

## 2.Simplification & Approximation

As we all know that simplification is most widely asked topic in almost every banking exam. So let us try to understand what is actually meant by word 'Simplification'.

Simplification means to find out a final answer for a complex calculation.

Simplification questions are asked to check the ability of a student to deal with numbers which can be in one of the following two types.

- Sometimes, a calculation is given and one of the numbers is missing from the calculation. To find out the missing number, we have to approximate the given numbers or do the basic operations.
- Sometimes all the numbers are given with some operations between them & we have to simplify the calculation.

### Rules related to Simplification

*Rule-(I) Replace 'of' by 'Multiplication' & '/' by 'Division'*

**Explanation:** Whenever we find 'of' in a simplification problem, we can replace that by 'multiplication(\*)'. Similarly '/' can be replaced by '÷'.

**Example: Find  $\frac{1}{4}$  of 20**

**Solution:**  $(\frac{1}{4}) \times 20 = 20 \div 4 = 5$

**Rule-(II) Always keep in mind the "BODMAS" rule. These operations have priorities in the same order as mentioned.**

**Explanation:** Whenever we have more than one operation in the given calculation, we have to do the operations according to the priority specified by 'BODMAS'

- B-Bracket
- O-Of (means multiplication)
- D-Division
- M-Multiplication
- A-Addition
- S-Subtraction

**Example: Simplify:  $(2+3)*30$**

**Solution:** In this question, we have two things-Bracket & Multiplication. According to the BODMAS rule, we have to solve bracket first and not multiplication. So now coming to bracket, we have only one operation-Addition, so we will do addition.

$$(2+3)*30 = 5*30$$

Now we have only one operation to do – Multiplication

$$5*30 = 150$$

**Example: Simplify: (2+5) of 80**

**Solution:** In this question, we have three things – bracket, addition & of. Replacing ‘of’ by ‘multiplication’.

$$(2+5) \text{ of } 80 = (2+5)*80$$

Now we have three things – bracket, addition & Multiplication. According to the BODMAS rule, we have to solve bracket first and not multiplication. So now coming to bracket, we have only one operation-Addition, we will do addition.

$$(2+5)*80 = 7*80$$

Now we will do multiplication.

$$7*80 = 560$$

**Rule-(III) Multiplication & Division have same priority(Do that operation first which is on left).**

**Explanation:** Though division has more priority than multiplication according to ‘BODMAS’ but we can perform multiplication first.

**Example: 8\*30/15**

$$8*30 \div 15$$

**Solution:** In this question, we have two things – Multiplication & Division. So we can perform any operation first as they have same priority.

Doing Multiplication first:

$$240 \div 15$$

$$16$$

Doing division first:

$$8*2$$

$$16$$

**Rule-(IV) Addition & Subtraction have same priority.**

**Explanation:** Though addition has more priority than division according to 'BODMAS' but we can perform any of the two operations first.

**Example:**  $30+40-15$

**Solution:** In this question, we have two things – Addition & Subtraction. So we can perform any operation first as they have same priority.

Doing Addition first:

$$70 - 15$$

$$55$$

Doing Subtraction first:

$$30 + 25$$

$$55$$

**Rule-(V) Don't hesitate in rounding the numbers to nearest integers.**

**Explanation:** Most of the times the numbers are given in such a way that you can round them quickly and get the answer (Rounding should be done or not, It can be realised by looking at the given options).

**Example:**  $(324.5*15)/(5.01*24.98)$

**Solution:**  $(325*15)/(5*25)$

$$=13*3$$

$$=39$$

[Some previous year questions asked in banking exams from simplification](#)

Now let us see some of the previous year questions asked from 'Simplification' & try to apply the rules learnt so far.

