

Geometry: Familiarity with elementary geometric figures and facts: Triangle and its various kinds of centres, Congruence and similarity of triangles, Circle and its chords, tangents, angles subtended by chords of a circle, common tangents to two or more circles.

Mensuration: Triangle, Quadrilaterals, Regular Polygons, Circle, Right Prism, Right Circular Cone, Right Circular Cylinder, Sphere, Hemispheres, Rectangular Parallelepiped, Regular Right Pyramid with triangular or square Base.

Trigonometry: Trigonometry, Trigonometric ratios, Complementary angles, Height and distances (simple problems only) Standard Identities like $\sin^2\theta + \cos^2\theta = 1$ etc.

Statistics and probability: Use of Tables and Graphs: Histogram, Frequency polygon, Bar diagram, Pie-chart; Measures of central tendency: mean, median, mode, standard deviation; calculation of simple probabilities.

SSC CGL Tier-I Cutoff

Category	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
SC	114	98	-	115.35	100.93	75.78	89.09	126.68	126.42	114.97
ST	103	88.50	111.10	104.92	93.75	62.81	77.57	118.16	111.85	106.36
OBC	125	110.00	103.22	135.95	119.23	95.11	114.27	145.94	146.23	130.36
EWS	-	-	-	135.04	109.21	104.64	102.35	143.44	141.82	127.41
UR	137	126.50	131.18	147.78	132.37	114.85	114.27	150.05	152.97	136.83
ESM	92	69.00	137.07	89.29	74.87	-	40.00	100.30	69.92	92.80
OH	97	84.50	40.00	98.43	85.99	47.42	70.70	115.98	113.10	100.87
HH	20	38.00	95.55	40.00	40.00	40.00	40.00	77.72	64.79	68.79
VH	68	89.50	40.00	110.41	95.76	40.00	40.00	121.59	102.97	72.00
Others-PWD	-	-	70.25	40.00	40.00	40.00	40.00	77.72	45.74	41.70

SSC CGL Tier-II Cutoff

Category	2016	2017	2018	2019	2020	2021	2022	2023	2024
SC	363.26	338.25	354.74	434.68	331.52	384.72	213.27	252	285.45
ST	341.00	311.25	327.05	405.13	309.87	345.12	192.23	241	266.49
OBC	397.00	379.75	403.33	478.82	381.12	440.22	242.79	271	306.27
EWS	-	-	-	466.42	366.47	423.11	228.63	265	300.03
UR	422.00	415.50	535.86	528.38	433.62	478.55	270.36	287	322.77
ESM	-	263.50	252.12	365.98	204.78	-	79.35	223	202.28
OH	333.00	294.00	302.50	392.97	287.10	341.27	187.58	234	258.66
HH	216.00	191.00	165.73	259.91	133.21	203.73	79.35	172	181.89
VH	336.00	311.00	280.98	422.76	317.48	-	158.48	228	219.45
PwD-Other	-	-	122.58	120.00	148.95	128.12	79.35	143	136.73

INDEX

SSC CGL - MATHS

TIER – 1

1 Number System

- 1.1** Computation of Whole Numbers **1**
- 1.2** Decimal & Fractions. **4**
- 1.3** Relationship between numbers **9**

2 Fundamental Arithmetical Operations

- 2.1** Percentages **20**
- 2.2** Ratio & Proportion **28**
- 2.3** Square & Square Roots, Cube & Cube Roots..... **34**
- 2.4** Averages..... **36**
- 2.5** Interests..... **43**
- 2.6** Profit & Loss **52**
- 2.7** Discount..... **61**
- 2.8** Partnership Business & Mixture & Alligation..... **70**
- 2.9** Time, Distance & Speed **75**
- 2.10** Time & Work, Pipe & Cisterns **87**

3 Algebra

- 3.1** Basic Algebraic identities of school Algebra & elementary surds (simple problems). **100**
- 3.2** Graphs of Linear Equations **117**

4 Geometry

- 4.1** Similarity with elementary geometric figures & congruence & similarity of triangles..... **121**
- 4.2** Circle & its chords, tangents, angles subtended tangents to two or more circles..... **129**

5 Mensuration

- 5.1** Right Prism, Cube, Cuboid, and regular right pyramid with triangular or square base..... **139**
- 5.2** Triangle **141**
- 5.3** Quadrilaterals & regular polygons..... **146**
- 5.4** Circle **150**
- 5.5** Right Circular Cone & Right circular cylinder **157**
- 5.6** Sphere & Hemispheres **160**

6 Trigonometry

- 6.1** Trigonometric ratios, Complementary angles, Trigonometric Identities..... **164**
- 6.2** Height & Distances..... **182**

7 Statistics

- 7.1** Use of tables & graphs, measures of mean, median, mode, standard deviation **187**

TIER – 2

1 Number System

- 1.1 Computation of Whole Numbers & Relationship between numbers 222
- 1.2 Decimal & Fractions. 236

2 Fundamental Arithmetical Operations

- 2.1 Percentages 249
- 2.2 Ratio & Proportion 258
- 2.3 Averages 268
- 2.4 Interests (simple & compound) 276
- 2.5 Profit, Loss & Discount 286
- 2.6 Partnership Business & Mixture & Alligation 302
- 2.7 Time, Distance & Speed 312
- 2.8 Time & Work 321

3 Algebra

- 3.1 Basic Algebraic identities of school Algebra & elementary surds (simple problems). 335
- 3.2 Linear Equations 346

4 Geometry

- 4.1 Similarity with elementary geometric figures & congruence & similarity of triangles 351
- 4.2 Circle & its chords, tangents, angles subtended tangents to two or more circles 360

5 Mensuration

- 5.1 Triangle 368
- 5.2 Quadrilaterals & regular polygons 375
- 5.3 Circle 381
- 5.4 Right Prism, Cube, Cuboid, and regular right pyramid with triangular or square base 386

- 5.5 Right Circular Cone & Right circular cylinder 393
- 5.6 Sphere & Hemispheres 403

6 Trigonometry

- 6.1 Trigonometric ratios, Complementary angles, Trigonometric Identities 411
- 6.2 Height & Distances 429

7 Statistics

- 7.1 Use of tables & Graphs Histogram, Frequency polygon, Bar-diagram, Pie-chart 436
- 7.2 Measures of central tendency mean, median, mode, standard deviation 448
- 7.3 Calculation of simple Probabilities 452

TIER – 1

**SSC - CGL
MATHS**

SSC CGL MATHS TIER - 1
NUMBER OF QUESTIONS ASKED IN PREVIOUS EXAMS (2010-2025)

