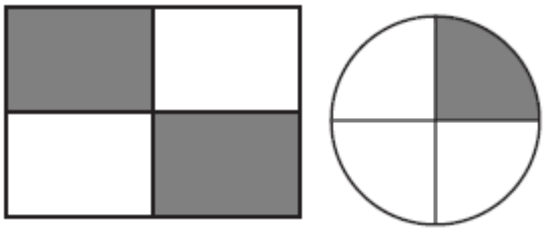
Mathematics

<table>
<tr><th>S.No</th><th>Topic</th><th>Description</th></tr>
<tr><td>1</td><td>Natural Numbers</td><td>The counting numbers 1, 2, 3, …… are called natural numbers</td></tr>
<tr><td>2</td><td>Whole Numbers</td><td>If we include the number 0 to the set of natural numbers, we get 0, 1, 2, 3, …… .</td></tr>
<tr><td>3</td><td>Division</td><td>Dividend = divisor × quotient + remainder
Division by zero is not a permissible operation in whole numbers.</td></tr>
<tr><td>4</td><td>Divisor and Factor</td><td>
<table>
<tr><th>Number</th><th>Divisors</th><th>Facts</th></tr>
<tr><td>24</td><td>1, 2, 3, 4, 6, 8, 12, 24</td><td>$1 \times 24 = 24$; $2 \times 12 = 24$
$3 \times 8 = 24$; $4 \times 6 = 24$</td></tr>
<tr><td>13</td><td>1, 13</td><td>$1 \times 13 = 13$</td></tr>
<tr><td>18</td><td>1, 2, 3, 6, 9, 18</td><td>$1 \times 18 = 18$, $2 \times 9 = 18$, $3 \times 6 = 18$</td></tr>
<tr><td>45</td><td>1, 3, 5, 9, 15, 45</td><td>$1 \times 45 = 45$, $3 \times 15 = 45$, $5 \times 9 = 45$</td></tr>
<tr><td>19</td><td>1, 19</td><td>$1 \times 19 = 19$</td></tr>
</table>
</td></tr>
<tr><td>5</td><td>Even Numbers</td><td>The whole numbers which are multiples of 2 are called even numbers.</td></tr>
<tr><td>6</td><td>Odd Numbers</td><td>The whole numbers which are not multiple of 2 are called odd numbers.</td></tr>
<tr><td>7</td><td>Prime Numbers</td><td>The natural numbers which have only two divisors are called prime numbers.</td></tr>
<tr><td>8</td><td>Composite Numbers</td><td>The natural numbers which have more than two divisors are called the composite numbers.</td></tr>
<tr><td colspan="3">Tip: 1 is neither prime nor composite</td></tr>
<tr><td>9</td><td colspan="2">Exponential Form
<table>
<tr><th>Repeated product of a number</th><th>Exponential Form</th><th>Base</th><th>Exponent or Index or power</th><th>Read</th></tr>
<tr><td>6×6</td><td>6^2</td><td>6</td><td>2</td><td>six squared or six raised to the power two.</td></tr>
<tr><td>$5 \times 5 \times 5$</td><td>5^3</td><td>5</td><td>3</td><td>Five cubed or five raised to the power three.</td></tr>
<tr><td>$2 \times 2 \times 2 \times 2 \times 2$</td><td>$2^5$</td><td>2</td><td>5</td><td>Two raised to the power five.</td></tr>
<tr><td>$10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10$</td><td>$10^7$</td><td>10</td><td>7</td><td>Ten raised to the power seven</td></tr>
</table>
</td></tr>
<tr><td colspan="3">Tip: The square of an odd number is odd.
The square of an even number is even.
The cube of an odd number is odd.
The cube of an even number is even.
The square of a prime number other than 2 is odd</td></tr>
<tr><td>10</td><td>Great Common Divisors (GCD)</td><td>Two numbers may have several common divisors. The largest among them is called the greatest common divisors (g.c.d) of the numbers.</td></tr>
</table>

		G.C.D. is also known as the highest common factor (H.C.F.) Ex: G.C.D of 12 and 16 $2 \mid 12,\ 16$ (Divide by common divisor 2) $2 \mid 6,\ 8$ (Divide by common divisor 2) $3,\ 4$ $\therefore$ g.c.d. $= 2 \times 2 = 4$
11	Least Common Multiple (LCM)	The smallest among the common multiples of two numbers is called their least common multiple (l.c.m.) Ex: L.C.M of 30 and 12 $2 \mid 30,\ 12$ (common divisor 2) $3 \mid 15,\ 6$ (common divisor 3) $5,\ 2$ (no common divisor) l.c.m. $= 2 \times 3 \times 5 \times 2 = 60$
Ex: GCD and LCM of 36,48 $2 \mid 36,\ 48$ (common divisor 2) $2 \mid 18,\ 24$ (common divisor 2) $3 \mid 9,\ 12$ (common divisor 3) $3,\ 4$ (No common divisor) $\therefore$ g.c.d. $= 2 \times 2 \times 3 = 12$ [Product of common divisors only] l.c.m. $= 2 \times 2 \times 3 \times 3 \times 4 = 144$.		
12	Fraction	A fraction is a part or parts of a whole  Fig 1 : 2 / 4 Fig 2: 1 / 4
13	Proper Fraction	If the numerator is less than its denominator, the fraction is called a proper fraction. For example $\frac{2}{7}$, $\frac{3}{4}$, $\frac{5}{8}$, $\frac{19}{37}$ are all proper fractions.
14	Improper Fraction	If the numerator is greater than its denominator, the fraction is called an improper fraction. For example $\frac{4}{3}$, $\frac{7}{2}$, $\frac{10}{4}$, $\frac{28}{5}$ are all improper fractions.

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15	Mixed Fraction	A number consisting of a natural number and a fraction is called a mixed fraction. For example $2\frac{1}{2}$, $3\frac{1}{4}$, $10\frac{3}{4}$, $4\frac{2}{7}$ are all mixed fractions.

Ex:

Find the quotient and remainder of $\frac{19}{5}$.

That is

$$5\overline{)\,19}\quad 3$$

$$15$$

$$4$$

Here 3 is the quotient, 4 is the remainder and 5 is the divisor.

