Chapter 2 Arithmetic Expressions

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Q. Example 1: Mallika spends ₹25 every day for lunch at school. Write the expression for the total amount she spends on lunch in a week from Monday to Friday.
Solution:
Money spent every day = ₹25
Total amount spent from Monday to Friday = 5×25

Q. Choose your favourite number and write as many expressions as you can having that value.
Solution:
Let the number be 7. Some expression with 7:
$12 - 5 = 7$
$20 - 13 = 7$
$42 \div 6 = 7$
$7 \times 1 = 7$
$3 + (9 - 5) = 7$
$(26 - 13) - (10 - 4) = 7$ etc.

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Figure it out

1. Fill in the blanks to make the expressions equal on both sides of the = sign:
(a) 13 + 4 = _____ + 6 (b) 22 + _____ = 6 × 5
(c) 8 × _____= 64 ÷ 2 (d) 34 – _____= 25
Solution:
(a) 13 + 4 = _____ + 6
17 = __ + 6
17 – 6 = __
or __ = 17 – 6
__ = 11

(b) 22 + _____ = 6 × 5
22 + __ = 30
__ = 30 – 22
__ = 8

(c) 8 × _____= 64 ÷ 2
8 × __ = 32

$\_\_ = \frac{32}{8}$

$\_\_ = 4$

(d) 34 – ____= 25

34 - __ = 25

34 -25 = __

9 = __

or __ = 9

2. Arrange the following expressions in ascending (increasing) order of their values.

(a) 67 – 19 (b) 67 – 20 (c) 35 + 25 (d) 5 × 11 (e) 120 ÷ 3

Solution:

(a) 67 – 19 = 48

(b) 67 – 20 = 47

(c) 35 + 25 = 60

(d) 5 × 11 = 55

(e) 120 ÷ 3 = 40

Since, 40 < 47 < 48 < 55 < 60

Therefore, 120 ÷ 3 < 67 – 20 < 67 – 19 < 5 × 11 < 35 + 25.

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Q. Use '>' or '<' or '=' in each of the following expressions to compare them. Can you do it without complicated calculations? Explain your thinking in each case.

(a) 245 + 289 __ 246 + 285

(b) 273 – 145 __ 272 – 144

(c) 364 + 587 __ 363 + 589

(d) 124 + 245 __ 129 + 245

(e) 213 – 77 __ 214 – 76

Solution:

(a) 245 + 289 __ 246 + 285

245 + 1 + 285 + 4 __ 245 + 1 + 285

245 + 285 + 5 __ 1 + 245 + 285

Removing the common terms,

$5 \geq 1$

∴ 245 + 289 $\geq$ 246 + 285.

(b) 273 – 145 __ 272 – 144

272 + 1 – 144 + 1 __ 272 – 144

272 – 144 + 2 __ 272 – 144

Removing the common terms,

$2 \geq 0$

$\therefore 273 - 145 \geq 272 - 144.$

(c) $364 + 587 \_\_ 363 + 589$
$363 + 1 + 587 \_\_ 363 + 587 + 2$
$363 + 587 + 1 \_\_ 2 + 363 + 587$
Removing the common terms,
$1 \leq 2$
$\therefore 364 + 587 \leq 363 + 589.$

(d) $124 + 245 \_\_ 129 + 245$
$124 + 245 \_\_ 124 + 5 + 245$
$124 + 245 \_\_ 5 + 124 + 245$
Removing the common terms,
$0 \leq 5$
$\therefore 124 + 245 \leq 129 + 245.$

(e) $213 - 77 \_\_ 214 - 76$
$213 - 76 + 1 \_\_ 213 + 1 - 76$
$213 - 76 + 1 \_\_ 213 - 76 + 1$
Removing the common terms,
$1 \equiv 1$
$\therefore 213 - 77 \equiv 214 - 76.$

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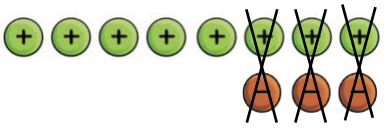
Q. Check if replacing subtraction by addition in this way does not change the value of the expression, by taking different examples. {Expression: 83 – 14 = 83 +(– 14)}
Solution:
$17 - 9 = 17 + (-9)$
$8 - 5 = 8 + (-5)$
$12 - 4 + 6 \times 3 = 12 + (-4) + 6 \times 3.$

Q. Can you explain why subtracting a number is the same as adding its inverse, using the Token Model of integers that we saw in the Class This 6 textbook of mathematics?
Solution:
Expression: $8 - 3 = 8 + (-3)$ or $(+8) - (+3) = (+8) + (-3)$

(+8) – (+3) = (+5)



(+8) + (-3) = (+5)

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Q. Complete the table:

