CHAPTER – 6

BODMAS

HIERARCHY OF ARITHMETIC OPERATIONS

To simplify arithmetic expressions, which involve various operations like brackets, multiplication, addition, etc. a particular sequence of the operations has to be followed. For example, 2 + 3 x 4 has to be calculated by multiplying 3 with 4 and the result 12 added to 2 to give the final result of 14 (you should not add 2 to 3 first to take the result 5 and multiply this 5 by 4 to give the final result as 20). This is because in arithmetic operations, multiplication should be done first before addition is taken up.

The hierarchy of arithmetic operations are given by a rule called BODMAS rule. The operations have to be carried out in the order in which they appear in the word BODMAS, where different letters of the word BODMAS stand for the following operations:
(**V** Vinculum)
B Brackets
O Of
D Division
M Multiplication
A Addition
S Subtraction

There are four types of brackets:

(i) Vinculum : This is represented by a bar on the top of the numbers. For example,

2 + 3 − $\overline{4+3}$; Here, the figures under the vinculum have to be calculated as 4 + 3 first and the "minus" sign before 4 is applicable to 7. Thus the given expression is equal to 2 + 3 − 7 which is equal to –2.

(ii) Simple Brackets: These are represented by ( )

(ii) Curly Brackets: These are represented by { }

(iv) Square Brackets: These are represented by [ ]

The brackets in an expression have to be opened in the order of vinculum, simple brackets, curly brackets and square brackets, i.e., [{ (¯) }] to be opened from inside outwards.

After brackets is O in the BODMAS rule standing for "of" which means multiplication. For example, 1/2 of 4 will be equal to 1/2 x 4 which is equal to 2.

After O, the next operation is D standing for division. This is followed by M standing for multiplication. After Multiplication, A standing for addition will be performed. Then, S standing for subtraction is performed.

6.01. $16 + \dfrac{3}{4}$ of $[32 − 16 ÷ 4 × 6 + \overline{23−11} + 3 − 2 × 6] = ?$

(A) 89/4 (B) 77/4
(C) 97/4 (D) 81/4

Sol. $16 + \dfrac{3}{4}$ of $[32 − 24 + 12 + 3 − 12] = 16 + \dfrac{3}{4}$ of $[1]$

$= 16 + \dfrac{3}{4} × 11 = 16 + \dfrac{33}{4} = \dfrac{97}{4}$ Choice (C)

6.02. $\dfrac{1.7 × 0.0028}{0.068 × 0.014} = ?$

(A) 5 (B) 10 (C) 20 (D) 15

Sol. $\dfrac{1.7 × 0.0028}{0.06 × 0.012} = \dfrac{17 × 28}{68 × 14} × 10 = 5$ Choice (A)

6.03. $3\dfrac{2}{9} + 5\dfrac{1}{4}\left(16\dfrac{2}{3} ÷ 13\dfrac{4}{6}\right) ÷ 6\dfrac{3}{4} = ?$

(A) 3140/369 (B) 1342/369
(C) 1456/369 (D) 1539/369

Sol. $3\dfrac{2}{9} + 5\dfrac{1}{4}\left(16\dfrac{2}{3} ÷ 13\dfrac{4}{6}\right) ÷ 6\dfrac{3}{4}$

$= \dfrac{29}{9} + \dfrac{21}{4}\left(\dfrac{50}{3} × \dfrac{6}{82}\right) ÷ \dfrac{27}{4}$

$= \dfrac{29}{9} + \dfrac{21}{4} × \dfrac{50}{3} × \dfrac{6}{82} × \dfrac{4}{27}$

$= \dfrac{29}{9} + \dfrac{350}{9 × 41} = \dfrac{1539}{369}$ Choice (D)

6.04. 40% of $\left[\left\{\left(\overline{16−8} + \overline{18−12}\right) × 5 − 6\right\} × 2 + 3\right] = ?$

(A) 262/5 (B) 271/5
(C) 267/5 (D) 313/5

Sol. 40% of $[\{(8 + 6) × 5 − 6\} × 2 + 3]$

$= \dfrac{2}{5}$ of $[64 × 2 + 3] = \dfrac{2}{5} × 131 = \dfrac{262}{5}$

Choice (A)

6.05. $5\dfrac{7}{6} + 16\dfrac{2}{3} + 18\dfrac{4}{9} − 13\dfrac{5}{6} = ?$

(A) 187/9 (B) 247/9
(C) 319/9 (D) 419/9

Sol. $5\dfrac{7}{6} + 16\dfrac{2}{3} + 18\dfrac{4}{9} − 13\dfrac{5}{6} = \dfrac{37}{6} + \dfrac{50}{3} + \dfrac{166}{9} − \dfrac{83}{6}$

$= \dfrac{54}{6} + \dfrac{166}{9} = \dfrac{247}{9}$ Choice (B)

Exercise – 6(a)

Directions for questions 1 to 30: From the given choices, select the correct alternative which gives an appropriate value to replace the question mark (?).

