

Chapter 0

Basics of Mathematics

When You Make Yourself Into Zero,
Your Power Becomes Invincible.

Mahatma Gandhi

Digit – Initial ten symbols that are used in mathematics. In Hindu- Arabic system, we have ten **digits**, namely

0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

Number – A number is a mathematical object used to count, measure, and label.

A number is denoted by a group of digits, called a **numeral**.

2, 12, 45, 502 etc.

Note – Every digit is may or may not be a number. But every number is not always a digit.

Ex – 1 is a digit, as per need we also consider 1 as a number. But in case of a number 24, at any condition we cannot say that 24 is a digit.

Value – Value is the net worth of that number/symbol/equation/inequality.

Result of arithmetic operations between 2 or more numbers. **Eg. Value of $12 + 13$ is 25.**

Price of any article. **Eg. Value (Cost) of a book is ₹5.**

Numerical representation of a variable. **Eg. Value of x is 10.**

BASIC MATHEMATIC OPERATIONS

ADDITION (+) : Process of finding the sum/total by combining two or more numbers.

Example: $5 + 15 + 6 = 26$

SUBTRACTION (-) : Subtraction means taking something away from a group or a number of things.

Example: Two students are selected from a class of 10 students. Then the number of unselected students is-

$$\begin{aligned} \text{Unselected} &= \text{Total} - \text{Selected} \\ &= 10 - 2 = 8 \end{aligned}$$

MULTIPLICATIONS (X) : Process to add a number to itself a particular number of times.

Example: 12 added to itself 3 times, which means 12 multiplied by 3.

$$12 + 12 + 12 = 36$$

OR

$$12 \times 3 = 36$$

DIVISION (\div) : Splitting a large group into equal smaller groups is known as **division**.

Example: If we contribute 8 pens to 4 students, we divide. Thus, $8 \div 4 = 2$. This means, each student gets 2 pens.

EXERCISE 0.1

Addition

1. $1 + 2$
2. $3 + 4$
3. $5 + 6$
4. $2 + 7$
5. $4 + 9$
6. $5 + 5$
7. $6 + 7$
8. $7 + 9$
9. $19 + 6$
10. $17 + 24$
11. $15 + 21$
12. $18 + 74$
13. $29 + 36$
14. $48 + 85$
15. $99 + 105$
16. $54 + 198$
17. $45 + 69$
18. $22 + 19$
19. $4 + 6 + 8$
20. $8 + 2 + 6$
21. $12 + 6 + 15$
22. $22 + 18 + 6$
23. $25 + 16 + 15$
24. $36 + 28 + 8$
25. $5 + 8 + 9 + 6$
26. $9 + 6 + 8 + 6$
27. $2 + 3 + 5 + 8$
28. $12 + 15 + 89$
29. $29 + 56 + 96$
30. $48 + 25 + 36$
31. $999 + 25 + 2$
32. $845 + 98 + 3$
33. $45 + 36 + 98$
34. $125 + 258 + 22$
35. $826 + 741 + 925$
36. $512 + 119 + 689$
37. $858 + 741 + 112$
38. $525 + 2584$
39. $956 + 554 + 23$
40. $5845 + 854$
41. $2541 + 846$
42. $26545 + 4545$
43. $4646 + 5646$
44. $8957 + 695$
45. $99586 + 56$
46. $223567 + 12$
47. $123 + 85694$
48. $12 + 856 + 5$
49. $55555 + 8585$
50. $35686 + 5866$
51. $256 + 856$
52. $2586 + 865$
53. $23654 + 1543$
54. $2164 + 16464$
55. $146446 + 154$
56. $31646 + 8456$
57. $2316546 + 85$
58. $1555 + 56521$
59. $21564 + 454$
60. $85245 + 545$

Subtraction

25. $74 - 23$
26. $64 - 46$
27. $112 - 52$
28. $125 - 69$
29. $325 - 285$
30. $269 - 143$
31. $485 - 215$
32. $498 - 354$
33. $569 - 256$
34. $186 - 89$
35. $598 - 126$
36. $656 - 586$
37. $857 - 258$
38. $856 - 85$
39. $646 - 515$
40. $1212 - 121$
41. $454 - 151$
42. $6565 - 212$
43. $8451 - 2151$
44. $3698 - 258$
45. $4582 - 695$
46. $15615 - 5151$
47. $151548 - 5545$
48. $81515 - 51221$
49. $99654 - 4154$
50. $541545 - 15415$
51. $71654 - 5415$
52. $845616 - 15641$
53. $8546 - 546 - 845$
54. $9855 - 256 - 1256$
55. $2584 - 854 - 785$
56. $3589 - 258 - 368$
57. $98745 - 2588 - 2654$
58. $5846 - 554 - 282$
59. $18265 - 185 - 4258$
60. $884564 - 14155$