TIER - 1		2010	2011	2012	2013	2014	2015	2016	2017	2019	2020	2021	2022	2023	2024	2025
1	NUMBER SYSTEM															
1.1	Computation of Whole Numbers	-	2	2	-	1	1	1	3	-	3	1	3	4	3	4
1.2	Decimal & Fractions	6	3	1	-	-	2	1	2	3	2	2	1	1	-	10
1.3	Relationship between numbers	6	6	3	1	1	2	2	4	3	3	4	13	1	4	-
2	FUNDAMENTAL ARITHMETICAL OPERATIONS															
2.1	Percentages	3	5	2	2	1	1	4	2	2	2	3	6	4	3	3
2.2	Ratio & Proportion	4	2	1	1	-	1	1	3	3	3	2	4	2	4	7
2.3	Square & Square Roots, Cube & Cube Roots	2	3	1	2	-	-	-	-	-	-	-	1	-	-	-
2.4	Averages	2	2	2	2	2	2	3	2	3	3	3	3	2	1	9
2.5	Interests	3	3	1	1	1	1	2	4	3	3	3	6	3	3	7
2.6	Profit & Loss	3	3	1	1	1	-	3	2	3	3	4	8	2	2	9
2.7	Discount	2	3	1	3	3	3	3	4	4	3	2	4	4	4	5
2.8	Partnership Business & Mixture & Alligation	-	2	-	-	2	2	-	-	-	-	-	2	1	2	16
2.9	Time, Distance & Speed	3	3	1	2	2	3	4	3	3	3	3	9	7	3	6
2.10	Time & Work, Pipe & Cisterns	4	3	1	3	3	3	2	3	3	3	3	6	8	3	5
3	ALGEBRA															
3.1	Basic algebraic identities of School Algebra and Elementary surds (simple problems)	5	2	5	6	6	3	12	7	10	7	9	13	8	6	3
3.2	Graphs of Linear Equations	-	-	1	1	2	2	-	6	-	-	-	-	-	-	3
4	GEOMETRY															
4.1	Similarity with elementary geometric figures & Congruence & similarity of triangles	-	-	3	3	3	1	3	3	2	3	4	8	2	2	3
4.2	Circle and its chords, tangents, angles subtended by chords of a circle, common tangents to two or more circles	-	-	2	4	3	-	2	1	5	3	5	3	3	3	8
5	MENSURATION															
5.1	Right Prism, Cube, Cuboid and Regular Right Pyramid with triangular or square Base	1	1	-	-	1	1	-	-	-	-	1	2	-	1	2
5.2	Triangle	-	2	-	-	1	2	5	1	1	2	2	5	1	2	4
5.3	Quadrilaterals & Regular Polygons	1	-	2	2	2	1	2	3	3	4	1	1	1	1	1
5.4	Circle	1	2	1	-	-	3	3	-	-	3	1	4	3	4	11
5.5	Right Circular Cone & Right Circular Cylinder	-	-	-	2	1	-	1	-	1	1	-	2	3	2	1
5.6	Sphere & Hemispheres	-	-	1	-	-	-	1	1	2	-	1	3	-	-	5
6	TRIGONOMETRY															
6.1	Trigonometric ratios, Complementary angles, Trigonometric Identities	-	-	9	6	6	7	5	9	9	9	9	15	9	9	3
6.2	Height & Distances	-	-	2	1	1	2	3	-	-	-	-	4	-	-	-
7	STATISTICS															
7.1	Use of Tables and Graphs, Measures of mean, median, mode, standard deviation	3	4	5	6	7	7	12	12	12	12	12	24	6	13	-

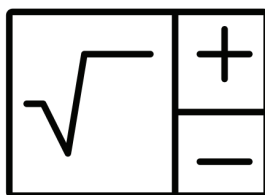
NUMBER SYSTEMS

SECTION

1

SYLLABUS

COMPUTATION OF
WHOLE NUMBER,
DECIMAL & FRACTIONS,
RELATIONSHIP
BETWEEN NUMBERS



Unit 1.1: Computation of Whole Numbers

Previous Year Exam Questions

[2011: SHIFT-1]

1. The remainder when 3^{21} is divided by 5 is

- (1) 1 (2) 2
(3) 3 (4) 4

[2011: SHIFT-1]

2. The last digit of $(1001)^{2008} + 1002$ is

- (1) 0 (2) 3
(3) 4 (4) 6

[2012: SHIFT-1]

3. The number nearest to 75070 which is divisible by 65, is

- (1) 75070 (2) 75075
(3) 75010 (4) 75065

[2012: SHIFT-1]

4. A farmer divides his herd of n cows among his four sons, so that the first son gets one-half the herd, the second one-fourth, the third son $\frac{1}{5}$ and the fourth son 7 cows. Then the value of n is

- (1) 240 (2) 100
(3) 180 (4) 140

[2014: SHIFT-1]

5. Arrange the following in ascending order $3^{34}, 2^{51}, 7^{17}$, we get

- (1) $3^{34} > 2^{51} > 7^{17}$ (2) $7^{17} > 2^{51} > 3^{34}$
(3) $3^{34} > 7^{17} > 2^{51}$ (4) $2^{51} > 3^{34} > 7^{17}$

[2015: SHIFT-1]

6. If $m = -4$, $n = -2$, then the value of $m^3 - 3m^2 + 3m + 3n + 3n^2 + n^3$ is

- (1) 124 (2) -124
(3) 126 (4) -126

[8 SEPT. 2016: SHIFT-2]

7. Number of composite numbers lying between 67 and 101 is

- (1) 27 (2) 24
(3) 20 (4) 23

[8 AUG. 2017: SHIFT-1]

8. How many numbers are there from 300 to 650 which are completely divisible by both 5 and 7?

- (1) 8 (2) 9
(3) 10 (4) 12

[17 AUG. 2017: SHIFT-2]

9. What is the value of 9991×10009 ?

- (1) 99999099 (2) 99999819
(3) 99999919 (4) 99999019

[23 AUG. 2017: SHIFT-3]

10. When a number is increased by 69, it becomes 103% of itself. What is the number?

- (1) 1300
(3) 2300

- (2) 3300
(4) 4300

[6 MARCH 2020: SHIFT-2]

11. Solve the following

$$113 \times 87 = ?$$

- (1) 10000 (2) 10026
(3) 9831 (4) 10169

[9 MARCH 2020: SHIFT-3]

12. The value of $(26 - 13 \times 2) \div 2 + 1$ is:

- (1) $\frac{26}{3}$ (2) 0
(3) 1 (4) 14

[9 MARCH 2020: SHIFT-3]

13. The value of 515×485 is:

- (1) 20825 (2) 249775
(3) 200825 (4) 250225

[13 AUGUST 2021: SHIFT-1]

14. The value of $20 \div 5$ of $8 \times [9 \div 6 \times (6-3)] - (10 \div 2$ of $20)$ is:

- (1) 6 (2) 2
(3) 1 (4) 0

[12 APRIL 2022: SHIFT-2]

15. The value of $40 \div 5$ of $2 \times [18 \div 6 \times (12 - 9)$ of $5 - (3 - 8)] \div 25$ is:

- (1) 5 (2) 7
(3) 8 (4) 4

[18 APRIL 2022: SHIFT-1]

16. Find the greatest number $234a5b$, which is divisible by 22, but NOT divisible by 5.

- (1) 234751 (2) 234058
(3) 234850 (4) 234652

[21 APRIL 2022: SHIFT-3]

17. Find the value of the following expression:

$$-5 + 5 + 625 \div 5 \times 5$$

- (1) 25 (2) 625
(3) 605 (4) 121

[14 JULY 2023: SHIFT-4]

18. Simplify the following expression.

$$(2 \times 7 - 5 + 9 \div 3) \div (4 + 2)^2 \times 2$$

- (1) 2 (2) $\frac{3}{2}$
(3) $\frac{2}{3}$ (4) 1.5

[14 JULY 2023: SHIFT-4]

19. Simplify the given expression.

$$18 \div 3 \text{ of } 2 \times 5 + 72 \div 18 \text{ of } 2 \times 3 - 4 \div 8 \times 2$$

- (1) 20 (2) $\frac{20}{3}$
(3) $\frac{25}{3}$ (4) 25

[24 JULY 2023: SHIFT-3]

20. If $720 \div 8 + 915 \div 15 - m + 32 \times 5 = 1104 \div 16 \times 111 \div 37$, then the value of m is:

- (1) 104 (2) 518
(3) 207 (4) 311

[24 JULY 2023: SHIFT-3]

21. Solve the following.

$$22 - [9 - \{6 - (10 - 4 + 3)\}] \div 2 \times 3$$

- (1) 12 (2) 4
(3) 3 (4) 20

[18 SEPT. 2024: SHIFT-3]

22. The value of $9 - 5 \times 6 + \{29 - (7 - 2)\} \div 8$ is:

- (1) -8 (2) 18
(3) -18 (4) 8

[23 SEPT. 2024: SHIFT-1]

23. Simplify

$$6 \times [28 \div 84 \times \{36 \times 49 \div (6 \times 7)\}].$$

- (1) 84 (2) 74
(3) 64 (4) 94

[26 SEPT. 2024: SHIFT-2]

24. Simplify the following expression.

$$(60 + 64 \div 4 \text{ of } 4) \times (1000 \div ((10 \text{ of } (3 + 2)) \times 2 \text{ of } 5)) - 28 + (100 \times 3 \text{ of } 3).$$

- (1) 600 (2) 1000
(3) 100 (4) 500

[12 SEPT. 2025: SHIFT-1]

25. $75 \cdot 31^3 + 18^3 - 37^3 + 210$ is equal to:

- (1) -36810 (2) -14820
(3) -45670 (4) -23450

[14 SEPT. 2025: SHIFT-1]

26. Find the product: $1.2 \times 2\frac{2}{5} \times \frac{3}{4}$

- (1) 2.4 (2) 2.5
(3) 2.16 (4) 2.1

[14 SEPT. 2025: SHIFT-1]