Expression	Expression as the sum of its terms	Terms
13 – 2 + 6	13 + (– 2) + 6	13, – 2, 6
5 + 6 × 3	5 + (6 × 3)	
4 + 15 – 9	( ) + ( ) + ( )	
23 – 2 × 4 + 16	( ) + ( ) + ( )	
28 + 19 – 8	( ) + ( ) + ( )	

Solution:

Expression	Expression as the sum of its terms	Terms
13 – 2 + 6	13 + (-2) + 6	13, -2, 6
5 + 6 × 3	5 + (6 × 3)	5, (6×3)
4 + 15 - 9	4 + 15 + (-9)	4, 15, -9
23 – 2 × 4 + 16	23 + [-2 × 4] + 16	23, (-2×4), 16
28 + 19 - 8	28 + 19 + (-8)	28, 19, -8

Q. Does changing the order in which the terms are added give different values?
Solution:
No, changing the order in which the terms are added give doesn't give different values.

Q. Will this also hold when there are terms having negative numbers as well? Take some more expressions and check.
Solution:
No, the sum will not change even on swapping terms with negative numbers.
Example 1: (-3) + (-9) = -12. Also, (-9) + (-3) = -12.
Example 2: (-5) + 7 = 2. Also, 7 + (-5) = 2.

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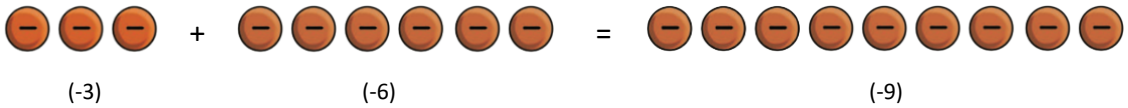
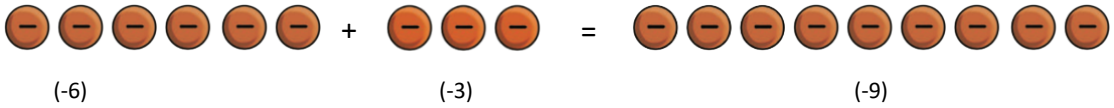
Q. Can you explain why this is happening using the Token Model of integers that we saw in the Class 6 textbook of mathematics?
Solution:
Using token model to explain, (-3) + (-6) = (-6) + (-3) = (-9)
(i) (-3) + (-6) = (-9)



(ii) (-6) + (-3) = (-9)

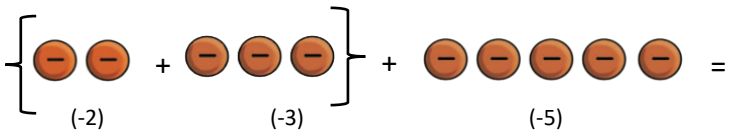


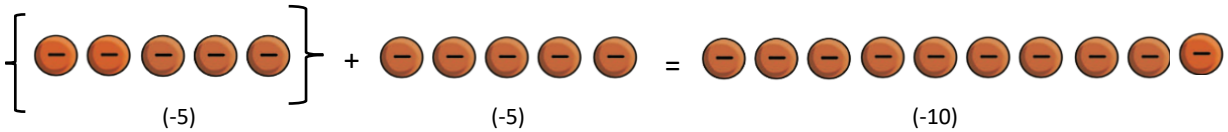
This proves that the result remains same even on swapping the position of the integers.

Q. Will this also hold when there are terms having negative numbers as well? Take some more expressions and check.
Solution:
Yes, even while adding negative integers grouping them in any order gives the same sum.
Example:
{(-2) + (-5)} + (-7) = (-2) + {(-5) + (-7)}
L.H.S: {(-2) + (-5)} + (-7) = (-7) + (-7) = (-14)
R.H.S: (-2) + {(-5) + (-7)} = (-2) + (-12) = (-14)
Thus we are getting the same value in both cases.

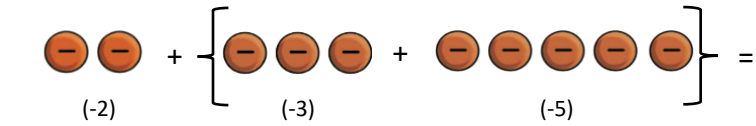
Q. Can you explain why this is happening using the Token Model of integers that we saw in the Class 6 textbook of mathematics?
Solution:
{(-2) + (-3)} + (-5) = (-2) + {(-3) + (-5)} = (-10)

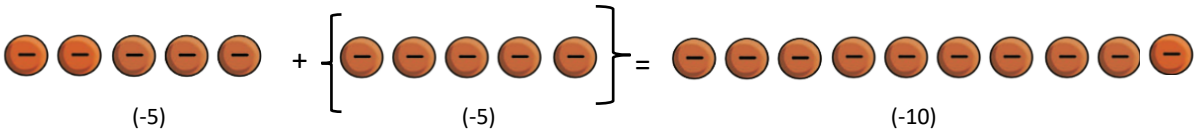
L.H.S: {(-2) + (-3)} + (-5)





R.H.S: (-2) + {(-3) + (-5)}





Both are same.

