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### TECHNIQUE # 1: COMPOUND INTEREST THROUGH EFFECTIVE PERCENTAGE

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**Challenge:** What will be the compound interest on 5000 for 2 years at 12% per annum?

- 1) 1250      2) 1200      3) 1272      4) 2174      5) None of these

Regular Method	Smart Method
$CI = P * (1+R/100)^T - P$ $CI = 5000 * (1+12/100)^2 - 5000$ $= 5000 * (112/100) * (112/100) - 5000$ $= 5000 * 112 * 112 / 10000 - 5000$ $= 5 * 1254.4 - 5000 \text{ (6-15 sec)}$ $= 6272 - 5000$ $= 1272$	$CI = (a+b+ab/100)\%$ of P, where a and b are interest rate percentages for 2 years. $CI = (12+12+12*12/100) * 5000$ $= 24+144/100 * 5000$ $= 25.44 * 5000$ $= 1272$

**Use this smart method to solve more such questions:**

**Question 1:** What will be the compound interest on 5000 for 2 years at 7% per annum?

- 1) 725      2) 700      **3) 724.50**      4) 714.50      5) None of these

**Question 2:** The compound interest on a certain amount for 2 years at the rate of 5% is 102.5. Find the amount.

- 1) 500      2) 725      3) 850      **4) 1000**      5) None of these

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## TECHNIQUE # 2: PERCENTAGE COMPARISON BETWEEN TWO VALUES

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**Challenge:** If A's salary is 25% more than B's salary, then by what per cent is B's salary less than A's salary?

- 1) 25%      2) 20%      3) 16.66%      4) Cannot be determined      5) None of these

Regular Method	Smart Method
$A = B + 25\% \text{ of } B$ $\Rightarrow A = B + B/4 = 5B/4$ $\Rightarrow B = 4A/5 = 80\% \text{ of } A$ $\Rightarrow B \text{ is only } 80\% \text{ of } A.$ Therefore, B is 20% less than A	Consider the fraction $1/4$ (=25%, given in the question) To find how much % is B <b>less</b> than A, just <b>increase</b> the <b>denominator</b> of the fraction by 1 (= value in the numerator) $\Rightarrow 1/4 \text{ becomes } 1/(4+1) = 1/5$ $\Rightarrow 1/5 = \mathbf{20\%}$ (Correct answer)

**NOTE:** To find by how much % is B **more** than A, **decrease the denominator** of the fraction by the value in the numerator

**Use this smart method to solve more such questions:**

**Question 1:** If Arjun's salary is 20% more than that of Bheem, then how much percent is Bheem's salary less than that of Arjun?

- 1) **16.66%**    2) 20%    3) 40%    4) 10%    5) None of these

**Question 2:** The sale of Company N is 40% less than that of Company T. Then by what per cent is the sale of company T more than that of N?

- 1) **66.66%**    2) 25%    3) 20%    4) 33.33%    5) None of these

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### TECHNIQUE # 3: ASSUMED AVERAGE

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**Challenge:** Find the average of 34, 29, 42, 35, 22, 30

- 1) 25      2) 30      3) 33      4) 28      5) None of these

Regular Method	Smart Method
<p>Average = <math>(34+29+42+35+22+30)/6</math> =&gt; Average = <math>192/6</math> =&gt; Average = 32</p> <p>Takes about 10-15 seconds to arrive at the correct answer.</p>	<p>Given Values: 34, 29, 42, 35, 22, 30 Let us assume the average to be 30 (since all the values are around 30) Deviations of the given values from the assumed average, i.e, 30 are as follows: +4, -1, +12, +5, -8, 0 Average (deviations) = <math>(+4-1+12+5-8+0)/6 = +2</math> =&gt; Average = <math>30+2 = 32</math> This method will help you arrive at the answer in about 5 seconds due to simplicity of the calculations.</p>

**Use this smart method to solve more such questions:**

**Question 1:** Find the average of 69, 73, 55, 71, 54, 59

- 1) 73.5      2) 69.5      3) 65      **4) 63.5**      5) None of these

**Question 2:** What is the average of 144, 153, 149, 135, 140

- 1) 139      **2) 144.2**      3) 135      4) 141.6      5) None of these

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#### TECHNIQUE # 4: AVERAGE WHEN A PERSON IS INCLUDED /EXCLUDED INTO/FROM THE GROUP

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**Challenge:** The average age of 39 students and a teacher of a Class are 11 years. If the age of teacher is excluded the average age of class is reduced by 1. What is the age of teacher?

