IMPORTANT IDENTITIES AND FORMULAS

CLASS 5TH

TABLE 1 TO 10

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100

TABLE 11 TO 20

11	12	13	14	15	16	17	18	19	20
22	24	26	28	30	32	34	36	38	40
33	36	39	42	45	48	51	54	57	60
44	48	52	56	60	64	68	72	76	80
55	60	65	70	75	80	85	90	95	100
66	72	78	84	90	96	102	108	114	120
77	84	91	98	105	112	119	126	133	140
88	96	104	112	120	128	136	144	152	160
99	108	117	126	135	144	153	162	171	180
110	120	130	140	150	160	170	180	190	200

SQUARES 1 TO 50

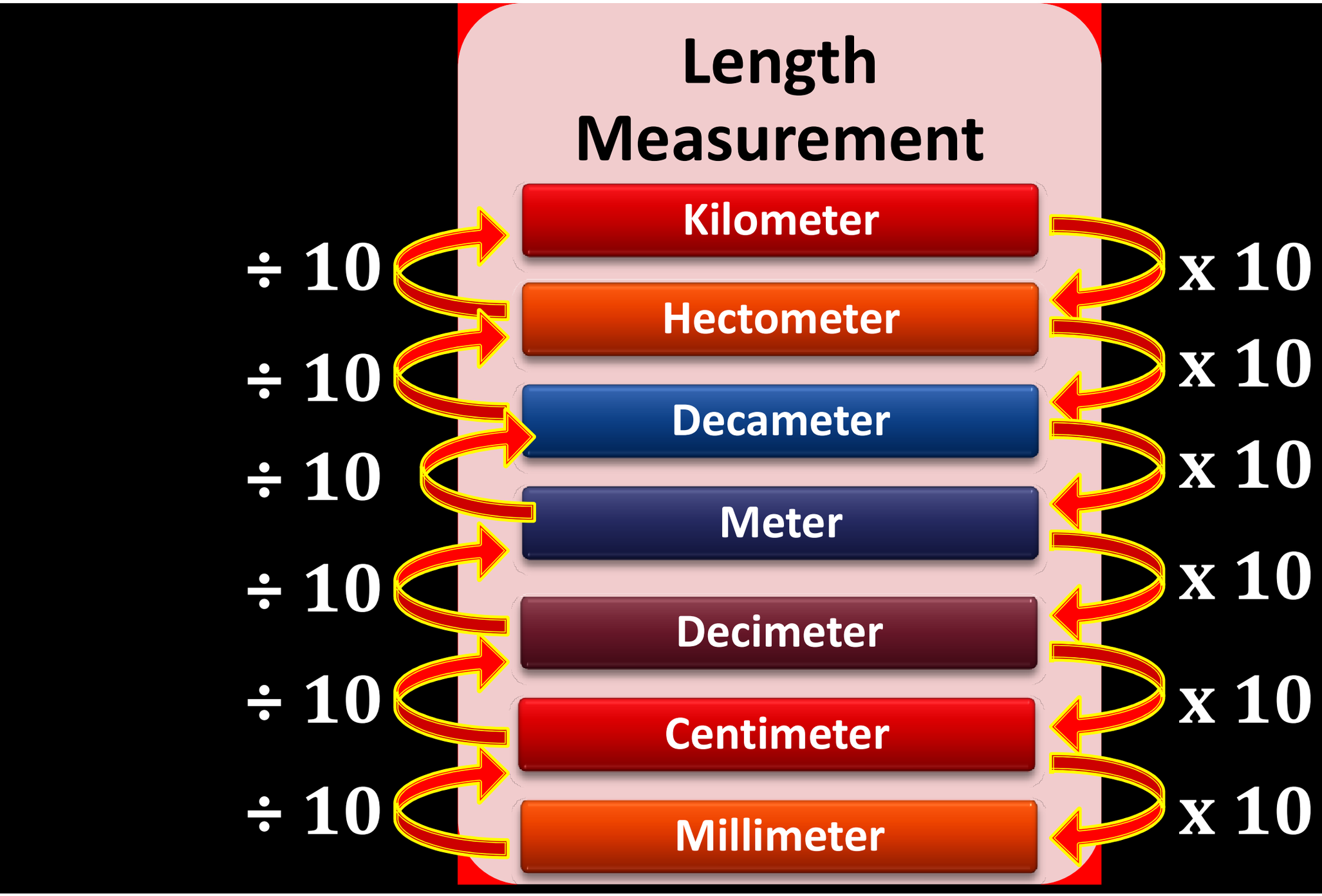
NUM	SQUARE	NUM	SQUARE	NUM	SQUARE	NUM	SQUARE	NUM	SQUARE
1	1	11	121	21	441	31	961	41	1681
2	4	12	144	22	484	32	1024	42	1764
3	9	13	169	23	529	33	1089	43	1849
4	16	14	196	24	576	34	1156	44	1936
5	25	15	225	25	625	35	1225	45	2025
6	36	16	256	26	676	36	1296	46	2116
7	49	17	289	27	729	37	1369	47	2209
8	64	18	324	28	784	38	1444	48	2304
9	81	19	361	29	841	39	1521	49	2401
10	100	20	400	30	900	40	1600	50	2500