(or denominator of $\frac{19}{5}$)

$$\therefore \frac{19}{5} = \text{quotient} + \frac{\text{remainder}}{\text{divisor}}$$

$$\frac{19}{5} = 3 + \frac{4}{5} \text{ or } \frac{19}{5} = 3\frac{4}{5}$$

16	Like Fractions	Fractions having the same denominator are called like fractions For example $\frac{1}{7}$, $\frac{2}{7}$, $\frac{5}{7}$, $\frac{8}{7}$, $\frac{10}{7}$ are all like fractions.
17	Unlike Fractions	Fractions having different denominators are called unlike fractions. For example $\frac{3}{4}$, $\frac{5}{8}$, $\frac{6}{7}$, $\frac{13}{14}$, $\frac{20}{11}$ are unlike fractions.
18	Which is bigger? $\frac{2}{5}$ or $\frac{3}{7}$ Here make these fractions to have the same denominator and then compare. The l.c.m. of 5 and 7 is 35. Now $\frac{2}{5} = \frac{2\times 7}{5\times 7} = \frac{14}{35}$ $\frac{3}{7} = \frac{3\times 5}{7\times 5} = \frac{15}{35}$ $\frac{15}{35}$ is bigger than $\frac{14}{35}$ So $\frac{3}{7}$ is bigger than $\frac{2}{5}$.	

19

Arrange the following in ascending order and in descending order :

$\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$, $\frac{1}{4}$

Find the equivalent fractions for $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$, $\frac{1}{4}$ by taking l.c.m. of the denominators

l.c.m. = 12

$3 \mid 3,\ 4,\ 6,\ 4$

$2 \mid 1,\ 4,\ 2,\ 4$

$2 \mid 1,\ 2,\ 1,\ 2$

$1,\ 1,\ 1,\ 1$

$3 \times 2 \times 2 = 12$

$\therefore \frac{2}{3} = \frac{2}{3} \times \frac{4}{4} = \frac{8}{12}$

$\frac{3}{4} = \frac{3}{4} \times \frac{3}{3} = \frac{9}{12}$

$\frac{5}{6} = \frac{5}{6} \times \frac{2}{2} = \frac{10}{12}$

$\frac{1}{4} = \frac{1}{4} \times \frac{3}{3} = \frac{3}{12}$

Writing these fractions in ascending order, $\frac{3}{12}$, $\frac{8}{12}$, $\frac{9}{12}$, $\frac{10}{12}$.

Therefore $\frac{1}{4}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$ are in ascending order.

20

Veni walked $2\frac{1}{2}$ *km* on first day, $3\frac{1}{4}$ *km* on the next day. How far did she walk on these two days?

Veni walked on the first day = $2\frac{1}{2}$ *km*

Veni walked on the second day = $3\frac{1}{4}$ *km*

Total distance walked by Veni = $2\frac{1}{2} + 3\frac{1}{4}$ (l.c.m. of 2 and 4 is 4)

$= \frac{5}{2} + \frac{13}{4} = \frac{5 \times 2}{2 \times 2} + \frac{13}{4}$

$= \frac{10}{4} + \frac{13}{4}$

$= \frac{23}{4}$

$= 5\frac{3}{4}$

Veni walked on these two days was $5\frac{3}{4}$ *km*

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21	Multiply $\frac{3}{5}$ and $\frac{8}{6}$ $\frac{3}{5} \times \frac{8}{6} = \frac{3 \times 8}{5 \times 6} = \frac{24}{30}$ $= \frac{4}{5}$
22	Divide $\frac{5}{8}$ by $\frac{5}{7}$ $\frac{5}{8} \div \frac{5}{7} = \frac{5}{8} \times \left(\text{reciprocal of } \frac{5}{7}\right)$ $= \frac{5}{8} \times \frac{7}{5}$ $= \frac{7}{8}$
23	Find the distance travelled in 1 hour if a person covers 42*km* in $4\frac{2}{3}$ hours. In $4\frac{2}{3}$ hours the person covers 42 *km*. In 1 hour the person covers $42 \div 4\frac{2}{3}$ *km* $= \frac{42}{1} \div \frac{14}{3}$ $= \frac{42}{1} \times \frac{3}{14} = \frac{126}{14}$. $= 9$ In 1 hour the person covers 9 *km*.
24	Divide 66.65 ÷ 0.215 $\frac{66.65}{0.215} = \frac{66.65 \times 1000}{0.215 \times 1000} = \frac{66650}{215}$ $= 310$ 310 215) 66650 645 215 215 0
25	In a classroom there are 25 boys and 15 girls. What is the ratio between the number of boys and the number of girls? The ratio between the number of boys and number of girls $= \frac{25}{15}$

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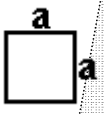
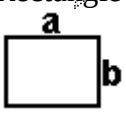
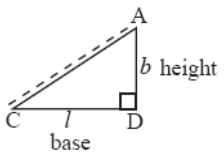
	When reduced to lowest form $= \frac{5}{3}$ It is customary to write this ratio as 5 : 3 $\therefore$ Ratio between the number of boys and girls = 5 : 3 (read as 5 is to 3) **The order in the ratio is very important.** For example, the ratio of number of boys to number of girls is different from the ratio of the number of girls to the number of boys.
26	The cost of a notebook is Rs. 20 and the cost of a pen is Rs. 15. What is the ratio between the cost of a notebook and the cost of a pen? Ratio between the cost of a note book and the cost of a pen $= 20 : 15$ $= 4 : 3$
27	Give two equivalent ratios to 2 : 3 $2 : 3 = \frac{2}{3} \times \frac{2}{2} = \frac{4}{6} = 4 : 6$ [Multiply the Numerator and the Denominator by 2] $2 : 3 = \frac{2}{3} \times \frac{3}{3} = \frac{6}{9} = 6 : 9$ [Multiply the Numerator and the Denominator by 3] $\therefore$ The two equivalent ratios to 2 : 3 are 4 : 6 and 6 : 9
28	Divide Rs. 240 in the ratio 3 : 5 3 : 5 means the first quantity is 3 parts and the second quantity is 5 parts. $\therefore$ The total number of parts $= 3 + 5 = 8$ 8 Parts $=$ Rs. 240 1 part $= \frac{240}{8} =$ Rs. 30. $\therefore$ 3 Parts $= 3 \times 30 =$ Rs. 90 5 parts $= 5 \times 30 =$ Rs. 150
29	Proportion Formation: Consider the proportion $2 : 3 = 10 : 15$ The first and fourth terms (2 and 15) are called the extreme terms or extremes. The second and third terms (3 and 10) are called the middle terms or means Means $2 : 3 = 10 : 15$ Extremes **Important Property :** Product of extremes = Product of means In the above example $2 \times 15 = 3 \times 10$ $30 = 30$