1. $7 × 11 × (7^2 − 6^2) × (5^3 − 11^2) = ?$
(A) 2002 (B) 8008
(C) 6006 (D) 4004

2. $\dfrac{1}{8}$ of $\dfrac{1}{7}$ of $\dfrac{7}{3}$ of $144 + ? = 13^2 − 5^2$
(A) 140 (B) 132 (C) 134 (D) 138

3. $\dfrac{4^2 × 5^3 + 6 × 4 × 5^2}{20} = ?$
(A) 120 (B) 130 (C) 140 (D) 110

4. $\dfrac{7}{14} + \dfrac{9}{36} + \dfrac{18}{27} - \dfrac{8}{24} = ?$

(A) $\dfrac{7}{4}$ (B) $\dfrac{11}{12}$ (C) $\dfrac{5}{6}$ (D) $\dfrac{13}{12}$

5. 3298 − 4253 + 5397 − 4386 = ?
(A) 48 (B) 56 (C) 64 (D) 40

6. $(15^2 + 16^2 + 13^2 + 1^2) \div (9^2 + 11^2 + 3^2 + 6) = ?$

(A) 2 (B) 4 (C) 1 (D) 3

7. $[8 - \{7 \text{ of } 16 \div 8 - 10 + 7\}] \times \left[\dfrac{36 \times 14 \times 81}{7 \times 72 \times 3} + 30\right] = ?$

(A) −171 (B) −59 (C) −3 (D) −161

8. $\overline{(24-20)^3 + (24-25)^3} \times 16\dfrac{2}{3}\% \text{ of } ? = 84$

(A) 4 (B) 6 (C) 8 (D) 2

9. $625 - (81 + 16^2) + \dfrac{3}{4} \text{ of } \dfrac{76}{18} \div \left(\dfrac{19}{72 \times 24}\right) = ?$

(A) 625 (B) 576 (C) 512 (D) 729

10. $17\% \text{ of } \dfrac{400}{3} \div \dfrac{17}{630} \div (3^4 + 2^3 + 200 - 3^2) = ?$

(A) 1 (B) −1 (C) 2 (D) 3

11. $[12 - \{9 \text{ of } 24 \div 12 - 14 + 5\}] \times \left[\dfrac{48 \times 22 \times 108}{11 \times 96 \times 9} + 36\right] = ?$

(A) 126 (B) 132 (C) 138 (D) 144

12. $[(21 \times 20) + (25 \times 8) + 7] \div (21^2 - 20^2 - 40) = ?$
(A) 617 (B) 607 (C) 627 (D) 637

13. $\sqrt{3025} - \sqrt{30.25} + \sqrt{0.003025} = ?$

(A) 49.565 (B) 49.655 (C) 49.555 (D) 50.555

14. $\dfrac{4.5 \times 18 + (12.5 \times 13.5)}{22.5} = ?$

(A) 10.9 (B) 11.1 (C) 11.2 (D) 11.3

15. $(5^2 + 4^{-2})(4^2 - 3^2)\,4^2 = ?$
(A) 2807 (B) 2793 (C) 2821 (D) 2779

16. $\dfrac{1.2 \times 1.2 \times 1.2 - 0.9 \times 0.9 \times 0.9}{(1.2)^2 + (0.9)^2 + 1.2 \times 0.9}$

(A) 0.1 (B) 0.3 (C) 0.6 (D) 0.8

17. 279 + (234 + 126) × 2 × 4 − 72 = ?
(A) 3624 (B) 3704 (C) 3807 (D) 3087

18. $\dfrac{6 \times 4 \div 2 - 4}{6 \times 4 \div 2 + 4} = \sqrt{?}$

(A) 1/64 (B) 1/12 (C) 1/16 (D) 1/4

19. 0.54 × 514 + 0.32 × 514 = ?
(A) 412.04 (B) 442.04 (C) 432.04 (D) 464.24

20. 9026 − 4128 + 3264 = ?
(A) 7562 (B) 7162 (C) 8162 (D) 8264

21. {12 − (37 + 22 ÷ 11 × 4)} + {28 + (4 of 9 − 17 − 52)}
(A) 28 (B) 33 (C) −38 (D) −33