- 1) 49 years      2) 39 years      3) 50 years    4) 52 years    5) None of these

Regular Method	Smart Method
<p>Average (39 students + Teacher) = 11 =&gt; Sum of ages of 39 students and the teacher = <math>11 \times 40 = 440</math> ----(1)</p> <p>If teacher is excluded, average age of remaining 39 students = <math>11 - 1 = 10</math> =&gt; Sum of ages of 39 students = <math>10 \times 39 = 390</math> ----(2)</p> <p>Teacher's age = (1) - (2) =&gt; Teacher's age = <math>440 - 390 = 50</math></p>	<p>When the teacher leaves the group, (s)he carries the age of 11 years and also takes 1 year from each of the 39 students (as the average is decreased by 1 after the teacher leaves the group)</p> <p>=&gt; Teacher's age = <math>11 + 39 \times 1 = 50</math></p>

**Use this smart method to solve more such questions:**

**Question 1:** The average age of 50 students and a teacher of a Class are 12 years. If the age of teacher is excluded the average age of class is reduced by 1. What is the age of teacher?

- 1) 62 years**    2) 60 years    3) 61 years    4) 53 years    5) None of these

**Question 2:** The average age of 30 students is 9 years. If the age of their teacher is included, it becomes 10 years. The age of the teacher is

- 1) 28 years    2) 30 years    **3) 40 years**    4) 43 years    5) None of these

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**TECHNIQUE # 5: PROFIT AND LOSS COMPARISON PROBLEM USING PROPORTIONALITY**

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**Challenge:** Sameer sold an article Rs 460 and earned a profit of 15%. At what price should it have been sold so as to earn a profit of 20%?

- 1) Rs 465                      2) Rs 480                      3) Rs 498                      4) Rs 485                      5) None of these

Regular Method	Smart Method
Initial Selling price of the article = Rs 460 Initial Profit = 15% $\Rightarrow$ Cost Price = $100 \times 460 / (100 + 15)$ $\Rightarrow$ Cost Price = $100 \times 460 / 115 = 400$ Desired Profit = 20% Required selling price = $(100 + 20) \times 400 / 100$ $\Rightarrow$ Required selling price = $120 \times 400 / 100$ $\Rightarrow$ Required selling price = 480	Initial profit = 15% Initial selling price = 115% = 460 Desired Profit = 20% Required selling price = 120% = ? Upon cross multiplication, we get Required selling price = $120 \times 460 / 115 = 480$

**Use this smart method to solve more such questions:**

**Question 1:** Arjun sold an article Rs 1200 and earned a profit of 25%. At what price should it have been sold so as to earn a profit of 30%?

- 1) Rs 1356    2) Rs 1428    **3) Rs 1248**                      4) Rs 1225    5) None of these

**Question 2:** Smita sold an article Rs 230 and earned a profit of 15%. At what price should it have been sold so as to earn a profit of 20%?

- 1) Rs 240**    2) Rs 244    3) Rs 200                      4) Rs 220    5) None of these

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**TECHNIQUE # 6: PROBLEMS ON TRAINS USING PROPORTIONALITY**

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**Challenge:** A train of length 120 m long crosses a pole in 3 seconds. How long will it take to cross a railway platform of length 240 m?

- 1) 4.5 seconds      2) 3.5 seconds      3) 5 seconds 4) 9 seconds 5) None of these

Regular Method	Smart Method
<p>Speed of the train = Length of the train/ Time take to cross the pole =&gt; Speed of the train = <math>120/3 = 40</math> m/s Time take to cross a platform = (Length of the train + Length of the platform)/Speed of the train =&gt; Time taken to cross the platform = <math>(120+240)/40 = 360/40</math> =&gt; Time taken to cross the platform = 9 seconds</p>	<p>Time taken by the train to cover a distance of 120 m = 3 seconds (crossing of pole) Time taken by the train to cover a distance of 360 m (120m + 240m) = ? =&gt; <math>? = 360 \times 3 / 120 = 9</math> seconds (Since time required is proportional to the distance covered)</p>

**Use this smart method to solve more such questions:**

**Question 1:** A train of length 80 m long crosses a pole in 4 seconds. How long will it take to cross a railway platform of length 120 m?

- 2) 12 seconds      **2) 10 seconds**      3) 15 seconds    4) 9 seconds 5) None of these

**Question 2:** A train of length 100 m long crosses a pole in 10 seconds. How long will it take to cross a railway platform of length 64 m?

- 3) 14.5 seconds      **2) 16.4 seconds**    3) 15 seconds    4) 9.2 seconds 5) None of these

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**TECHNIQUE # 7: EFFICIENCY BASED PROBLEM FROM TIME AND WORK**

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**Challenge:** Sejal alone can complete a task in 12 days. She works alone for 4 days. She completes the remaining work in 4 days with the help of her colleague. How many days will the colleague alone take to complete the task?