30	A man travels at a certain uniform speed and covers 150 km in 3 hours. What will be the distance covered by him in 5 hours in the same speed? Let x be the distance covered in 5 hours. Time (hour) — distance (Km) 3 — 150 5 — x Time and distance are in direct Variation. $\therefore 3 : 5 = 150 : x$ $3 \times x = 5 \times 150$ $\frac{3 \times x}{3} = \frac{5 \times 150}{3}$ $\therefore x = \frac{5 \times 150}{3} = \frac{750}{3} = 250$ km The distance covered in 5 hours = 250 km.
31	Convert the following into percentages $\frac{2}{5} = \frac{2}{5} \times \frac{100}{100} = \frac{40}{100} = 40\%$
32	Convert the following into fractions $25\% = \frac{25}{100} = \frac{1}{4}$
33	Convert the following decimals into percentage $0.25 = 0.25 \times \frac{100}{100} = \frac{25}{100} = 25\%$
34	The monthly salary of Meena is Rs. 4000. She spends 80% of her salary every month. How much does she save every month? Meena's monthly salary = Rs. 4000 Expenditure = 80% of 4000 $= \frac{80}{100} \times 4000 =$ Rs. 3200 $\therefore$ Savings = 4000 – 3200 = Rs. 800
35	**Profit or Loss:** **CP** = Cost Price / **SP** = Selling Price / **P** = Profit / **L** = Loss $\therefore$ Gain or profit = S.P. – C.P. — $\therefore$ Loss = C.P. – S.P. Further, C.P. = S.P. – Profit — Further, S.P. = C.P. – Loss S.P. = C.P. + Profit — C.P. = S.P. + Loss

36	Profit Percentage and Loss Percentage: $\text{Profit percent} = \frac{\text{profit}}{\text{C.P.}} \times 100\ \%$ $\quad$ $\text{Loss percent} = \frac{\text{Loss}}{\text{C.P.}} \times 100\ \%$	
37	A man purchased an article for Rs. 2000 and sold it for Rs. 2500. Find the profit percent $\text{Profit} = \text{S.P.} - \text{C.P.}$ $= 2500 - 2000 = \text{Rs. } 500$ $\text{Profit percent} = \frac{\text{profit}}{\text{C.P.}} \times 100\ \%$ $= \frac{500}{2000} \times 100\% = 25\%$	
38	Selling Price = Cost Price * ((100 +or- %Profit or Loss) / 100) Cost Price = Selling Price * (100 (100 +or- %Profit or Loss)) + ve when profit, -ve when Loss.	
39	Simple Interest: Let p be the principal r be the rate of interest n be the number of years Interest on Rs. 100 for one year $= r$ $\therefore$ Interest on Rs. p for one year $= \frac{r}{100} \times p = \frac{pr}{100}$ Interest on Rs. p for 'n' years $= \frac{pr}{100} \times n = \frac{prn}{100}$ $\text{Interest (I)} = \frac{pnr}{100}$	
40	Square  	Area of a square = side × side $A = a^2$ Perimeter of a square = 4 × side $P = 4a$
41	Rectangle  	Area of a rectangle = length × breadth **A = a * b** perimeter of a rectangle = 2 lengths + 2 breadths **P = 2 (a + b)**
42	Right Angle Triangle  	Hence area of a right triangle $= \frac{1}{2} \times \text{base} \times \text{height}$ $A = \frac{1}{2} bh$ Perimeter = Sum of all the three sides The sum of the measures of the angles of a triangle is 180°.

		The sum of the measures of any two sides is always greater than the third side
43	Co- Efficient	$7x$ The coefficient of x is 7 $-11m^3$ The coefficient of m^3 is -11
44	Square Roots	$\sqrt{121} = \sqrt{11 \times 11} = \sqrt{11^2} = 11$ $\therefore$ The positive square root of 121 is 11. $\sqrt{\frac{9}{25}} = \sqrt{\frac{3 \times 3}{5 \times 5}} = \sqrt{\left(\frac{3}{5}\right) \times \left(\frac{3}{5}\right)} = \sqrt{\left(\frac{3}{5}\right)^2} = \frac{3}{5}$ $\therefore$ The positive square root of $\frac{9}{25}$ is $\frac{3}{5}$ $\sqrt{0.25} = \sqrt{0.5 \times 0.5} = \sqrt{(0.5)^2} = 0.5$ $\therefore$ The positive square root of 0.25 is 0.5
45	Cube Roots	$\sqrt[3]{125} = \sqrt[3]{5 \times 5 \times 5} = \sqrt[3]{5^3} = 5$ $\sqrt[3]{512} = \sqrt[3]{8 \times 8 \times 8} = \sqrt[3]{8^3} = 8$ $\sqrt[3]{\frac{1}{27}} = \sqrt[3]{\frac{1}{3} \times \frac{1}{3} \times \frac{1}{3}} = \sqrt[3]{\left(\frac{1}{3}\right)^3} = \frac{1}{3}$
46	Variation	The cost of 5 fruits is Rs.25. Find the cost of 15 fruits. Number of fruits: 5, 15 ↓ Cost of fruits: 25, x ↓ Here $5 : 15 = 25 : x$ $5 \times x = 15 \times 25$ $x = \frac{15 \times 25}{5} = 75$ $\therefore$ The cost of 15 fruits = Rs. 75
47	Inverse Variation ***(Time and work)***	Six workers can do a job in 12 days. In how many days eight workers will do the same job ? Number of workers: 6, 8 ↓ Number of days: 12, x ↑

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		We know that as the number of workers increases the number of days decreases. ∴ The two quantities are in inverse variation. i.e $6 : 8 = x : 12$ $8 \times x = 6 \times 12$ $x = \frac{6 \times 12}{8} = 9$ ∴ 8 workers can do the same job in 9 days.
48	***(Time and Speed)***	A person travels from Chennai to Madurai in 9 hours at a speed of 50 km / hour. What is the time taken to reach Madurai from Chennai at a speed of 75 km / hour? Speed (km): 50 ↓ 75 ↓ — Time (Hrs.): 9 ↑ x ↑ As speed increases time decreases. ∴ It is in inverse variation. Here $50 : 75 = x : 9$ $75 \times x = 9 \times 50$ $\therefore x = \frac{9 \times 50}{75} = 6$ ∴ Time taken to reach Madurai from Chennai at a speed of 75 km / hr = 6 hrs.
49	***(Article and Cost)***	A person purchases 20 chocolates at Rs.5 each. With the same amount how many chocolates can be purchased at Rs.10 each ? Cost per chocolate: 5 ↓ 10 — Number of chocolates: 20 ↑ x ↑ As cost increases number of chocolates decreases. ∴ It is in inverse variation Here $5 : 10 = x : 20$ $10 \times x = 5 \times 20$ $x = \frac{5 \times 20}{10} = 10$ ∴ Number of chocolates for the same amount = 10
50	Recurring Deposit P – Principal - (monthly instalment) r – Rate of interest per annum n – Number of months Interest, $I = \frac{Pn\ (n+1)\ r}{2 \times 12 \times 100}$ Total amount, A = Principal × Number of instalments + Interest	