27. What is the value of $\frac{(0.1 \times 0.1 \times 0.1 + 0.03 \times 0.03 \times 0.03)}{(0.3 \times 0.3 \times 0.3 + 0.09 \times 0.09 \times 0.09)}$

- (1) 0.027 (2) 0.009
(3) 0.729 (4) 0.037

[14 SEPT. 2025: SHIFT-1]

28. $0.1 + 0.01 + 0.001 = ?$

- (1) 0.123 (2) 0.111
(3) 0.121 (4) 0.211

Answer Key									
1	2	3	4	5	6	7	8	9	10
(3)	(2)	(2)	(4)	(2)	(4)	(1)	(3)	(3)	(3)
11	12	13	14	15	16	17	18	19	20
(3)	(3)	(2)	(2)	(3)	(4)	(2)	(3)	(1)	(1)
21	22	23	24	25	26	27	28		
(2)	(3)	(1)	(2)	(2)	(3)	(4)	(2)		

Solutions

1. **Correct Answer is (3):**

We analyze the powers of 3 modulo 5:

$$\begin{aligned} 3^1 \bmod 5 &= 3 \\ 3^2 \bmod 5 &= 9 \bmod 5 = 4 \\ 3^3 \bmod 5 &= 27 \bmod 5 = 2 \\ 3^4 \bmod 5 &= 81 \bmod 5 = 1 \end{aligned}$$

We observe a repeating cycle: **(3, 4, 2, 1)** with a length of 4.

Since the cycle repeats every 4 terms, we calculate:

$$21 \bmod 4 = 1$$

Since the remainder is 1, we take the first value in the cycle, which is 3.

Thus, the remainder when 3^{21} is divided by 5 is 3.

2. **Correct Answer is (2):** The last digit of a number depends only on the last digit of its base when raised to a power. So, we analyze:

$$1001^{2008} \bmod 10$$

Since the last digit of 1001 is 1, we have:

$$1^{2008} \bmod 10 = 1$$

Thus, the last digit of 1001^{2008} is 1.

Now, consider the last digit of 1002, which is 2.

$$1 + 2 = 3$$

The last digit of $(1001)^{2008} + 1002$ is 3.

3. **Correct Answer is (2):**

$$\frac{75070}{65} = 1154\frac{60}{65}$$

$$\begin{aligned} \text{Thus, required number} \\ = 75070 + (65 - 60) = 75075 \end{aligned}$$

4. **Correct Answer is (4):** We are given that a farmer divides his herd of n cows among his four sons as follows:

- The **first son** gets $\frac{1}{2}$ of the herd.
- The **second son** gets $\frac{1}{4}$ of the herd.
- The **third son** gets $\frac{1}{5}$ of the herd.
- The **fourth son** gets exactly 7 cows.

Since the total number of cows is n , we sum up all the parts: $\frac{1}{2}n + \frac{1}{4}n + \frac{1}{5}n + 7 = n$

$$\frac{10}{20}n + \frac{5}{20}n + \frac{4}{20}n + 7 = n$$

$$\frac{19}{20}n + 7 = n$$

$$7 = n - \frac{19}{20}n$$

$$7 = \frac{1}{20}n$$

$$n = 140$$

5. **Correct Answer is (2):** Since logarithm is a monotonic function, we compare:

$$\log(3^{34}) = 34\log 3$$

$$\log(2^{51}) = 51\log 2$$

$$\log(7^{17}) = 17\log 7$$

Approximating values: $\log 2 \approx 0.3010$, $\log 3 \approx 0.4771$, $\log 7 \approx 0.8451$

Now compute:

$$34 \times 0.4771 = 16.2214$$

$$51 \times 0.3010 = 15.351$$

$$17 \times 0.8451 = 14.3667$$

$$14.3667 < 15.351 < 16.2214$$

$$\text{Thus, the order is: } 7^{17} < 2^{51} < 3^{34}$$

So the correct answer is **(b)**.

6. **Correct Answer is (4):** We need to evaluate the expression:

$$E = m^3 - 3m^2 + 3m + 3n + 3n^2 + n^3$$

for $m = -4$ and $n = -2$.

For $m = -4$:

$$m^3 = (-4)^3 = -64$$

$$-3m^2 = -3(-4)^2 = -3(16) = -48$$

$$3m = 3(-4) = -12$$

For $n = -2$:

$$3n = 3(-2) = -6$$

$$3n^2 = 3(-2)^2 = 3(4) = 12$$

$$n^3 = (-2)^3 = -8$$

$$E = (-64) + (-48) + (-12)$$

$$+(-6) + 12 + (-8)$$

$$= -64 - 48 - 12 - 6 + 12 - 8$$

$$= -126$$

7. **Correct Answer is (1):** Composite numbers are numbers that have more than two factors (i.e., they are not prime numbers).

Prime numbers between 67 and 101: 67, 71, 73, 79, 83, 89, 97

Total numbers in the range = 34 (from 68 to 100)

Number of prime numbers = 7

Thus, number of composite numbers = $34 - 7 = 27$.

The number of composite numbers between 67 and 101 is 27.

8. **Correct Answer is (3):** Since 5 and 7 are co-prime, their LCM is:

$$\text{LCM}(5, 7) = 5 \times 7 = 35$$

Thus, we need to count the multiples of 35 in the given range (300 to 650).

The smallest multiple of 35 greater than or equal to 300: $35 \times 9 = 315$

The largest multiple of 35 less than or equal to 650: $35 \times 18 = 630$

This forms an arithmetic sequence where:

- First term $a = 315$
- Common difference $d = 35$
- Last term $l = 630$

The number of terms is given by:

$$n = \frac{l - a}{d} + 1$$

$$n = \frac{630 - 315}{35} + 1$$

$$n = \frac{315}{35} + 1 = 9 + 1 = 10$$

The number of such numbers is 10.

9. **Correct Answer is (3):** We can solve this problem using the identity:

$$(a - b) \times (a + b) = a^2 - b^2$$

Here, let $a = 10000$ and $b = 9$, so:

$$9991 \times 10009 = (10000 - 9)$$

$$\times (10000 + 9)$$

Using the identity:

$$10000^2 - 9^2 = 100000000 - 81$$

$$= 99999919$$

Thus, the value of 9991×10009 is **99,999,919**.

10. **Correct Answer is (3):** Since the new number is **103%** of the original number, we can write:

$$x + 69 = 103\% \text{ of } x$$

$$x + 69 = \frac{103}{100}x$$

$$69 = \frac{103}{100}x - x$$

$$69 = \left(\frac{103}{100} - 1\right)x$$

$$69 = \left(\frac{103}{100} - \frac{100}{100}\right)x$$

$$69 = \frac{3}{100}x$$

$$x = \frac{69 \times 100}{3}$$

$$x = \frac{6900}{3} = 2300$$

The number is **2300**.

11. **Correct Answer is (3):**

$$113 \times 87 = 113 \times (100 - 13)$$

$$= (113 \times 100) - (113 \times 13)$$

$$= 11300 - 1469$$

$$= 9831$$

12. **Correct Answer is (3)**

$$(26 - 13 \times 2) \div 2 + 1$$

$$= (26 - 26) \div 2 + 1 = 0 \div 2 + 1$$

$$= 0 + 1 = 1$$

13. **Correct Answer is (2):**

$$515 \times 485 = (500 + 15)(500 - 15)$$

$$\text{Since we know that } (a - b)(a + b) = a^2 - b^2$$

$$\text{Thus, } (500 + 15)(500 - 15)$$

$$= 500^2 - 15^2 = 250000 - 225$$

$$= 249775$$

14. **Correct Answer is (2):**

$$20 \div 5 \text{ of } 8 \times [9 \div 6 \times (6 - 3)] - (10 \div 2 \text{ of } 20)$$

$$= 20 \div 40 \times [9 \div 6 \times 3]$$

$$- (10 \div 40)$$

$$= 20 \div 40 \times [1.5 \times 3] - (10 \div 40)$$

$$= 0.5 \times 4.5 - 0.25 = 2.25 - 0.25$$

$$= 2$$

15. **Correct Answer is (3):** To evaluate the given expression step by step, we follow **BODMAS** (Brackets, Orders, Division, Multiplication, Addition, Subtraction) rules.

