MasterLeap Tuition Grade 7 formula sheet

Topics Covered:

- Number System (Integers, Fractions, Decimals)
- Algebra (Expressions and Equations)
- Ratio and Proportion (Advanced)
- Percentage and Profit-Loss
- Geometry (Lines, Angles, Triangles)
- Mensuration (Perimeter, Area, Volume)
- Exponents and Powers
- Data Handling

SECTION 1: NUMBER SYSTEM

Integers (Advanced)

Operation	Rule	Example
Addition	Same sign → Add; Different signs → Subtract	-5 + (-3) = -8; 8 + (-3) = 5
Subtraction	Add the opposite of the second number	5 - (-3) = 5 + 3 = 8
Multiplication	(-) × (-) = (+); (-) × (+) = (-)	(-4) × (-3) = 12; (-4) × 3 = -12
Division	(-) ÷ (-) = (+); (-) ÷ (+) = (-)	(-12) ÷ (-4) = 3; (-12) ÷ 4 = -3

Order of Operations	BODMAS/PEMDAS	Brackets, Orders, Division/Multiplication, Addition/Subtraction

Fractions and Decimals

Operation	Fractions	Decimals
Addition	Find LCM of denominators	Line up decimal points
Subtraction	Find LCM of denominators	Line up decimal points
Multiplication	Multiply numerators, multiply denominators	Multiply as whole numbers, count decimal places
Division	Multiply by reciprocal	Move decimal in divisor to make whole

Rational Numbers

Concept	Definition	Example
Rational Number	Number that can be written as p/q where p,q are integers, q≠0	3/4, -2/5, 7, 0.25

Equivalent Rational Numbers	Multiply numerator and denominator by same number	2/3 = 4/6 = 6/9 = 8/12
Standard Form	No common factor between numerator and denominator except 1	6/8 in standard form = 3/4

Comparison of Rational Numbers

Rule	Example
Positive numbers > Negative numbers	3 > -5
Among positive, larger numerator with same denominator	5/7 > 3/7
Different denominators: Cross multiply	Compare 3/4 and 4/5: 3×5=15, 4×4=16 → 15<16 → 3/4 < 4/5

SECTION 2: EXPONENTS AND POWERS

Laws of Exponents

Law	Formula	Example
Product	$a^m \times a^n = a^{m+n}$	$2^3 \times 2^4 = 2^7$

Quotient	$a^m \div a^n = a^{m-n}$ (m>n)	$2^5 \div 2^3 = 2^2$
Power of Power	$(a^m)^n = a^{mn}$	$(2^3)^2 = 2^6$
Power of Product	$(ab)^m = a^m \times b^m$	$(2\times3)^2 = 2^2 \times 3^2 = 4\times9=36$
Power of Quotient	$(a/b)^m = a^m/b^m$	$(2/3)^3 = 2^3/3^3 = 8/27$
Zero Exponent	$a^0 = 1$ (a ≠ 0)	$5^0 = 1$
Negative Exponent	$a^{-n} = 1/a^n$	$2^{-3} = 1/2^3 = 1/8$

Scientific Notation

Rule	Example	
Writing in scientific notation	Move decimal to get number between 1 and 10, multiply by power of 10	$5{,}670{,}000 = 5.67 \times 10^6$
Converting back	Move decimal according to exponent	$3.45 \times 10^4 = 34{,}500$

SECTION 3: ALGEBRA

Algebraic Expressions

Term	Definition	Example
Monomial	Expression with one term	5x, -3y², 7
Binomial	Expression with two terms	2x + 3, 4a - 5b
Trinomial	Expression with three terms	x² + 2x + 1
Polynomial	Expression with one or more terms	Any of the above

Addition and Subtraction

Operation	Rule	Example
Addition	Add like terms only	(3x + 2y) + (5x - y) = 8x + y
Subtraction	Subtract like terms only	(7x - 3y) - (2x + y) = 5x - 4y