Multiplication

1. 2×3
2. 4×5
3. 6×9
4. 9×5
5. 8×3
6. 9×3
7. 3×4
8. $4 \times 6 \times 8$
9. $8 \times 2 \times 6$
10. 12×14
11. 12×16
12. 21×12
13. 45×65
14. 35×42
15. 25×78
16. 35×64
17. 36×25
18. 74×29
19. 47×78
20. 23×56
21. 89×54
22. 74×62
23. 74×35
24. 36×97
25. 58×125
26. 126×32
27. 241×124
28. $5 \times 8 \times 9 \times 6$
29. $9 \times 6 \times 8 \times 6$
30. $12 \times 15 \times 89$
31. $29 \times 56 \times 96$
32. $48 \times 25 \times 36$
33. $25 \times 98 \times 56$
34. $12 \times 58 \times 69$
35. $35 \times 89 \times 45$
36. $49 \times 56 \times 89$
37. $25 \times 36 \times 75$
38. $2 \times 25 \times 999$
39. $45 \times 36 \times 98$
40. $98 \times 845 \times 3$
41. $121 \times 12 \times 31$
42. $362 \times 12 \times 85$
43. $874 \times 45 \times 96$
44. $36 \times 354 \times 425$
45. 256×856
46. 2586×865
47. $112 \times 854 \times 26$
48. $514 \times 38 \times 457$
49. $251 \times 356 \times 47$
50. 85245×548

Subtraction

1. $9 - 6$
2. $4 - 2$
3. $8 - 7$
4. $8 - 3$
5. $3 - 2$
6. $9 - 5$
7. $8 - 2$
8. $22 - 8$
9. $25 - 9$
10. $30 - 20$
11. $31 - 12$
12. $36 - 24$
13. $48 - 25$
14. $56 - 18$
15. $84 - 37$
16. $59 - 21$
17. $91 - 19$
18. $98 - 65$
19. $53 - 23$
20. $45 - 32$
21. $45 - 18$
22. $58 - 27$
23. $69 - 35$
24. $85 - 24$

Division

- | | | | |
|------------------|---------------------|-----------------------|----------------------|
| 1. $6 \div 3$ | 13. $91 \div 7$ | 25. $9700185 \div 15$ | 38. $19968 \div 26$ |
| 2. $8 \div 2$ | 14. $144 \div 6$ | 26. $169 \div 13$ | 39. $25758 \div 27$ |
| 3. $9 \div 4$ | 15. $441 \div 7$ | 27. $5461160 \div 8$ | 40. $18048 \div 32$ |
| 4. $12 \div 4$ | 16. $1176 \div 21$ | 28. $9212 \div 14$ | 41. $19110 \div 35$ |
| 5. $15 \div 5$ | 17. $3125 \div 25$ | 29. $10013 \div 17$ | 42. $216788 \div 22$ |
| 6. $24 \div 3$ | 18. $51034 \div 19$ | 30. $63540 \div 15$ | 43. $11772 \div 18$ |
| 7. $18 \div 9$ | 19. $10272 \div 12$ | 31. $8385 \div 13$ | 44. $11645 \div 17$ |
| 8. $25 \div 5$ | 20. $4752 \div 18$ | 32. $17746 \div 19$ | 45. $18715 \div 19$ |
| 9. $56 \div 14$ | 21. $88776 \div 14$ | 33. $13734 \div 21$ | 46. $11120 \div 16$ |
| 10. $64 \div 16$ | 22. $5346 \div 11$ | 34. $43740 \div 12$ | 47. $19110 \div 26$ |
| 11. $36 \div 9$ | 23. $30430 \div 17$ | 35. $41846 \div 49$ | 48. $6656 \div 13$ |
| 12. $98 \div 7$ | 24. $7618 \div 13$ | 36. $30744 \div 36$ | 49. $22372 \div 34$ |
| | | 37. $267916 \div 11$ | 50. $63168 \div 64$ |

