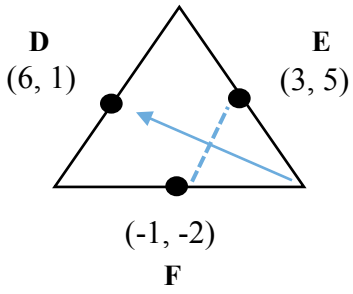
$C = \frac{1+1}{1} = 2,\ B = \frac{0+1}{0-1} = -1$ Integrate $\int_2^3 \frac{2}{x-1}dx = 2log\ (2)$ present in (c).

J&K CET (Jammu and Kashmir Common Entrance Test)

Example: The midpoints of a triangle are D(6,1), E(3,5) and F(-1,-2), then the vertex opposite to D is, **(2007)**

(a) (-4, 2) (b) (-4, 5) (c) (2,5) (d) (10,8)

Answer:



Vertex opposite to D is

[(3+(-1)-6), (5+(-2)-1)]=[-4, 2]

Procedure: (F+E-D) Sutra Used: Urdhwa Tiryakbhyam (Vertically crosswise)

Kerala CET (Kerala Common Entrance Test) **(2010)**

Example: $\int \frac{x+2}{2x^2+6x+5}dx = p\int \frac{4x+6}{2x^2+6x+5}dx + \frac{1}{2}\int \frac{dx}{2x^2+6x+5}$ then the value of p is

(a) $\frac{1}{3}$ (b) $\frac{1}{2}$ (c) $\frac{1}{4}$ (d) 2

Answer: $p = \frac{1}{2}$

Procedure: If $I = \int \frac{Ax+B}{ax^2+bx+c}dx$ then $Numerator = p\frac{d(denominator)}{dx} + q$

Here $p = \frac{A}{2a}$ Sutra Used: Vilokanam (Mere Observation)

OJEE (Orissa Joint Engineering Entrance)

Example 1: $\int \frac{x}{(x^2-a^2)(x^2-b^2)}dx =$ **(2007)**

(a) $\frac{1}{a^2-b^2}\log\left|\frac{x^2-a^2}{x^2-b^2}\right| + c$ (b) $\frac{1}{a^2-b^2}\log\left|\frac{x^2-b^2}{x^2-a^2}\right| + c$

(c) $\frac{1}{2(a^2-b^2)}\log\left|\frac{x^2-a^2}{x^2-b^2}\right| + c$ (d) $\frac{1}{2(a^2-b^2)}\log\left|\frac{x^2-b^2}{x^2-a^2}\right| + c$

Answer: $\int \frac{x}{(x^2-a^2)(x^2-b^2)}dx = \int \frac{1}{2}\left[\frac{dt}{(t-a^2)(t-b^2)}\right]$ (Put $x^2 = t, 2xdx = dt$)

$$=\int \frac{1}{2}\left[\frac{A}{(t-a^2)} + \frac{B}{(t-b^2)}\right]dt = \frac{1}{2}\int\left[\frac{1/(a^2-b^2)}{(t-a^2)} + \frac{1/(b^2-a^2)}{(t-b^2)}\right]dt = \frac{1}{2(a^2-b^2)}\log\left|\frac{x^2-a^2}{x^2-b^2}\right| + c$$

Procedure: Put $t = a^2$ to find A and $t = b^2$ to find B in $\frac{1}{(t-a^2)(t-b^2)}$

Therefore $A = \frac{1}{(a^2-b^2)}, B = \frac{1}{(b^2-a^2)}$

Sutra Used: Paravartya Yojayet (Transpose and Apply), Vilokanam (Mere Observation)

Example 2: $\int \frac{x+1}{x(1+xe^x)^2}dx =$ **(2009)**

(a) $\log\left|\frac{xe^x}{1+xe^x}\right| + \frac{1}{1+xe^x} + c$ (b) $\log\left|\frac{xe^x}{1+xe^x}\right| - \frac{1}{1+xe^x} + c$

(c) $\log\left|\frac{1+xe^x}{xe^x}\right| + \frac{1}{1+xe^x} + c$ (d) $None$

BITSAT

Example 1: If the lines 2x - 3y = 5 and 3x - 4y = 7 are two diameters of a circle of radius 7, then the equation of the circle is,