Multiplication

Type	Rule	Example
Monomial × Monomial	Multiply coefficients, add exponents of same variables	(3x²)(4x³) = 12x⁵
Monomial × Binomial	Distribute monomial to each term	2x(3x + 4) = 6x² + 8x

| Binomial × Binomial | FOIL method | (x+2)(x+3) = x² + 3x + 2x + 6 |
| | | = x² + 5x + 6 |

Standard Identities

Identity	Formula
$(a + b)^2$	$a^2 + 2ab + b^2$
$(a - b)^2$	$a^2 - 2ab + b^2$
$(a + b)(a - b)$	$a^2 - b^2$
$(x + a)(x + b)$	$x^2 + (a+b)x + ab$

Solving Equations

Equation Type	Method	Example
Linear (one variable)	Isolate variable	$3x + 5 = 20 \rightarrow 3x = 15 \rightarrow x = 5$
With variables both sides	Collect variables on one side	$5x - 3 = 2x + 9 \rightarrow 5x - 2x = 9 + 3 \rightarrow 3x = 12 \rightarrow x = 4$
With fractions	Multiply by LCM of denominators	$(x/2) + (x/3) = 5 \rightarrow$ Multiply by 6: $3x + 2x = 30 \rightarrow 5x = 30 \rightarrow x = 6$

SECTION 4: RATIO, PROPORTION, AND PERCENTAGE

Ratio

Concept	Formula	Example
Ratio	a : b = a/b	4 : 5 = 4/5
Equivalent Ratios	Multiply/divide both terms by same number	3:4 = 6:8 = 9:12
Dividing in a Ratio	Total parts = sum of ratio terms	Divide 100 in ratio 2:3 → 2+3=5 parts → 2/5×100=40, 3/5×100=60

Proportion

Type	Definition	Example
Direct Proportion	$x_1/y_1 = x_2/y_2$	More items → More cost
Inverse Proportion	$x_1 \times y_1 = x_2 \times y_2$	More speed → Less time
Continued Proportion	$a : b = b : c \rightarrow b^2 = ac$	2,4,8: 2/4 = 4/8 = 1/2

Percentage Applications

Application	Formula	Example
Percentage of a number	(p% of x) = (p × x)/100	15% of 80 = (15×80)/100 = 12
Percentage increase	New = Original × (1 + r/100)	Increase 80 by 15% = 80 × 1.15 = 92
Percentage decrease	New = Original × (1 - r/100)	Decrease 80 by 15% = 80 × 0.85 = 68
Finding original after increase	Original = New/(1 + r/100)	After 15% increase, price is 92 → Original = 92/1.15 = 80

SECTION 5: PROFIT AND LOSS

Basic Terms

Term	Definition
Cost Price (CP)	Price at which an article is purchased
Selling Price (SP)	Price at which an article is sold
Profit	SP > CP → Profit = SP - CP
Loss	CP > SP → Loss = CP - SP

Marked Price (MP)	Price marked on the article (before discount)
Discount	Reduction on marked price

Formulas

Formula	Expression
Profit %	(Profit/CP) × 100
Loss %	(Loss/CP) × 100
SP when profit % given	CP × (100 + Profit%)/100
SP when loss % given	CP × (100 - Loss%)/100
CP when profit % given	(SP × 100)/(100 + Profit%)
CP when loss % given	(SP × 100)/(100 - Loss%)
Discount	MP - SP
Discount %	(Discount/MP) × 100
SP after discount	MP × (100 - Discount%)/100

SECTION 6: SIMPLE INTEREST

Simple Interest Formulas

Formula	Expression	Variables
Simple Interest (SI)	SI = (P × R × T)/100	P = Principal, R = Rate %, T = Time (years)
Amount (A)	A = P + SI	
Amount directly	A = P[1 + (R×T)/100]	
Principal (P)	P = (100 × SI)/(R × T)	
Rate (R)	R = (100 × SI)/(P × T)	
Time (T)	T = (100 × SI)/(P × R)	