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Q. Does adding the terms of an expression in any order give the same value? Take some more expressions and check. Consider expressions with more than 3 terms also.
Solution:
Yes, adding the terms of an expression in any order give the same value.
Example:
{(-7) + 12} + (-13) + (-5) = (-7) + 12 + {(-13) + (-5)}

L.H.S: {(-7) + 12} + (-13) + (-5) = 5 + (-13) + (-5)
= -8 + (-5)
= -13
R.H.S: (-7) + 12 + {(-13) + (-5)} = (-7) + 12 + (-18)
= 5 + (-18)
= -13

Q. Manasa is adding a long list of numbers. It took her five minutes to add them all and she got the answer 11749. Then she realised that she had forgotten to include the fourth number 9055. Does she have to start all over again? (Numbers list: 1342, 774, 8611, 9055, 1022)
Solution:
No, she doesn't have to start over again. She can simply add the forgotten number (9055) to the previous sum (11749) to get the final correct answer.
Calculation: 11,749 + 9,055 = 20,804.

Q. Manasa is going outside to play. Her mother says, "Wear your hat and shoes!" Which one should she wear first?
Solution:
It doesn't matter what she wears first; both pieces contribute equally to her final look. This situation is commutative in nature.

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Q. If the total number of friends goes up to 7 and the tip remains the same, how much will they have to pay? Write an expression for this situation and identify its terms. (Amu, Charan, Madhu, and John went to a hotel and ordered four dosas. Each dosa cost ₹23, and they wish to thank the waiter by tipping ₹5.)

Solution:

Cost of each dosa = ₹23

Cost of 7 dosas = 7 × ₹23

Tip given = ₹5

Total amount with tip = 7 × ₹23 + ₹5 (Expression)

= ₹161 + ₹5

= ₹166.

Terms in expression: 7 × ₹23, ₹5.

Q. Children playing "Fire in the mountain". 33 students were playing and ruby didn't play. Teacher called out '5'. Students formed groups of 5. Ruby wrote 6 x 5 + 3. Think and discuss why she wrote this.

Solution:

Ruby wrote 6 × 5 + 3 because the expression (6 × 5) represents the total number of students who grouped themselves in teams of 5, and (3) represents the students who were left over, as they couldn't form a complete group of 5.

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Q. For each of the cases below, write the expression and identify its terms:

(i) If the teacher had called out '4', Ruby would write _____

(ii) If the teacher had called out '7', Ruby would write _____

(iii) Write expressions like the above for your class size.

Solution:

(i) Since, 33 ÷ 4 give quotient 8 and remainder 1. Therefore, Ruby could write $4 \times 8 + 1$.

(ii) Since, 33 ÷ 7 gives quotient 4 and remainder 5. Therefore, Ruby could write $7 \times 4 + 5$.

(iii) Number of students in my class = 43

If the teacher had called out 4, expression would be $4 \times 10 + 3$.

If the teacher had called out 7, expression would be $7 \times 6 + 1$.

Q. Identify the terms in the two expressions above. (Expressions: 432 = 4 × 100 + 1 × 20 + 1 × 10 + 2 × 1 and 432 = 8 × 50 + 1 × 10 + 4 × 5 + 2 × 1)

Solution:

(i) 432 = 4 × 100 + 1 × 20 + 1 × 10 + 2 × 1

Terms: (4×100), (1×20), (1×10) and (2×1).

(ii) $432 = 8 \times 50 + 1 \times 10 + 4 \times 5 + 2 \times 1$
Terms: (8×50), (1×10), (4×5) and (2×1).

Q. Can you think of some more ways of giving ₹432 to someone?
Solution:
Some ways are:
(i) $432 = 8 \times 50 + 3 \times 10 + 2 \times 1$.
(ii) $432 = 20 \times 20 + 2 \times 10 + 2 \times 5 + 2 \times 1$.

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Figure it out

1. Find the values of the following expressions by writing the terms in each case.
(a) $28 - 7 + 8$ (b) $39 - 2 \times 6 + 11$
(c) $40 - 10 + 10 + 10$ (d) $48 - 10 \times 2 + 16 \div 2$ (e) $6 \times 3 - 4 \times 8 \times 5$
Solution:
(a) $28 - 7 + 8 = 28 + (-7) + 8$
$= 21 + 8 = 29.$
Terms: 28, (-7) , 8.