CUBES 1 TO 50

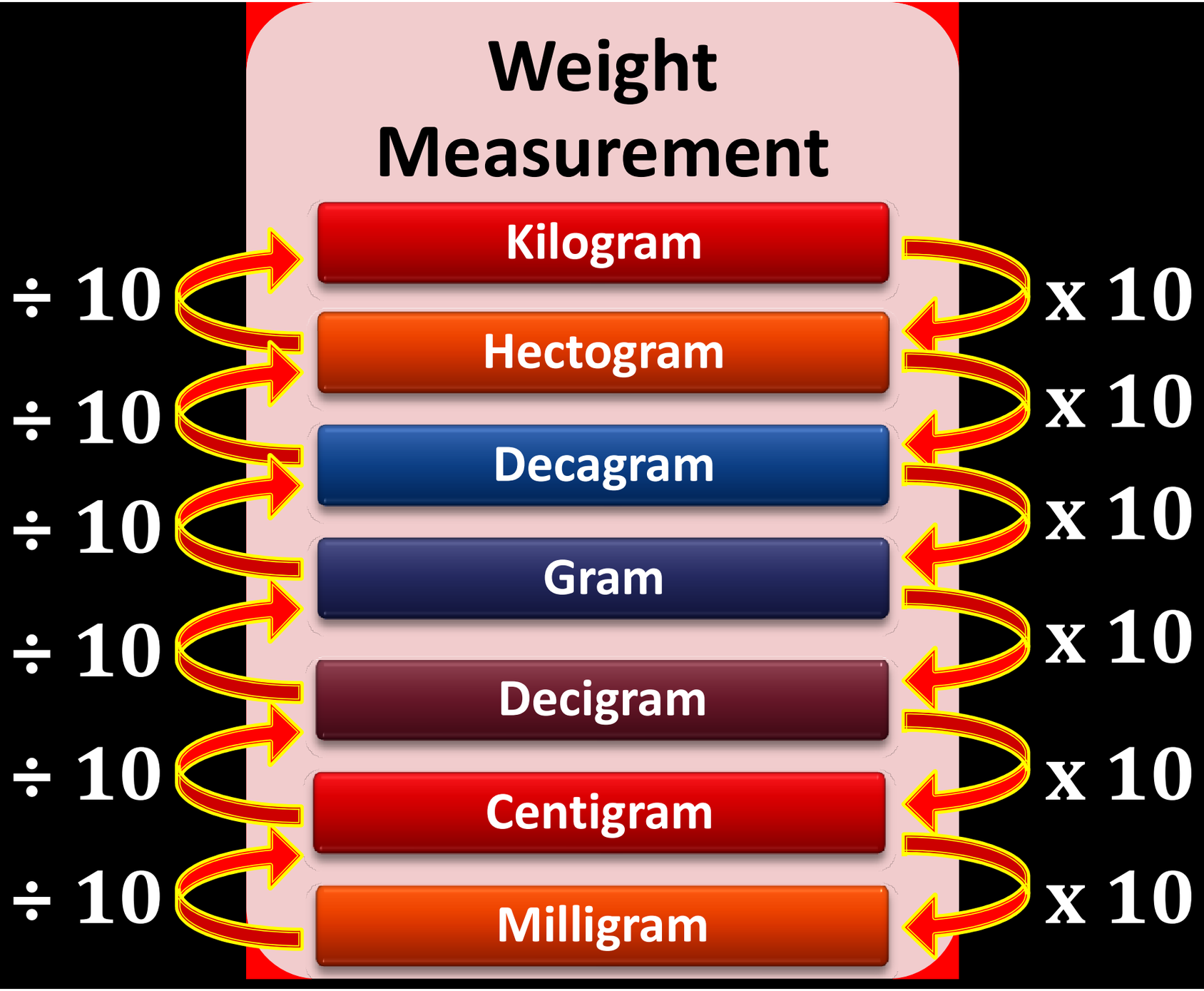
NUM	CUBE	NUM	CUBE	NUM	CUBE	NUM	CUBE	NUM	CUBE
1	1	11	1331	21	9261	31	29791	41	68921
2	8	12	1728	22	10648	32	32768	42	74088
3	27	13	2197	23	12167	33	35937	43	79507
4	64	14	2744	24	13824	34	39304	44	85184
5	125	15	3375	25	15625	35	42875	45	91125
6	216	16	4096	26	17576	36	46656	46	97336
7	343	17	4913	27	19683	37	50653	47	103823
8	512	18	5832	28	21952	38	54872	48	110592
9	729	19	6859	29	24389	39	59319	49	117649
10	1000	20	8000	30	27000	40	64000	50	125000