(a) $x^2 + y^2 + 2x + 4y - 47 = 0$ (b) $x^2 + y^2 = 49$

(c) $x^2 + y^2 - 2x + 2y - 47 = 0$ (d) $x^2 + y^2 = 17$

Example 2: $\int \frac{dx}{x^4+x^3} = \frac{A}{x^2} + \frac{B}{x} + \log\left|\frac{x}{x+1}\right| + c$ then **(2009)**

(a) $A = \frac{1}{2}, B = 1$ (b) $A = 1,\ B = \frac{-1}{2}$ (c) $A = \frac{-1}{2}, B = 1$ (d) $A = 1, B = 1$

$\frac{1}{x^4+x^3} = \frac{1}{x^3(x+1)} = \frac{A}{x^3} + \frac{B}{x^2} + \frac{C}{x} + \frac{D}{x+1}$

$Put\ x = 0\ in\ \frac{1}{x^3(x+1)}\ to\ get\ A = \frac{1}{0+1} = 1$

$Put\ x = -1\ in\ \frac{1}{x^3(x+1)}\ to\ get\ C = \frac{1}{(-1)^3} = -1$

Sutra Used: Paravartya Yojayet (Transpose and Apply)

DCE (2013)

Example 1: Area of quadrilateral whose vertices are (2,3), (3,4), (4,5) and (5,6) is equal to,

(a) 0 (b) 4 (c) 6 (d) None

Ans: $A = \frac{1}{2}\begin{vmatrix} 2 & 3 \\ 3 & 4 \\ 4 & 5 \\ 5 & 6 \\ 2 & 3 \end{vmatrix} = (8-9) + (15-16) + (24-25) + (15-12) = -1-1-1+3 = 0$

Sutra Used: Urdhwa Tiryakbhyam (Vertically crosswise)

Example 2: $\int \frac{dx}{x^2+4x+13} dx =$ (2007)

(a) $log\ (x^2 + 4x + 13) + c$ (b) $\frac{1}{3}\tan^{-1}\left|\frac{x+2}{3}\right| + c$

(c)$log\ (2x + 4) + c$ (d)$\frac{2x+4}{(x^2+4x+13)^2} + c$

Answer: $\frac{2}{\sqrt{|-36|}}\tan^{-1}\left(\frac{2x+4}{\sqrt{|-36|}}\right), a > 0, D < 0$

Procedure: $I = \int \frac{dx}{ax^2+bx+c} = \begin{cases} \frac{1}{\sqrt{D}}\log\left[\frac{f'-\sqrt{D}}{f'+\sqrt{D}}\right], & a > 0, D > 0 \\ \frac{1}{\sqrt{D}}\log\left[\frac{\sqrt{D}-f'}{\sqrt{D}+f'}\right], & a < 0, D > 0 \\ \frac{2}{\sqrt{|D|}}\tan^{-1}\left(\frac{f'}{\sqrt{|D|}}\right), & a > 0, D < 0 \\ \frac{2}{f'}, & D = 0 \end{cases}$

Sutra Used: Chalana Kalanabhyam (Differential Calculus), Vilokanam (Mere Observation)

BCECE

Example: $\int \frac{dx}{\sqrt{(1-x)(x-2)}} dx =$ **(2010)**

(a) $\sin^{-1}(2x - 3) + c$ (b) $\sin^{-1}(2x + 5) + c$

(c)$\sin^{-1}(3 - 2x) + c$ (d) $\sin^{-1}(5 - 2x) + c$

Ans: $\int \frac{dx}{\sqrt{(1-x)(x-2)}} dx = \int \frac{dx}{\sqrt{-x^2+3x-2}} dx = \frac{1}{\sqrt{|-1|}}\sin^{-1}\left[\frac{|-2x+3|}{\sqrt{1}}\right] + c$

Procedure: $I = \int \frac{dx}{\sqrt{ax^2+bx+c}} = \begin{cases} \frac{1}{\sqrt{a}}\log\left[\frac{f'}{2a} + \sqrt{\frac{f}{a}}\right], a > 0, D > 0 \\ \frac{1}{\sqrt{|a|}}\sin^{-1}\left[\frac{|f'|}{\sqrt{D}}\right], a < 0, D > 0 \\ \frac{1}{\sqrt{a}}\sinh^{-1}\left[\frac{f'}{\sqrt{D}}\right], a > 0, D < 0 \end{cases}$