Given Expression:

$$40 \div 5 \text{ of } 2 \times [18 \div 6 \times (12$$

$$- 9) \text{ of } 5 - (3 - 8)] \div 25$$

Start with the parentheses: $(12 - 9) = 3$ and $(3 - 8) = -5$

Substitute into the brackets:

$$18 \div 6 \times 3 \text{ of } 5 - (-5)$$

"of" means multiplication: $3 \text{ of } 5 = 15$

Now the expression becomes:

$$18 \div 6 \times 15 - (-5)$$

Simplify division and multiplication from left to right: $18 \div 6 = 3, 3 \times 15 = 45$

$$\text{Now } 45 - (-5) = 45 + 5 = 50$$

So, the value inside the brackets is 50.

The expression becomes:

$$40 \div 5 \text{ of } 2 \times 50 \div 25$$

"of" means multiplication: $5 \text{ of } 2 = 10$

The expression now becomes:

$$40 \div 10 \times 50 \div 25$$

Simplify division and multiplication from left to right: $40 \div 10 = 4, 4 \times 50 = 200, 200 \div 25 = 8$

16. **Correct Answer is (4):**

Given:

$234a5b$ is divisible by 22, but not divisible by 5.

Concept used:

- If a number is even or a number whose last digit is an even number i.e. 2, 4, 6, 8 including 0, it is always completely divisible by 2.
- If the last number is either 0 or 5, the entire number is divisible by 5.
- **Divisibility law of 11:** If the difference of the alternating sum of digits of the number is a multiple of 11 (e.g. 2343 is divisible by 11 because $(2 + 4) - (3 + 3) = 0$, which is a multiple of 11).

Calculation:

$$22 = 11 \times 2$$

So, b can be 0, 2, 4, 6, 8

But the number is divisible by 5 so 0 cannot be the possible value of b .

To get the greatest number $a > b$:

Now,

$$(2 + 4 + 5) - (3 + a + b)$$

$$= 0 \text{ or multiple of } 11$$

$$11 - 3 - a - b$$

$$= 0 \text{ or multiple of } 11$$

$$8 - a - b = 0 \text{ or multiple of } 11$$

$$a + b = 8$$

Possible value of a and b are (8, 0), (7, 1), (6, 2), (5, 3), (4, 4), (3, 5), (2, 6), (1, 7), (0, 8).

For b = 2:

- a = 6

For b = 4:

- a = 4

So, only possible values of a and b = 6, 2.

So, the number is 234652.

Required number is 234652.

17. Correct Answer is (2):

$$\begin{aligned} & -5 + 5 + 625 \div 5 \times 5 \\ & = -5 + 5 + 125 \times 5 \\ & = -5 + 5 + 625 = 625 \end{aligned}$$

18. Correct Answer is (3):

$$\begin{aligned} & (2 \times 7 - 5 + 9 \div 3) \div (4 + 2)^2 \times 2 \\ & = (2 \times 7 - 5 + 3) \div 36 \times 2 \\ & = (14 - 2) \div 36 \times 2 \\ & = 12 \div 36 \times 2 \\ & = \frac{2}{3} \end{aligned}$$

19. Correct Answer is (1):

$$\begin{aligned} & 18 \div 3 \text{ of } 2 \times 5 + 72 \div 18 \text{ of } 2 \times 3 \\ & \quad - 4 \div 8 \times 2 \\ & = 18 \div 6 \times 5 + 72 \div 36 \times 3 - 4 \\ & \quad \div 8 \times 2 \\ & = 3 \times 5 + 2 \times 3 - \frac{1}{2} \times 2 \\ & = 15 + 6 - 1 \\ & = 20 \end{aligned}$$

20. Correct Answer is (1)

$$\begin{aligned} & 720 \div 8 + 915 \div 15 - m + 32 \times 5 \\ & = 1104 \div 16 \times 111 \div 37 \\ & 90 + 61 - m + 160 = 69 \times 3 \end{aligned}$$

$$\begin{aligned} 311 - m &= 207 \\ -m &= 207 - 311 \\ -m &= -104 \\ m &= 104 \end{aligned}$$

21. Correct Answer is (2):

$$\begin{aligned} & 22 - [9 - \{6 - (10 - 4 + 3)\}] \div 2 \\ & \quad \times 3 \\ & = 22 - [9 - \{6 - (9)\}] \div 2 \times 3 \\ & = 22 - [9 - \{-3\}] \div 2 \times 3 \\ & = 22 - [12] \div 2 \times 3 \\ & = 22 - 6 \times 3 \\ & = 22 - 18 \\ & = 4 \end{aligned}$$

22. Correct Answer is (3):

$$\begin{aligned} & 9 - 5 \times 6 + \{29 - (7 - 2)\} \div 8 \\ & = 9 - 5 \times 6 + \{29 - 5\} \div 8 \\ & = 9 - 5 \times 6 + 24 \div 8 \\ & = 9 - 5 \times 6 + 3 \\ & = 9 - 30 + 3 \\ & = -18 \end{aligned}$$

23. Correct Answer is (1):

$$\begin{aligned} & 6 \times [28 \div 84 \times \{36 \times 49 \\ & \quad \div (6 \times 7)\}] \\ & \Rightarrow 6 \times [28 \div 84 \times \{36 \times 49 \div 42\}] \\ & \Rightarrow 6 \times [28 \div 84 \times \{36 \times \frac{7}{6}\}] \\ & \Rightarrow 6 \times [28 \div 84 \times 42] \\ & \Rightarrow 6 \times 14 \Rightarrow 84 \end{aligned}$$

24. Correct Answer is (2):

$$\begin{aligned} & (60 + 64 \div 4 \text{ of } 4) \\ & \times \{1000 \div ((10 \text{ of } (3 + 2) \\ & \quad \times 2 \text{ of } 5))\} \\ & -28 + (100 \times 3 \text{ of } 3) \\ & = (60 + 64 \div 16) \\ & \times \{1000 \div (50 \times 10)\} - 28 + 900 \end{aligned}$$

$$\begin{aligned} & = (60 + 4) \times \{1000 \div 500\} - 28 \\ & \quad + 900 \\ & = 64 \times 2 + 972 \\ & = 1000 \end{aligned}$$

25. Correct Answer is (2):

Calculate cubes:

$$\begin{aligned} 31^3 &= 29791 \\ 18^3 &= 5832 \\ 37^3 &= 50653 \end{aligned}$$

Substitute in the expression:

$$\begin{aligned} 31^3 + 18^3 - 37^3 + 210 &= \\ -15030 + 210 &= -14820 \end{aligned}$$

26. Correct Answer is (3):

$$\begin{aligned} x &= 1.2 \times 2\frac{2}{5} \times \frac{3}{4} \\ x &= 1.2 \times \frac{12}{5} \times \frac{3}{4} \\ x &= \frac{9}{5} \times 1.2 = 2.16 \end{aligned}$$

27. Correct Answer is (4):

$$\begin{aligned} & x \\ & = \frac{(0.1 \times 0.1 \times 0.1 + 0.03 \times 0.03 \times 0.03)}{(0.3 \times 0.3 \times 0.3 + 0.09 \times 0.09 \times 0.09)} \\ & = \frac{(0.03)^3 \left(\left(\frac{0.1}{0.03} \right)^3 + 1 \right)}{(0.09)^3 \left(\left(\frac{0.3}{0.09} \right)^3 + 1 \right)} \\ & x = \left(\frac{1}{3} \right)^3 \left(\frac{\left(\frac{10}{3} \right)^3 + 1}{\left(\frac{10}{3} \right)^3 + 1} \right) \\ & x = \left(\frac{1}{3} \right)^3 = \frac{1}{27} = 0.037 \end{aligned}$$

28. Correct Answer is (2):

$$\begin{aligned} x &= 0.1 + 0.01 + 0.001 \\ x &= 0.100 + 0.010 + 0.001 = 0.111 \end{aligned}$$

Unit 1.2: Decimal and Fractions

Previous Year Exam Questions

1. $\frac{0.125+0.027}{0.25-0.15+0.09}$ is equal to

- (1) 0.3 (2) 0.5
(3) 0.8 (4) 0.9

[2010: SHIFT-1]