Divisibility Rules

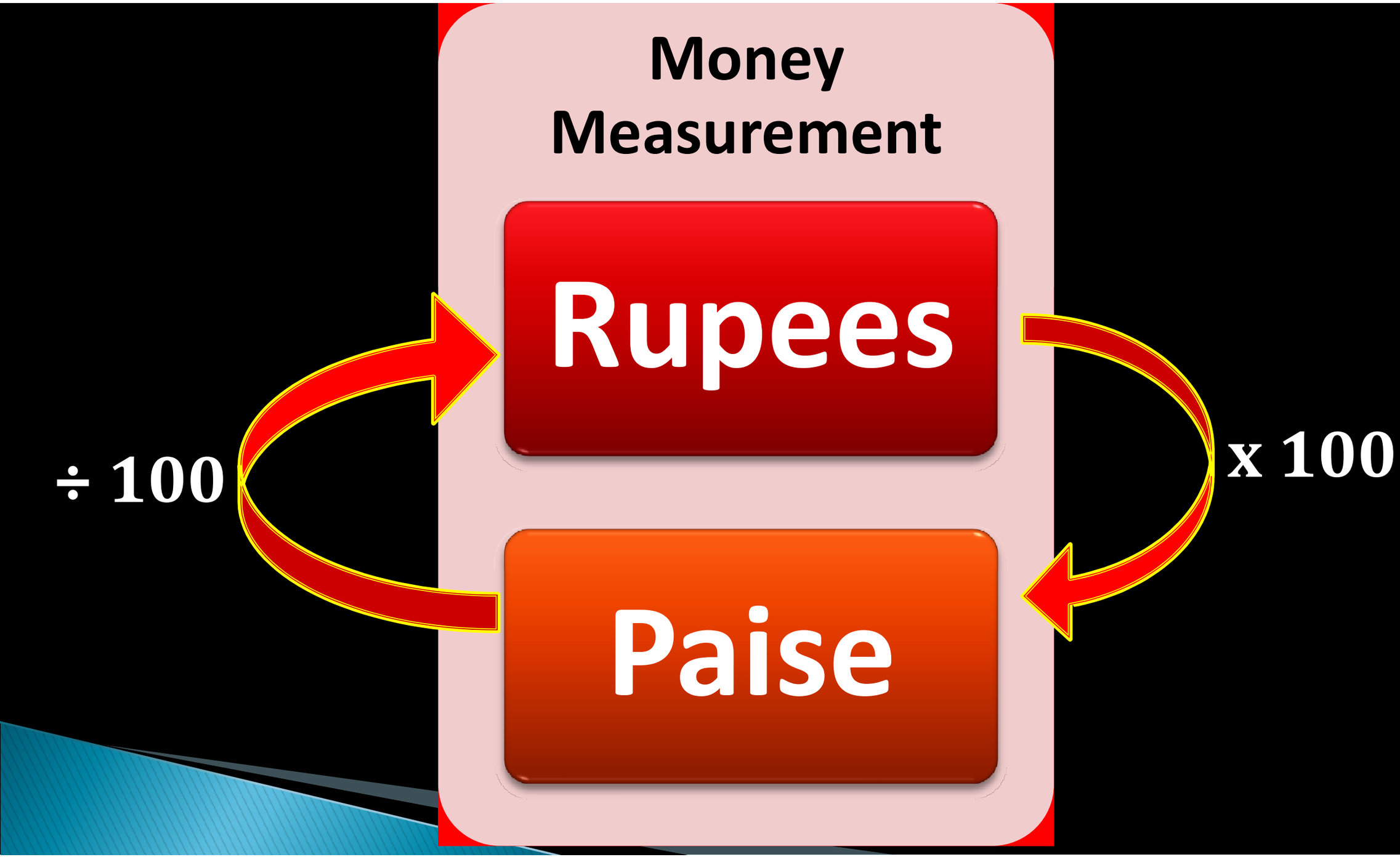
A number is divisible by. . .		Divisible	Not Divisible
2	if the last digit is even (0, 2, 4, 6, or 8).	3,978	4,975
3	if the sum of the digits is divisible by 3.	315	139
4	if the last two digits form a number divisible by 4.	8,512	7,518
5	if the last digit is 0 or 5.	14,975	10,978
6	if the number is divisible by both 2 and 3	48	20
9	if the sum of the digits is divisible by 9.	711	93