**Q.1) Simplify:  $127.001 * 7.998 + 6.05 * 4.001$**

1. 1000
2. 1020
3. 1040
4. 1080
5. None of these

**Solution:** Using the rounding concept

$$127 * 8 + 6 * 4$$

Using the BODMAS rule

$$1016 + 24$$

1040 (Option 3)

**Q.2) What will come at place of ?:  $9876 \div 24.96 + 215.005 - ? = 309.99$**

1. 270
2. 280
3. 290
4. 300
5. 310

**Solution:** Using the rounding concept

$$9875 \div 25 + 215 - ? = 310$$

Using the BODMAS rule

$$395 + 215 - ? = 310$$

$$610 - ? = 310$$

$$? = 300 \text{ (Option 4)}$$

**Q.3) What will come at place of a:  $(128 \div 16 \times a - 7*2)/(7^2 - 8*6 + a^2) = 1$**

1. 1
2. 5
3. 9
4. 13
5. 17

**Solution:** Using the BODMAS rule

$$(8*a - 14)/(49 - 48 + a^2) = 1$$

$$(8a - 14)/(1 + a^2) = 1$$

$$8a - 14 = 1 + a^2$$

$$a^2 - 8a + 15 = 0$$

$$a = 3 \text{ or } 5 \text{ (Option 2)}$$

**Q.4) What will come at place of ?:  $85.147 + 34.192 \times 6.2 + ? = 802.293$**

1. 400
2. 450
3. 550
4. 600
5. 500

**Solution:** Using the rounding concept

$$85 + 35 \times 6 + ? = 803$$

Using the BODMAS rule

$$85 + 210 + ? = 803$$

$$295 + ? = 803$$

$$? = 508 \text{ [approx. = 500] (Option 5)}$$

**Q.5) What will come at place of ?:  $3/8 \text{ of } 168 \times 15 \div 5 + ? = 549 \div 9 + 235$**

1. 189
2. 107
3. 174
4. 296
5. None of these

**Solution:** Using the BODMAS rule

$$(3 \times 168 \div 8) \times 15 \div 5 + ? = 549 \div 9 + 235$$

$$(504 \div 8) \times 3 + ? = 61 + 235$$

$$63 \times 3 + ? = 296$$

$$189 + ? = 296$$

? = 107 (Option 2)

### Key points to remember related to Simplification:

- Replace 'of' by 'Multiplication'.
- Replace '/' by 'Division'.
- Always do the operations in priority according to 'BODMAS'.
- Division & Multiplication have same priority (Start from left).
- Addition & Subtraction have same priority.
- Rounding can be done to simplify problems.
- When the given options are very close then rounding doesn't help much.
- Always look at the options before doing simplification that can help in elimination of options.

## Basic Rules of Simplification

### *BODMAS Rule*

It defines the correct sequence in which operations are to be performed in a given mathematical expression to find the correct value. This means that to simplify an expression, the following order must be followed –

**B** = Bracket,  
**O** = Order (Powers, Square Roots, etc.)  
**D** = Division

**M** = Multiplication  
**A** = Addition

**S** = Subtraction

**1.** Hence, to solve simplification questions correctly, you must apply the operations of **brackets** first. Further, in solving for brackets, the order – (), {} and [] – should be strictly followed.  
**2.** Next you should evaluate **exponents** (for instance powers, roots etc.)

**3.** Next, you should perform **division and multiplication**, working from left to right. (division and multiplication rank equally and are done left to right).

**4.** Finally, you should perform **addition and subtraction**, working from left to right. (addition and subtraction rank equally and are done left to right).

**EXAMPLE 1:** Solve  $12 + 22 \div 11 \times (18 \div 3)^2 - 10$

$$\begin{aligned} &= 12 + 22 \div 11 \times 6^2 - 10 \text{ (Brackets first)} \\ &= 12 + 22 \div 11 \times 36 - 10 \text{ (Exponents)} \\ &= 12 + 2 \times 36 - 10 = 12 + 72 - 10 \text{ (Division and multiplication, left to right)} \\ &= 84 - 10 = 74 \text{ (Addition and Subtraction, left to right)} \end{aligned}$$

**EXAMPLE 2:** Solve  $4 + 10 - 3 \times 6 / 3 + 4$

$$= 4 + 10 - 18/3 + 4 = 4 + 10 - 6 + 4 \text{ (Division and multiplication, left to right)}$$

$$= 14 - 6 + 4 = 8 + 4 = 12 \text{ (Addition and Subtraction, left to right)}$$

### **To Solve Modulus of a Real Number**

The Modulus (or the absolute value) of  $x$  is always either positive or zero, but never negative. For any real number  $x$ , the absolute value or modulus of  $x$  is denoted by  $|x|$  and is defined as

$$|x| = x \text{ \{if } x \geq 0\} \text{ and } -x \text{ \{if } x < 0\}}$$

**EXAMPLE 1:** Solve  $|8|$

$$|8| = |-8| = 8$$

### **Tips to Crack Approximation**

#### **Conversion of decimal numbers to nearest number**

To solve such questions, first convert the decimal to nearest value. Then simplify the given equation using the new values that you have obtained.