(b) $39 - 2 \times 6 + 11 = 39 + \{(-2) \times 6\} + 11$
$= 39 + (-12) + 11$
$= 27 + 11 = 38.$
Terms: 39, (-2×6), 11.

(c) $40 - 10 + 10 + 10 = 40 + (-10) + 10 + 10$
$= 30 + 10 + 10$
$= 30 + 20 = 50.$
Terms: 40, (-10), 10, 10.

(d) $48 - 10 \times 2 + 16 \div 2 = 48 + (-10 \times 2) + (16 \div 2)$
$= 48 + (-20) + 8$
$= 28 + 8 = 36.$
Terms: 48, (-10×2), $(16 \div 2)$.

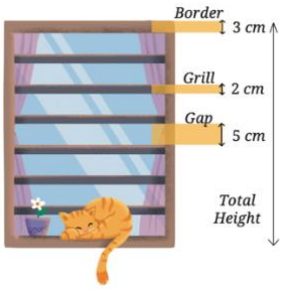
(e) $6 \times 3 - 4 \times 8 \times 5 = (6 \times 3) + (-4 \times 8 \times 5)$
$= 18 + (-160)$
$= -142.$
Terms: (6×3), $(-4 \times 8 \times 5)$.

2. Write a story/situation for each of the following expressions and find their values.
(a) 89 + 21 – 10 (b) 5 × 12 – 6
(c) 4 × 9 + 2 × 6
Solution:
(a) Story: Ramesh had 89 marbles. He got 21 more marbles from his friend and later gave 10 marbles to another friend.
Expression: 89 + 21 – 10 = 110 – 10 = 100.

(b) Story: There were 5 classrooms, each having 12 desks. One day, 6 desks were found broken and were removed.
Expression: 5 × 12 – 6 = 60 – 6 = 54.

(c) Story: A bakery baked 4 trays of cupcakes, with 9 cupcakes on each tray, and 2 trays of cookies, with 6 cookies on each tray.
Expression: 4 × 9 + 2 × 6 = 36 + 12 = 48.

3. For each of the following situations, write the expression describing the situation, identify its terms and find the value of the expression.
(a) Queen Alia gave 100 gold coins to Princess Elsa and 100 gold coins to Princess Anna last year. Princess Elsa used the coins to start a business and doubled her coins. Princess Anna bought jewellery and has only half of the coins left. Write an expression describing how many gold coins Princess Elsa and Princess Anna together have.
(b) A metro train ticket between two stations is ₹40 for an adult and ₹20 for a child. What is the total cost of tickets:
(i) for four adults and three children?
(ii) for two groups having three adults each?
(c) Find the total height of the window by writing an expression describing the relationship among the measurements shown in the picture.
Solution:
(a) Princess Elsa and Princess Anna both had 100 gold coins each.
Elsa doubled her coins, while Anna was left with half of hers.
Expression: (2 × 100) + (100 ÷ 2)
Terms: (2 × 100), (100 ÷ 2).
Value: (2 × 100) + (100 ÷ 2) = 200 + 50 = 250.
Therefore, together they have 250 gold coins.



(b) Ticket for adults = ₹40
Ticket for a child = ₹20
(i) For four adults and three children:
Expression: (4 × 40) + (3 × 20)
Terms: (4 × 40), (3 × 20)
Value: (4 × 40) + (3 × 20) = 160 + 60 = 220.
Therefore, total cost is ₹220.

(ii) For two groups having three adults each:
Expression: (3 × 40) + (3 × 40)

Terms: (3×40), (3×40)
Value: $(3 \times 40) + (3 \times 40) = 120 + 120 = 240$.
Therefore, Total cost is ₹240.

(c) Border = 3 cm
Grill = 2 cm
Gap = 5 cm
Expression: $(6 \times 2) + (2 \times 3) + (7 \times 5)$
Terms: (6×2), (2×3), (7×5).
Value: $(6 \times 2) + (2 \times 3) + (7 \times 5) = 12 + 6 + 35 = 53$.

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Q.

53 + (–16) = 37	53 + (–16) = 37	–87 + (–16) =
54 + (–16) = 38 54 is one more than 53, so the value will be 1 more than 37.	52 + (–16) = 52 is one less than 53, so the value will be 1 less than 37.	–88 + (–15) =
		–86 + (–18) =
53 + (–15) =	53 + (–17) = Is –17 one more or one less than –16?	–97 + (–26) =

Solution:

53 + (–16) = 37	53 + (–16) = 37	–87 + (–16) = -103
54 + (–16) = 38 54 is one more than 53, so the value will be 1 more than 37.	52 + (–16) = 36 52 is one less than 53, so the value will be 1 less than 37.	–88 + (–15) = -103 (-88) is one less than (-87) and (-15) is one more than (-16). Since, (-1) + (1) = 0, so the value remains the same (-103).
		–86 + (–18) = -104 (-86) is one more than (-87) and (-18) is two less than (-16). Since, (+1) + (-2) = (-1), so the value will be 1 less than -103.
53 + (–15) = 38 (-15) is one more than (-16), so the value will be 1 more than 37.	53 + (–17) = 36 (–17) one less than –16, so the value will be 1 less than 37	–97 + (–26) = -123 (-97) is ten less than (-87) and (-26) is also 10 less than (-16). Since, (-10) + (-10) = (-20), so the value will be (-20) less than (-103). i.e. (-103) + (-20) = -123.