2. The sum of the series

(1+0.6+0.06+0.006+0.0006+....) is

- (1) $1\frac{2}{3}$ (2) $1\frac{1}{3}$
(3) $2\frac{1}{3}$ (4) $2\frac{2}{3}$

[2010: SHIFT-1]

3. The number 0.121212.... in the form $\frac{p}{q}$ is equal to

- (1) $\frac{4}{11}$ (2) $\frac{2}{11}$

[2010: SHIFT-1]

(3) $\frac{4}{33}$

(4) $\frac{2}{33}$

[2010: SHIFT-1]

4. $\left(1\frac{1}{2} + 11\frac{1}{2} + 111\frac{1}{2} + 1111\frac{1}{2}\right)$ is equal to

- (1) 1236 (2) $1234\frac{1}{2}$
(3) 618 (4) 617

[2010: SHIFT-1]

5. $\overline{0.001}$ is equal to

- (1) $\frac{1}{1000}$ (2) $\frac{1}{999}$
(3) $\frac{1}{99}$ (4) $\frac{1}{9}$

[2010: SHIFT-1]

6. $\frac{4.41 \times 0.16}{2.1 \times 1.6 \times 0.21}$ is simplified to

- (1) 1 (2) 0.1
(3) 0.01 (4) 10

[2011: SHIFT-1]

7. The value of $\frac{2\frac{1}{3}-1\frac{2}{11}}{3+\frac{1}{3+\frac{1}{3}}}$

(1) $\frac{38}{109}$

(2) $\frac{109}{38}$

(3) 1

(4) $\frac{116}{109}$

[2011: SHIFT-1]

8. The Value of $\frac{3\sqrt{2}}{\sqrt{3}+\sqrt{6}} - \frac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}} + \frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}}$ is

(1) 4

(2) 0

(3) $\sqrt{2}$

(4) $3\sqrt{6}$

[2011: SHIFT-1]

9. $\frac{(0.05)^2+(0.41)^2+(0.003)^2}{(0.005)^2+(0.041)^2+(0.0003)^2}$ is

(1) 10

(2) 100

(3) 1000

(4) None of these

[2012: SHIFT-1]

10. $3 - \frac{\sqrt{3}+\sqrt{5}}{4} - \frac{1}{3+\sqrt{5}}$ is equal to

(1) 0

(2) $\frac{3}{2}$

(3) $\frac{\sqrt{5}}{2}$

(4) $\sqrt{5}$

[2015: SHIFT-1]

11. The value of $\frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-2} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{3-\sqrt{8}}$ is

(1) 0

(2) 1

(3) 5

(4) 7

[2015: SHIFT-1]

12. Choose the incorrect relation(s) from the following:

(i) $\sqrt{6} + \sqrt{2} = \sqrt{5} + \sqrt{3}$

(ii) $\sqrt{6} + \sqrt{2} < \sqrt{5} + \sqrt{3}$

(iii) $\sqrt{6} + \sqrt{2} > \sqrt{5} + \sqrt{3}$

(1) (i)

(2) (ii)

(3) (i) and (iii)

(4) (ii) and (iii)

[8 SEPT. 2016: SHIFT-2]

13. If $\sqrt{3} = 1.732$, then the value of $\frac{9+2\sqrt{3}}{\sqrt{3}}$ is

(1) 7.109

(2) 7.196

(3) 5.196

(4) 7.296

[8 AUG. 2017: SHIFT-1]

14. If $x = \frac{2\sqrt{15}}{\sqrt{3}+\sqrt{5}}$ then what is the value of $\frac{x+\sqrt{5}}{x-\sqrt{5}} + \frac{x+\sqrt{3}}{x-\sqrt{3}}$?

(1) $\sqrt{5}$

(2) $\sqrt{3}$

(3) $\sqrt{15}$

(4) 2

[23 AUG. 2017: SHIFT-3]

15. Sum of a fraction and thrice its reciprocal is $31/6$. What is the fraction?

(1) $2/9$

(2) $9/4$

(3) $9/2$

(4) $4/9$

[6 JUNE 2019: SHIFT-2]

16. The value of $\frac{9}{15}$ of $\left(\frac{2}{3} \div \frac{2}{3} \text{ of } \frac{3}{2}\right) \div \left(\frac{3}{4} \times \frac{3}{4} \div \frac{3}{4} \text{ of } \frac{4}{3}\right)$ of $\left(\frac{5}{4} \div \frac{5}{2} \times \frac{2}{5} \text{ of } \frac{4}{5}\right)$ is:

(1) $\frac{18}{125}$

(2) $\frac{20}{9}$

(3) $\frac{4}{25}$

(4) $\frac{40}{9}$

[13 JUNE 2019: SHIFT-3]

17. $9\frac{3}{4} \div \left[2\frac{1}{6} \div \left\{4\frac{1}{3} - \left(2\frac{1}{2} + \frac{3}{4}\right)\right\}\right]$ is equal to:

(1) 3

(2) $\frac{39}{8}$

(3) 4

(4) $\frac{15}{4}$

[19 JUNE 2019: SHIFT-3]

18. The value of $9\frac{3}{4} + \left[2\frac{1}{6} \div \left\{4\frac{1}{3} - \left(2\frac{1}{2} + \frac{3}{4}\right)\right\}\right]$ is:

(1) $\frac{47}{4}$

(2) $\frac{15}{4}$

(3) 3

(4) 4

[3 MARCH 2020: SHIFT-1]

19. If '+' means '-', '-' means '+', '×' means '÷' and '÷' means '×', then the value of $\frac{42-12 \times 3 + 8 \div 2 + 15}{8 \times 2 - 4 + 9 \div 3}$ is:

(1) $\frac{15}{19}$

(2) $-\frac{5}{3}$

(3) $-\frac{15}{19}$

(4) $\frac{5}{3}$

[6 MARCH 2020: SHIFT-2]

20. Solve the following.

$$\frac{4}{3} \div \frac{1}{6} \times 2 - 1 = ?$$

(1) -2

(2) 8

(3) 3

(4) 15

[17 AUGUST 2021: SHIFT-2]

21. $5\frac{1}{5} \div \left[3\frac{1}{2} - \left\{\frac{5}{6} - \left(\frac{3}{5} + \frac{1}{10} - \frac{4}{15}\right)\right\}\right]$ is equal to:

(1) $\frac{72}{31}$

(2) $\frac{52}{31}$

(3) $\frac{12}{31}$

(4) $\frac{22}{31}$

[24 AUGUST 2021: SHIFT-3]

22. Simplify the following expression:

$$\left(\frac{3}{4} - \frac{1}{4} \div \frac{1}{4} \text{ of } \frac{2}{5}\right) \div \left(\frac{3}{4} \div \frac{2}{3} \text{ of } \frac{3}{5}\right)$$

(1) $\frac{14}{75}$

(2) $-\frac{70}{27}$

(3) $-\frac{14}{15}$

(4) $\frac{32}{75}$

[18 APRIL 2022: SHIFT-1]

23. The value of $\frac{46+\frac{3}{4}\text{of}32-6}{37-\frac{3}{4}\text{of}(34+6)}$ is:

(1) $\frac{54}{7}$

(2) $\frac{64}{7}$

(3) $\frac{34}{7}$

(4) $\frac{44}{7}$

[19 JULY 2023: SHIFT-2]

24. Simplify the following expression:

$$\frac{(12+5-\frac{48}{10}+71)+\left(\frac{72+6 \times 7}{11}\right) \times [(51+4-13)+(13-12 \times 7)]}{232}$$

(1) $-\frac{31}{233}$

(2) $\frac{31}{232}$

(3) $\frac{41}{232}$

(4) $-\frac{31}{232}$

[12 SEPT. 2025: SHIFT-1]

25. Arrange the fractions $\frac{5}{9}, \frac{4}{7}, \frac{3}{5}$ and $\frac{2}{3}$ in ascending order.

(1) $\frac{3}{5}, \frac{4}{7}, \frac{2}{3}, \frac{5}{9}$

(2) $\frac{5}{9}, \frac{4}{7}, \frac{3}{5}, \frac{2}{3}$

(3) $\frac{2}{3}, \frac{3}{5}, \frac{4}{7}, \frac{5}{9}$

(4) $\frac{4}{7}, \frac{5}{9}, \frac{2}{3}, \frac{3}{5}$

[12 SEPT. 2025: SHIFT-1]

