Equations
Polynomials
Algebra

Equations Algebra

- Simple eqs
- Quadratic eqn
- Cubic eqn (Fermat's Theorem)
- Special Equations
- Polynomials
- Maxima Minima
- Functions & Graphs
- Logarithms
- Inequalities
- Modulus

Shortcuts

Workshops series

Quant cutoff clearing:
1. Visual Geometry
2. Vedic Numbers
3. Equations Polynomials
4. Dirty (Modern) Quant
5. Arithmetic
6. DI Without Pen

Verbal cutoff clearing:
1. RC in half time
2. Grammar/Sentence Cor
3. Vocab & FIBs
4. Paragraph Comp & Jum
5. Critical Reasoning
6. Logical Reasoning

Increase score by 40 marks!

Simple Equations

The difference between a two – digit number and its reverse (interchanging the digits) is 36. If the difference between the digits is 4 then what is the original number?

a) 18 b) 53 c) 73
d) 29 e) None of these

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a) 18
b) 53
✓ c) 73
d) 29
e) None of these

23. The sum of the numerator and denominator of a fraction is 11. If 1 is added to the numerator and 2 is subtracted from denominator, it becomes 2/3. Find the fraction.

a) 4/9 b) 5/3
c) 3/8 d) 2/9

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b) 5/3
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A certain number of tennis balls were purchased for Rs 450. Five more balls could have been purchased in the same amount if each ball was cheaper by Rs 15. The number of balls purchased was?

a) 20 b) 10

c) 30 d) 15 e) 33

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a) 20
b) 10
c) 30 ✓
d) 15
e) 33

Advance Equations

Three friends, returning from a movie, stopped to eat at a restaurant. After dinner, they paid their bill and noticed a bowl of mints at the front counter. Sita took one-third of the mints, but returned four because she had a momentary pang of guilt. Fatima then took one-fourth of what was left but returned three for similar reason. Eswari then took half of the remainder but threw two back into the bowl. The bowl had only 17 mints left when the raid was over. How many mints were originally in the bowl?

a. 38 b. 31 c. 41 d. None of these

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✓ Correct 48

A shop stores x kg of rice. The first customer buys half this amount plus half a kg of rice. The second customer buys half the remaining amount plus half a kg of rice. Then the third customer also buys half the remaining amount plus half a kg of rice. Thereafter, no rice is left in the shop. Which of the following best describes the value of x?

(1) $2 \leq x \leq 6$
(2) $5 \leq x \leq 8$
(3) $9 \leq x \leq 12$
(4) $11 \leq x \leq 14$

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(3) $9 \leq x \leq 12$ (4) $11 \leq x \leq 14$

Correct ans 7

Ten years ago, the ages of the members of a joint family of eight people added up to 231 years. Three years later, one member died at the age of 60 years and a child was born during the same year. After another three years, one more member died, again at 60, and a child was born during the same year. The current average age of this eight-member joint family is nearest to

(1) 22.6 years (2) 22.1 years
(3) 21 years (4) 25 years

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(3) 21 years ✓(4) 25 years

Answer = 231 + 80 – 60 – 60 = 191
Average = 191/8 = 23.8 approx 25

Variable Equations

A man earns x% on the first Rs. 2,000 and y% on the rest of his income. If he earns Rs. 700 from income of Rs. 4,000 and Rs. 900 from if his income is Rs. 5,000, find x%.

a. 20% b. 15% c. 25% d. None of these

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2000x + 2000y = 700
2000x + 3000y = 900
Y = 20%
X = 15%

Davji Shop sells samosas in boxes of different sizes. The samosas are priced at Rs. 2 per samosa up to 200 samosas. For every additional 20 samosas, the price of the whole lot goes down by 10 paise per samosa. What should be the maximum size of the box that would maximise the revenue?

1. 240 2. 300 3. 400 4. None of these

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1. 240 2. 300 3. 400 4. None of these

Revenue = Qty x price
= (200 + 20n) x (2 – 0.1n)

Where n= lots

Cyclic Equations

Let $x = \sqrt{4 + \sqrt{4 - \sqrt{4 + \sqrt{4 - \ldots \text{to infinity}}}}}$.

Then x equals

(1) 3

(2) $\left(\dfrac{\sqrt{13} - 1}{2}\right)$

(3) $\left(\dfrac{\sqrt{13} + 1}{2}\right)$

(4) $\sqrt{13}$

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(4) $\sqrt{13}$

X = V4 + V4 - X

$$\text{Let } y = \cfrac{1}{2 + \cfrac{1}{3 + \cfrac{1}{2 + \cfrac{1}{3 + \ldots}}}}$$

What is the value of y?

(1) $\frac{\sqrt{11}+3}{2}$

(2) $\frac{\sqrt{11}-3}{2}$

(3) $\frac{\sqrt{15}+3}{2}$

(4) $\frac{\sqrt{15}-3}{2}$

$$\text{Let} \quad y = \cfrac{1}{2 + \cfrac{1}{3 + \cfrac{1}{2 + \cfrac{1}{3 + \ldots}}}}$$

Y = 1 / (2 + 1 / (3 + Y))

What is the value of y?