- 1) 9                      2) 12                      3) 10                      4) Cannot be determined                      5) None of these

Regular Method	Smart Method
<p>Let the capacity of Sejal and her colleague be S and C respectively.</p> <p>Work equation formed is as follows:</p> $W = S \times 12 = S \times 4 + (S + C) \times 4$ $\Rightarrow 12S = 4S + 4S + 4C$ $\Rightarrow 12S = 8S + 4C$ $\Rightarrow 4S = 4C$ $\Rightarrow S = C$ <p><math>\Rightarrow</math> The capacity of Sejal (S) and her colleague (C) is equal. Therefore, the number of days required by her colleague alone will be equal to the number of days required by Sejal = 12</p>	<p>As seen in the question, Sejal works alone for 4 days and works with her colleague for another 4 days. So Sejal has worked for a total of 8 days. Therefore, she will be able to complete <math>\frac{8}{12} = \frac{2}{3}</math> of the total work in those 8 days (as she can complete the total work in 12 days).</p> <p>Hence, the remaining <math>\frac{1}{3}</math> of the work was done by her colleague who has worked only for 4 days in the process. So her colleague can complete <math>\frac{1}{3}</math> in 4 days, which means she can complete the total work in <math>4 \times 3 = 12</math> days</p>

**Use this smart method to solve more such questions:**

**Question 1:** Ram alone can complete a task in 15 days. He works alone for 5 days. He completes the remaining work in 6 days with the help of his colleague. How many days will the colleague alone take to complete the task?

- 1) **22.5**                      2) 12                      3) 16                      4) Cannot be determined                      5) None of these

**Question 2:** Nitin alone can complete a task in 20 days. He works alone for 5 days. He completes the remaining work in 5 days with the help of his colleague. How many days will the colleague alone take to complete the task?

- 1) 12                      **2) 10**                      3) 15                      4) 20                      5) None of these

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**TECHNIQUE # 8: PERCENTAGE CHANGE IN AREA OF A QUADRILATERAL**

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**Challenge:** The length of a rectangle increased by 40% and its breadth increased by 20%. What will be the percentage increase in the area of the rectangle?

- 1) 50%      2) 10%      3) 44%      4) 68%      5) None of these

Regular Method	Smart Method
<p>Let the original length and breadth of the rectangle be <math>l</math> and <math>b</math> respectively.</p> <p>Area of the rectangle, <math>A = l \times b = lb</math></p> <p>New length, <math>l' = l + 40\% \text{ of } l = 1.4l</math></p> <p>New breadth, <math>b' = b + 20\% \text{ of } b = 1.2b</math></p> <p>Area of the new rectangle, <math>A' = 1.4l \times 1.2b</math></p> <p><math>\Rightarrow A' = 1.68lb</math></p> <p>Percentage change in the area of the rectangle <math>= [(A' - A)/A] \times 100</math></p> <p><math>= [(1.68lb - lb)/lb] \times 100 = 0.68 \times 100 = 68\%</math></p>	<p>Percentage change in area of the rectangle can be measured using the effective percentage formula <math>= a + b + ab/100</math>.</p> <p>Here, <math>a = 40</math> and <math>b = 20</math></p> <p><math>\Rightarrow</math> Percentage change in area of the rectangle <math>= 40 + 20 + 40 \times 20/100</math></p> <p><math>= 68\%</math></p>

**Use this smart method to solve more such questions:**

**Question 1:** The length of a rectangle increased by 20% and its breadth increased by 10%. What will be the percentage increase in the area of the rectangle?

- 1) 23%      2) 25%      **3) 32%**      4) 30%      5) None of these

**Question 2:** The length of a rectangle increased by 50% and its breadth decreased by 20%. What will be the percentage increase in the area of the rectangle?

- 1) 10%      **2) 20%**      3) 30%      4) 40%      5) None of these



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### TECHNIQUE # 9: MULTIPLICATION WITH 5

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**Challenge:**  $436 \times 5 = ?$

- 1) 2560      2) 2180      3) 2340      4) 2460      5) None of these

Regular Method	Smart Method
The traditional multiplication method involves paperwork and takes about 8-10 seconds to get the required answer.	Multiplication with 5 can be done much faster without any paper work by taking 5 as $10/2$ . All you need to do is take half of the given number and multiply the result by 10 (which is a no brainer) $\Rightarrow 436 \times 5 = 436 \times (10/2)$ $\Rightarrow = (436/2) \times 10 = 2180$

**Use this smart method to solve more such questions:**

**Question 1:**  $234 \times 5 = ?$

- 1) 1140      2) 1440      **3) 1170**      4) 1770      5) None of these

**Question 2:**  $6317 \times 5 = ?$

- 1) 21535      2) 38855      3) 22145      4) 45685      **5) 31585**

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**TECHNIQUE # 10: MULTIPLICATION OF COMPLEMENTARY NUMBERS**

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**Challenge:**  $43 \times 47 = ?$

- 1) 2021      2) 2521      3) 1621      4) 2421      5) None of these

Regular Method	Smart Method
The traditional multiplication method involves paperwork and takes about 10-12 seconds to get the required answer.	43 and 47 are complementary numbers as the units places (3 and 7) add to 10 and the tens places is same (4 in both no's). Such numbers can be multiplied in two simple steps: Step 1: Multiply the units places = $3 \times 7 = 21$ Step 2: Multiply the tens place with the next integer = $4 \times 5 = 20$ Therefore, $43 \times 47 = 2021$

**Use this smart method to solve more such questions:**

**Question 1:**  $24 \times 26 = ?$

- 1) 724      2) 684      **3) 624**      4) 1024      5) None of these

**Question 2:**  $77 \times 73 = ?$

- 1) 3721      2) 5241      3) 5681      **4) 5621**      5) None of these

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### TECHNIQUE # 11: SQUARE ROOT OF THE GIVEN PERFECT SQUARE

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**Challenge:** What is the square root of 3721?

