CHAPTER

09

APPROXIMATION OF EXPRESSIONS

Approximation

An approximation means the most nearest value of a term. The term can be applied to various properties (e.g. value, quantity, image, description) that are nearly but not exactly same.

e.g. if we ask age of someone, he does not say 10 yr, 4 months, 20 days. He simply says, I am approximately 10 yr old.

Thus, conversion of exact numbers into approximate numbers is called approximation or rounding off. The numbers are rounded to the nearest tens, hundreds, thousands etc. depending upon the requirement.

Rules for Approximation

To round or approximate a number to a required place, we look at the digit just right to the required place. If the digit is less than 5, we leave it and if it is 5 or more than 5 we add 1 to the digit at the required place. In each case we put zeros in place of all digits to the right of the required place.

In case of decimal we check the digit after decimal.

e.g. Rounded off to the nearest hundred.

(i) 1878

(ii) 31238

(iii) 16.73

Sol.

(i) In 1878, the digit at the hundreds place is 8 and the digit to the right of it is 7 which is more than 5. So we add 1 at hundreds place and remaining ten and unit digit consider as 0.

$\therefore$ 1878 rounded to the nearest hundred = 1900

(ii) In 31238, the digit at the hundreds place is 2 and the digit to the right of it is 3. Which is less than 5. So, we keep the face value of hundred will remain same and the remaining then and unit digit consider as 0.

$\therefore$ 31238 rounded to the nearest hundred = 31200

(iii) In 16.73, the digit after decimal is 7. So, we add 1 to the digit before the decimal and leave out the digit after decimal place.

$\therefore$ 16.73 rounded to the whole number = 17

Example **1.** Find the sum of 425, 998, 789, 869 and 954 to its nearest thousand.

(1) 4030 (2) 4035 (3) 4000 (4) 4040

Sol. (3) The sum = (425 + 998 + 789 + 869 + 954) = 4035

In 4035, the digit at the thousands place is 4 and the digit just right to it is 0 (less than 5) leave it.

So, 4035 rounded to the nearest thousand = 4000

Example **2.** Round 83.486 to the nearest hundredth.

(1) 83.490 (2) 83490 (3) 84 (4) 83.480

Sol. (1) The digit at hundredths place is 6. So, the digit at tenth place, i.e. 8 will change to 9 and 6 will change to zero. Hence, the number will be 83.490.

Entrance Corner

1. The sum of 975, 983, 923, 913 and 985 to its nearest hundred will be **[JNV 2011, 1997]**
(1) 4500 (2) 4600 (3) 4700 (4) 4800

2. What is the approximate value of 275.0003×3.005? **[JNV 2010]**
(1) 825 (2) 830 (3) 810 (4) 835

3. What is the approx value of 16268? **[JNV 2007]**
(1) 16200 (2) 16300 (3) 16260 (4) 16270

4. On dividing 93.45 by 0.015, what is the approximate answer? **[JNV 2005]**
(1) 0.6 (2) 60 (3) 600 (4) 6000

5. The number 66.0684, correct to the nearest ten is **[JNV 2001]**
(1) 66.068 (2) 66.07 (3) 66.1 (4) 70

6. The nearest thousands of 29789 will be written as **[JNV 2000]**
(1) 29000 (2) 29700
(3) 29800 (4) 30000

7. Value of 725 to the nearest hundred is **[JNV 1999]**
(1) 700 (2) 900 (3) 600 (4) 800

8. The number which is nearest thousand of 5555 will be **[JNV 1998]**
(1) 5000 (2) 5500 (3) 5550 (4) 6000

9. When rounded the nearest thousand, the number 8320 will be **[JNV 1996]**
(1) 8000 (2) 8300 (3) 8400 (4) 9000

10. The number 37504 when rounded off to the nearest hundred is **[JNV 1995]**
(1) 37000 (2) 37500 (3) 40000 (4) 30000

11. 18.24 when multiplied by 20.2, we get the approximate result is **[JNV 1994]**
(1) 365 (2) 368 (3) 364 (4) 362

12. The number 76.0684, when rounded to the nearest ten is **[JNV 1993]**
(1) 76.068 (2) 76.07
(3) 76.1 (4) 80

Answers

1. (4)	**2.** (1)	**3.** (4)	**4.** (4)	**5.** (4)	**6.** (4)	**7.** (1)	**8.** (4)	**9.** (1)	**10.** (2)
11. (2)	**12.** (4)								

Hints and Solutions

1. ∵ The sum = 975 + 983 + 923 + 913 + 985
= 4779
∴ In nearest hundred, it will be written as 4800.

2. $275.0003 \times 3.005 = 826.3759 \approx 825$

3. Approx value of 16268 = 16270

4. $93.45 \div 0.015 = \frac{93450}{15} = 6230$
= 6000 (approx.)

5. The number, correct to the nearest ten is 70.

6. The digit at the thousands place is 9 and the digit just right to it is 7.
So, 29789 rounded to the nearest thousands
= 30000

7. The digit just right to 7 is 2. Therefore, in nearest hundred it will be written as 700.

8. ∵ The digit at the thousand place is 5 and the digit just right to it is 5.
∴ In nearest thousand it will be written as 6000.