Figure it out

1. Fill in the blanks with numbers, and boxes with operation signs such that the expressions on both sides are equal.
(a) 24 + (6 – 4) = 24 + 6 __ _____
(b) 38 + (_____ _____) = 38 + 9 – 4
(c) 24 – (6 + 4) = 24 __ 6 – 4
(d) 24 – 6 – 4 = 24 – 6 __ _____
(e) 27 – (8 + 3) = 27 __ 8 __ 3
(f) 27 – (_____ _____) = 27 – 8 + 3
Solution:
(a) 24 + (6 – 4) = 24 + 6 $-$ 4

(b) 38 + (9 $-$ 4) = 38 + 9 – 4

(c) 24 – (6 + 4) = 24 $-$ 6 – 4

(d) 24 – 6 – 4 = 24 – 6 $+$ (-4)

(e) 27 – (8 + 3) = 27 $-$ 8 $-$ 3

(f) 27 – (8 $-$ 3) = 27 – 8 + 3

2. Remove the brackets and write the expression having the same value.
(a) 14 + (12 + 10) (b) 14 – (12 + 10)
(c) 14 + (12 – 10) (d) 14 – (12 – 10)
(e) –14 + 12 – 10 (f) 14 – (–12 – 10)
Solution:
(a) 14 + (12 + 10) = 14 + 12 + 10

(b) 14 – (12 + 10) = 14 – 12 – 10

(c) 14 + (12 – 10) = 14 + 12 – 10

(d) 14 – (12 – 10) = 14 – 12 + 10

(e) -14 + 12 – 10 = -14 + 12 – 10

(f) 14 – (-12 – 10) = 14 + 12 + 10

3. Find the values of the following expressions. For each pair, first try to guess whether they have the same value. When are the two expressions equal?
(a) (6 + 10) – 2 and 6 + (10 – 2)
(b) 16 – (8 – 3) and (16 – 8) – 3

(c) 27 – (18 + 4) and 27 + (–18 – 4)

Solution:

(a) (6 + 10) – 2 and 6 + (10 – 2)

$6 + 10 - 2 \underline{\quad} 6 + 10 - 2$

$16 - 2 \underline{\quad} 16 - 2$

$14 \underline{=} 14$

Here, the two expressions are equal.

(b) 16 – (8 – 3) and (16 – 8) – 3

$16 - 8 + 3 \underline{\quad} 16 - 8 - 3$

$8 + 3 \underline{\quad} 8 - 3$

$11 \underline{\neq} 4$

Here, the two expressions are not equal.

(c) 27 – (18 + 4) and 27 + (–18 – 4)

$27 - 18 - 4 \underline{\quad} 27 - 18 - 4$

$9 - 4 \underline{\quad} 9 - 4$

$5 \underline{=} 5$

Here, the two expressions are equal.

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4. In each of the sets of expressions below, identify those that have the same value. Do not evaluate them, but rather use your understanding of terms.

(a) 319 + 537, 319 – 537, –537 + 319, 537 – 319

(b) 87 + 46 – 109, 87 + 46 – 109, 87 + 46 – 109, 87 – 46 + 109, 87 – (46 + 109), (87 – 46) + 109

Solution:

(a) 319 + 537, 319 – 537, –537 + 319, 537 – 319

319 – 537 and –537 + 319 → Same value → Follow commutative property of addition.

(b) 87 + 46 – 109, 87 + 46 – 109, 87 + 46 – 109, 87 – 46 + 109, 87 – (46 + 109), (87 – 46) + 109

87 – 46 + 109 and (87 – 46) + 109 → Same value → Follow associative property of addition.

87 + 46 – 109, 87 + 46 – 109, 87 + 46 – 109 → Exactly same.

5. Add brackets at appropriate places in the expressions such that they lead to the values indicated.

(a) 34 – 9 + 12 = 13

(b) 56 – 14 – 8 = 34

(c) –22 – 12 + 10 + 22 = –22

Solution:

(a) 34 – 9 + 12 = 13

34 – (9 + 12) = 13.