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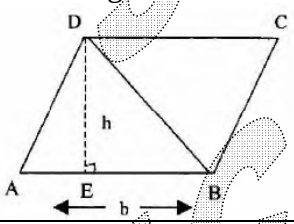
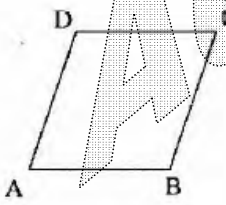
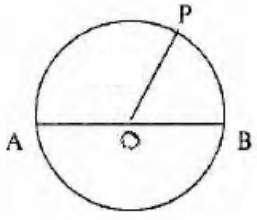
51	**Simple interest** $(I) = \frac{P\,n\,r}{100}$ **where P = Principal** **n = Number of years** **r = Rate of interest per annum.** **Amount = Principal + Interest** **(i.e) A = P + I** **Interest = Amount – Principal** **(i.e) I = A – P** **Number of years, n** $= \frac{100 \times I}{P \times r}$ **Rate of interest per annum, r** $= \frac{100 \times I}{P \times n}$ **Principal, P** $= \frac{100 \times I}{n \times r}$	
52	Parallelogram  	**Area of a parallelogram, A = *bh* sq. units.** **Where *b* = base of the parallelogram** ***h*** **= altitude of the parallelogram**
53	Rhombus  	In a parallelogram if all the four sides are equal then it is called rhombus. A = *bh* sq.units **Area of a rhombus, A** $= \frac{1}{2}\, d_1\, d_2$ **sq. units**
54	Circle  	**Relation between Diameter and Radius:** Diameter = 2 × radius **(i.e) *d* = 2*r*** **Relation between diameter and circumference of a circle:** $\frac{C}{d} = \frac{\text{Circumference}}{\text{diameter}} = \pi$ or $C = \pi d$

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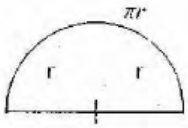
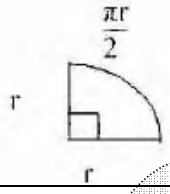
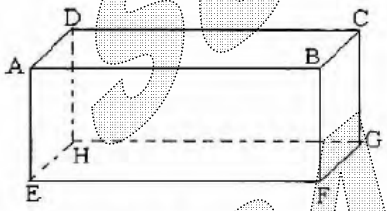
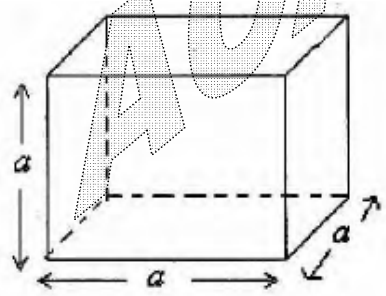
		Circumfernce, C = $\frac{\text{Distance travelled}}{\text{Number of revolutions}}$ Number of revolutions = $\frac{\text{Distance travelled}}{\text{Circumference}}$ **Area of a circle = πr^2 sq. units** **The circumference (Perimeter) of a circle = πd (or) $2\pi r$ units.**
55	Semi Circle 	**Area of a semicircle = $\frac{\pi r^2}{2}$ sq. units** **Perimeter of a semicircle = $(\pi + 2)\, r$ units.**
56	Quadrant 	**Area of a quadrant = $\frac{\pi r^2}{4}$ sq. units** **Perimeter of a quadrant = $(\frac{\pi}{2} + 2)$ r units**
57	Cuboid – Volume 	**The volume of a cuboid = (length × breadth × height) cu.units** **(i.e) $V = l \times b \times h$ cu. units = lbh cu.units , where V is the volume of the cuboid and l,b and h are the length, the breadth and the height of the cuboid respectively.** **Note** 1. Length , breadth and height of the cuboid must be expressed in the same units. 2. From the above formula, we also obtain that (a) length , $l = \frac{V}{b \times h}$ units (b) breadth , $b = \frac{V}{l \times h}$ units (c) height , $h = \frac{V}{l \times b}$ units
58	Cube 	The volume of the cube is given by V = (Length × breadth × height) cu. units = (Side × Side × Side) cu. units **That is V = $a \times a \times a$** **V = a^3 cu. units** **where V is the volume of the cube and 'a' is the side (or edge)of the cube.**
59	Sum of Polynomials	Add: $x + 2y + 3z$ and $4x - y + z$ $x + 2y + 3z$ $4x - y + z$ $5x + y + 4z$ $\therefore$ The sum is $5x + y + 4z$
60	Subtract Polynomials	Subtract (a) $2x + 3$ from $5x + 7$

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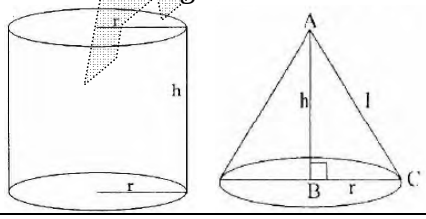
		$5x + 7$ $2x + 3$ (–) (–) (Changing the sign) $3x + 4$ (Adding the polynomials) ∴ The difference is $3x + 4$.
61	Multiplication	$2a^2$ and $5a$ $2a^2 \times 5a = (2 \times 5) \times (a^2 \times a^1)$ $= 10 \times a^{2+1} = 10a^3$
62	Division	$x^4 \div x^2$ $x^4 \div x^2 = \frac{x^4}{x^2} = \frac{x \times x \times x \times x}{x \times x} = x^2$ or simply $\frac{x^4}{x^2} = x^{4-2} = x^2$
63	Value of Expression	Find the value of $4x - 5$ if $x = 3$. Substitute $x = 3$ in the expression $4x - 5$ ∴ $4x - 5 = 4(3) - 5$ $= 12 - 5$ $= 7$
64	Square Root	Find The square root of 54756 2 3 4 2 | 5 47 56 4 43 | 1 4 7 1 2 9 464 | 1 8 5 6 1 8 5 6 0 The square root of 54756 is 234.
65	Square Root Decimal Number	Find the square root of 477.4225 21.85 2 | 477.4225 4 41 | 77

