INFINITY 2K24

APTITUDE WORKSHOP

BIDCAS

PRO TIPS:-

- DON'T JUST LEARN. PRACTICE.
- TRY TO SOLVE QUESTIONS MENTALLY.
- SPEED WILL DETERMINE YOUR RESULT.
- CONSISTENCY IS KEY.
- APTITUDE IS VERY BENEFICIAL FOR YOUR PROFESSIONAL LIFE.

SYLLABUS

- SQUARE AND CUBE IDENTITIES.
- BODMAS
- ALGEBRA.
- POWER SIMPLIFICATION.
- AREA AND VOLUME.
- PYTHOGORAS THEOREM.
- RATIO AND PROPORTION.
- VENN DIAGRAM.
- AGE QUESTIONS.

SQUARE AND CUBE IDENTITIES

Formulas where square are involved are

- $(a + b)^2 = a^2 + b^2 + 2ab$
- $(a - b)^2 = a^2 + b^2 - 2ab$
- $(a - b)\,(a + b) = a^2 - b^2$
- $(x + a)\,(x + b) = x^2 + (a + b)\,x + ab$
- $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$
- $(a - b - c)^2 = a^2 + b^2 + c^2 - 2ab + 2bc - 2ca$

Formulas where Cube are involved are

- $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$
- $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$
- $a^3 - b^3 = (a - b)\,(a^2 + b^2 + ab)$
- $a^3 + b^3 = (a + b)\,(a^2 + b^2 - ab)$
- $(a + b + c)^3 = a^3 + b^3 + c^3 + 3(a + b)(b + c)(c + a)$
- $x^3 + y^3 + z^3 - 3xyz = (x + y + z)\,(x^2 + y^2 + z^2 - xy - yz - zx)$

EXAMPLE:-

(ii) $(4x - 5y)(16x^2 + 20xy + 25y^2)$

$= (4x - 5y)[(4x)^2 + (4x)(5y) + (5y)^2)]$

We know, a^3 - b^3 = (a - b)(a^2 + b^2 + ab)

$= (4x)^3 - (5y)^3$

$= 64x^3 - 125y^3$

B.O.D.M.A.S.

B ⟶ **B**racket - () or { }

O ⟶ **O**rder or Power - 2^5, 3^7, $\sqrt{2}$

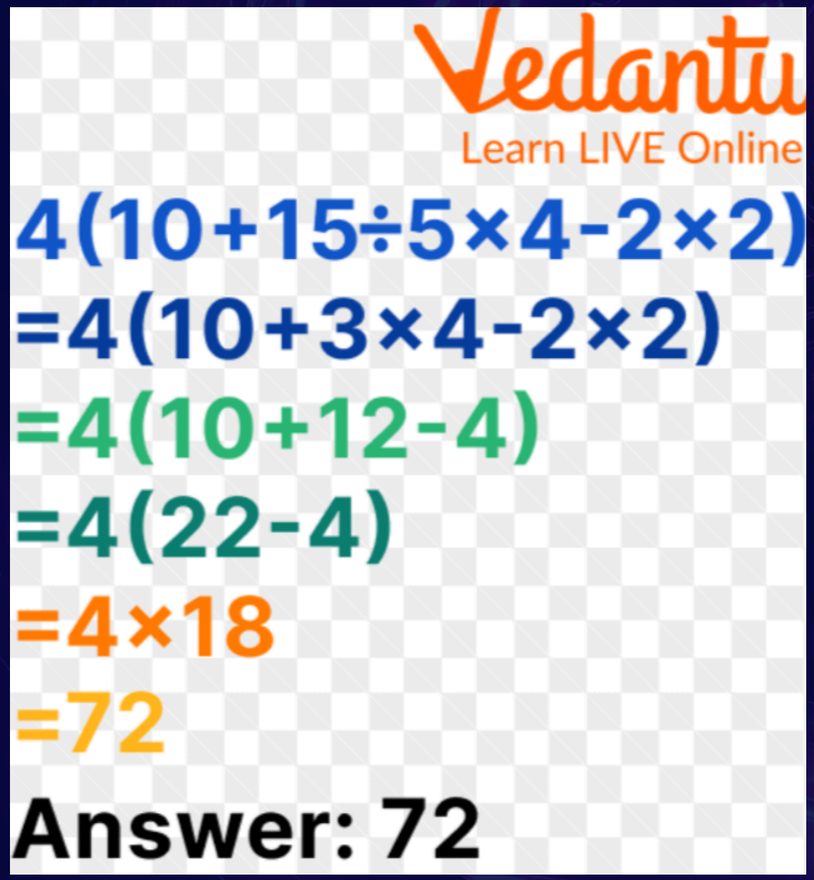
D ⟶ **D**ivision (÷)