- 1) 67      2) 61      3) 37      4) 51      5) None of these

Regular Method	Smart Method
<p>The square root of a given number can be obtained using the Long Division method is obviously long, as the name says, and hence time consuming.</p> <p>Depending on the given perfect square, it may take anywhere between 15 seconds to 30 seconds to get the required answer.</p>	<p>Square root of a perfect square can be obtained in 3 simple steps in about 3-5 seconds as follows:</p> <p>Step 1: Units place of the given number (3721) is 1. Hence the square root ends in 1 or 9.</p> <p>Step 2: Leave the last two digits of the given number (3721). The remaining part is 37 and the highest perfect square less than 37 is <math>36 = 6^2</math>. Hence the tens place of the final answer will be 6. So the two possible answers are 61 and 69.</p> <p>Step 3: Both the possible answers (61 and 69) fall between 60 and 70.</p> <p>Square of 60 = 3600 and square of 7 = 4900</p> <p>The given number 3721 is closer to 3600 when compared to 4900. Hence the answer has to be closer to 60. So the correct answer is 61 (closer to 60 when compared to the number 69)</p>

**Use this smart method to solve more such questions:**

**Question 1:** What is the square root of 1849?

- 1) **43**      2) 67      3) 33      4) 57      5) None of these

**Question 2:** What is the square root of 3249?

- 1) 67      2) 73      3) **57**      4) 67      5) None of these

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### TECHNIQUE # 12: SQUARES OF NUMBERS FROM 26 TO 75

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**Challenge:** What is the square of 63?

- 1) 3609      2) 3969      3) 3729      4) 3909      5) None of these

Regular Method	Smart Method
Regular method of finding the square of 63 involves paper work where we multiply 63 with 63 and get the answer as 3969 in about 10 seconds.	The smart method involves using the $(a \pm b)^2$ expansion with $a = 50$ and memorizing squares up to 25 $(a \pm b)^2 = a^2 \pm 2ab + b^2$ $n^2 = (50 \pm x)^2 = 50^2 \pm 2 \cdot 50 \cdot x + x^2$ $\Rightarrow n^2 = 2500 \pm 100x + x^2$ $(63)^2 = (50+13)^2 = 2500 + 100 \cdot 13 + 13^2$ $= 2500 + 1300 + 169 = 3969$

**Use this smart method to solve more such questions:**

**Question 1:** What is the square of 47?

- 1) **2209**      2) 3039      3) 3729      4) 2309      5) None of these

**Question 2:** What is the square of 39?

- 1) 1321      2) 1627      3) **1521**      4) 1781      5) None of these

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**TECHNIQUE # 13: SQUARES OF NUMBERS FROM 76 TO 125**

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**Challenge:** What is the square of 89?

- 1) 7921      2) 6481      3) 8181      4) 7981      5) None of these

Regular Method	Smart Method
Regular method of finding the square of 89 involves paper work where we multiply 89 with 89 and get the answer as 7921 in about 10 seconds.	The smart method involves using the $(a \pm b)^2$ expansion with $a = 100$ and memorizing squares up to 25 $(a \pm b)^2 = a^2 \pm 2ab + b^2$ $n^2 = (100 \pm x)^2 = 100^2 \pm 2 \cdot 100 \cdot x + x^2$ $\Rightarrow n^2 = 10000 \pm 200x + x^2$ $(89)^2 = (100 - 11)^2 = 10000 - 200 \cdot 11 + 11^2$ $= 10000 - 2200 + 121 = 7921$

**Use this smart method to solve more such questions:**

**Question 1:** What is the square of 93?

- 1) 7979      **2) 8649**      3) 6729      4) 9129      5) None of these

**Question 2:** What is the square of 113?

- 1) 13459      2) 10129      3) 14539      **4) 12769**      5) None of these

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**TECHNIQUE # 14: VERIFICATION BASED ON RATIOS FOR SOLVING AGE RELATED PROBLEMS**

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**Challenge:** Ages of Ajay and Vijay are in the ratio of 2:3 respectively. Six years hence, the ratio of their ages will become 11:15 respectively. What will be Ajay's present age?  
1) 15 years      2) 24 years      3) 16 years      4) 35 years      5) None of these