26. Simplify: $\left(2\frac{1}{2} + 3.6\right) - 1.9$

(1) 4.2

(2) 5.2

(3) 6.2

(4) 7.2

[12 SEPT. 2025: SHIFT-1]

27. Evaluate: $7\frac{1}{4} - \left[\frac{5}{6} \div \left\{ \frac{1}{3} - \left(\frac{1}{2} \times \left(\frac{3}{4} - \frac{1}{4} \right) \right) \right\} \right]$

- (1) $-3\frac{1}{4}$
(3) $-2\frac{3}{4}$

- (2) $3\frac{1}{4}$
(4) $2\frac{3}{4}$

[13 SEPT. 2025: SHIFT-1]

28. Evaluate: $6 - \left[\frac{2}{3} \div \left\{ \frac{1}{6} + \left(\frac{1}{2} \times \left(1 - \frac{1}{3} \right) \right) \right\} \right]$

- (1) $\frac{14}{3}$
(3) $\frac{16}{3}$

- (2) $\frac{15}{3}$
(4) $\frac{17}{3}$

[15 SEPT. 2025: SHIFT-1]

29. Simplify: $\left(\frac{7}{5} \div \frac{14}{15} \right) \times \left(\frac{10}{7} \div \frac{5}{3} \right)$

- (1) $\frac{9}{7}$
(3) $\frac{6}{7}$

- (2) $\frac{5}{7}$
(4) $\frac{8}{7}$

[15 SEPT. 2025: SHIFT-1]

30. Simplify: $\left(1.5 + \frac{3}{8} \right)^3 - \left(\frac{9}{5} \times 1.25 \right)$

- (1) 4.3418
(3) 6.5526

- (2) 5.3418
(4) 7.5526

[15 SEPT. 2025: SHIFT-1]

31. Simplify: $\left(\left(1.5 + \frac{3}{4} \right) \div \left(2.25 - \frac{1}{2} \right) \right) + 0.6$

- (1) 1.8857
(3) 3.8857

- (2) 2.8857
(4) 4.8857

[16 SEPT. 2025: SHIFT-1]

32. A tank holds $5\frac{3}{4}$ liters of water. If 2.375 liters are drained twice, how much water remains?

(1) 1

(2) $1\frac{1}{4}$ (3) $1\frac{3}{8}$ (4) $1\frac{1}{2}$

[16 SEPT. 2025: SHIFT-1]

33. Simplify: $\left[\left(\frac{2}{3} \right) + \left(\frac{4}{5} \div \frac{2}{7} \right) \right] \div \left[\left(\frac{3}{2} \right) - \left(\frac{5}{6} \times \frac{3}{4} \right) \right]$

(1) $\frac{416}{105}$ (2) $\frac{418}{110}$ (3) $\frac{425}{250}$ (4) $\frac{526}{350}$

[16 SEPT. 2025: SHIFT-1]

34. Simplify: $\left(2\frac{1}{2} + 3.6 \right) \div 0.75 + \left(1.25 \times \frac{4}{5} \right)$

(1) $\frac{137}{15}$ (3) $\frac{127}{15}$ (2) $\frac{160}{15}$ (4) $\frac{148}{15}$

Answer Key

1	2	3	4	5	6	7	8	9	10
(3)	(1)	(3)	(1)	(2)	(1)	(1)	(2)	(2)	(2)
11	12	13	14	15	16	17	18	19	20
(3)	(3)	(2)	(4)	(3)	(4)	(2)	(1)	(3)	(4)
21	22	23	24	25	26	27	28	29	30
(2)	(3)	(2)	(4)	(2)	(1)	(3)	(1)	(1)	(1)
31	32	33	34						
(1)	(1)	(1)	(1)						

Solutions

1. Correct Answer is (3):

Calculate the Numerator:

$$0.125 + 0.027 = 0.152$$

Calculate the Denominator:

$$0.25 - 0.15 + 0.09 = 0.19$$

Divide the Numerator by the Denominator:

$$\frac{0.152}{0.19} = 0.8$$

Therefore, the correct answer is (c).

2. Correct Answer is (1):

Here $(0.6 + 0.06 + 0.006 + 0.0006 + \dots)$ is a G.P. and for this GP $a = 0.6$ and $r = 0.1$

Now we know that $S_n = \frac{a}{1-r}$

$$\text{So, } S_n = \frac{0.6}{1-0.1} = \frac{0.6}{0.9} = \frac{2}{3}$$

$$\text{Thus, } (1 + 0.6 + 0.06 + 0.006 + 0.0006 + \dots)$$

$$= 1 + \frac{2}{3} = 1\frac{2}{3}$$

3. Correct Answer is (3):

$$0.121212 \dots = 0.\overline{12} = \frac{12}{99} = \frac{4}{33}$$

4. Correct Answer is (1):

$$\begin{aligned} & \left(1\frac{1}{2} + 11\frac{1}{2} + 111\frac{1}{2} + 1111\frac{1}{2} \right) \\ &= (1 + 11 + 111 + 1111) \\ & \quad + \left(\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} \right) \\ &= 1234 + 2 = 1236 \end{aligned}$$

5. Correct Answer is (2):

$$0.\overline{001} = \frac{1}{999}$$

6. Correct Answer is (1):

$$\frac{4.41 \times 0.16}{2.1 \times 1.6 \times 0.21} = \frac{441 \times 16}{21 \times 16 \times 21} = 1$$

7. Correct Answer is (1):

Expression

$$= \frac{\frac{7}{3} \times \frac{13}{11}}{3 + \frac{1}{\frac{9+1}{3}}} = \frac{\frac{77-39}{33}}{3 + \frac{1}{\frac{3}{10}}} = \frac{\frac{38}{33}}{3 + \frac{10}{3}}$$

$$= \frac{\frac{38}{33}}{\frac{10}{10}} = \frac{38}{33} \times \frac{33}{109} = \frac{38}{109}$$

$$= \frac{38}{99+10} = \frac{38}{33} \times \frac{33}{109} = \frac{38}{109}$$

8. Correct Answer is (2): Expression

$$\begin{aligned} &= \frac{3\sqrt{2}}{\sqrt{3}+\sqrt{6}} - \frac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}} + \frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}} \\ &= \frac{3\sqrt{2}(\sqrt{6}-\sqrt{3})}{(\sqrt{6}+\sqrt{3})(\sqrt{6}-\sqrt{3})} - \frac{4\sqrt{3}(\sqrt{6}-\sqrt{2})}{(\sqrt{6}+\sqrt{2})(\sqrt{6}-\sqrt{2})} + \frac{\sqrt{6}}{(\sqrt{3}+\sqrt{2})} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}} \\ &= \frac{3\sqrt{2}(\sqrt{6}-\sqrt{3})}{6-3} - \frac{4\sqrt{3}(\sqrt{6}-\sqrt{2})}{(6-2)} + \frac{\sqrt{6}(\sqrt{3}-\sqrt{2})}{3-2} \\ &= \sqrt{2}(\sqrt{6}-\sqrt{3}) - \sqrt{3}(\sqrt{6}-\sqrt{2}) + \sqrt{6}(\sqrt{3}-\sqrt{2}) \\ &= \sqrt{12} - \sqrt{6} - \sqrt{18} + \sqrt{16} + \sqrt{18} - \sqrt{12} \\ &= 0 \end{aligned}$$

9. Correct Answer is (2):

$$\frac{(0.05)^2 + (0.41)^2 + (0.073)^2}{(0.005)^2 + (0.041)^2 + (0.0003)^2} = \frac{(0.05)^2 + (0.41)^2 + (0.073)^2}{\frac{1}{100}((0.05)^2 + (0.41)^2 + (0.073)^2)} = 100$$