(b) 56 – 14 – 8 = 34
(56 – 14) – 8 = 34

(c) –22 – 12 + 10 + 22 = –22
–22 – (12 + 10) + 22 = –22

6. Using only reasoning of how terms change their values, fill the blanks to make the expressions on either side of the equality (=) equal.
(a) 423 + _____= 419 + _____
(b) 207 – 68 = 210 – _____
Solution:
(a) 423 + _____= 419 + _____
Since 419 is 4 less than 423, we must add 4 more to 419's side to balance.
∴ 433 + 2 = 419 + 6. (6 is more than 2).

(b) 207 – 68 = 210 – _____
Since 210 is 3 more than 207, subtract 3 more from right-side to balance.
∴ 207 – 68 = 210 – 71 (71 is 3 more than 68)

7. Using the numbers 2, 3 and 5, and the operators '+' and '–', and brackets, as necessary, generate expressions to give as many different values as possible. For example, 2 – 3 + 5 = 4 and 3 – (5 – 2) = 0.
Solution:
(i) 2 + (3 + 5) = 10
(ii) 2 – (3 + 5) = 2 – 8 = -6
(iii) (-2) – (3 + 5) = -2 – 8 = -10
(iv) (-2) + (3 – 5) = -2 + (-2) = -4
(v) 5 + (3 - 2) = 5 + 1 = 6
Different values obtained are 10, -10, 6, -6, -4.

8. Whenever Jasoda has to subtract 9 from a number, she subtracts 10 and adds 1 to it. For example, 36 – 9 = 26 + 1.
(a) Do you think she always gets the correct answer? Why?
(b) Can you think of other similar strategies? Give some examples.
Solution:
(a) Yes, Jasoda always gets the correct answer.
Subtracting 9 is the same as subtracting 10 and adding 1 back, because:
–9 = –10 + 1
So, 36 – 9 = 36 – 10 + 1 = 26 + 1 = 27, which is correct.

(b) Examples of some similar strategies:-
To subtract 19, subtract 20 and add 1:
54 – 19 = 54 – 20 + 1 = 34 + 1 = 35
To subtract 8, subtract 10 and add 2:

43 – 8 = 43 – 10 + 2 = 33 + 2 = 35
To subtract 18, subtract 20 and add 2:
65 – 18 = 65 – 20 + 2 = 45 + 2 = 47

9. Consider the two expressions: a) 73 – 14 + 1, b) 73 – 14 – 1. For each of these expressions, identify the expressions from the following collection that are equal to it.
(a) 73 – (14 + 1) (b) 73 – (14 – 1) (c) 73 + (–14 + 1) d) 73 + (–14 – 1)
Solution:
a) 73 – 14 + 1 = 59 + 1 = 60.
b) 73 – 14 – 1 = 59 – 1 = 58.

(a) 73 – (14 + 1) = 73 – 15 = 58.
(b) 73 – (14 – 1) = 73 – 13 = 60.
(c) 73 + (–14 + 1) = 73 + (-13) = 60.
(d) 73 + (-14 – 1) = 73 + (-15) = 58.

Therefore,
73 – 14 + 1 is equal to 73 – (14 – 1) and 73 + (–14 + 1).
73 – 14 – 1 is equal to 73 – (14 + 1) and 73 + (-14 – 1).

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Q. If another friend, Sangmu, joins them and orders the same items, what will be the expression for the total amount to be paid? [Expression for Lhamo and Norbu who each ordered a vegetable cutlet costing ₹43 and a rasgulla costing ₹24 is 2 × (43 + 24)]
Solution:
If another friend, Sangmu joins them and orders the same items.
Then, the total amount to be paid is 3 × (43 + 24).

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Q. 5 × 4 + 3 ≠ 5 × (4 + 3). Can you explain why?
Solution:
L.H.S: 5 × 4 + 3 = 20 + 3 = 23
R.H.S: 5 × (4 + 3) = 5 × 4 + 5 × 3 = 20 + 15 = 35.
Since, 23 ≠ 35
∴ 5 × 4 + 3 ≠ 5 × (4 + 3).

Q. Is 5 × (4 + 3) = 5 × (3 + 4) = (3 + 4) × 5?
Solution:
5 × (4 + 3) = 5 × 4 + 5 × 3 = 20 + 15 = 35.
5 × (3 + 4) = 5 × 3 + 5 × 4 = 15 + 20 = 35.

(3 + 4) × 5 = 7 × 5 = 35.
Since, all these expressions have 35 as result.
∴ 5 × (4 + 3) = 5 × (3 + 4) = (3 + 4) × 5.

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Q. 97 × 25 = 100 × 25 – 3 × 25. Find this value.
Solution:
97 × 25 = 100 × 25 – 3 × 25 = 2500 – 75 = 2425.