Regular Method	Smart Method
<p>Let the ages of Ajay and Vijay be A and V respectively.</p> <p><math>A:V = 2:3 \Rightarrow A = 2x</math> and <math>V = 3x</math>;</p> <p><math>(A+6)/(V+6) = 11/15</math></p> <p><math>\Rightarrow (2x+6)/(3x+6) = 11/15</math></p> <p><math>\Rightarrow 15(2x+6) = 11(3x+6)</math></p> <p><math>\Rightarrow 30x+90 = 33x+66</math></p> <p><math>\Rightarrow 3x = 24 \Rightarrow x = 8</math></p> <p><math>\Rightarrow</math> Ajay's present age = <math>2x</math> <math>= 2*8 = 16</math></p>	<p><math>A:V = 2:3 \Rightarrow</math> Ajay's present age must be a multiple of 2.</p> <p>Upon verification, option (1) and option (4) are ruled out as these are not the multiples of 2</p> <p><math>(A+6)/(V+6) = 11/15</math></p> <p><math>\Rightarrow</math> Ajay's age after 6 years must be a multiple of 11.</p> <p>According to option (2), <math>A = 24</math></p> <p><math>\Rightarrow</math> Age after 6 years = <math>24+6 = 30</math>, which is not a multiple of 11. Hence, option (2) is ruled out.</p> <p>From option (3), <math>A = 16</math></p> <p><math>\Rightarrow A+6 = 16+6 = 22</math>, which is a multiple of 11.</p> <p>Therefore, option (3) is the correct answer.</p>

**Use this smart method to solve more such questions:**

**Question 1:** Ages of Arun and Deepak are in the ratio of 2:1 respectively. 3 years hence, the ratio of their ages will become 5:3 respectively. What will be Arun's present age?

1) 15 years      **2) 12 years**      3) 20 years      4) 30 years      5) None of these

**Question 2:** Present ages of Sameer and Anand are in the ratio of 5:4 respectively. Three years hence, the ratio of their ages will become 11:9 respectively. What is Anand's present age in years?

**1) 24 years**      2) 27 years      3) 30 years      4) 40 years      5) None of these

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**TECHNIQUE # 15: MULTIPLICATION USING A SIMPLE ALGEBRAIC IDENTITY**

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**Challenge:**  $73 \times 87 = ?$

- 1) 6421      2) 6351      3) 6251      4) 4921      5) None of these

Regular Method	Smart Method
The traditional multiplication method involves paper work and takes about 10-12 seconds to get the required answer.	Upon observation, we find that $73 \times 87$ can be expressed as $(80-7)(80+7)$ We know, $(a+b)(a-b) = a^2 - b^2$ $\Rightarrow (80-7)(80+7) = 80^2 - 7^2$ $= 6400 - 49 = 6351$ As seen above, we can do such complex multiplications in about 4 seconds using a simple Algebraic formula.

**Use this smart method to solve more such questions:**

**Question 1:**  $44 \times 56 = ?$

- 1) 2724      2) 2684      **3) 2464**      4) 1024      5) None of these

**Question 2:**  $82 \times 98 = ?$

- 1) 8036**      2) 7456      3) 4686      4) 6646      5) None of these

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**TECHNIQUE # 16: PROBLEMS BASED ON CONSECUTIVE NUMBERS**

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**Challenge:** The sum of 5 consecutive odd numbers is 575. What will be the sum of the next set of 5 consecutive odd numbers?

- 1) 625      2) 580      3) 600      4) 650      5) None of these

Regular Method	Smart Method
<p>Let the 5 odd consecutive numbers be <math>x, x+2, x+4, x+6, x+8</math></p> $\Rightarrow x+x+2+x+4+x+6+x+8 = 575$ $\Rightarrow 5x+20 = 575$ $\Rightarrow x = 111$ <p>So the 5 numbers are 111, 113, 115, 117 and 119</p> <p>Therefore, the next 5 consecutive numbers are 121, 123, 125, 127 and 129</p> <p>Required answer = <math>121+123+125+127+129</math> <math>= 625</math></p>	<p>Let <math>a, b, c, d, e, f, g, h, i</math> and <math>j</math> be the ten consecutive odd numbers of which <math>a</math> to <math>e</math> belong to the first set and <math>f</math> to <math>j</math> belong to the second set.</p> <p><math>f = a+10</math> (since the difference between each pair of consecutive numbers is 2). Similarly, <math>g = b+10, h = c+10, i = d+10</math> and <math>j = e+10</math></p> $\Rightarrow f+g+h+i+j = a+b+c+d+e+50$ $\Rightarrow \text{Required answer} = 575+50 = 625$

**Use this smart method to solve more such questions:**

**Question 1:** The sum of 3 consecutive odd numbers is 256. What will be the sum of the next set of 3 consecutive odd numbers?

- 1) **274**      2) 280      3) 300      4) 350      5) None of these

**Question 2:** The sum of five consecutive even numbers is 600. What is the sum of the next set of the consecutive even numbers?