Sutra Used: Chalana Kalanabhyam (Differential Calculus), Vilokanam (Mere Observation)

AMU **(2007)**

Example: $\int \frac{2x^2+3}{(x^2-1)(x^2+4)}dx = alog\left(\frac{x-1}{x+1}\right) + b\tan^{-1}\left(\frac{x}{2}\right) + c$ then value of a and b are

(a) (1,-1) (b) (-1, 1) (c) $\left(\frac{1}{2}, \frac{-1}{2}\right)$ (d) $\left(\frac{1}{2}, \frac{1}{2}\right)$

Procedure: Consider $\frac{2x^2+3}{(x^2-1)(x^2+4)} = \frac{2t+3}{(t-1)(t+4)} = \frac{A}{(t-1)} + \frac{B}{(t+4)}$,

Put $t = 1$ and $t = -4$ in $\frac{2t+3}{(t-1)(t+4)}$ to find $A = \frac{2.1+3}{1+4} = 1, B = \frac{2.(-4)+3}{-4-1} = 1$

$\int \frac{2x^2+3}{(x^2-1)(x^2+4)}dx = \int \frac{1}{(x^2-1)}dx + \int \frac{1}{(x^2+4)}dx = \frac{1}{2}log\left(\frac{x-1}{x+1}\right) + \frac{1}{2}\tan^{-1}\left(\frac{x}{2}\right) + c$

Sutra Used: Paravartya Yojayet (Transpose and Apply), Vilokanam (Mere Observation)

NDA

Example 1: Two straight lines $x - 3y - 2 = 0$ and $2x - 6y - 6 = 0$ **(2011 -I)**

(a) Never intersect (b) Intersect at a single point

(c) Intersect at infinite number of points (d) Intersect at more than one point (finite)

Answer: By observation (Vilokanam) we can say slopes are same. Therefore lines are parallel and intersect at infinite number of points.

Example 2: The point of intersection of two lines $2x + 3y + 4 = 0$ and $4x + 3y + 2 = 0$ is at a distance d from origin. The value of d is **(2009 -I)**

(a)$\sqrt{2}$ (b) $\sqrt{3}$ (c) $\sqrt{5}$ (d) $\sqrt{7}$

$x = \frac{-6+12}{12-6} = 1$ $y = \frac{-16+4}{6} = -2,$ $\sqrt{5}$ is the correct answer.

Sutra Used: Paravartya Yojayet (Transpose and Apply)

Some of the examples are taken from Bank exams. Elementary squaring, adding, finding the square root can be done using Vedic Mathematics sutra.

Central Bank of India, Clerk (2009)

Example: If 51^2 is added to the square of a number, the answer so obtained is 15826. What is the number?

(a) 115 (b) 114 (c) 116 (d) 113

Answer: 115

Sutra Used: Antyayorveva (By the final digits), Vilokanam (By Mere Observation)

Indian Overseas Bank, Clerk (2009)

Example: If 49^2 is added to the square of a number, the answer so obtained is 9125. What is the number?

(a) 6724 (b) 95 (c) 4624 (d) 82

Answer: 82

Sutra Used: Antyayorveva (By the final digits), Vilokanam (By Mere Observation)

Canara Bank PO (2009)

$x^2 + (123)^2 = (246)^2 - (99)^2 - 2462$ then x is equal to

(a)184 (b)186 (c)182 (d)180

Answer: 182

Sutra Used: Antyayorveva (By the final digits)

Dena Bank Clerk **(2009)**

The product of 995×997 is

(a) 99015 (b) 992015 (c) 99215 (d) None of these

Answer: 992015

Sutra Used: Nikhilam Navatascaraman Dasatah (All from 9 and the last from 10),

12th NCERT

Example: Evaluate $\int \frac{5x-2}{(x-2)^2} dx$

Answer: $\int \frac{5x-2}{(x-2)^2} dx = \int \frac{A}{(x-2)^2} dx + \int \frac{B}{x-2} dx = \frac{-8}{x-2} + 5\log(x-2) + c$

Procedure: Put $x = 2$ in $\frac{5x-2}{(x-2)^2}$ to get $A = 5(2) - 2 = 8$ and $B = \frac{d(5x-2)}{dx} = 5$