M ⟶ **M**ultiplication (×)

A ⟶ **A**ddition (+)

S ⟶ **S**ubtraction (–)

EXAMPLE:-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4(10+15÷5×4-2×2)
=4(10+3×4-2×2)
=4(10+12-4)
=4(22-4)
=4×18
=72
Answer: 72

ALGEBRA

The sum of three times a number and 2 less than 4 times that same number is 61. Write an equation and solve to determine the value of the unknown number.

$3n + 4n - 2 = 61$

$7n - 2 = 61$

$+2 \quad +2$

$\frac{7n}{7} = \frac{63}{7}$

$n = 9$

27

$+36$

63

-2

61

POWER SIMPLIFICATION

A Key To The Laws Of Exponents

Law	Example
$a^m a^n = a^{m+n}$	$2^3 2^4 = 2^{3+4} = 2^7 = 128$
$(a^m)^n = a^{mn}$	$(2^3)^4 = 2^{3.4} = 2^{12} = 4096$
$(ab)^n = a^n b^n$	$(20)^3 = (2.10)^3 = 2^3.10^3 = 8.1000 = 8000$
$(\frac{a}{b})^n = \frac{a^n}{b^n}$	$(\frac{2}{5})^3 = \frac{2^3}{5^3} = \frac{8}{125}$
$\frac{a^m}{a^n} = a^{m-n}$	$\frac{2^5}{2^3} = 2^{5-3} = 2^2 = 4$
$\frac{a^m}{a^n} = \frac{1}{a^{n-m}}$	$\frac{2^3}{2^5} = \frac{1}{2^{5-3}} = \frac{1}{2^2} = \frac{1}{4}$

EXAMPLE:-

(ii) $\dfrac{3^{-5}\times10^{-5}\times125}{5^{-7}\times6^{-5}}$

$\because 125 = 5\times5\times5 = 5^3$

$10^{-5} = (2\times5)^{-5} = (2^{-5}\times5^{-5})$

$6^{-5} = (2\times3)^{-5} = (2^{-5}\times3^{-5})$

$$\therefore \frac{3^{-5}\times10^{-5}\times125}{5^{-7}\times6^{-5}} = \frac{3^{-5}\times(2\times5)^{-5}\times5^3}{5^{-7}\times(2\times3)^{-5}}$$

$$= \frac{3^{-5}\times2^{-5}\times5^{-5}\times5^3}{5^{-7}\times2^{-5}\times3^{-5}}$$

$$= \left(\frac{3^{-5}}{3^{-5}}\right)\times\left(\frac{2^{-5}}{2^{-5}}\right)\times\left(\frac{5^{-5}\times5^3}{5^{-7}}\right)$$

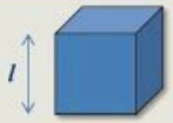
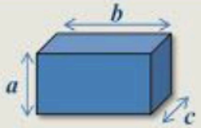
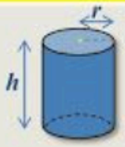
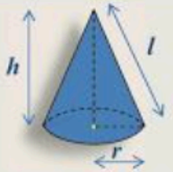
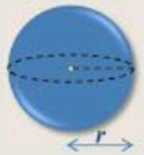
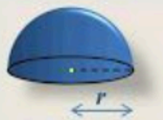
$= 3^{-5-(-5)}\times2^{-5-(-5)}\times5^{-5+3-(-7)}$