- 1) 400      2) **650**      3) 600      4) 550      5) None of these



### TECHNIQUE # 17: SUBSTITUTION METHOD IN TRIGONOMETRY

**Challenge:** The value of  $\frac{\cos^3\theta + \sin^3\theta}{\cos\theta + \sin\theta} + \frac{\cos^3\theta - \sin^3\theta}{\cos\theta - \sin\theta}$  is equal to

- 1) -1      2) 1      **3) 2**      4) 0      5) -2

Regular Method	Smart Method
<p>Use Trigonometric Identities along with Algebraic Identities:</p> $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$ $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$ $\Rightarrow \frac{\cos^3\theta + \sin^3\theta}{\cos\theta + \sin\theta} + \frac{\cos^3\theta - \sin^3\theta}{\cos\theta - \sin\theta}$ $= \left( \frac{(\cos\theta + \sin\theta)(\cos^2\theta - \cos\theta\sin\theta + \sin^2\theta)}{\cos\theta + \sin\theta} \right) + \left( \frac{(\cos\theta - \sin\theta)(\cos^2\theta + \cos\theta\sin\theta + \sin^2\theta)}{\cos\theta - \sin\theta} \right)$ $\Rightarrow \frac{\cos^3\theta + \sin^3\theta}{\cos\theta + \sin\theta} + \frac{\cos^3\theta - \sin^3\theta}{\cos\theta - \sin\theta}$ $= (\cos^2\theta - \cos\theta\sin\theta + \sin^2\theta) + (\cos^2\theta + \cos\theta\sin\theta + \sin^2\theta)$ $\Rightarrow \frac{\cos^3\theta + \sin^3\theta}{\cos\theta + \sin\theta} + \frac{\cos^3\theta - \sin^3\theta}{\cos\theta - \sin\theta} = 2(\cos^2\theta + \sin^2\theta) = 2$ <p>(since <math>\cos^2\theta + \sin^2\theta = 1</math>)</p>	<p>Let's substitute some random value for <math>\theta</math> so that we can solve the equation directly with numerical values instead of dealing with trigonometric and algebraic identities. Please note that the given question is independent of the value of <math>\theta</math></p> <p>Let's say, <math>\theta = 0</math></p> $\Rightarrow \frac{\cos^3\theta + \sin^3\theta}{\cos\theta + \sin\theta} + \frac{\cos^3\theta - \sin^3\theta}{\cos\theta - \sin\theta}$ $= (1+0)/(1+0) + (1-0)/(1-0)$ $= 1+1 = 2$

**Use this Smart method to solve more questions:**

**Question 1:** The value of  $\frac{1}{(1+\tan^2\theta)} + \frac{1}{(1+\cot^2\theta)}$  is

- 1) 1/4      **2) 1**      3) 2      4) 1/2      5) None of these

**Question 2:** The value of  $\frac{1}{\operatorname{cosec}\theta - \cot\theta} - \frac{1}{\sin\theta}$  is

- 1) 1      **2)  $\cot\theta$**       3)  $\operatorname{cosec}\theta$       4)  $\tan\theta$       5) None of these

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**TECHNIQUE # 18: CUBE ROOT OF THE GIVEN PERFECT CUBE**

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**Challenge:** What is the cube root of 328509?

- 1) 63      2) 61      **3) 69**      4) 79      5) None of these

Regular Method	Smart Method
<p>Finding out the cube root of a given number using the conventional method may take about 2-3 minutes.</p>	<p>Cube root of a perfect cube can be obtained in 2 simple steps in about 3 seconds as follows:</p> <p>Step 1: Units place of the given number (328509) is 9. Hence the cube root ends in 9.</p> <p>Step 2: Leave the last three digits of the given number (328509). The remaining part is 328 and the highest perfect cube less than 328 is <math>216 = 6^3</math>. Hence the tens place of the final answer will be 6.</p> <p>So the answer is 69.</p>

**Use this smart method to solve more such questions:**

**Question 1:** What is the cube root of 373248?

- 1) 73      **2) 72**      3) 78      4) 79      5) None of these

**Question 2:** What is the cube root of 79507?

- 1) 43**      2) 41      3) 53      4) 47      5) None of these

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**TECHNIQUE # 19: UNITS PLACE METHOD IN SIMPLIFICATIONS**

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**Challenge:**  $(?)^2 + (65)^2 = (160)^2 - (90)^2 - 7191$