SUCCESS ACADEMY

		428 | 41 / 3642 / 3424 4365 | 21825 / 21825 / 0
66	Cube Root	Find the cube root of 5832 Resolving 5832 into prime factors, we get $5832 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$ $= (2 \times 2 \times 2) \times (3 \times 3 \times 3) \times (3 \times 3 \times 3)$ (Making triples) $\sqrt[3]{5832} = 2 \times 3 \times 3$ $= 18$
67	Convert Decimal to Binary Convert 23 and 58 into base 2 numbers **Solution:** 2 | 23 / 2 | 11 — 1 / 2 | 5 — 1 / 2 | 2 — 1 / 2 | 1 — 0 / 0 — 1 $23 = 10111_2$ **Solution:** 2 | 58 / 2 | 29 — 0 / 2 | 14 — 1 / 2 | 7 — 0 / 2 | 3 — 1 / 2 | 1 — 1 / 0 — 1 $58 = 111010_2$	
68	Convert Binary to Decimal Convert 101101_2 into decimal number Place values: 1 0 1 1 0 1 / 2^5 2^4 2^3 2^2 2^1 2^0 $= 1x2^5 + 0x2^4 + 1x2^3 + 1x2^2 + 0x2^1 + 1x2^0$ $= (1x32) + 0 + (1x8) + (1x4) + 0 + (1x1)$ $= 32 + 8 + 4 + 1$ $= 45$ $\therefore 101101_2 = 45$	

68 a	Binary Addition Add $10101_2 + 1010_2$ $\begin{array}{r} 10101 \\ +\ 1010 \\ \hline 11111 \end{array}$ $10101_2 + 1010_2 = 11111_2$	Addition table $0_2 + 0_2 = 0_2$ $1_2 + 0_2 = 1_2$ $0_2 + 1_2 = 1_2$ $1_2 + 1_2 = 10_2$ (0 with carry over 1) $1_2 + 1_2 + 1_2 = 11_2$
69	Binary Subtraction Subtract : $110_2 - 10_2$ $\begin{array}{r} 110_2 \\ 10_2 \\ \hline 100_2 \end{array}$ $\therefore 110_2 - 10_2 = 100_2$	Subtraction table $0_2 - 0_2 = 0_2$ $1_2 - 0_2 = 1_2$ $1_2 - 1_2 = 0_2$ $10_2 - 1_2 = 1_2$
70	Compound Interest: [Compounded Anually] If P is the principal, n the number of years, and i the rate of interest, then, Compound amount = $p\left(1+\frac{r}{100}\right)^n$ Compound interest = amount - principal $= p \times \left(1+\frac{r}{100}\right)^n - p$	
71	Volume of Right Circular Cylinder / Volume of Right Circular Cone 	Volume of the right circular cylinder= $\pi r^2 h$ cu. units. Volume of a cone, $V = \frac{1}{3}\pi r^2 h$ cu. units
72	Algebra Solve $\frac{x-2}{2x+1} = \frac{3}{11}$	$11(x-2) = 3(2x+1)$ $11x - 22 = 6x + 3$ $11x - 6x = 3 + 22$ $5x = 25$ $x = \frac{25}{5} = 5$ $\therefore x = 5.$

AIGEES ACADEMY

73	Sum of 3 consecutive odd numbers is 51. Find the numbers. $x + (x + 2) + (x + 4) = 51$ $x + x + 2 + x + 4 = 51$ $3x + 6 = 51$ [adding the like terms] $\therefore 3x + 6 = 51$ is the required equation.
74	Siva Kumar is 7 times as old as his daughter Preethi. After 5 years he will be 4 times as old as his daughter. What are their present ages? Let the present age of Preethi be x years Then, the present age of Siva Kumar $= 7x$ years After 5 years Preethi's age $= (x + 5)$ years and Siva Kumar's age $= (7x + 5)$ years By the problem, $7x + 5 = 4 \times (x + 5)$ $7x + 5 = 4x + 20$ is the required equation. **Solving the equation:** $7x + 5 = 4x + 20$ $7x - 4x = 20 - 5$ $3x = 15$ $x = 15 \times \frac{1}{3} = 5$ $\therefore$ Preethi's present age $= x = 5$ years SivaKumar's present age $= 7x = 7 \times 5 = 35$ years.
75	Solve: $2x = 1 + 5y$, $2x + 3y - 9 = 0$ The given equations may be written as $2x - 5y = 1$ ---------- (1) $2x + 3y = 9$ ---------- (2) (–) (–) (–) Subtracting $-8y = -8$ $y = -\frac{1}{8} \times (-8) = 1$ $\therefore \quad y = 1$

SUCCESS ACADEMY

By substituting y = 1 in equation (2), we get

$$2x + 3y = 9$$
$$2x + 3(1) = 9$$
$$2x + 3 = 9$$
$$2x = 9 - 3 = 6$$
$$x = \frac{1}{2} \times 6 = 3$$
$$\therefore x = 3$$

$\therefore x = 3$, y = 1 is the solution of the given equations.

Note:

In the above example we substitute the value of y in equation (2) to find the value of x. Hence while checking we should substitute both the values of x and y in equation (1).

Check: The equation (1) is $2x - 5y = 1$

Substituting $x = 3$ and y = 1,

$2(3) - 5(1) = 6 - 5 = 1$

Hence the equation is satisfied.

76 The total age of a man and his son at present is 45. Five years ago the man was 6 times as old as his son. Find their present ages.

Let the present age of the man and his son be x and y years respectively.

Their total age is 45

ie., $x + y = 45$ ---------- (1)

5 years ago, the man's age = $x - 5$

the son's age = $y - 5$

At that time the man's age = 6 times of the son's age

ie., $x - 5 = 6(y - 5)$

$x - 5 = 6y - 30$

$x - 6y = -30 + 5$

$x - 6y = -25$ ---------- (2)

Solving the equation (1) and (2), we get

$$x + y = 45$$
$$x - 6y = -25$$
$$(-)\ (+)\ \ (+)$$

Subtracting $7y = 70$

$$y = \frac{70}{7} = 10$$
$$y = 10$$

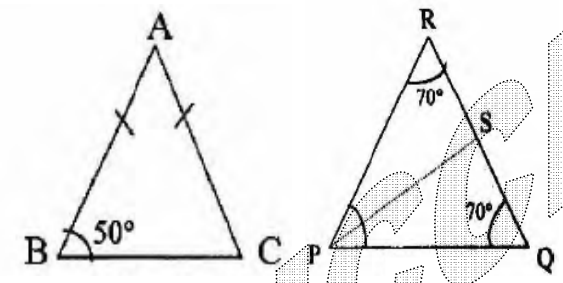
SUCCESS ACADEMY

Substituting y = 10 in equation (1), we get

$$x + y = 45$$
$$x + 10 = 45$$
$$x = 45 - 10 = 35$$
$$x = 35$$

∴ The man's present age is 35 and the son's present age is 10.

77 Isosceles Triangle



$\angle C = \angle B$

In a triangle if two sides are equal, then the angles opposite to the equal sides are also equal.

PQ = PR.

Therefore, in a triangle if two angles are equal then the sides opposite to those angles are also equal.