9. ∵ The number 8320 is less than 8500.
Therefore, in nearest thousand it will be written as 8000.

10. ∵ The digit just right to 5 is 0.
∴ In nearest hundred it will be written as 37500.

11. $18.24 \times 20.2 = 368.448$
The digit at hundredth place is 4 which is < 5. So, making all the digits after decimal 0, the result is 368.000 or 368.

12. In 76.0684, 6 is greater than 5, so we add 1 to 7. Then, value of 76.0684, rounded to the nearest ten = 80

Practice Exercise

1. Rounded off to whole number 135.78.
(1) 135 (2) 136 (3) 13.5 (4) 13578

2. What approximate value should come in place of question mark (?)?
$840.0003 \div 23.999 = ?$
(1) 47 (2) 8 (3) 35 (4) 18

3. Calculate the approximate value of expression
$6885.009 - 419.999 - 94.989$
(1) 6370 (2) 6830 (3) 6200 (4) 6450

4. What is the approximate value of
$11111 \div 111 \div 11$?
(1) 20 (2) 5 (3) 10 (4) 9

5. What is the approximate value of
$(8531 + 6307 + 1093) \div (501 + 724 + 396)$?
(1) 10 (2) 7 (3) 16 (4) 13

6. The sum of 865, 795, 491, 639 and 367 to its nearest hundred will be
(1) 3300 (2) 3400 (3) 3200 (4) 3100

7. Calculate the value $(897 + 635 + 468 - 120 - 721)$ to its nearest hundred.
(1) 1100 (2) 1200 (3) 1300 (4) 1000

8. The number which is nearest thousand of 4444 will be
(1) 4000 (2) 5000 (3) 4400 (4) 4500

9. When rounded the nearest hundred 2871 will be
(1) 2000 (2) 2900 (3) 2800 (4) 3000

10. Approximation value of (6.97×0.093) is
(1) 0.7 (2) 0.8 (3) 7.0 (4) 8.0

11. Approximation value of 15.38×0.98
(1) 14 (2) 18 (3) 13 (4) 15

12. Approximation value of (1.09×5.908) is
(1) 5 (2) 6 (3) 10 (4) 12

13. Round 14.444 to the nearest hundredth place
(1) 14.45 (2) 14.44 (3) 14 (4) 14.5

14. The number 14656152 when rounded off to the nearest lakh is
(1) 1500000 (2) 1400000 (3) 1000000 (4) 2000000

15. 1320.82 when rounded to the nearest tenth (whole number) is
(1) 1320 (2) 1320.1 (3) 1321 (4) 1322

16. Calculate the value $1524.79 \times 19.92 + 495.26$ to its nearest thousand
(1) 33000 (2) 34000 (3) 31000 (4) 26000

17. Calculate the approximation value of $328 + 437 + 189 - 286$.
(1) 960 (2) 670 (3) 950 (4) 780

18. Sum of 111, 222, 333, 444 and 555 to its nearest hundred
(1) 1700 (2) 1600 (3) 1800 (4) 1400

19. Approximation value of (3.28×1.25) is
(1) 5 (2) 6 (3) 3 (4) 7

20. Approximation value of (7.89×3.90) is
(1) 32 (2) 21 (3) 24 (4) 28

21. Approximation value of
$8.34 + 4.97 + 1.89 + 7.19 - 6.90$
(1) 14 (2) 16 (3) 18 (4) 15

Answers

1. (2)	**2.** (3)	**3.** (1)	**4.** (4)	**5.** (1)	**6.** (3)	**7.** (2)	**8.** (1)	**9.** (2)	**10.** (1)
11. (4)	**12.** (2)	**13.** (2)	**14.** (1)	**15.** (3)	**16.** (3)	**17.** (2)	**18.** (1)	**19.** (3)	**20.** (1)
21. (4)									

Hints and Solutions

1. In numeral 135.78, digit after decimal is 7 (more than 5), so we add 1 to the digit before the decimal and leave out the all decimal value.

$\therefore$ 135.78 rounded to the whole number = 136

2. Approximate value of 840.0003 = 840 and 23.999 = 24

So, $840 \div 24 = 35$

3. Given, 6885.009 − 419.999 − 94.989

Approximate value = 6885 − 420 − 95 = 6370

4. $\frac{11111 \times 1 \times 1}{111 \times 11} \approx \frac{10000}{110 \times 10} = 9.09$

$\therefore$ Digit after decimal is 0 (less than 5), So we leave it and rounded 9.09 to the whole number 9.

5. Given,

$(8531 + 6307 + 1093) \div (501 + 724 + 396)$

Approximate value

$= (8530 + 6300 + 1090) \div (500 + 720 + 400)$

$= 15920 \div 1620 = 9.82$

$\therefore$ Digit after decimal is 8 (more than 5), so we add 1 to digit before the decimal and leave out the remaining decimal value.

$\therefore$ 9.82 rounded to the whole number 10.