- 1) 75      2) 77      3) 79      4) 81      **5) None of these**

Regular Method	Smart Method
$?^2 + 65^2 = 160^2 - 90^2 - 7191$ $65^2 = 4225$ $160^2 = 25600$ $90^2 = 8100$ $\Rightarrow ?^2 + 65^2 = 160^2 - 90^2 - 7191$ $\Rightarrow ?^2 + 4225 = 25600 - 8100 - 7191$ $\Rightarrow ?^2 = 25600 - 8100 - 7191 - 4225$ $\Rightarrow ?^2 = 6084$ $\Rightarrow ? = \text{Square root of } 6084$ $\Rightarrow ? = 78$	$\Rightarrow ?^2 + 65^2 = 160^2 - 90^2 - 7191$ Units place of $65^2 = 5$ Units place of $160^2 = 0$ Units place of $90^2 = 0$ Considering only the Unit's places, we get $\Rightarrow ?^2 + \underline{\quad}5 = \underline{\quad}0 - \underline{\quad}0 - \underline{\quad}1$ $\Rightarrow ?^2 = \underline{\quad}0 - \underline{\quad}0 - \underline{\quad}1 - \underline{\quad}5$ $\Rightarrow ?^2 = \underline{\quad\quad}4$ $\Rightarrow ? = \text{Square of a number that ends}$ $\text{in } 4$ $\Rightarrow ? = \underline{\quad\quad}2 \text{ or } \underline{\quad\quad}8$ Hence the answer is option 5, None of these

**Use this smart method to solve more such questions:**

**Question 1:**  $?^2 + 79^2 = 172^2 - 88^2 - 8203$

- 1) 93      2) 89      3) 83      4) 81      **5) None of these**

**Question 2:** Square root of  $3249 + 75^2 + \text{Square root of } ? = 5745$

- 1) 3721      2) 4096      3) 3481      **4) 3969**      5) 3364

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**TECHNIQUE # 20: RATIOS AND PROPORTION**

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**Challenge:** A sum of money is divided among A, B, C and D ratio 3:5:8:9 respectively. If the share of D is 1872 more than the share of A, then what is the total amount of money of B & C together?

- 1) 4156      2) 4165      3) 4056      4) 4065      5) None of these

Regular Method	Smart Method
Let the total amount be T A's share = $(3/25)*T$ B's share = $(5/25)*T$ C's share = $(8/25)*T$ D's share = $(9/25)*T$ $\Rightarrow D = A + 1872$ $\Rightarrow (9/25)*T = (3/25)*T + 1872$ $\Rightarrow (6/25)*T = 1872$ $\Rightarrow T = 1872*25/6 = 7800$ $B+C = (5/25)*T + (8/25)*T = (13/25)*T$ $\Rightarrow B+C = (13/25)*7800 = 4056$	A's share = 3 parts B's share = 5 parts C's share = 8 parts D's share = 9 parts D - A = 9 parts - 3 parts = 6 parts = 1872 B+C = 5 parts + 8 parts = 13 parts = ? Upon cross multiplication, we get $B+C = 13*1872/6 = 4056$

**Use this smart method to solve more such questions:**

**Question 1:** A sum of money is divided among A, B, C and D in the ratio 5:8:9:11. If the share of B is 2475 more than the share of A, then what is the total amount of money of A & C together?

- 1) 9900      **2) 11550**      3) 10725      4) 9075      5) None of these

**Question 2:** A sum of money is divided among P, Q, R and S in the ratio 6:9:8:10. If the share of Q is 2463 more than the share of P, then what is the total amount of money of P & R together?

- 1) 9963      **2) 11494**      3) 10725      4) 9075      5) None of these

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**TECHNIQUE # 21: DISTANCE BETWEEN TRAINS BASED ON PROPORTIONALITY**

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**Challenge:** Two trains start at the same time from A and B and proceed towards B and A at 36 kmph and 42 kmph respectively. When they meet, it is found that one train has moved 48 km more than the other. What is the distance between A and B?

- 1) 624 km      2) 636 km      3) 544 km      4) 460 km      5) None of these

Regular Method	Smart Method
<p>Let the distance between A and B be 'd'</p> <p>Let the distance between A and meeting point be x and that between B and meeting point be x+ 48 <math>\Rightarrow x+(x+48) = d</math></p> <p>Since the two trains start at the same time, the time taken by each train to reach the meeting point is equal.</p> <p><math>\Rightarrow T_1 = T_2 \Rightarrow D_1/S_1 = D_2/S_2</math> (since <math>t = d/s</math>)</p> <p><math>\Rightarrow x/36 = (x+48)/42</math></p> <p><math>\Rightarrow 7x = 6x+288 \Rightarrow x = 288</math></p> <p>Required answer, <math>d = x+(x+48)</math></p> <p><math>\Rightarrow d = 288+288+48 = 624</math> km</p>	<p>Distance covered by first train in 1 hour is 36 km and that covered by the second train is 42 km</p> <p><math>\Rightarrow</math> Difference of distances covered by the two trains in 1 hour = <math>42 - 36 = 6</math> km</p> <p>Total difference of distances covered by the two trains at meeting point = 48 km</p> <p><math>\Rightarrow</math> Time for which the two trains have travelled = <math>48/6 = 8</math> hours</p> <p>Distance covered by the two trains together in 1 hour = <math>36 \text{ km} + 42 \text{ km} = 78</math> km</p> <p>Required answer = <math>78 \times 8 = 624</math> km</p>

**Use this smart method to solve more such questions:**

**Question 1:** A train leaves station A at the speed of 30 kmph. At the same time, another train departs from station B at the speed of 45 kmph. When they meet, it is found that one train has travelled 60 km more than the other. What is the distance between A and B?