$= 3^{-5+5}\times2^{-5+5}\times5^{-5+10}$

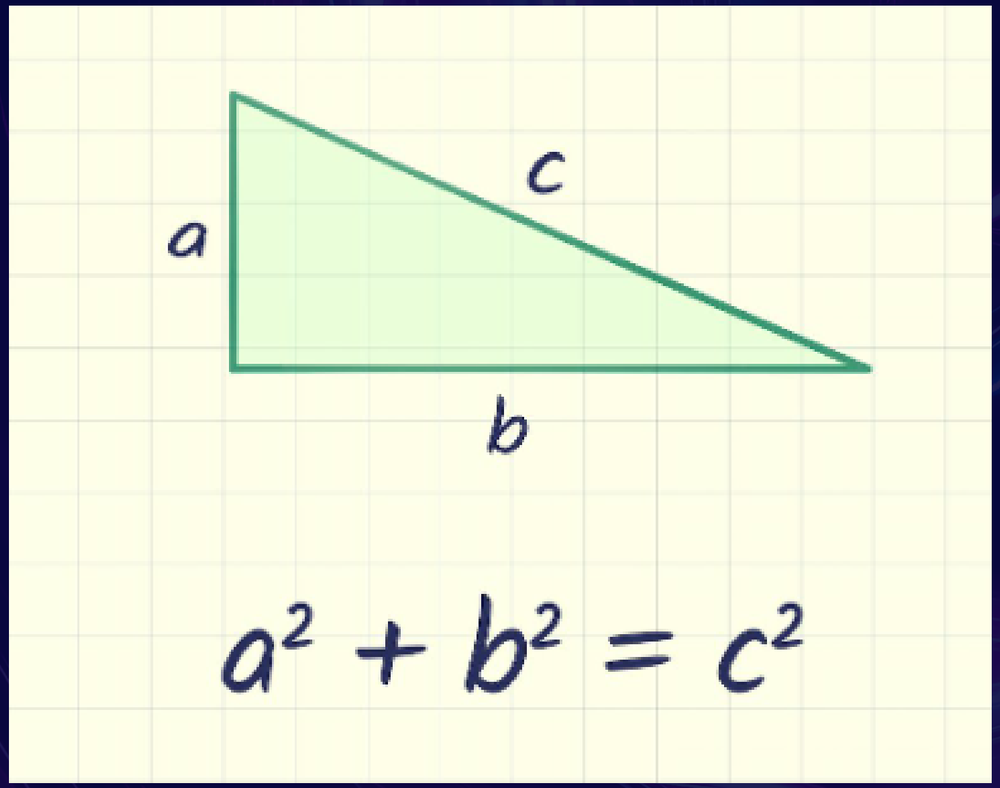
$= 3^0\times2^0\times5^0$

$= 1\times1\times5^5 = 5^5$

AREA AND VOLUME

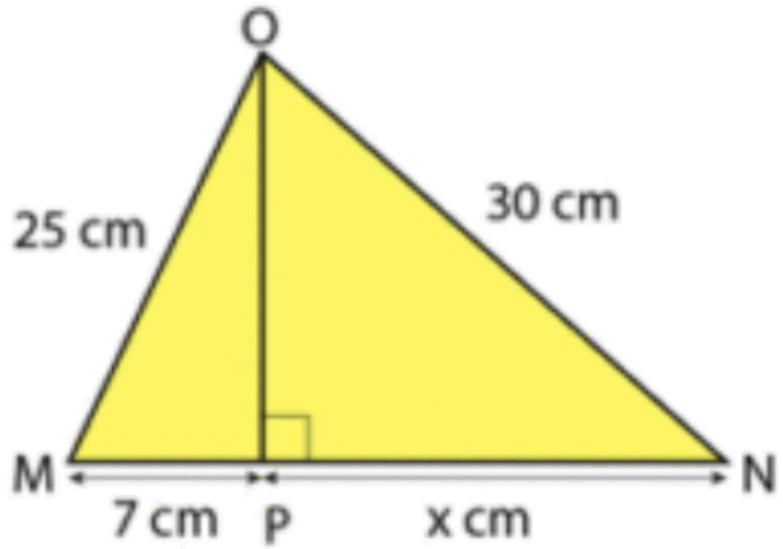
CUBE	CUBOID	CYLINDER
		
SURFACE AREA TOTAL $A = 6l^2$ SIDES $A = 4l^2$ VOLUME $V = l^3$	SURFACE AREA TOTAL $A = 2(ab + bc + ac)$ SIDES $A = 2(ab + 2ac)$ VOLUME $V = abc$	SURFACE AREA TOTAL $A = 2\pi r(r + h)$ CURVED $A = 2\pi rh$ VOLUME $V = \pi r^2 h$
CONE	**SPHERE**	**HEMISPHERE**
		
SURFACE AREA TOTAL $A = \pi r^2 + \pi rl$ CURVED $A = \pi rl$ VOLUME $V = \frac{1}{3}\pi r^2 h$	SURFACE AREA $A = 4\pi r^2$ VOLUME $V = \frac{4}{3}\pi r^3$	SURFACE AREA TOTAL $A = 3\pi r^2$ CURVED $A = 2\pi r^2$ VOLUME $V = \frac{2}{3}\pi r^3$

PYHTOGORAS THEOREM



EXAMPLE:-

OMN is a triangle.
MP = 7 cm, OM = 25 cm, ON = 30 cm



Work out the length of PN.