Length Measurement
Kilometer
Hectometer
Decameter
Meter
Decimeter
Centimeter
Millimeter
÷ 10
÷ 10
÷ 10
÷ 10
÷ 10
÷ 10
x 10
x 10
x 10
x 10
x 10
x 10

Weight Measurement



Liquid Measurement


Money
Measurement
Rupees
Paise
÷ 100
x 100

ARITHMATIC CALCULATION OF FRACTIONS

$$\frac{a}{b} + \frac{c}{d} = \text{LCM Method}$$

$$\frac{a}{b} - \frac{c}{d} = \text{LCM Method}$$

$$\frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}$$

$$\frac{a}{b} \div \frac{c}{d} = \frac{a \times d}{b \times c}$$

CLASS 6TH

Quantity weights:

- a) 1 kilometer (km) = 1000 Meters (m)
  b) 1 Meter (m) = 100 Centimeter (cm)
  c) 1 Centimeter (cm) = 10 Millimeter (mm)
  d) 1 Kilogram (kg) = 1000 Grams (gm)
  e) 1 Liter (l) = 1000 Milliliters (ml)

Roman Numerals:

I – 1

II – 2

V – 5

X – 10

L – 50

C – 100

D – 500

M – 1000

PROPERTY	IMPLEMENTATION
Closure Property of Addition Closure Property of Multiplication	Integer + Integer = Integer Integer x Integer = Integer
Commutative Property under Addition Commutative Property under Multiplication	$a + b = b + a$ $a \times b = b \times a$
Associativity of Addition Associativity of Multiplication	$(a + b) + c = a + (b + c)$ $a \times (b \times c) = (a \times b) \times c$
Distributive Property under Addition Distributive Property under Subtraction	$a \times b + a \times c = a \times (b + c)$ $a \times b - a \times c = a \times (b - c)$
Additive Identity	$a + 0 = a = 0 + a$
Multiplicative Identity	$a \times 0 = 0 = 0 \times a$

Mensuration

- Perimeter of a rectangle = 2 × (length + breadth)
- Perimeter of a square = 4 × length of its side
- Perimeter of an equilateral triangle = 3 × length of a side
- Area of a rectangle = length × breadth
- Area of a square = side × side = $(\text{side})^2$

Algebra Formulas

- $x \times y = xy$;
  such as $5 \times a = 5a = a \times 5$.