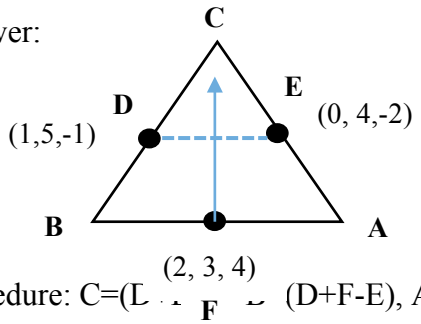
Sutra Used: Paravartya Yojayet (Transpose and Apply), Chalana Kalanabhyam (Differential Calculus)

11th NCERT

The mid points of the sides of a triangle are (1,5,-1), (0, 4 -2) and (2,3,4). Find its vertices.

(11th NCERT Exemplar Page 222)

Answer:



Vertex C = [(1+0-2), (5+4-3), (-1-2-4)]=[-1, 6,-7]

Vertex B = [(2+1-0), (5+3-4), (-1+4-(-2))]=[3, 4,5]

Vertex A= [(0+2-1), (4+3-5), (-2+4-(-1))]=[1, 2,3]

Procedure: C=(L (D+F-E), A=(E+F-D)

Sutra Used: Urdhwa Tiryakbhyam (Vertically crosswise)

10th NCERT

Example 1: Solve $\frac{5}{x-1}+\frac{1}{y-2}=2, \quad \frac{6}{x-1}-\frac{3}{y-2}=1$ (CBSE 2009)

Answer: Let $A=\frac{1}{x-1}, B=\frac{1}{y-2}$. Then $5A+B=2 \quad A=\frac{1-(-6)}{6-(-15)}=\frac{7}{21}=\frac{1}{3},\ x-1=3,\ x=4$

$6A-3B=1 \quad B=2-5.\frac{1}{3}=\frac{1}{3}, \quad y-2=3,\ y=5$

Sutra Used: Paravartya Yojayet (Transpose and Apply)

Example 2: If A (-5, 7) B(-4, -5) C (-1, -6) & D(4, 5) of the vertices of a quadrilateral. Find the area of quadrilateral ABCD. (10th NCERT Page 170)

Ans: $A=\frac{1}{2}\begin{vmatrix} -5 & 7 \\ -4 & -5 \\ -1 & -6 \\ 4 & 5 \\ -5 & 7 \end{vmatrix}=(25+28)+(24-5)+(-5+24)+(28+25)=72\ sq\ units$

Sutra Used: Urdhwa Tiryakbhyam (Vertically crosswise)

Example 3: Find the area of the triangle whose vertices are

A (5, 2), B(4, 7) & C (7, -4) (10th NCERT Page 169)

Ans: $A=\frac{1}{2}\begin{vmatrix} 5 & 2 \\ 4 & 7 \\ 7 & -4 \\ 5 & 2 \end{vmatrix}=(35-8)+(-16-49)+(14+20)=2\ sq\ units$

Sutra Used: Urdhwa Tiryakbhyam (Vertically crosswise)

Results

Conventional maths methods take more time, space, effort and maximum use of pen and paper. VM takes less time, space, effort and minimal pen and paper use. Thus using Vedic Mathematics methods can accelerate calculation processes, and save time by eliminating steps of calculation.

Discussion

After knowing the pattern, it is easy for a student to perform mental calculations. So, recognizing hidden patterns will produce an "aahaa" effect as part of the simplification process. The VM system suggests a unique technique of calculations based on simple rules and principles which are alternatives to the laborious inductive and deductive methods of conventional mathematics. Vedic Maths methods increase mental agility, boost self-confidence, and enhance observation skills. In any of the above mentioned career-deciding examinations, every second is precious. VM methods helps save time. A single extra mark can make a huge difference in student rank, e.g. reduce rank 300 to 200, and increasing the chance of getting the desired job.

Conclusion

VM methods plays major role in deciding someone's career. This includes most courses by which students can become an IAS officer, Forest officer, Management head, Hotel Manager, Bank Manager, Army officer, Engineer, Teacher, etc. Using Vedic Maths has merit in any competitive exam where quantitative aptitudes, mathematical reasoning and high school mathematics are key requirements.

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