Examples

Given	Find	Calculation
P=1000, R=10%, T=3 years	SI	SI = (1000×10×3)/100 = 300
P=1000, R=10%, T=3 years	A	A = 1000 + 300 = 1300

SECTION 7: GEOMETRY

Lines and Angles

Concept	Property
Adjacent Angles	Share a common arm and vertex
Linear Pair	Adjacent angles on a straight line, sum = 180°
Vertically Opposite Angles	Equal when two lines intersect
Corresponding Angles	Equal when lines are parallel
Alternate Interior Angles	Equal when lines are parallel
Alternate Exterior Angles	Equal when lines are parallel
Co-interior Angles	Sum = 180° when lines are parallel

Triangle Properties

Property	Statement
Angle Sum Property	Sum of three angles = 180°
Exterior Angle Property	Exterior angle = Sum of two opposite interior angles
Triangle Inequality	Sum of any two sides > Third side
Pythagoras Theorem	In right triangle, (Hypotenuse)² = (Base)² + (Height)²

Types of Triangles (Based on Sides)

Type	Properties
Equilateral	All sides equal, all angles 60°, each exterior angle = 120°
Isosceles	Two sides equal, base angles equal, altitude from vertex bisects base
Scalene	All sides different, all angles different

Types of Triangles (Based on Angles)

Type	Properties
Acute-angled	All angles < 90°
Right-angled	One angle = 90°, side opposite 90° is hypotenuse
Obtuse-angled	One angle > 90°

Congruence of Triangles

Criterion	Condition
SSS	Three sides of one triangle equal to three sides of another

SAS	Two sides and included angle equal
ASA	Two angles and included side equal
AAS	Two angles and a non-included side equal
RHS	Right angle, hypotenuse, and one side equal

SECTION 8: MENSURATION

Perimeter and Area

Shape	Perimeter	Area
Square	$4s$	s^2
Rectangle	$2(l + b)$	$l \times b$
Triangle	$a + b + c$	$\frac{1}{2} \times b \times h$
Parallelogram	$2(a + b)$	$b \times h$
Rhombus	$4a$	$\frac{1}{2} \times d_1 \times d_2$
Circle	$2\pi r$	πr^2

Circle Related Terms

Term	Definition	Formula
Radius (r)	Distance from center to circumference	
Diameter (d)	Twice the radius	$d = 2r$
Circumference	Distance around circle	$C = 2\pi r = \pi d$
Area	Space inside circle	$A = \pi r^2$
π (pi)	Constant = 3.14 or 22/7	

Volume and Surface Area (3D Shapes)

Shape	Volume	Lateral Surface Area	Total Surface Area
Cube	a^3	$4a^2$	$6a^2$
Cuboid	$l \times b \times h$	$2h(l + b)$	$2(lb + bh + hl)$
Cylinder	$\pi r^2 h$	$2\pi rh$	$2\pi r(h + r)$

SECTION 9: DATA HANDLING

Measures of Central Tendency

Measure	Definition	Formula
Mean	Average	Sum of all observations / Number of observations
Median	Middle value	Arrange in order: if n odd → middle; if n even → average of two middle
Mode	Most frequent value	Value that appears maximum times

Range

- Range = Largest value - Smallest value

Bar Graphs and Double Bar Graphs

- Bar Graph: Represents data using bars of equal width
- Double Bar Graph: Compares two sets of data side by side

Probability

Term	Definition	Formula
Experiment	An action with uncertain outcome	Tossing a coin
Outcome	Result of an experiment	Head or Tail
Event	Set of desired outcomes	Getting a head

Probability	Chance of an event occurring	P(E) = (Number of favorable outcomes)/(Total number of outcomes)

Probability Scale

- 0 → Impossible event
- 1 → Certain event
- Values between 0 and 1 represent likelihood