**EXAMPLE 1:** Solve  $4433.764 - 2211.993 - 1133.667 + 3377.442$

Here,

$$4433.764 = 4434$$

$$2211.993 = 2212$$

$$1133.667 = 1134$$

$$3377.442 = 3377$$

$$\text{Now simplify, } 4434 - 2212 - 1134 + 3377 = 4466$$

**EXAMPLE 2:** Solve  $530 \times 20.3\% + 225 \times 16.8\%$

Here, 20.3% becomes 20% and 16.8% becomes 17%

Now, simplify  $530 \times 20\% + 225 \times 17\%$

$$= 106 + 38.25 = 144.25$$

### **Approximation of Square Roots**

(1) To simplify a square root, you can follow these steps:

(2) Factor the number inside the square root sign.

(3) If a factor appears twice, cross out both and write the factor one time to the left of the square root sign. If the factor appears three times, cross out two of the factors and write the factor outside the sign, and leave the third factor inside the sign. Note: If a factor appears 4, 6, 8, etc. times, this counts as 2, 3, and 4 pairs, respectively.

(4) Multiply the numbers outside the sign.

(5) Multiply the numbers left inside the sign.

(6) To simplify the square root of a fraction, simplify the numerator and simplify the denominator.

**NOTE:** Check that the outside number squared times the inside number should equal the original number inside the square root.

*Example 1: Simplify  $12^{1/2}$ .*

1.  $\sqrt{12} = \sqrt{2 \times 2 \times 3}$

2.  $\sqrt{2 \times 2 \times 3} = 2 \times \sqrt{3}$

3.  $2 \times \sqrt{3} = 2 \times \sqrt{3}$

4. Check:  $2^2 \times 3 = 12$

*Example 2: Simplify  $\sqrt{600}$ .*

1.  $\sqrt{600} = \sqrt{2 \times 2 \times 2 \times 3 \times 5 \times 5}$

2.  $\sqrt{2 \times 2 \times 2 \times 3 \times 5 \times 5} = 2 \times 5 \times \sqrt{2 \times 3}$

3.  $2 \times 5 \times \sqrt{2 \times 3} = 10 \times \sqrt{6}$

4. Check:  $10^2 \times 6 = 600$

*Example 3: Simplify  $\sqrt{810}$ .*

1.  $\sqrt{810} = \sqrt{2 \times 3 \times 3 \times 3 \times 3 \times 5}$

2.  $\sqrt{2 \times 3 \times 3 \times 3 \times 3 \times 5} = 3 \times 3 \times \sqrt{2 \times 5}$