78 Logarithmic Notation

$3 = \log_9 729$ is equivalent to $9^3 = 729$;

$\frac{1}{3} = \log_8 2$ is equivalent to $8^{\frac{1}{3}} = 2$;

$-3 = \log_{10} 0.001$ is equivalent to $10^{-3} = 0.001$;

$2 = \log_7 49$ is equivalent to $7^2 = 49$;

$\frac{1}{2} = \log_9 3$ is equivalent to $9^{\frac{1}{2}} = 3$ or $\sqrt{9} = 3$;

$-\frac{3}{2} = \log_4\left(\frac{1}{8}\right)$ is equivalent to $4^{\frac{-3}{2}} = \frac{1}{8}$.

79 Solve

$\log_{25} 5 = \frac{1}{2}$ is equivalent to $(25)^{\frac{1}{2}} = 5$.

$\log_2\left(\frac{1}{4}\right) = -2$ is equivalent to $(2)^{-2} = \frac{1}{4}$.

$\log_{216} 6 = \frac{1}{3}$ is equivalent to $(216)^{\frac{1}{3}} = 6$.

$\log_3\left(\frac{1}{9}\right) = -2$ is equivalent to $(3)^{-2} = \frac{1}{9}$.

80	Solve $2 = 64^{\frac{1}{6}}$ is equivalent to $\frac{1}{6} = \log_{64} 2$. $9^{-3} = \frac{1}{729}$ is equivalent to $-3 = \log_9\left(\frac{1}{729}\right)$. $\left(\frac{1}{8}\right)^{\frac{2}{3}} = \frac{1}{4}$ is equivalent to $\frac{2}{3} = \log_{\frac{1}{8}}\left(\frac{1}{4}\right)$. $\frac{1}{7} = 7^{-1}$ is equivalent to $-1 = \log_7\left(\frac{1}{7}\right)$.	
90	Solve $\log_3 x = -2$ $3^{-2} = x$ or $x = \frac{1}{3^2} = \frac{1}{9}$.	Solve $\log_b 100 = 2$ $b^2 = 100 = 10^2$. $\therefore \quad b = 10$.
91	Solve $x + 2 \log_{27} 9 = 0$ $x = -2 \log_{27} 9$ or $\frac{-x}{2} = \log_{27} 9$ $(27)^{\frac{-x}{2}} = 9$ or $(3^3)^{\frac{-x}{2}} = 3^2$ or $(3)^{\frac{-3x}{2}} = 3^2$ $\frac{-3x}{2} = 2$ or $x = \frac{-4}{3}$.	Solve $x + 2\log_{27} 9 = 0$. $x = \log_{\left(\frac{1}{8}\right)} 512$. $\therefore \left(\frac{1}{8}\right)^x = 512 = 8^3$. or $(8^{-1})^x = 8^3$ or $8^{-x} = 8^3$. $\therefore -x = 3$ or $x = -3$.
92	Product Rule If a, m and n are positive numbers and $a \neq 1$, then $\log_a (mn) = \log_a m + \log_a n$	Division Rule If m, n and a are positive numbers and $a \neq 1$, then, $\log_a\left(\frac{m}{n}\right) = \log_a m - \log_a n$.
93	Power Rule If a and m are positive numbers, $\log_a m^n = n \log_a m$.	Reciprocal Rule If m and n are positive numbers other than 1, then $\log_n m = \frac{1}{\log_m n}$.
94	Algebric Formula $(x + a)(x + b) \equiv x^2 + (a + b)x + ab$ $(x - a)(x + b) \equiv x^2 + (b - a)x - ab$ $(x + a)(x - b) \equiv x^2 + (a - b)x - ab$ $(x - a)(x - b) \equiv x^2 - (a + b)x + ab$ $(a + b)^2 \equiv a^2 + 2ab + b^2$ $(a - b)^2 \equiv a^2 - 2ab + b^2$ $(a + b)(a - b) \equiv a^2 - b^2$	

95 Evaluate

$(x+3)(x+5) = x^2 + (3+5)x + 3 \times 5 = x^2 + 8x + 15.$

$(p+9)(p-2) = p^2 + (9-2)p - 9 \times 2 = p^2 + 7p - 18.$

$(z-7)(z-5) = z^2 - (7+5)z + 7 \times 5 = z^2 - 12z + 35.$

$(x-8)(x+2) = x^2 + (2-8)x - 8 \times 2 = x^2 - 6x - 16.$

96 Evaluate

(a) $107 \times 103 = (100+7)(100+3)$

$= 100^2 + (7+3) \times 100 + 7 \times 3$

$= 10000 + 10 \times 100 + 21$

$= 10000 + 1000 + 21$

$= 11021.$

(b) 56×48

$= (50+6)(50-2)$

$= 50^2 + (6-2) \times 50 - 6 \times 2$

$= 2500 + 200 - 12$

$= 2688.$

97 Algebric Formula

$$a^2 + b^2 = \tfrac{1}{2}\left[(a+b)^2 + (a-b)^2\right]$$

$$ab = \tfrac{1}{4}\left[(a+b)^2 - (a-b)^2\right]$$

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

$$(a-b)^2 = (a+b)^2 - 4ab$$

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

$$(a+b)^2 = (a-b)^2 + 4ab$$

98 Formula:

$$(a+b)^3 \equiv a^3 + 3a^2b + 3ab^2 + b^3 \qquad (a-b)^3 \equiv a^3 - 3a^2b + 3ab^2 - b^3$$

$$a^3 + b^3 \equiv (a+b)^3 - 3ab(a+b) \qquad a^3 - b^3 \equiv (a-b)^3 + 3ab(a-b)$$

99 Trignometry

θ	$0°$	$30°$	$45°$	$60°$	$90°$
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not defined
$\cot\theta$	Not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0
$\sec\theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not defined
$\operatorname{cosec}\theta$	Not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1

Scholarly Academy

100 Arithmetic Mean

$$\bar{x} = \frac{x_1 + x_2 + \ldots + x_n}{n}$$

Calculate the mean of the data 9, 11, 13, 15, 17, 19.

$$\bar{x} = \frac{\sum x_i}{N} = \frac{9+11+13+15+17+19}{6} = 14.$$

101 Compute the A.M. of the following data:

x	10	11	13	15	16	19
f	4	5	8	6	4	3

x	f	$f \times x$
10	4	40
11	5	55
13	8	104
15	6	90
16	4	64
19	3	57
Total	$N = 30$	$\sum fx = 410$

$$\bar{x} = \frac{\sum f_i x_i}{N} = \frac{410}{30} = 13.67.$$

102 Calculate Arithmetic Mean

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60
Marks	12	18	27	20	17	6

Class	**Mid-value x**	**Frequency f**	$f \times x$
0-10	5	12	60
10-20	15	18	270
20-30	25	27	675
30-40	35	20	700
40-50	45	17	765
50-60	55	6	330
		$N = 100$	$\sum fx = 2800$

From the table, we get N = the total frequency = 100, $\sum fx = 2800$.

$$\therefore \quad \bar{x} = \frac{\sum fx}{N} = \frac{2800}{100} = 28.$$

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103 Find the median of 23, 25, 29, 30, 39.