- 1) 150 km      **2) 300 km**      3) 360 km      4) 240 km      5) None of these

**Question 2:** Two trains start at the same time from A and B and proceed towards B and A at 38 kmph and 46 kmph respectively. When they meet, it is found that one train has moved 64 km more than the other. What is the distance between A and B?

- 1) 672 km**      2) 636 km      3) 544 km      4) 460 km      5) None of these

**TECHNIQUE # 22: SUBSTITUTION METHOD IN ALGEBRA**

**Challenge:** If  $a+b+c=0$ , then the value of  $(- + - + -)$  is

- 1) 2              2) 3              3) 4              4) 5              5) None of these

Regular Method	Smart Method
$a+b+c = 0$ $\Rightarrow a+b = -c$ $\Rightarrow (a+b)^3 = (-c)^3$ $\Rightarrow a^3+b^3+3ab(a+b) = -c^3$ $\Rightarrow a^3+b^3+3ab(-c) = -c^3$ (since $a+b+c = 0$ , we get $a+b = -c$ ) $\Rightarrow a^3+b^3-3abc = -c^3$ $\Rightarrow a^3+b^3+c^3 = 3abc$ $\Rightarrow (a^3+b^3+c^3)/(abc) = 3$ $\Rightarrow a^3/(abc) + b^3/(abc) + c^3/(abc) = 3$ $\Rightarrow a^2/(bc) + b^2/(ac) + c^2/(ab) = 3$  Therefore, $(\frac{a^2}{bc} + \frac{b^2}{ac} + \frac{c^2}{ab}) = 3$	<p>Let's substitute values of a, b and c such that <math>a+b+c = 0</math>.</p> <p>For example, let <math>a = 2</math>, <math>b = -1</math> and <math>c = -1</math> since, <math>2-1-1 = 0</math></p> <p>Given expression <math>= \frac{a^2}{bc} + \frac{b^2}{ac} + \frac{c^2}{ab}</math></p> $= \frac{2^2}{(-1)(-1)} + \frac{(-1)^2}{(2)(-1)} + \frac{(-1)^2}{(2)(-1)}$ $= (4/1) + (-1/2) + (-1/2) = 3$

**Use this smart method to solve more such questions:**

**Question 1:** If  $- = - = - = 3$ , then  $_____ = ?$

- 1) 2              2) 3              3) 4              **4) 9**              5) None of these

**Question 2:** If  $x = \frac{a}{b}$ , then the value of  $\frac{a}{b} + \frac{b}{a}$  is

- 1) a              2) b              3) 0              **4) 2**              5) None of these

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**TECHNIQUE # 23: EFFECTIVE PERCENTAGE IN PROFIT AND LOSS**

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**Challenge:** A shopkeeper marks his goods in such a way that even after allowing a discount of 20%, he makes a profit of 12%. How much percent above the cost price is the marked price?

- 1) 32%      2) 8%      3) 12%      4) 40%      5) None of these

Regular Method	Smart Method
<p><math>S = [(100-D)/100]*M</math>, where S is the selling price, D is the discount and M is the marked price.</p> <p><math>\Rightarrow S = [(100-20)/100]*M = 80M/100</math> -- (1)</p> <p><math>S = [(100+P)/100]*C</math>, where S is the selling price, P is the profit and C is the cost price.</p> <p><math>\Rightarrow S = [(100+12)/100]*C = 112C/100</math> -- (2)</p> <p>From (1) and (2), we get</p> <p><math>80M/100 = 112C/100</math></p> <p><math>\Rightarrow M = 112C/80 = 1.4C = (140/100)C</math></p> <p><math>\Rightarrow M = 140\%</math> of Cost price</p> <p>Therefore, the marked price is 40% above the cost price</p>	<p><math>p = d + m + d*m/100</math>, where</p> <p>p is the profit percentage, d is the discount percentage (taken negative) and m is the marked up percentage</p> <p><math>\Rightarrow 12 = -20+m+(-20*m)/100</math></p> <p><math>\Rightarrow m - m/5 = 12+20</math></p> <p><math>\Rightarrow 4m/5 = 32 \Rightarrow m = 40</math></p> <p>Therefore, the marked price is 40% above the cost price</p>

**Use this smart method to solve more such questions:**

**Question 1:** A shopkeeper marks his goods in such a way that after allowing a discount of 10%, he gains 17%. How much percent above C.P. is the marked price?

- 1) 50%      **2) 30%**      3) 27%      4) 7%      5) None of these

**Question 2:** A shopkeeper marks his goods in such a way that after allowing a discount of 20%, he gains 28%. How much percent above C.P. is the marked price?

- 1) 60%**      2) 32%      3) 48%      4) 56%      5) None of these