EXERCISE 0.2**Word Problems**

- In a school there are 458 boys and 524 girls. Find the number of students in this school.
- Rani got ₹ 325 from her father and ₹ 289 from her mother. How much money does she have now?
- Abhay played a car game and scored 453 points in first round and 673 points in second round. The game was over after the second round. How many points did he have at the end of the game?
- There are 230 lions and 140 tigers in a Sanctuary. These are the only wild animals in the Sanctuary. Find the total number of wild animals in the Sanctuary.
- In a phone, 243 calls are made before noon and 389 calls are made after noon. Find the number of calls made in a day.
- A bike rental shop has 5416 old bikes and 6986 new bikes. What is the total number of bikes in the shop?
- In a dance show, 1201 men and 1389 women participated. What is the total number of participants?
- Ram jogs 1300 m and runs 1800 m. Find the total distance covered.
- A famous book contains 2012 pages. A new version includes 1003 more pages. What is the total number of pages in a new version?
- There are 3289 birds in a forest. 1438 more birds join during summer. Find the number of birds in summer.
- The population of a Gwalior City was 8,363,710 in 2008. It was expected to increase by 1,201,987 by the end of 2009. What was the expected population of Gwalior City at the end of 2009?
- Mr. Amhay wrote a book on Video Games and released 50, 525 copies. Because the book was popular among the readers, the publishers decided to publish a second edition with 40, 399 copies. Find the total number of copies published.
- In the School library, there are 398,456 old books. The management decided to add 67,876 new books. How many books will be there in library?
- A company manufactures 523,500 watches on Monday and 324,800 watches on Tuesday. Find the total number of watches manufactured on those two days.
- In a particular year, 76,43,872. Students appear for an exam, Out of them if 42,37,602 Were girls, how many were boys?
- An oil tank can hold 60 litres of oil. Another oil tank can hold thrice as much. What is the total capacity of both the tanks?
- You have finished 122 questions out of 156. How many more questions do you have to work on to finish?

Word Problems

18. A shopkeeper bought 240 balls and sold 148 balls. How many balls were left unsold?
19. An animal care society tested 356 pet animals. 127 were infected by diseases. Find the number of healthy pet animals that participated in the medical tests.
20. In an annual celebration, 674 students participated. Of them, 392 were boys. Find the number of girls who participated.
21. Director James directed a film which ran for 248 minutes. During the editing process, 109 minutes were removed. What is the final running time of the film, after editing?
22. Mark has a book which contains 649 pages. He has already read 495 pages. How many pages are unread?
23. There are 5718 DVDs in Mr. Miller's shop. 2199 are audio DVDs and the rest of them are video DVDs. Find the number of video DVDs in Mr. Miller's shop.
24. Clara withdrew ₹ 6789 from her account. The initial amount in her account was ₹ 8790. Find the balance left after the withdrawal.
25. A free medical camp was conducted in Mexico. 1278 males participated in the camp. The entry book shows 4012 people participated in the camp. Find the number of females who participated.
26. Cathy needs at least 2000 points to go to level 2 in a video game. She has only 1254 points in level 1. How many more points does she need to qualify for level 2?
27. The average distance from earth to the sun is 92, 589, 230 miles. The distance from earth to the moon is 92,350,373 miles less than the distance from earth to the sun. Find the distance from earth to the moon.
28. Clara bought a brand new car for ₹ 26,086. The estimated value of the car after 5 years is ₹15,990. If she sells the car after 5 years, by how much less money would she have?
29. Mr. Milson donates ₹3,599 by check for Haiti relief fund. The amount in his account is ₹108,458. What will be the balance in his account once the check is released?
30. There are 15 biscuits in a packet. A shop orders 156 packets. How many biscuits will be in the 156 packets?
31. A school buys 172 boxes of pencils. Each box has 12 pencils. How many pencils has the school bought?
32. A wholesaler sells apples for 17p each. A grocer buys 197 apples. How much will they cost?
33. It takes 18 minutes to make a toy car. How many minutes will it take to make 205 cars?
34. A machine makes 16 dice in a minute. A working day is 264 minutes. How many dice are made in 264 minutes?
35. A cinema has 21 screens. Each screen has 297 seats. How many seats are there in the cinema?
36. Eggs are sold in trays of 24. In a week, a farmer sells 372 trays. How many eggs does he sell in one week?
37. A bag of nails contains 613 nails. A hardware store has 23 bags. How many nails are in the 23 bags?
38. A tall office building has 85 floors. Each floor has 48 windows. Each window is to be decorated with 64 tiny bulbs. How many bulbs would be needed to decorate all the windows?
39. A football club has an average attendance of 859 people to each match. What is the total attendance for the 29 matches played in a season?
40. A machine makes 8521 dice in a week. In a 52-week working year, how many dice are made in a year?
41. A cinema chain has 28 cinemas. The average weekly attendance is 9828 people. What is the total attendance across the whole chain?
42. Mrs Cross bakes 40 cupcakes and stores them in boxes of 10. How many boxes does she need?
43. There are 789 pages in a book. How many pages are there in 14 books?
44. Kamal saves Rs. 485 every month. How much did he save in 5 years?