6. $\because$ Sum = 865 + 795 + 491 + 639 + 367 = 3157

$\therefore$ Digit just after 1 is 5

Therefore , in nearest hundred it will be written as 3200.

7. Value = (897 + 635 + 468 − 120 − 721) = 1159

$\therefore$ Digit after 1 is 5 (equal to 5), so we add 1 to the digit before 5, hence 1159 is rounded off to 1200.

8. In 4444, the digit at the thousands place is 4 and the digit just right to it is 4, which is less than 5. So, we leave it.

$\therefore$ 4444 rounded to the nearest thousand = 4000

9. In 2871, the digit at the hundred place is 8 and the digit just right to it is 7.

So, 2871 rounded to the nearest hundred = 2900

10. Approximation of 6.97 = 7

Approximation of 0.093 = 0.1

$\therefore$ $6.97 \times 0.093 \approx 7 \times 0.1 = 0.7$

11. Approximation of 15.38 = 15

Approximation of 0.98 = 1

$\therefore$ $15.38 \times 0.98 \approx 15 \times 1 = 15$

12. Approximation value of 1.09 = 1

and 5.908 = 6

$\therefore$ $1.09 \times 5.908 \approx 1 \times 6 = 6$

13. In 14.444, the digit at the hundredth place is 4 and the digit just right to it is 4, which is less than 5. So, leave it.

$\therefore$ Required number = 14.44

14. In 14656152, the digit at the lakh place is 6 and the digit just right to it is 5.

$\therefore$ Required number = 1500000

15. In 1320.8, the digit at the tenth place is 8.

$\therefore$ Required number = 1321

16. Calculating the value

$= 1524.79 \times 19.92 + 495.26$

$= 1525 \times 20 + 495 = 30995$

Digit to the right of thousand is 9, so we will add 1 to the thousand place and would rounded 30995 to 31000.

17. Calculating the value

$= 328 + 437 + 189 - 286$

$= 668$

$\therefore$ Approximate value = 668 = 670

18. Sum = 111 + 222 + 333 + 444 + 555 = 1665

Digit just after 6 is 6 (more than 5).

Hence, nearest hundred of 1665 = 1700

19. Approximation of 3.28 = 3

Approximation of 1.25 = 1

$\therefore$ $3.28 \times 1.25 \approx 3 \times 1 = 3$

20. Approximation of 7.89 = 8

Approximation of 3.90 = 4

$\therefore$ $7.89 \times 3.90 \approx 8 \times 4 = 32$

21. Approximation of 8.34 = 8

Approximation of 4.97 = 5

Approximation of 1.89 = 2

Approximation of 7.19 = 7

Approximation of 6.90 = 7

$\therefore$ $8.34 + 4.97 + 1.89 + 7.19 - 6.90$

$\approx 8 + 5 + 2 + 7 - 7 = 15$

Self Practice

1. The number which is nearest thousand of 5550 will be
(1) 5500 (2) 5000 (3) 6000 (4) 5600

2. The number 39969 when rounded off to the nearest hundred is
(1) 3900 (2) 40000 (3) 39900 (4) 39800

3. Round 18.35 to the tenth place
(1) 18 (2) 18.3 (3) 19 (4) 18.4

4. Round 40.438 to the nearest hundredth place
(1) 40.43 (2) 40.44 (3) 40.4 (4) 41

5. 84.6 when rounded to the nearest one is
(1) 84 (2) 90 (3) 85 (4) 84.1

6. When 22.54 is rounded to the nearest one, we get
(1) 23 (2) 22 (3) 22.6 (4) 22.5

7. Rounded of 18768 to the nearest hundred
(1) 18800 (2) 18700 (3) 18750 (4) 16000

8. Rounded 193.76 to the hundred place
(1) 194.90 (2) 194.00 (3) 193.00 (4) 192.00

9. Rounded of 121.79×10.11
(1) 1120 (2) 1342 (3) 1220 (4) 1210

10. Approximation of $(491 + 831 + 410) \div (11 + 28 + 34)$
(1) 24 (2) 23 (3) 25 (4) 46

11. Approximation of $(31 \times 14 \times 7) - (26 + 12)$
(1) 3500 (2) 3000 (3) 2400 (4) 2800

12. Approximation of $11.003 \times 19.998 \times 9.010$
(1) 1970 (2) 1980 (3) 1710 (4) 1680

13. Approximation of $1088.88 + 1800.08 + 1880.80$
(1) 3950 (2) 4620 (3) 6810 (4) 4770

14. Approximation of $16.007 \times 14.995 \times 6.080$
(1) 1440 (2) 1350 (3) 1510 (4) 1250

15. Approximation of $7000.001 \div 699.983 \times 4.020$
(1) 25 (2) 32 (3) 40 (4) 60

Answers

1. (3)	**2.** (2)	**3.** (4)	**4.** (2)	**5.** (3)	**6.** (1)	**7.** (1)	**8.** (2)	**9.** (3)	**10.** (1)
11. (2)	**12.** (2)	**13.** (4)	**14.** (1)	**15.** (3)					