Q. Use this method to find the following products:
(a) 95 × 8
(b) 104 × 15
(c) 49 × 50
Is this quicker than the multiplication procedure you use generally?
Solution:
(a) 95 × 8 = 95 × (10 – 2)
= 95 × 10 – 95 × 2
= 950 – 190 = 760.

(b) 104 × 15 = (100 + 4) × 15
= 100 × 15 + 4 × 15
= 1500 + 60 = 1560.

(c) 49 × 50 = (50 – 1) × 50
= 50 × 50 – 1 × 50
= 2500 – 50 = 2450.

Q. Which other products might be quicker to find like the ones above?
Solution:
(i) 36 × 102 = 36 × (100 + 2) = 36 × 100 + 36 × 2 = 3600 + 72 = 3672.
(ii) 75 × 98 = 75 × (100 – 2) = 75 × 100 – 75 × 2 = 7500 – 150 = 7350.
(iii) 42 × 52 = 42 × (50 + 2) = 42 × 50 + 42 × 2 = 2100 + 84 = 2184.
(iv) 995 × 67 = (1000 – 5) × 67 = 67 × 1000 – 67 × 5 = 6700 – 335 = 6365.

Figure it out

1. Fill in the blanks with numbers, and boxes by signs, so that the expressions on both sides are equal.
(a) 3 × (6 + 7) = 3 × 6 + 3 × 7
(b) (8 + 3) × 4 = 8 × 4 + 3 × 4
(c) 3 × (5 + 8) = 3 × 5 __ 3 × ____

(d) (9 + 2) × 4 = 9 × 4__ 2 × ____
(e) 3 × (____ + 4) = 3 ____+____
(f) (____+ 6) × 4 = 13 × 4 + ____
(g) 3 × (____+____) = 3 × 5 + 3 × 2
(h) (____+____) × ____= 2 × 4 + 3 × 4
(i) 5 × (9 – 2) = 5 × 9 – 5 × ____
(j) (5 – 2) × 7 = 5 × 7 – 2 × ____
(k) 5 × (8 – 3) = 5 × 8 __ 5 × ____
(l) (8 – 3) × 7 = 8 × 7 __ 3 × 7
(m) 5 × (12 –____) =____ __ 5 ×____
(n) (15 – ____) × 7 = ____ __ 6 × 7
(o) 5 × (____–____) = 5 × 9 – 5 × 4
(p) (____–____) × ____= 17 × 7 – 9 × 7

Solution:

(c) 3 × (5 + 8) = 3 × 5 + 3 × 8

(d) (9 + 2) × 4 = 9 × 4+ 2 × 4

(e) 3 × (7 + 4) = 3 x 7 + 3 × 4

(f) (13 + 6) × 4 = 13 × 4 + 6 × 4

(g) 3 × (5 + 2) = 3 × 5 + 3 × 2

(h) (2 + 3) × 4= 2 × 4 + 3 × 4

(i) 5 × (9 – 2) = 5 × 9 – 5 × 2

(j) (5 – 2) × 7 = 5 × 7 – 2 × 7

(k) 5 × (8 – 3) = 5 × 8 – 5 × 3

(l) (8 – 3) × 7 = 8 × 7 – 3 × 7

(m) 5 × (12 – 3) =5 × 12 – 5 × 3

(n) (15 – 6) × 7 = 15 × 7 – 6 × 7

(o) 5 × (9 – 4) = 5 × 9 – 5 × 4

(p) (17 – 9) × 7 = 17 × 7 – 9 × 7

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2. In the boxes below, fill '<', '>' or '=' after analysing the expressions on the LHS and RHS. Use reasoning and understanding of terms and brackets to figure this out and not by evaluating the expressions.
(a) (8 – 3) x 29 ___ (3 – 8) x 29
(b) 15 + 9 x 18 ___ (15 + 9) x 18
(c) 23 x (17 – 9) ___ 23 x 17 + 23 x 9
(d) (34 – 28) x 42 ___ 34 x 42 – 28 x 42
Solution:
(a) (8 – 3) x 29 ___ (3 – 8) x 29
Positive × 29 $\geq$ Negative × 29
∴ (8 – 3) x 29 $\geq$ (3 – 8) x 29.

(b) 15 + 9 x 18 ___ (15 + 9) x 18
Smaller value (multiplication first) $\leq$ Bigger Value (addition first)
∴ 15 + 9 x 18 $\leq$ (15 + 9) x 18.

(c) 23 x (17 – 9) ___ 23 x 17 + 23 x 9
Smaller value (involves subtraction of terms) $\leq$ Bigger value (involves addition of terms)
23 x (17 – 9) $\leq$ 23 x 17 + 23 x 9.

(d) (34 – 28) x 42 ___ 34 x 42 – 28 x 42
This is a property called distributive property, so both are equal.
(34 – 28) x 42 $=$ 34 x 42 – 28 x 42.