RATIO AND PROPORTIONS

The angles of a triangle are in ratio of 3:4:8.
What are the measures of each angle?

3:4:8 → 3n, 4n, 8n

$3n + 4n + 8n = 180^\circ$

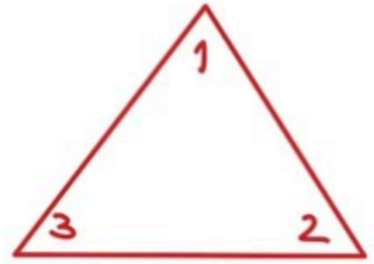
$\frac{15n}{15} = \frac{180^\circ}{15}$

$n = 12^\circ$

$3n = 3(12^\circ) = 36^\circ$

$4n = 4(12^\circ) = 48^\circ$

$8n = 8(12^\circ) = 96$



$\angle 1 + \angle 2 + \angle 3 = 180^\circ$

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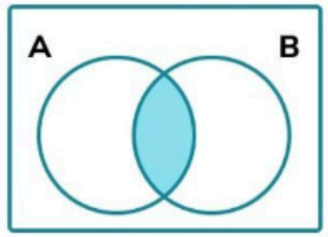
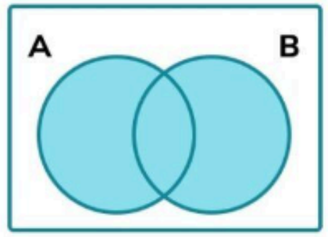
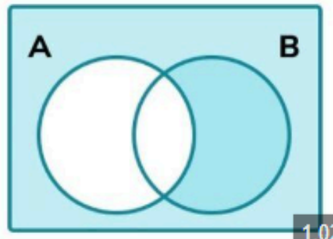
VENN DIAGRAM

$A \cap B$	'A and B' The intersection of A and B. The elements in both sets A and B.	
$A \cup B$	'A or B' The union of A or B. Any element in set A or set B.	
A'	'Not A' The complement of A. Any element not in A.	

Some important formulas

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Some Important Formulae: For any three sets A, B, C.

(i) $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

(ii) If $A \cap B = \phi$, then $n(A \cup B) = n(A) + n(B)$

(iii) $n(A - B) + n(A \cap B) = n(A)$

(iv) $n(B - A) + n(A \cap B) = n(B)$

(v) $n(A \cup B) = n(A - B) + n(A \cap B) + n(B - A)$

(vi) $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$

EXAMPLE:-

1. If A and B are two sets such that n (A ∪ B) = 50, n (A) = 28 and n (B) = 32, find n (A ∩ B).

Solution:

We have,

$n(A \cup B) = 50$

$n(A) = 28$

$n(B) = 32$

We know, $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

Substituting the values, we get

$50 = 28 + 32 - n(A \cap B)$

$50 = 60 - n(A \cap B)$

$-10 = -n(A \cap B)$

$\therefore n(A \cap B) = 10$

AGE QUESTIONS

1. Ashu is x years old while his mother Mrs. Veena is x^2 years old. Five years hence Mrs. Veena will be three times old as Ashu. Find their present ages.

Solution:

Given, Ashu's present age is x years and his mother Mrs. Veena is x^2 years.
After 5 years, Ashu age will be $(x + 5)$ years
And his mother Mrs. Veena age will be $(x^2 + 5)$ years
Given relationship between their ages can be expressed as:

$x^2 + 5 = 3(x + 5)$

$x^2 + 5 = 3x + 15$ $x^2 + 5 - 3x - 15 = 0$

$x^2 - 5x + 2x + 10 = 0$

$x(x - 5) + 2(x - 5) = 0$

$(x - 5)(x + 2) = 0$

$x = 5$ or $x = -2$(neglected) since, the age can never be negative
Hence, Ashu's present age is 5 years and his mother's age is 25 years.

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ALL THE BEST

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