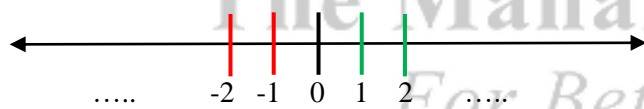
Word Problems

46. Amy buys a bag of sweets. There are 18 sweets in the bag and she eats half of them. How many sweets does she eat?
47. Toby has 30 tomato seeds to plant. He plants 5 in each pot. How many pots of tomato plants will Toby have?
48. Mr Mann washes 22 socks. How many pairs of socks does he wash?
49. Sausages are sold in packets of 10. If a butcher makes 80 sausages, how many packets does he have?
50. Matthew shares 8 football stickers between his two best friends. How many stickers does each friend receive?
51. Thomas has 35 building blocks. He wants to build towers with 5 bricks in each. How many towers can he build?
52. There are some motorbikes in a carpark. Jamal counts 10 wheels. How many motorbikes are there?
53. Alice grows tulips with 10 petals each. There are 100 petals in her garden. How many tulips are there?
54. Finley has 16 marbles. He gives half of his marble collection to his sister. How many does his sister receive?
55. 36 people need to travel to the cricket match. Each taxi can take 4 people. How many taxis will they need?
56. Joey's mum bought 25 toys for party bags. She shared them between 5 bags. How many toys were put in each bag?
57. What is the weight of two dozen biscuits if each biscuit weighs 4g?
58. 128400 pens are to be packed in cartons with 150 pens in each. How many cartons will be needed?

INTEGERS

An integer is a number with no decimal or fractional part, from the set of negative and positive numbers, including zero.

-2, -35, 0, 3, 14, etc.



Integers

Negative Integers: An integer is negative if it is smaller than zero.

-1, -2, -3,

Positive Integers: An integer is positive if it is greater than zero.

1, 2, 3, 4,

SIGN CONVERSIONS

When arithmetic operations are performed with numbers having different signs (+, -) then the resulting number and sign are written on the basis of the operated number.

ADDITION

To learn sign conversion, we will take two numbers in each case for easy learning.

Case I: When the sign of both the numbers is Positive Sign (+).

Operation: Addition

Sign: Positive (+)

Ex: $4 + 5 = 9$

Case II: When the sign of both the numbers is Negative Sign (-).

Operation: Addition

Sign: Negative (-)

Ex: $-4 - 5 = -9$

EXERCISE 0.3

Solve the following:

1. $5 - 6$
2. $-2 + 7$
3. $-4 - 9$
4. $-5 - 5$
5. $6 - 7$
6. $3 - 8$
7. $-7 + 9$
8. $2 - 9$
9. $-12 + 4$
10. $-19 - 6$
11. $22 - 19$
12. $-17 - 24$
13. $15 - 21$
14. $18 - 74$
15. $29 - 36$
16. $-48 + 85$
17. $99 - 105$
18. $-45 + 69$
19. $109 - 156$
20. $201 - 89$
21. $-252 - 142$
22. $-85 + 125$
23. $25 - 254$
24. $-25 - 254$
25. $-658 + 85$
26. $-54 + 198$
27. $-125 - 289$
28. $-512 + 318$
29. $-815 + 321$
30. $-369 - 145$
31. $365 - 256$
32. $12 - 6 + 15$
33. $-22 + 18 - 16$
34. $125 - 258 - 022$
35. $-512 - 119 - 68$
36. $-858 - 71 + 925$
37. $36 - 28 + 852$
38. $25 + 16 - 745$
39. $826 - 289 - 118$
40. $-954 + 958 - 76$
41. $846 - 254 + 20$
42. $845 - 416 + 524$
43. $955 - 475 - 654$
44. $-525 + 854 - 10$
45. $-955 - 78 - 124$
46. $521 + 52 - 658$
47. $699 + 585 + 25$
48. $352 - 854 + 35$
49. $285 - 585 - 228$
50. $521 + 52 - 658$
51. $(-2) \times (-3)$
52. $4 \times (-8)$
53. -6×8
54. $9 \times (-5)$
55. $(-8) \times 3$
56. 9×8
57. $-12 \times (-5)$
58. $14 \times (-9)$
59. $(-21) \times 14$
60. $45 \times (-64)$
61. $(-35) \times 42$
62. $24 \times (-78)$
63. $(-35) \times 64$
64. $24 \times (-37)$
65. $(-73) \times 29$
66. $47 \times (-78)$
67. $(-23) \times 56$
68. $89 \times (-45)$
69. $(-74) \times 62$
70. $126 \times (-39)$
71. $(-241) \times (-124)$
72. $(-21) \times 2 \times (-3)$
73. $(-62) \times (-5) \times 8$
74. $14 \times (-84) \times 36$
75. $46 \times 32 \times (-37)$
76. $7 \times (-84) \times (-8)$
77. $25 \div 5$
78. $88 \div (-8)$
79. $-84 \div 7$
80. $-96 \div (-12)$
81. $-48 \div 8$
82. $-63 \div (-9)$
83. $54 \div (-9)$
84. $-96 \div 6$
85. $-85 \div (-17)$
86. $144 \div (-16)$
87. $-91 \div 7$
88. $-51 \div (-17)$
89. $-125 \div (-25)$
90. $150 \div (-30)$

Case III: When the sign of the greater numbers is Positive (+) and the smaller is Negative (-).

Operation: Subtraction

Sign: Positive (+)

Ex: $-4 + 5 = 1$

Case IV: When the sign of the greater numbers is Negative (-) and the smaller is Positive (+)

Operation: Subtraction

Sign: Negative (-)

Ex: $4 - 5 = -1$

MULTIPLICATION

To learn sign conversion, we will take two numbers in each case for easy learning.

Case I: When the sign of both the numbers are same.

(+, +) OR (-, -).

Sign: Positive (+)

Ex: $6 \times 4 = 24$

$(-6) \times (-4) = 24$

Case I: When the sign of both the numbers are different. (+, -) OR (-, +).

Sign: Negative (-)

Ex: $6 \times (-4) = -24$

$(-6) \times 4 = -24$

DIVISION

To learn sign conversion, we will take two numbers in each case for easy learning.

Case I: When the sign of both the numbers are same.

(+, +) OR (-, -).

Sign: Positive (+)

Ex: $16 \div 4 = 4$

$(-16) \div (-4) = 4$

Case I: When the sign of both the numbers are different. (+, -) OR (-, +).

Sign: Negative (-)

Ex: $16 \div (-4) = -4$

$(-16) \div 4 = -4$

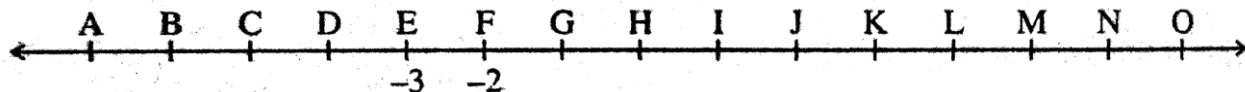
* If there is a negative (-) sign before the bracket, then every sign inside the bracket will be change.

Ex: $-(-a + b)$ changed to $(a - b)$.

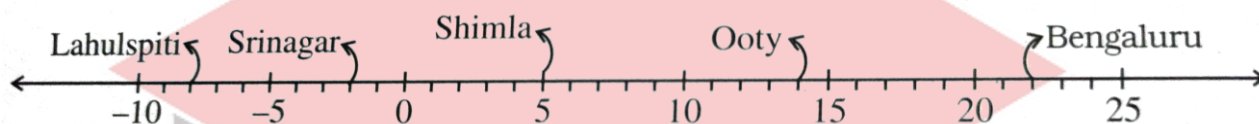
EXERCISE 0.4

Word Problems

1. Subtract (-4) from (-10) ;
2. Which of the numbers do you get if you subtract -40 from -50 ;
3. What is the value of 3 less than -2 on the number line?
4. Solve the following question using the number line given below



- a. -3 and -2 are marked by E and F respectively. Which integers are marked by B, D, H, J, M and O?
 - b. What is the difference between B and F?
 - c. What is the difference between D and J?
 - d. What is the length of the given line (AO)?
5. Following number line shows the temperature in degree Celsius ($^{\circ}\text{C}$) at different places on a particular day.