(1) $\frac{\sqrt{11}+3}{2}$ (2) $\frac{\sqrt{11}-3}{2}$

(3) $\frac{\sqrt{15}+3}{2}$ (4) $\frac{\sqrt{15}-3}{2}$

Cubic Equations

solve the equation

$x^3 - 5x^2 + 8x - 4 = 0.$

(1) $x = -2, 3$ or 9

(2) $x = -2, 3$ or 4

(3) $x = -3, 3$ or 4

(4) $x = 1, 2$

solve the equation

$x^3 - 4x^2 - 9x + 36 = 0.$

(1) $x = -2, 3$ or 9

(2) $x = -2, 3$ or 4

(3) $x = -3, 3$ or 4

(4) ✓ $x = 1, 3$ or 4

Nature of Roots

Descartes' Rule of Signs

Find the maximum number of positive roots for the expression

$$f(x) = 4x^7 + 3x^6 + x^5 + 2x^4 - x^3 + 9x^2 + x + 1 = 0.$$

a) 1
b) 2
c) 3
d) 4

Find the maximum number of positive roots for the expression

$f(x) = 4x^7 + 3x^6 + x^5 + 2x^4 - x^3 + 9x^2 + x + 1 = 0.$

a) 1
b) 2 two sign changes ✓
c) 3
d) 4

Find the maximum number of positive roots for the expression

$$f(x) = x^5 - x^4 + 3x^3 + 9x^2 - x + 5$$

a) 1
b) 2
c) 3
d) 4

Find the maximum number of positive roots for the expression

$$f(x) = x^5 - x^4 + 3x^3 + 9x^2 - x + 5$$

a) 1
b) 2
c) 3
d) 4

$$f(x) = +x^5 - x^4 + 3x^3 + 9x^2 - x + 5$$

1 2 3 4

$$f(-x) = -x^5 - x^4 - 3x^3 + 9x^2 + x + 5$$

1

There are 4, 2, or 0 positive roots, and exactly 1 negative root.

Find the maximum number of negative roots for the expression

$$f(x) = x^5 + x^4 + 4x^3 + 3x^2 + x + 1$$

a) 1
b) 2
c) 3
d) 0

Find the maximum number of negative roots for the expression

$$f(x) = x^5 + x^4 + 4x^3 + 3x^2 + x + 1$$

a) 1
b) 2
c) 3 ✓
d) 0

$$f(x) = +x^5 + x^4 + 4x^3 + 3x^2 + x + 1$$

There are no sign changes, so there are no positive roots. Now I look at $f(-x)$:

$$f(-x) = (-x)^5 + (-x)^4 + 4(-x)^3 + 3(-x)^2 + (-x) + 1$$

$$= -x^5 + x^4 - 4x^3 + 3x^2 - x + 1$$

There are five sign changes, so there are as many as five negative roots.

There are no positive roots, and there are five, three, or one negative roots.

Find the maximum number of negative roots for the expression

$f(x) = 2x^4 - x^3 + 4x^2 - 5x + 3 = 0$

a) 1
b) 2
c) 3
d) 0

Find the maximum number of negative roots for the expression

$$f(x) = 2x^4 - x^3 + 4x^2 - 5x + 3 = 0$$

a) 1
b) 2
c) 3
d) 0

$$f(x) = +2x^4 - x^3 + 4x^2 - 5x + 3$$

There are four sign changes, so there are 4, 2, or 0 positive roots. Now I look at $f(-x)$:

$$f(-x) = 2(-x)^4 - (-x)^3 + 4(-x)^2 - 5(-x) + 3$$

$$= +2x^4 + x^3 + 4x^2 + 5x + 3$$

There are no sign changes, so there are no negative roots.

There are four, two, or zero positive roots, and zero negative roots.

Special Equations

How many combinations possible?

$$2x + 3y = 14$$

$$3x + 5y = 20$$

$$3x + 4y = 15$$

Total number of integer pairs (x,y) satisfying the equation $x + y = xy$

(1) 0
(2) 1
(3) 2
(4) None

Total number of integer pairs (x,y) satisfying the equation x + y =xy

(1) 0
(2) 1
(3) 2
(4) None

Two cases
0 0
2 2

The number of solutions of the equation $2x + y = 40$ where both x and y are positive integers and $x \leq y$ is:

(1) 7 (2) 13 (3) 14 (4) 18 (5) 20

The number of solutions of the equation $2x + y = 40$ where both x and y are positive integers and $x \le y$ is:

(1) 7 (2) 13 (3) 14 (4) 18 (5) 20

X	Y
1	38
2	36
3	34
4	32
5	30
6	28
7	26
8	24
9	22
10	20
11	18
12	16
13	14
14	12
15	10

X = 1 to 13

Suppose you have a currency, named Miso, in three denominations: 1 Miso, 10 Misos and 50 Misos. In how many ways can you pay a bill of 107 Misos?

(1) 17
(2) 16
(3) 18
(4) 15
(5) 19

Suppose you have a currency, named Miso, in three denominations: 1 Miso, 10 Misos and 50 Misos. In how many ways can you pay a bill of 107 Misos?

(1) 17
(2) 16
(3) 18
(4) 15
(5) 19

50	10	1	Tot
2	0	7	1
1	0-5		6
0	0-10		11

How many three digit positive integers, with digits x, y and z in the hundred's, ten's and unit's place respectively, exist such that $x < y$, $z < y$ and $x \neq 0$?

a) 245
b) 285
c) 240
d) 320

How many three digit positive integers, with digits x, y and z in the hundred's, ten's and unit's place respectively, exist such that $x < y$, $z < y$ and $x \neq 0$?

a) 245
b) 285
c) 240 ✓
d) 320

Y	X	Z	Ways	Total
1	0	0	0	0
2	1	0-1	1x2	2
3	1-2	0-2	2x3	6
4	1-3	0-3	3x4	12
5	1-4	0-4	4x5	20
6			5x6	30
7			6x7	42
8			7x8	56
9			8x9	72
				240