The given values are already in the ascending order. No. of observations $N = 5$.

This is an odd number. So the median $= \left(\frac{N+1}{2}\right)^{\text{th}}$ term $= \left(\frac{5+1}{2}\right)^{\text{th}}$ term

$= 3^{\text{rd}}$ term $= 29$.

$\therefore$ Median $= 29$.

104 Find the median of 29, 23, 25, 29, 30, 25, 28.

Arranging the observations in the ascending order, we get

23, 25, 25, 28, 29, 29, 30.

N = Number of observations = 7, odd integer.

$\therefore$ Median $= \left(\frac{N+1}{2}\right)^{\text{th}}$ term $= \left(\frac{7+1}{2}\right)^{\text{th}}$ term $= 4^{\text{th}}$ term $= 28$.

105 Find the median of 26, 25, 29, 23, 25, 29, 30, 25, 28, 30.

Arranging the observations in the ascending order, we get

23, 25, 25, 25, 26, 28, 29, 29, 30, 30.

N = No. of observations = 10, an even integer.

$\therefore$ Median = average of $\frac{N}{2}^{\text{th}}$ and $\left(\frac{N}{2}+1\right)^{\text{th}}$ terms = average of 5^{th} and 6^{th} terms

= average of 26 and 28 $= \frac{26+28}{2} = 27$.

106 Calculate Median

Variable (x)	5	10	15	20	25	30
Frequency(f)	3	6	10	8	2	3

x	f	Cumulative frequency
5	3	3
10	6	9
15	10	19
20	8	27
25	2	29
30	3	32

Total frequency $= N = \sum f = 32$ and so $\frac{N}{2} = 16$.

The median is the $\left(\frac{N}{2}\right)^{\text{th}}$ value $= 16^{\text{th}}$ value. But the 16^{th} value occurs in the class whose cumulative frequency is 19. The corresponding value of the variate is 15.

Hence, the median = 15.

107

Mode:

In a set of individual observations, mode is defined as the value which occurs most often.

Find the mode of 7, 4, 5, 1, 7, 3, 4, 6,7.

Arranging the data in the ascending order, we get

1, 3, 4, 4, 5, 6, 7, 7, 7.

In the above data 7 occurs maximum number of times. Hence mode = 7.

108

Find the mode for 12, 15, 11, 12, 19, 15, 24, 27, 20, 12, 19, 15.

Arranging the data in the ascending order, we get

11, 12, 12, 12, 15, 15, 15, 19, 19, 20, 24, 27.

Here 12 occurs 3 times and 15 also occurs 3 times.

∴ both 12 and 15 are the modes for this data. We observe that there are two modes for the given data.

109

Find the Mode

Wage	45	50	55	60	65	70	75
No. of Employees	12	11	14	13	12	10	9

We observe from the table that the maximum frequency is 14. The value of the variate (wage) corresponding to the maximum frequency 14 is 55. This is the mode of the data.

110

Arithmetic Progression: An **Arithmetic progression** is a sequence of numbers in which each term except the first is obtained by adding a fixed number to the immediately preceding term. This fixed number is called the common difference.

General form of an A.P. is a, a + d, a + 2d,...

with first term a, and C.D. = d

The general term or the nth term of an A.P. is $\boxed{t_n = a+(n-1)d}$

111

AP

Find the 12^{th} term of an A.P. 6, 1, –4...

Consider the A.P in the form a, a + d, a + 2d, ...

Here, $a = 6$, $d = 1 - 6 = -5$, $n = 12$

$t_n = a + (n-1)\,d$

$t_{12} = 6 + (12 - 1)(-5) = 6 + (11 \times -5) = 6 - 55 = -49$

∴ The 12^{th} term is –49

112

The 7^{th} term of an A.P is –15 and the 16^{th} term is 30. Find the A.P.

Consider the A.P in the form a, a + d, a + 2d,...

$t_7 = a + 6d = -15$

$t_{16} = a + 15d = 30$

$t_{16} - t_7 \Rightarrow 9d = 45,\ d = 5$

Substituting $d = 5$ in t_7 we get

$a + 30 = -15,\quad a = -45$

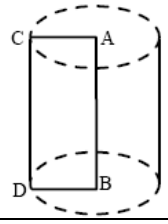
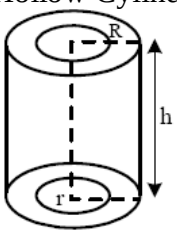
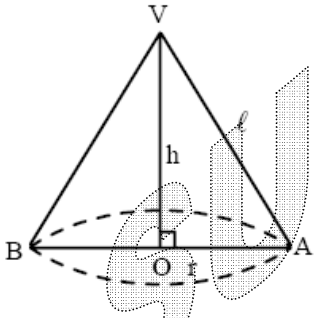
∴ The A.P is –45, –40, –35...

113	Geometric Progression: It means each term of the sequence except the first is obtained by multiplying the preceding term by a constant factor. Such a sequence is called **Geometric progression**. The constant factor is called common ratio (C.R). The general form of a G.P is a, ar, ar^2, ar^3, ... with $a \neq 0$ C.R = $r \neq 0$ The n^{th} term of the G.P is $\boxed{t_n = ar^{n-1}}$
114	GP Find the 5^{th} term of the G.P 64, 16, 4... $a = 64, \quad r = \frac{16}{64} = \frac{1}{4}, \quad n = 5$ $t_n = ar^{n-1}, \quad t_5 = ar^{5-1} = ar^4$ $t_5 = 64\left(\frac{1}{4}\right)^4 = \frac{64}{256} = \frac{1}{4}$ $\therefore$ 5^{th} term of the given G.P. is $\frac{1}{4}$
115	Sum of n terms of an Arithmetic Progression $S_n = \frac{n}{2}[2a + (n-1)d]$ Find the sum of the first 11 terms of the A.P 3, 8, 13… Given A.P is 3, 8, 13, …. Here $a = 3, \ d = 8 - 3 = 5, \ n = 11, \ S_n = \frac{n}{2}[2a + (n-1)d]$ $= \frac{11}{2}[(2\times 3) + (11-1)5] = \frac{11}{2}[6+50] = \frac{11}{2}\times 56 = 308$ $\therefore$ The sum of the first 11 terms of the given A.P is 308.
116	Sum of first n natural numbers $\sum_1^n n = \frac{n(n+1)}{2}$ Find the sum of $1 + 2 + 3 + \ldots + 30$ $\sum n = \frac{n(n+1)}{2}$ $\sum_1^{30} n = \frac{30(30+1)}{2} = 15 \times 31 = 465$