- a. Observe this number line and write the temperature of the places marked on it?
 - b. What is the temperature difference between the hottest and the coldest places among the above?
 - c. What is the temperature difference between Lahulspiti and Srinagar?
 - d. What is the temperature difference between Srinagar and Bengaluru?
6. In a quiz, positive marks are given for correct answers and negative marks are given for incorrect answers. If Jack's score in five successive rounds were 25, -5 , -10 , 15 and 10 what was his total at the end?
 7. At Srinagar temperature was -5°C on Monday and then it dropped by 2°C on Tuesday. What was the temperature of Srinagar on Tuesday? On Wednesday, it rose by 4°C . What was the temperature on this day?
 8. A plane is flying at the height of 5000 m above the sea level. At a particular point, it is exactly above submarine floating one 1200 m below the sea level. What is the vertical distance between them?
 9. Mohan deposits ₹2,000 in his bank account and withdrawals ₹1,642 from it, the next day. Find the balance in Mohan's account after the withdrawal.
 10. In a quiz team A scored -40 , 10, 0 and team B scored 10, 0, -40 in three successive rounds. Which team scored more?
 11. In the morning, the temperature was -10°C and it decreased 3 degrees by the evening. What was the temperature in the evening?
 12. The difference between -50°C and 72°C is
 13. The temperature dropped 15°C in the last 30 days. If the rate of temperature drop remains the same, how many degrees will the temperature drop in the next ten days?
 14. The expenditure of the company was Rs. 82,93,875 in 2015. If the present expenditure is Rs. 1,22,83,210. Find the increase in Expenditure?
 15. In a class test containing 15 questions, 4 marks are given to every correct answer and (-2) marks are given for every incorrect answer. Gurmeet attempts all questions but only nine of her answers are correct what is her total score. One of her friends get only 5 answers correct. What will be her score?
 16. For certain freezing process required that room temperature be lowered from 40°C at a rate of 5°C

Word Problems

- every hour. What will be the room temperature 10 hours after the process begins?
17. Suppose we represent the distance above the ground by a positive integer and that below the ground by a negative integer then answer the following:
 - a. An elevator descends into a mine shaft at the rate of 5 meter per minute. What will be its position after one hour?
 - b. If it begins to descend from 15 meter above the ground, what will be its position after 45 minutes?
 18. In a class test containing 10 questions, 5 marks are awarded for every correct answer and (-2) marks are awarded for every incorrect answer and 0 for questions not attempted.
 - a. Mohan gets 4 correct and 6 incorrect answers. What is his score?
 - b. Reshma gets five correct answers and five incorrect answers. What is her score?
 - c. Heena gets two correct and five incorrect answers out of several questions she attempts. What is her score?
 19. The temperature at 12 noon was 10°C above zero. If it decreases at the rate of 2°C per hour until midnight, at what time would that temperature be 8°C below zero? what would be the temperature at mid-night?
 20. An elevator is on the 20th floor. It goes down 11 floors and then up 5 floors. What floor is the elevator on now?
 21. A deep-sea exploring ship is pulling up a diver at the rate of 25 feet per minute. The diver is 200 feet below sea level. How deep was the diver 10 minutes ago?
 22. If it is 5°C outside and the temperature will drop 17°C in the next six hours, how cold will it get?
 23. Josie has ₹470 left on her checking account. If she writes a check for ₹550, what will Josie's balance be?
 24. It will be -12° tonight. The weatherman predicts it will be 25° warmer by noon tomorrow. What will the temperature be by noon tomorrow?
 25. The average temperature at the South Pole is -45°F . The average temperature on the Equator is 92°F . How much warmer is the average temperature on the Equator than at the South Pole?
 26. Felix reported that the coldest day on record for his town was five times colder than yesterday's temperature, -4°C . What was the temperature of the coldest day on record in Felix's town?
 27. The elevation of Mt. Everest is 29,028 feet. The elevation of the Dead Sea is -485 feet. What is the difference in the elevation between Mt. Everest and the Dead Sea?
 28. A scuba diver swam 96 feet beneath the surface of the lake. He then climbs up 49 feet. What is his depth now?
 29. The temperature was -3°C last night. It is now -4°C . What was the change in temperature?
 30. Two golfers completed one round of golf. The first golfer had a score of +6 and the second golfer had a score of -3. How many more shots did the first golfer take?