$a \times a \times a \times \ldots$ 9 times $= a^{12}$

CLASS 7TH

Practical Geometry

- Area of a Square = Side^2
- Perimeter of a Square = 4 × Side
- Area of Rectangle = Length × Breadth
- Perimeter of a Rectangle = 2 × (Length + Breadth)
- Area of a Parallelogram = Base × Height
- Area of Triangle = 1/ 2 × Base × Height
- Circumference of a circle = π d, where 'd' is the diameter of a circle and π = 22/7 or 3.14
- Area of a circle = πr^2

Exponents and Power Formulas

- Law of Product: $a^m \times a^n = a^{m+n}$
- Law of Quotient: $a^m/a^n = a^{m-n}$
- Law of Zero Exponent: $a^0 = 1$
- Law of Negative Exponent: $a^{-m} = 1/a^m$
- Law of Power of a Power: $(a^m)^n = a^{mn}$
- Law of Power of a Product: $(ab)^m = a^m b^m$
- Law of Power of a Quotient: $(a/b)^m = a^m/b^m$

Comparing Quantities Formulas

- Increase in Percentage
  = (Change / Original Amount) × 100
- Profit percent
  = (Profit / Cost price) × 100
- Simple Interest
  = (Principal × Rate × Time) / 100
- Amount = Principal + Interest

Algebra Formulas

- $(a-b)^2 = a^2 - 2ab + b^2$
- $(a-b-c)^2 = a^2 + b^2 + c^2 - 2ab + 2bc - 2ac$

Important Formulas

- $a^x / a^y = a^{x-y}$
- $a^x / b^x = (a/b)^x$
- $(a^x)^y = a^{xy}$
- $(a-b-c)^2 = a^2 + b^2 + c^2 - 2ab + 2bc - 2ac$
- Increase in Percentage = (Change / Original Amount) × 100
- Profit percent = (Profit / Cost price) × 100
- Simple Interest = (Principal × Rate × Time) / 100
- Amount = Principal + Interest
- Pythagoras Theorem : $(\text{Hypotenuse})^2 = (\text{Adjacent Side})^2 + (\text{Opposite Side})^2$
- Area of a Circle = πr^2, where 'r' is the radius of a circle and π = 22/7 or 3.14

CLASS 8TH

Rational Numbers

- Additive Identity states (a / b + 0) = (a / b)
- Multiplicative Identity states (a / b) × 1 = (a/b)
- Multiplicative Inverse states (a / b) × (b/a) = 1
- Additive Inverse is defined as the value, which on adding with the original number results zero value.
- a+(-a)=a-a=0
- Original Number + x=0
- Additive Inverse of 10 is -10

- The Multiplicative inverse of a number, say, N, is represented by $1/N$ or N^{-1}
- It is also called reciprocal.
- Fact : When a number by its own multiplicative inverse, the resultant value is equal to zero.

Geometry

- Curved Surface Area of a Cone = $1/2 \times l \times 2\pi r = \pi rl$, where 'r' is its base radius and 'l' its slant height. 'l' = $\sqrt{(r^2 + h^2)}$
- Volume of a Cuboid
  = Base Area × Height
  = Length × Breadth × Height
- Volume of a Cone = $(1 / 3)\pi r^2 h$
- Volume of a Sphere = $(4/3)\ \pi\ r^3$
- Volume of a Hemisphere = $(2/3)\ \pi r^3$