22. $\left\{\dfrac{30(7 + 4 - 12)}{-5 + 6 + 9}\right\} \div \left\{\dfrac{(8 \times 9 - 32)3}{(17 + 15 - 31)10}\right\}$

(A) −4 (B) −1 (C) −1 (D) −1/4

23. $(8 \text{ of } 7 + 49 - 11^2 + 17) - (45 \times 6 \div 3 - 63) + (7 \times 9 \times 3 - 13^2 + 53)$
(A) 47 (B) 53 (C) 37 (D) 57

24. $\left\{\dfrac{1^2 + 2^2 + 3^2 - 11}{78 - (4^2 + 5^2 + 6^2 + 2)}\right\} \times \left\{\dfrac{-15 - (16 - \overline{12 + 12})\,2}{18 \times 4 - 2 \times 6^2 - 1}\right\}$

(A) −1 (B) 3 (C) −1/3 (D) 1

25. $9 \times 5^2 \times 4 \times 6 \times 3 \div (225 \times 8 \text{ of } 3) + 3^2 - 5^2 + 4^2$
(A) 2 (B) 3 (C) 1 (D) 4

26. $(0.004)^2 + (0.04)^2 + (0.4)^2 + 4^2 = ?$
(A) 16.161616   (B) 16.001616
(C) 16.01616   (D) 16.000016

27. $\dfrac{85^2 + 115^2 + 170 \times 115}{200} = ?$

(A) 200 (B) 300 (C) 150 (D) 205

28. $\dfrac{26^3 + 24^3 + 72 \times 26^2 + 78 \times 24^2}{50} = ?$

(A) 2400 (B) 2325 (C) 2300 (D) 2500

29. 24% of 2325 = ? % of 232.5
(A) 240% (B) 124% (C) 2400% (D) 2040%

30. $42^2 + ? = 40 \times 58$
(A) 776 (B) 876 (C) 556 (D) 676

Exercise – 6(b)

Directions for questions 1 to 30: From the given choices, select the correct alternative which gives an appropriate value to replace the question mark (?).

1. $\sqrt{3249} - \sqrt{2209} = ?$
(A) 10 (B) 12 (C) 14 (D) 16

2. $\sqrt{3136} \times 3 + \sqrt{12544} \times 4 = ?$
(A) 716 (B) 516 (C) 416 (D) 616

3. $\dfrac{56 \times 34 \times (55 \times 55 - 9)}{58 \times 52} = ?$

(A) 2904 (B) 1904 (C) 2844 (D) 2802

4. $\sqrt{0.0004 + 0.004 + 0.01} = ?$
(A) 1.2 (B) 0.12 (C) 0.012 (D) 0.0012

5. 0.2 ÷ 0.08 of 0.25 =?
(A) 0.032 (B) 0.1 (C) 0.32 (D) 10

6. $24^2 \div 15\%$ of $480 + 6^2 = ?$
(A) 72   (B) 36   (C) 39   (D) 44

7. $56 + 32 \times 343 \div 49 - 140 = ?$
(A) 140   (B) 280   (C) 180   (D) 330

8. $25 + (14^2 - 8^2) \div 2^2 - 1 = ?$
(A) 55   (B) 57   (C) 38   (D) 12

9. 18% of $650 \div 3^2 - ? = 89$
(A) 123   (B) -18 (C) -76 (D) 84

10. $11^3 \times (16^2 - 14^2 - 40) \div 2 - 10^4 = ?$
(A) 12310   (B) 12100   (C) 33840   (D) 3310

11. $\sqrt[4]{16} \times 100\%$ of $26 = 13 \times ?$
(A) 3   (B) 3.5   (C) 1   (D) 4

12. $6\frac{1}{2} - 4\frac{1}{3} + 6\frac{1}{3} - 3\frac{1}{2} = ?$
(A) 5   (B) 6   (C) 7   (D) 8

13. $666.666 + 6.66666 - 33.3333 + 333.333 = ?$
(A) 915.332   (B) 925.224
(C) 940.42   (D) None of these