SUCCESS ACADEMY

117	Find the sum of $11 + 12 + 13 + \ldots + 31$ $1 + 2 + 3 + \ldots + 31 = \frac{31 \times 32}{2} = 496$ $1 + 2 + \ldots + 10 = \frac{10 \times 11}{2} = 55$ $11 + 12 + 13 + \ldots 31 = (1 + 2 + \ldots + 31) - (1 + 2 + 3 \ldots + 10) = 496 - 55 = 441$
118	Sum of the first n odd numbers If ℓ is the last odd number of the series then $S_n = \left[\frac{\ell + 1}{2}\right]^2$ Find the sum of $11 + 13 + \ldots + 35$ $1 + 3 + \ldots + 35 = \left(\frac{35+1}{2}\right)^2 = 18^2 = 324$
119	Sum of the squares of the first n natural numbers $\sum_1^n n^2 = 1^2 + 2^2 + 3^2 + \ldots + n^2$ $\sum_1^n n^2 = \frac{n(n+1)(2n+1)}{6}$ Find the sum of $1^2 + 2^2 + \ldots + 20^2$ $\sum_1^n n^2 = \frac{n(n+1)(2n+1)}{6}$; $\sum_1^{20} n^2 = \frac{20(20+1)(2\times20+1)}{6} = \frac{20\times21\times41}{6} = 2870$
120	Sum of the cube of the first n natural numbers $\sum_1^n n^3 = 1^3 + 2^3 + 3^3 + \ldots + n^3$ $\sum_1^n n^3 = \left[\frac{n(n+1)}{2}\right]^2$ $1^3 + 2^3 + 3^3 + \ldots + 20^3 = \left[\frac{20 \times 21}{2}\right]^2 = 210^2 = 44100$ Verify! The total number of rectangles (including squares) in a chess board. $\sum_1^8 n^3 = \left[\frac{8 \times 9}{2}\right]^2 = 36^2 = 1296$

Success Academy

121	Right Circular Cylinder 	For a right circular cylinder of radius r and height h, (a) Base Area $= \pi r^2$ sq. units; (b) Curved surface area $= 2\pi rh$ sq. units (c) Total surface area $= 2\pi r\,(h + r)$ sq. units; (d) Volume $= \pi r^2 h$ cubic units.
122	Hollow Cylinder 	Area of the base $= \pi(R^2 - r^2)$ sq. units $= \pi(R+r)(R-r)$ sq. units Curved surface area $= 2\pi h\,(R+r)$ sq. units Total surface area $= 2\pi\,(R+r)\,(h+R-r)$ sq.units Volume of the material $= \pi h\,(R^2 - r^2)$ $= \pi h\,(R+r)\,(R-r)$ cubic units.
123	Right Circular Cone 	For a right circular cone of radius r, height h and slant height ℓ, Area of the base $= \pi r^2$ sq. units Curved surface area $= \pi r\ell$ sq. units Total surface area $= \pi r\,(\ell + r)$ sq. units Volume $= \frac{1}{3}\pi r^2 h$ cubic units.
124	Sphere (a) Surface area $= 4\pi r^2$ square units (b) Volume $= \frac{4}{3}\pi r^3$ cubic units For a hemisphere of radius r (a) Curved surface area $= 2\pi r^2$ square units (b) Volume $= \frac{2}{3}\pi r^3$ cubic units (c) Total surface area of a solid hemisphere $= 3\pi r^2$ square units	
125	Rational Expressions Simplify $\frac{5x+20}{7x+28}$ $\frac{3x+9}{3x+15}$ $\frac{5x+20}{7x+28} = \frac{5(x+4)}{7(x+4)} = \frac{5}{7}$ $\frac{3x+9}{3x+15} = \frac{3(x+3)}{3(x+5)} = \frac{x+3}{x+5}$	
126	Simplify $\frac{x^2 - x - 6}{x^2 + 5x + 6}$ $\frac{x^2 - x - 6}{x^2 + 5x + 6} = \frac{(x-3)(x+2)}{(x+2)(x+3)} = \frac{x-3}{x+3}$	

127

Divide $\frac{x^2-25}{x+3}$ by $\frac{(x+5)^2}{x^2-9}$

$$\frac{(x+5)(x-5)}{x+3} \div \frac{(x+5)^2}{(x+3)(x-3)}$$

$$\frac{(x+5)(x-5)}{x+3} \times \frac{(x+3)(x-3)}{(x+5)^2} = \frac{(x-5)(x-3)}{x+5}$$

128

Range

Find the range of the data 27,28,34,36,39,59. Also find the coefficient of range.

Largest value L = 59; Smallest value S = 27

Range = L – S = 59–27 = 32

$$\text{Coefficient of Range} = \frac{L-S}{L+S} = \frac{59-27}{59+27} = \frac{32}{86} = 0.372$$

129

Standard Deviation:

$$\sigma = \sqrt{\frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2} \qquad \sigma = \sqrt{\frac{\Sigma (x-\bar{x})^2}{n}}$$

Calculate the standard deviation for the data 14, 22, 9, 15, 20, 17, 12, 11

x	x^2
14	196
22	484
9	81
15	225
20	400
17	289
12	144
11	121
$\Sigma x = 120$	$\Sigma x^2 = 1940$

$$\sigma = \sqrt{\frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2}$$

$$= \sqrt{\frac{1940}{8} - \left(\frac{120}{8}\right)^2}$$

$$= \sqrt{242.5 - 225}$$

$$= \sqrt{17.5}$$

$\sigma = 4.18$

130

The marks obtained by 10 students in a class test out of 100 marks are 62, 49, 71, 75, 33, 41, 100, 88, 50, 31. Calculate the standard deviation of the marks.

$$\bar{x} = \frac{\Sigma x}{n} = \frac{62+49+71+75+33+41+100+88+50+31}{10} = \frac{600}{10} = 60$$

x	$d = x - \bar{x} = x - 60$	d^2
62	2	4
49	−11	121
71	11	121
75	15	225
33	−27	729
41	−19	361
100	40	1600
88	28	784
50	−10	100
31	−29	841
	$\Sigma d = 0$	$\Sigma d^2 = 4886$

$$\sigma = \sqrt{\frac{\Sigma d^2}{n}}$$
$$= \sqrt{\frac{4886}{10}}$$
$$= \sqrt{488.6}$$
$$= 22.10$$

Therefore, standard deviation is 22.10

131 Variance: It is the square of the standard deviation

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