Exponents Formulas

- Law of Product: $a^m \times a^n = a^{m+n}$
- Law of Quotient: $a^m/a^n = a^{m-n}$
- Law of Zero Exponent: $a^0 = 1$
- Law of Negative Exponent: $a^{-m} = 1/a^m$
- Law of Power of a Power: $(a^m)^n = a^{mn}$
- Law of Power of a Product: $(ab)^m = a^m b^m$
- Law of Power of a Quotient: $(a/b)^m = a^m/b^m$

Comparing Quantities Formulas

- Discount = Marked Price - Sale Price
- Simple Interest = (Principal × Rate × Time)/100
- Compound Interest Formula = Amount - Principal
- If the interest is to be calculated annually, then

  Amount = Principal $(1 + \text{Rate}/100)^{n}$

  ‘n’ is the time period.

Algebra

- $(a + b)^2 = a^2 + 2ab + b^2$
- $(a + b)\,(a - b) = a^2 - b^2$
- $(a - b)^2 = a^2 - 2ab + b^2$

Important Formulas

- Additive inverse of rational number: $a/b = -b/a$
- Multiplicative Inverse of $a/b = c/d$, if $a/b \times c/d = 1$
- Distributivity $a(b - c) = ab - ac$
- Probability of the occurrence of an event = Number of outcomes that comprise an event/ Total number of outcomes
- Compound Interest formula = Amount - Principal, Amount in case the interest is to be calculated annually = Principal $(1 + \text{Rate}/100)^n$, where 'n' is the time period.
- $(a - b)^2 = a^2 - 2ab + b^2$
- $(a + b)(a - b) = a^2 - b^2$
- Euler's Formula: For any polyhedron, Number of faces + Number of vertices - Number of edges = 2
- Volume of a Cone = $(1 / 3)\pi r^2 h$
- Volume of a Sphere = $(4/3) \pi r^3$

CLASS 9TH

Number System

- $\sqrt{ab} = \sqrt{a}\,\sqrt{b}$
- $\sqrt{(a/b)} = \sqrt{a} / \sqrt{b}$
- $(\sqrt{a} + \sqrt{b})\,(\sqrt{a} - \sqrt{b}) = a - b$
- $(\sqrt{a} + \sqrt{b})^2 = a + 2\sqrt{ab} + b$
- $(a + \sqrt{b})\,(a - \sqrt{b}) = a^2 - b$
- $(a + b)\,(a - b) = a^2 - b^2$

Algebra Formulas

- $(x+ y)^2 = x^2 + 2xy + y^2$
- $(x - y)^2 = x^2 - 2xy + y^2$
- $x^2 - y^2 = (x + y)(x - y)$
- $(x + a)(x + b) = x^2 + (a + b)x + ab$

- $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$
- $(x - y)^3 = x^3 - y^3 - 3xy(x - y)$
- $(x - y)^3 = x^3 - y^3 - 3xy(x - y)$

  $= x^3 - 3x^2y + 3xy^2 - y^3$
- $x^3 + y^3 + z^3 - 3xyz$

  $= (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$

SURFACE AREAS AND VOLUMES

- Curved Surface Area of a Cone = $1/2 \times l \times 2\pi r = \pi rl$
- Total Surface Area of a Cone = $\pi rl + \pi r^2 = \pi r(l + r)$
- Surface Area of a Sphere = $4 \pi r^2$
- Curved Surface Area of a Hemisphere = $2\pi r^2$
- Total Surface Area of a Hemisphere = $3\pi r^2$
- Volume of a Cone = $1/3 \pi r^2 h$
- Volume of a Sphere = $4/3 \pi r^3$
- Volume of a Hemisphere = $2/3 \pi r^3$

Statistics and Probability

- Class-mark = (Upper limit + Lower limit)/ 2
- Mean = Sum of the observations / Total number of observations
- Mode = The observation occurring the most frequent times
- Experimental Probability Formula: The trial counts in which the event (E) has occurred / The sum of trials

CLASS 10TH

Algebra Formulas

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

- $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$
- $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$
- $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2xz$
- $(x + y - z)^2 = x^2 + y^2 + z^2 + 2xy - 2yz - 2xz$
- $(x - y + z)^2 = x^2 + y^2 + z^2 - 2xy - 2yz + 2xz$
- $(x - y - z)^2 = x^2 + y^2 + z^2 - 2xy + 2yz - 2xz$
- $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - xz)$