3.  $3 \times 3 \times \sqrt{2 \times 5} = 9 \times \sqrt{10}$

4. Check:  $9^2 \times 10 = 810$

## Simplification and Approximation Questions-

1.  $572 \div 26 \times 12 - 200 = 2^?$

- A. 5
- B. 3
- C. 6
- D. 7
- E. None of these

Answer – **C. 6**

**Explanation :**

$$572 \div 26 = 22$$

$$22 \times 12 = 264$$

$$264 - 200 = 64 = 2^6$$

2.  $43931.03 \div 2011.02 \times 401.04 = ?$

- A. 7500
- B. 8300
- C. 8800
- D. 8850
- E. None of these

Answer – **C. 8800**

**Explanation :**

$$(44000 \div 2000) \times 400 = 8800$$

3.  $[(3\sqrt{8} + \sqrt{8}) \times (8\sqrt{8} + 7\sqrt{8})] - 98 = ?$

- A. 352
- B. 382
- C. 362
- D. 372
- E. None of these

Answer – **B. 382**

**Explanation :**

$$[\sqrt{8}(3 + 1) \times \sqrt{8}(8 + 7)] - 98$$

$$[4\sqrt{8} \times 15\sqrt{8}] - 98$$

$$480 - 98 = 382$$

4.  $(23.1)^2 + (48.6)^2 - (39.8)^2 = ? + 1147.69$

- A. 185.84
- B. 175.84
- C. 135.84
- D. 163.84
- E. None of these

Answer – **D. 163.84**

**Explanation :**

$$533.61 + 2361.96 - 1584.04 = ? + 1147.69$$

$$1311.53 - 1147.69 = 163.84$$

5.  **$3463 \times 295 - 18611 = ? + 5883$**

A. 997071

B. 997091

C. 999090

D. 997090

E. None of these

Answer – **B. 997091**

**Explanation :**

$$3463 \times 295 = 1021585$$

$$1021585 - (18611 + 5883) = 997091$$

6.  **$\sqrt{7378} \times \sqrt{1330} \div \sqrt{660} = ?$**

A. 130

B. 120

C. 160

D. 170

E. None of these

Answer – **B. 120**

**Explanation :**

$$\sqrt{7378} \approx 86; \sqrt{1330} \approx 36; \sqrt{660} \approx 26$$

$$86 \times 36 \div 26$$

7.  **$6999 \div 70.005 \times 94.998 = ? \times 19.999$**

A. 475

B. 380

C. 640

D. 720

E. None of these

Answer – **A. 475**

**Explanation :**

$$7000 \div 70 \times 95 = ? \times 20 \approx 475$$

8.  **$89.988\% \text{ of } 699.9 + 50.002\% \text{ of } 999.99 - 170.015 = ?$**

A. 950

B. 930

C. 960

D. 970

E. None of these

Answer **C. 960**

**Explanation :**

$$\approx (700 * (90/100) + 1000 * (50/100)) - 170 \\ \approx 630 + 500 - 170 \approx 960$$