10. Correct Answer is (2):

$$\frac{1}{3 + \sqrt{5}} = \frac{3 - \sqrt{5}}{(3 + \sqrt{5})(3 - \sqrt{5})}$$

$$= \frac{3-\sqrt{5}}{9-5} = \frac{3-\sqrt{5}}{4}$$

$$\therefore 3 - \frac{3+\sqrt{5}}{4} - \frac{3-\sqrt{5}}{4}$$

$$= \frac{12-3-\sqrt{5}-3+\sqrt{5}}{4} = \frac{6}{4} = \frac{3}{2}$$

11. Correct Answer is (3):

We are given the expression:

$$E = \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-2}$$

$$- \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{3-\sqrt{8}}$$

For a term of the form $\frac{1}{\sqrt{a}-\sqrt{b}}$, we multiply the numerator and denominator by the conjugate $\sqrt{a} + \sqrt{b}$:

$$= \frac{1}{\sqrt{a}-\sqrt{b}} \times \frac{\sqrt{a}+\sqrt{b}}{\sqrt{a}+\sqrt{b}}$$

$$= \frac{\sqrt{a}+\sqrt{b}}{(\sqrt{a}-\sqrt{b})(\sqrt{a}+\sqrt{b})}$$

$$= \frac{\sqrt{a}+\sqrt{b}}{a-b}$$

Applying this to each term:

$$\therefore E = \frac{\sqrt{7}+\sqrt{6}}{7-6} - \frac{\sqrt{6}+\sqrt{5}}{6-5}$$

$$+ \frac{\sqrt{5}+2}{5-4} - \frac{\sqrt{8}+\sqrt{7}}{8-7} + \frac{3+\sqrt{8}}{9-8}$$

$$\therefore E = (\sqrt{7}+\sqrt{6}) - (\sqrt{6}+\sqrt{5})$$

$$+ (\sqrt{5}+2) - (\sqrt{8}+\sqrt{7})$$

$$+ (3+\sqrt{8}) = 2+3 = 5$$

12. Correct Answer is (3): To compare the expressions, we approximate:

$$\sqrt{6} \approx 2.449, \sqrt{2} \approx 1.414$$

$$\sqrt{5} \approx 2.236, \sqrt{3} \approx 1.732$$

$$\sqrt{6} + \sqrt{2} \approx 2.449 + 1.414 = 3.863$$

$$\sqrt{5} + \sqrt{3} \approx 2.236 + 1.732 = 3.968$$

Since $3.863 \neq 3.968$, **Statement (i) is incorrect.**

Since $3.863 < 3.968$, **Statement (ii) is correct.**

Since $\sqrt{6} + \sqrt{2} < \sqrt{5} + \sqrt{3}$, **Statement (iii) is incorrect.**

The incorrect statements are (i) and (iii).

13. Correct Answer is (2):

Let's solve the given expression:

$$\frac{9+2\sqrt{3}}{\sqrt{3}}$$

$$= \frac{9+2\sqrt{3}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{9\sqrt{3}+2 \times 3}{3}$$

$$= 3\sqrt{3} + 2$$

$$= 3 \times 1.732 + 2$$

$$= 5.196 + 2$$

$$= 7.196$$

14. Correct Answer is (4):

$$x = \frac{(2\sqrt{15})}{\sqrt{3}+\sqrt{5}}$$

$$\Rightarrow \frac{x+\sqrt{5}}{x-\sqrt{5}} + \frac{x+\sqrt{3}}{x-\sqrt{3}}$$

$$\Rightarrow \frac{\frac{2\sqrt{15}}{\sqrt{3}+\sqrt{5}} + \sqrt{5}}{\frac{2\sqrt{15}}{\sqrt{3}+\sqrt{5}} - \sqrt{5}} + \frac{\frac{2\sqrt{15}}{\sqrt{3}+\sqrt{5}} + \sqrt{3}}{\frac{2\sqrt{15}}{\sqrt{3}+\sqrt{5}} - \sqrt{3}}$$

$$\Rightarrow \frac{2\sqrt{15} + \sqrt{15} + 5}{2\sqrt{15} - \sqrt{15} - 5}$$

$$+ \frac{2\sqrt{15} + \sqrt{15} + 3}{2\sqrt{15} - \sqrt{15} - 3}$$

$$\frac{3\sqrt{15} + 5}{\sqrt{15} - 5} + \frac{3\sqrt{15} + 3}{\sqrt{15} - 3}$$

$$\Rightarrow \frac{60 - 16\sqrt{15}}{30 - 8\sqrt{15}} \Rightarrow 2$$

$$\therefore \text{answer is } 2$$

15. Correct Answer is (3):

Let the fraction be x.

According to the problem, the **sum of the fraction and thrice its reciprocal** is $\frac{31}{6}$:

$$x + 3 \times \frac{1}{x} = \frac{31}{6}$$

$$x^2 + 3 = \frac{31}{6}x$$

$$6x^2 + 18 = 31x$$

$$6x^2 - 31x + 18 = 0$$

$$6x^2 - 31x + 18 = 0$$

Using the **quadratic formula**:

$$x = \frac{-(-31) \pm \sqrt{(-31)^2 - 4(6)(18)}}{2(6)}$$

$$x = \frac{31 \pm \sqrt{961 - 432}}{12}$$

$$x = \frac{31 \pm \sqrt{529}}{12}$$

$$x = \frac{31 \pm 23}{12}$$

$$x = \frac{31+23}{12} = \frac{54}{12} = \frac{9}{2}$$

$$x = \frac{31-23}{12} = \frac{8}{12} = \frac{2}{3}$$

Thus, the **most reasonable answer** is: $9/2$.

16. Correct Answer is (4):

$$\frac{9}{15} \text{ of } \left(\frac{2}{3} \div \frac{2}{3} \text{ of } \frac{3}{2}\right) \div \left(\frac{3}{4} \times \frac{3}{4} \div \frac{3}{4} \text{ of } \frac{4}{3}\right) \text{ of } \left(\frac{5}{4} \div \frac{5}{2} \times \frac{2}{5} \text{ of } \frac{4}{5}\right)$$

$$= \frac{3}{5} \text{ of } \left(\frac{2}{3} \div \frac{2}{3}\right) \div \left(\frac{3}{4} \times \frac{3}{4} \div 1\right) \text{ of } \left(\frac{5}{4} \div \frac{5}{2} \times \frac{2}{5}\right)$$

$$= \frac{3}{5} \times \frac{2}{3} \div \frac{9}{16} \text{ of } \left(\frac{5}{4} \times \frac{2}{5} \times \frac{8}{25}\right)$$

$$= \frac{2}{5} \div \frac{9}{16} \text{ of } \frac{4}{25}$$

$$= \frac{2}{5} \div \frac{100}{9}$$

$$= \frac{2}{5} \times \frac{100}{9}$$

$$= \frac{40}{9}$$

17. Correct Answer is (2):

$$9\frac{3}{4} \div \left[2\frac{1}{6} \div \left\{4\frac{1}{3} - \left(2\frac{1}{2} + \frac{3}{4}\right)\right\}\right]$$

$$= \frac{39}{4} \div \left[\frac{13}{6} \div \left\{\frac{13}{3} - \left(\frac{5}{2} + \frac{3}{4}\right)\right\}\right]$$

$$= \frac{39}{4} \div \left[\frac{13}{6} \div \left\{\frac{13}{3} - \frac{13}{4}\right\}\right]$$

$$= \frac{39}{4} \div \left[\frac{13}{6} \div \frac{13}{12}\right]$$

$$= \frac{39}{4} \div \left[\frac{13}{6} \times \frac{12}{13}\right]$$

$$= \frac{39}{4} \div \frac{2}{1}$$

$$= \frac{39}{4} \times \frac{1}{2}$$

$$= \frac{39}{8}$$

18. Correct Answer is (1):

$$9\frac{3}{4} + \left[2\frac{1}{6} \div \left\{4\frac{1}{3} - \left(2\frac{1}{2} + \frac{3}{4}\right)\right\}\right]$$

$$= \frac{39}{4} + \left[\frac{13}{6} \div \left\{\frac{13}{3} - \left(\frac{5}{2} + \frac{3}{4}\right)\right\}\right]$$

$$= \frac{39}{4} + \left[\frac{13}{6} \div \left\{\frac{13}{3} - \frac{13}{4}\right\}\right]$$

$$= \frac{39}{4} + \left[\frac{13}{6} \div \frac{13}{12}\right]$$

$$= \frac{39}{4} + \left(\frac{13}{6} \times \frac{12}{13}\right)$$

$$= \frac{39}{4} + \frac{2}{1}$$

$$= \frac{47}{4}$$

19. Correct Answer is (3):

Rewriting the expression:

$$42 + 12 \div 3 - 8 \times 2 - 15$$

$$8 \div 2 + 4 - 9 \times 3$$

Solve the Numerator

$$42 + (12 \div 3) - (8 \times 2) - 15$$

$$= 42 + 4 - 16 - 15$$

$$= 42 + 4 - 16 - 15 = 15$$

Solve the Denominator

$$(8 \div 2) + 4 - (9 \times 3)$$

$$= 4 + 4 - 27$$

$$= 8 - 27 = -19$$

Final Calculation

$$\frac{15}{-19} = -\frac{15}{19}$$

20. Correct Answer is (4):

$$\frac{4}{3} \div \frac{1}{6} \times 2 - 1 = \frac{4}{3} \times \frac{6}{1} \times 2 - 1$$

$$= 16 - 1 = 15$$

21. Correct Answer is (2):

$$5\frac{1}{5} \div \left[3\frac{1}{2} - \left\{ \frac{5}{6} - \left(\frac{3}{5} + \frac{1}{10} - \frac{4}{15} \right) \right\} \right]$$

$$= \frac{26}{5} \div \left[\frac{7}{2} - \left\{ \frac{5}{6} - \frac{13}{30} \right\} \right]$$

$$= \frac{26}{5} \div \left[\frac{7}{2} - \frac{12}{30} \right]$$

$$= \frac{26}{5} \div \frac{93}{30}$$

$$= \frac{26}{5} \times \frac{30}{93}$$

$$= \frac{52}{31}$$

22. Correct Answer is (3):

Let's simplify the given expression step by step.

$$\left(\frac{3}{4} - \frac{1}{4} \div \frac{1}{4} \text{ of } \frac{2}{5} \right) \div \left(\frac{3}{4} \div \frac{2}{3} \text{ of } \frac{3}{5} \right)$$

$$= \left(\frac{3}{4} - \frac{1}{4} \div \frac{1}{4} \times \frac{2}{5} \right) \div \left(\frac{3}{4} \div \frac{2}{3} \times \frac{3}{5} \right)$$

$$= \left(\frac{3}{4} - \frac{1}{4} \div \frac{1}{10} \right) \div \left(\frac{3}{4} \div \frac{2}{5} \right)$$

$$= \left(\frac{3}{4} - \frac{1}{4} \times \frac{10}{1} \right) \div \left(\frac{3}{4} \times \frac{5}{2} \right)$$

$$= \left(-\frac{7}{4} \right) \div \left(\frac{15}{8} \right)$$

$$= -\frac{7}{4} \times \frac{8}{15} = -\frac{14}{15}$$

23. Correct Answer is (2):

$$46 + \frac{3}{4} \text{ of } 32 - 6$$

$$37 - \frac{3}{4} \text{ of } (34 + 6)$$

$$= \frac{46 + \frac{3}{4} \times 32 - 6}{37 - \frac{3}{4} \times 40}$$

$$= \frac{46 + 24 - 6}{37 - 30}$$

$$= \frac{64}{7}$$

24. Correct Answer is (4):

$$\frac{\left((12+5-\frac{48}{16}+71) + \frac{(72+6*7)}{11} \right)}{[(51+4-13)+(13-12*7)]}$$

$$= \frac{232}{232}$$

$$\frac{\left((12+5-3+71) + \frac{(2+4*2)}{11} \right)}{[(51+4-13)+(13-8*4)]}$$

$$= \frac{232}{232}$$

$$\frac{\left(85 + \frac{(44)}{11} * [(42) + (-71)] \right)}{232}$$

$$= \frac{(85 + 4 * [-29])}{232}$$

$$= \frac{85 - 116}{232}$$

$$= -\frac{31}{232}$$

25. Correct Answer is (2)

Let's compare the fractions by converting them to decimals

$$\frac{5}{9} \approx 0.555$$

$$\frac{4}{7} \approx 0.571$$

$$\frac{3}{5} = 0.6$$

$$\frac{2}{3} \approx 0.667$$

Now arrange from smallest to largest (ascending order):

$$\frac{5}{9} < \frac{4}{7} < \frac{3}{5} < \frac{2}{3}$$

26. Correct Answer is (1)

$$\left(2\frac{1}{2} + 3.6 \right) - 1.9$$

$$= (2.5 + 3.6) - 1.9 = 6.1 - 1.9$$

$$= 4.2$$

27. Correct Answer is (3)

$$7\frac{1}{4} - \left[\frac{5}{6} \div \left\{ \frac{1}{3} - \left(\frac{1}{2} \times \left(\frac{3}{4} - \frac{1}{4} \right) \right) \right\} \right]$$

$$= \frac{29}{4} - \left[\frac{5}{6} \div \left\{ \frac{1}{3} - \left(\frac{1}{2} \times \frac{1}{2} \right) \right\} \right]$$

$$= \frac{29}{4} - \left[\frac{5}{6} \div \left\{ \frac{1}{3} - \frac{1}{4} \right\} \right]$$

$$= \frac{29}{4} - \left[\frac{5}{6} \div \frac{1}{12} \right]$$

$$= \frac{29}{4} - 10$$

$$= -\frac{11}{4}$$

$$= -2\frac{3}{4}$$

28. Correct Answer is (1)

$$6 - \left[\frac{2}{3} \div \left\{ \frac{1}{6} + \left(\frac{1}{2} \times \frac{2}{3} \right) \right\} \right]$$

$$= 6 - \left[\frac{2}{3} \div \left\{ \frac{1}{6} + \frac{1}{3} \right\} \right]$$

$$= 6 - \left[\frac{2}{3} \div \frac{1}{2} \right]$$

$$= 6 - \frac{4}{3}$$

$$= \frac{14}{3}$$

So, Correct option is a.

29. Correct Answer is (1)

$$\left(\frac{7}{5} \div \frac{14}{15} \right) \times \left(\frac{10}{7} \div \frac{5}{3} \right)$$

$$= \left(\frac{7}{5} \times \frac{15}{14} \right) \times \left(\frac{10}{7} \times \frac{3}{5} \right)$$

$$= \frac{3}{2} \times \frac{6}{7} = \frac{9}{7}$$

30. Correct Answer is (1)

$$\left(1.5 + \frac{3}{8} \right)^3 - \left(\frac{9}{5} \times 1.25 \right)$$

$$= (1.875)^3 - 2.25$$

$$= 6.5918 - 2.25 = 4.3418$$

31. Correct Answer is (1)

$$\left(\left(1.5 + \frac{3}{4} \right) \div \left(2.25 - \frac{1}{2} \right) \right) + 0.6$$

$$= (1.5 + 0.75) \div (2.25 - 0.5) + 0.6$$

$$= 2.25 \div 1.75 + 0.6$$

$$= 1.2857 + 0.6 = 1.8857$$

32. Correct Answer is: (1)

Tank capacity = $5\frac{3}{4}$ liters = 5.75 liters.

Water drained twice = $2.375 \times 2 = 4.75$ liters.

Remaining water = $5.75 - 4.75 = 1.00$ liter

So, Correct option is a.

33. Correct Answer is: (1)

$$\left[\frac{2}{3} + \frac{4}{5} \times \frac{7}{2} \right] \div \left[\frac{3}{2} - \frac{5}{6} \times \frac{3}{4} \right]$$

$$= \left[\frac{2}{3} + \frac{14}{5} \right] \div \left[\frac{3}{2} - \frac{5}{8} \right]$$

$$= \left[\frac{10}{15} + \frac{42}{15} \right] \div \left[\frac{12}{8} - \frac{5}{8} \right]$$

$$= \frac{52}{15} \div \frac{7}{8}$$

$$= \frac{52}{15} \times \frac{8}{7}$$

$$= \frac{416}{105}$$

So, Correct option is a.

34. Correct Answer is: (1)

$$\left(2\frac{1}{2} + 3.6 \right) \div 0.75 + \left(1.25 \times \frac{4}{5} \right)$$

First term:

$$2\frac{1}{2} = 2.5 \Rightarrow 2.5 + 3.6 = 6.1$$

$$6.1 \div 0.75 = \frac{6.1}{0.75} = \frac{610}{75} = \frac{122}{15}$$

Second term:

$$1.25 \times \frac{4}{5} = \frac{5}{4} \times \frac{4}{5} = 1$$

Add:

$$\frac{122}{15} + 1 = \frac{122}{15} + \frac{15}{15} = \frac{137}{15}$$

So, Correct option is a.