Arithmetic Progression Formulas

- $a_n = a + (n - 1)\, d$, where an is the nth term.
- $S_n = n/2\, [2a + (n - 1)d]$

Trigonometry Formulas

- $\sin(90° - A) = \cos A$
- $\cos(90° - A) = \sin A$
- $\tan(90° - A) = \cot A$
- $\cot(90° - A) = \tan A$
- $\sec(90° - A) = \operatorname{cosec} A$
- $\operatorname{cosec}(90° - A) = \sec A$
- $\sin^2 \theta + \cos^2 \theta = 1 \Rightarrow \sin^2 \theta = 1 - \cos^2 \theta \Rightarrow \cos^2 \theta = 1 - \sin^2 \theta$
- $\operatorname{cosec}^2 \theta - \cot^2 \theta = 1 \Rightarrow \operatorname{cosec}^2 \theta = 1 + \cot^2 \theta \Rightarrow \cot^2 \theta = \operatorname{cosec}^2 \theta - 1$
- $\sec^2 \theta - \tan^2 \theta = 1 \Rightarrow \sec^2 \theta = 1 + \tan^2 \theta \Rightarrow \tan^2 \theta = \sec^2 \theta - 1$
- $\sin \theta \operatorname{cosec} \theta = 1 \Rightarrow \cos \theta \sec \theta = 1 \Rightarrow \tan \theta \cot \theta = 1$

Circle Formulas

- The tangent to a circle equation $x_2 + y_2 = a_2$ for a line $y = mx + c$ is given by the equation $y = mx \pm a\sqrt{[1+ m_2]}$.
- The tangent to a circle equation $x_2 + y_2 = a_2$ at (a_1,b_1) is $xa_1 + yb_1 = a_2$

Surface Area and Volume Formulas

Sphere:

- Volume of Sphere = $4/3 \times \pi r^3$
- Lateral Surface Area of Sphere (LSA) = $4\pi r^2$
- Total Surface Area of Sphere (TSA) = $4\pi r^2$

Right Circular Cylinder:

- Volume of Right Circular Cylinder = $\pi r^2 h$
- Lateral Surface Area of Right Circular Cylinder (LSA) = $2\times(\pi rh)$
- Total Surface Area of Right Circular Cylinder (TSA) = $2\pi r\times(r + h)$

Hemisphere

- Volume of Hemisphere = ⅔ x (πr^3)
- Lateral Surface Area of Hemisphere (LSA) = $2\pi r^2$
- Total Surface Area of Hemisphere (TSA) = $3\pi r^2$

Prism

- Volume of Prism = B × h
- Lateral Surface Area of Prism (LSA) = p × h

Important Formulas

- $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$
- $(a – b)^3 = a^3 - b^3 - 3ab(a – b)$
- $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2xz$
- $an = a + (n - 1)\, d$
- $Sn = n/2\, [2a + (n - 1)d]$
- $\sin^2 \theta + \cos^2 \theta = 1 \Rightarrow \sin^2 \theta = 1 - \cos^2 \theta \Rightarrow \cos^2 \theta = 1 - \sin^2 \theta$
- $\text{cosec}^2 \theta - \cot^2 \theta = 1 \Rightarrow \text{cosec}^2 \theta = 1 + \cot^2 \theta \Rightarrow \cot^2 \theta = \text{cosec}^2 \theta - 1$
- $\sec^2 \theta - \tan^2 \theta = 1 \Rightarrow \sec^2 \theta = 1 + \tan^2 \theta \Rightarrow \tan^2 \theta = \sec^2 \theta - 1$
- $\sin \theta \, \text{cosec} \, \theta = 1 \Rightarrow \cos \theta \sec \theta = 1 \Rightarrow \tan \theta \cot \theta = 1$
- Vol of Sphere $= 4/3 \times \pi\, r^3$
- Surface Area of Sphere $= 4\pi r^2$