14. $\sqrt{12100} + \dfrac{23}{161}$ of $1064 = ?$
(A) 340   (B) 260   (C) 262   (D) 346

15. $\dfrac{(13.25 + 18.75)}{6 + 2} = ?$
(A) 4   (B) 5   (C) 6   (D) 8

16. $5170 \div 470 \times 18 + 2438 - 2145 = ?$
(A) 291   (B) 393   (C) 491   (D) 576

17. $1104 \div 23 + 1367 - 2439 + 121 \times 14 = ?$
(A) 620   (B) 670   (C) 760   (D) 780

18. $\dfrac{8}{13}$ of $\dfrac{65}{24}$ of $(6 \times 7 - 5 \times 3) + 4 \times 8 - \dfrac{1}{4}$ of $72 \div 9 = ?$
(A) 23   (B) 35   (C) 45   (D) 75

19. $2448 \div 6$ of 3 of $4 + 3^3 \times 20 = ?$
(A) 475   (B) 547   (C) 745   (D) 574

20. $5.40 \div 30 \times 0.5 + 4.32 = ? \div 1000$
(A) 4410   (B) 441   (C) 4.41   (D) 44100

21. $484 \times 14 \div ? = 121 + 12 \times 20 - 30 \times 8$
(A) 16   (B) 26   (C) 43   (D) 56

22. $8580 \div 6 \times 7.8 + 725 \div 29 \times 9 = ?$
(A) 10340   (B) 12145
(C) 2025   (D) 11379

23. 60% of $1300 = ?\%$ of $1700 + 30^2 \div 90 - 20\%$ of 400
(A) 30   (B) 50   (C) 60   (D) 80

24. 45% of 60% of 80% of $\left[\dfrac{714}{8} \div \dfrac{17}{64}\right] \div 378 \times 1125 = ?$
(A) 116   (B) 126   (C) 184   (D) 216

25. $\dfrac{2}{5}$ of $\left\{\left(36 \div \overline{28 \div 7} \times \dfrac{1}{9}\right) + \dfrac{1}{9}\right\} = ?$
(A) $\dfrac{1}{9}$ (B) $\dfrac{2}{9}$ (C) $\dfrac{5}{9}$ (D) $\dfrac{4}{9}$

26. $\dfrac{3}{325}$ of $\dfrac{4}{25}$ of $\dfrac{65}{9}$ of $\dfrac{60}{96}$ of $\left\{\left(\dfrac{27}{4} - \dfrac{17}{4}\right) + \dfrac{15}{4}\right\}$ of $\dfrac{3}{5} = ?$
(A) $\dfrac{1}{20}$ (B) $\dfrac{1}{40}$ (C) $\dfrac{3}{20}$ (D) $\dfrac{4}{15}$

27. $\dfrac{9}{15}$ of $\dfrac{45}{81}\left\{\dfrac{49}{6} \times \left(\dfrac{16}{7} - 2\right)\right\}$ of $\left\{\dfrac{24}{5} \div \dfrac{16}{15}\right\} = ?$
(A) 7/2   (B) 2/7   (C) 3/7   (D) 5/9

28. $\dfrac{6}{164} \times \dfrac{8}{48} \times \sqrt{49} \div \dfrac{7}{3} = ?$
(A) $\dfrac{1}{41}$ (B) $\dfrac{2}{41}$ (C) $\dfrac{3}{41}$ (D) $\dfrac{3}{164}$

29. $\left(\dfrac{\sqrt{169} \times \sqrt{49}}{\sqrt[3]{343} \times \sqrt{121}}\right)$ of $11^2 + 4^3 - 9^2 = ?$
(A) 81   (B) 121   (C) 126   (D) 143

30. $\sqrt{169} \times 45 + \sqrt{289} \times 16 = ?$
(A) 272   (B) 585   (C) 578   (D) 857

Key

Exercise – 6(a)

1. D	6. D	11. D	16. B	21. C	26. A
2. D	7. A	12. C	17. D	22. D	27. A
3. B	8. C	13. C	18. D	23. A	28. D
4. D	9. B	14. B	19. B	24. B	29. A
5. B	10. D	15. A	20. C	25. B	30. C

Exercise – 6(b)

1. A	6. D	11. D	16. C	21. D	26. B
2. D	7. A	12. A	17. B	22. D	27. A
3. B	8. B	13. D	18. D	23. B	28. D
4. B	9. C	14. C	19. D	24. D	29. C
5. D	10. D	15. B	20. A	25. D	30. D