9.  $\sqrt{(7^2 \times 24 \times 2 - (11)^3 + 3)} = ?$

- A. 52
- B. 32
- C. 62
- D. 72
- E. None of these

Answer – **B. 32**

**Explanation :**

$$\sqrt{(2352 - 1331 + 3)} = \sqrt{1024} = 32$$

10. **65% of  $\sqrt{3136 \times 5} = ? + 154$**

- A. 56
- B. 28
- C. 35
- D. 32
- E. None of these

Answer – **B. 28**

**Explanation :**

$$(65/100) * 56 * 5 = ? + 154 \\ 182 - 154 = 28$$

•  **$(32.3)^2 \div 4 + \sqrt{361} = ?^2 + 50$**

- 1.15
- 2.13
- 3.11
- 4.17
- 5. None of these

Answer – **1.15**

**Explanation :**

$$32 * 32 = 1024 \\ 1024 / 4 + 19 = 256 + 19 = 275$$

•  **$5742 \div 22 \times \sqrt{?} - 1290.76 = 536.24$**

- 1.121
- 2.25
- 3.36
- 4.49
- 5. None of these

Answer – **4.49**

**Explanation :**

$$261 * ? - 1290.76 = 536.24$$

$$261 * ? = 1827$$

$$? = 7$$

$$\sqrt{?} = 49$$

• **54 % 7865 + 17 % 532 – 39 % 4269 = ?**

1.2072.35

2.2420.76

3.2672.63

4.2570.36

5.None of these

Answer & Explanation

Answer – **3.2672.63**

**Explanation :**

$$4247.1 + 90.44 - 1664.91 = 2672.63$$

•  **$1/(729)^{2/3} * 1/(1296)^{1/4} \div 1/(2187)^{2/7} = ?$**

1.1/45

2.1/54

3.2/61

4.3/75

5.None of these

Answer & Explanation

Answer – **2.1/54**

**Explanation :**

$$1/81 * 1/6 \div 1/9 = 9/81 * 6 = 1/54$$

•  **$256 \times 256 + 173 \times 173 = ?$**

1.96432

2.94465

3.95465

4.90510

5.None of these

Answer & Explanation

Answer – **3.95465**

**Explanation :**

$$a^2 + b^2 = [(a+b)^2 + (a-b)^2] / 2$$

$$? = 184041 + 6889$$

$$? = 95465$$

•  **$\sqrt{(191 \times 7 + 231 - 839)} = ?$**

1.27

2.33

3.23

4.37

5. None of these

Answer & Explanation

Answer – **1.27**

**Explanation :**

$$1337+231-839 = 729$$

$$27*27 = 729$$

•  **$[\frac{3}{2} + 2(\frac{1}{5}) - \frac{7}{10}]$  of ? = 1098**

1.463

2.326

3.276

4.366

5. None of these

Answer & Explanation

Answer – **4.366**

**Explanation :**

$$[15+22-\frac{7}{10}] * x = 1098$$

$$X = 1098/3 = 366$$

•  **$0.9775 + 999.98+98.750 - 9999.099 = ?$**

1.-8899.39

2.9877.92

3.8999.93

4.8899.39

5. None of these

Answer & Explanation

Answer -1.-8899.39

**Explanation :**

$$1099.7075-9999.099= -8899.39$$

•  **$(1675 \div 5) + (5328 \div 12) * (8430 \div 15) = ?^2 - 235$**

1.152

2.138

3.158

4.142

5. None of these

Answer & Explanation

Answer – **3.158**

**Explanation :**

$$335+444*56 = 24864+335 = 25199 - 235 = 24964$$

$$158*158 = 24964$$

•  **$17.006*0.001+21.101-31.900 = ?$**

1.12.990

2.-10.782

3.11.882

4.-12.782

5.None of these

Answer & Explanation

Answer – **2.-10.782**

**Explanation :**

$$0.017006 + 21.101 = 21.118$$

$$21.118 - 31.900 = -10.782$$

•  **$47.008 - 20.998 + \sqrt{256.01} = ? * 2.0001$**

a) 20

b) 21

c) 22

d) 23

e) 24

Answer & Explanation

Answer – **b) 21**

**Explanation :**

$$47 - 21 + 16 = ? * 2$$

$$? = 21$$

•  **$2176.981 + 413.001 - 1872.993 = ? + 12.01 * 21.992$**

a) 423

b) 433

c) 443

d) 453

e) 463

Answer & Explanation

Answer – **d) 453**

**Explanation :**

$$2177 + 413 - 1873 = ? + 264$$

$$? = 453$$

•  **$(1/2) * (47.001 * 17.998) - (1/2) * (2/7) * 49.012 = ?$**

a) 423

b) 420

c) 416

d) 450

e) 432

Answer & Explanation

Answer – **c) 416**

**Explanation :**

$$(1/2) * (846) - 7 = ?$$

$$? = 416$$

•  $\sqrt{80.9} + \sqrt{224.98} + 13.01 \cdot 17.99 = ?$

- a) 253
- b) 257
- c) 263
- d) 267
- e) none of these

Answer & Explanation

Answer – b) **257**

**Explanation :**

$$9 + 15 + 13 \cdot 18 = ?$$

$$? = 257$$

•  $1235.092 + 4532.998 - ? + 1279.991 = 4000.001$

- a) 2048
- b) 3048
- c) 3648
- d) 4048
- e) none of these

Answer & Explanation

Answer – b) **3048**

**Explanation :**

$$? = 7048 - 4000 = 3048$$

•  $1.980 \cdot 4.059 + 14.0101 \cdot 3.009 - 4.003 \cdot 6.001 = ?$

- a) 22
- b) 24
- c) 26
- d) 28
- e) 30

Answer & Explanation

Answer – c) **26**

**Explanation :**

$$8 + 42 - 24 = ?$$

$$? = 26$$

•  $(1/2) \cdot (1/17.01) \cdot 289 \cdot ? = 4.001 \cdot 2.01$

- a) 16/17
- b) 14/17
- c) 15/17
- d) 13/17
- e) 17/16

Answer & Explanation

Answer – a) **16/17**

**Explanation :**

$$? = (4 \cdot 2 \cdot 2) / 17 = 16/17$$

•  $\sqrt{1023.90} + \sqrt{16.01} * \sqrt{24.91} = ? - (3/4) * (95.98)$

- a) 114
- b) 124
- c) 128
- d) 134
- e) 136

Answer & Explanation

Answer – b) **124**

**Explanation :**

$$32 + 4 * 5 = ? - 3 * 24$$

$$? = 124$$

• **21% of 4200 + 47% of 3000 - ? = 17.001 \* 21.998**

- a) 1818
- b) 1898
- c) 1918
- d) 1928
- e) none of these

Answer & Explanation

Answer – c) **1918**

**Explanation :**

$$21 * 42 + 47 * 30 - ? = 17 * 22$$

$$? = 1918$$

•  **$(3/7) * (14/19) * (38/3) * ? = 17$**

- a) 11/4
- b) 13/4
- c) 15/4
- d) 17/4
- e) 19/4

Answer & Explanation

Answer – d) **17/4**

**Explanation :**

$$? * 2 * 2 = 17$$

$$? = 17/4$$