3. Here is one way to make 14: 2 x (1 + 6) = 14. Are there other ways of getting 14? Fill them out below:
(a) _____× (_____+_____) = 14
(b) _____× (_____+_____) = 14
(c) _____× (_____+_____) = 14
(d) _____× (_____+_____) = 14
Solution:
(a) 2 × (3 + 4) = 14
(b) 7 × (2 + 0) = 14
(c) 2 × (5 + 2) = 14
(d) 2 × (0 + 7) = 14

4. Find out the sum of the numbers given in each picture below in at least two different ways. Describe how you solved it through expressions.

Solution:
(i) Sum = $4 \times 5 + 8 \times 4 = 20 + 32 = 52$.
Also, Sum = $4 \times (5 + 8) = 4 \times 13 = 52$.

(ii) Sum = $5 \times 8 + 6 \times 8 = 40 + 48 = 88$.
Also, Sum = $8 \times (5 + 6) = 8 \times (11) = 88$.

Figure it out

1. Read the situations given below. Write appropriate expressions for each of them and find their values.
(a) The district market in Begur operates on all seven days of a week. Rahim supplies 9 kg of mangoes each day from his orchard and Shyam supplies 11 kg of mangoes each day from his orchard to this market. Find the amount of mangoes supplied by them in a week to the local district market.
(b) Binu earns ₹20,000 per month. She spends ₹5,000 on rent, ₹5,000 on food, and ₹2,000 on other expenses every month. What is the amount Binu will save by the end of a year?
(c) During the daytime a snail climbs 3 cm up a post, and during the night while asleep, accidentally slips down by 2 cm. The post is 10 cm high, and a delicious treat is on its top. In how many days will the snail get the treat?
Solution:
(a) Mangoes supplied by Rahim per day = 9 kg
Mangoes supplied by Shyam per day = 11 kg
Total amount of mangoes supplied by both in a week = $7 \times (9 + 11)$ kg
$= 7 \times 9 + 7 \times 11$
$= 63 + 77 = 140$ kg.

(b) Total salary = ₹20,000
Rent expenses = ₹5,000
Food expenses = ₹5,000
Other expenses = ₹2,000
Total amount saved at the end of year = $12 \times \{20,000 – (5000 + 5000 + 2000)\}$
$= 12 \times \{20,000 – 12,000\}$
$= 12 \times 8,000 = ₹96,000$.

(c) Height of post = 10 cm
Climb during the day = 3 cm

Slip during the night = 2 cm
Let, total days taken by snail = y
∴ $10 = y \times (3 - 2)$
$10 = y \times 1$
$y = 10$.
Therefore, the snail will take 10 days to reach the top.

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2. Melvin reads a two-page story every day except on Tuesdays and Saturdays. How many stories would he complete reading in 8 weeks? Which of the expressions below describes this scenario?
(a) $5 \times 2 \times 8$
(b) $(7 - 2) \times 8$
(c) 8×7
(d) $7 \times 2 \times 8$
(e) $7 \times 5 - 2$
(f) $(7 + 2) \times 8$
(g) $7 \times 8 - 2 \times 8$
(h) $(7–5) \times 8$
Solution:
Stories completed in 8 weeks are represented by the expressions given below:
(b) $(7 - 2) \times 8$
(g) $7 \times 8 - 2 \times 8$

3. Find different ways of evaluating the following expressions:
(a) $1 - 2 + 3 - 4 + 5 - 6 + 7 - 8 + 9 - 10$
(b) $1 - 1 + 1 - 1 + 1 - 1 + 1 - 1 + 1 - 1$
Solution:
(a)
Way 1: $1 - 2 + 3 - 4 + 5 - 6 + 7 - 8 + 9 - 10 = (1 - 2) + (3 - 4) + (5 - 6) + (7 - 8) + (9 - 10)$
$= (-1) + (-1) + (-1) + (-1) + (-1) = (-5)$.

Way 2: $1 - 2 + 3 - 4 + 5 - 6 + 7 - 8 + 9 - 10 = 1 + 3 + 5 + 7 + 9 - 2 - 4 - 6 - 8 - 10$
$= (1 + 3 + 5 + 7 + 9) - (2 + 4 + 6 + 8 + 10)$
$= 25 - 30 = (-5)$.

Way 3: $1 - 2 + 3 - 4 + 5 - 6 + 7 - 8 + 9 - 10 = -1 + 3 - 4 + 5 - 6 + 7 - 8 + 9 - 10$
$= 2 - 4 + 5 - 6 + 7 - 8 + 9 - 10$
$= -2 + 5 - 6 + 7 - 8 + 9 - 10$
$= 3 - 6 + 7 - 8 + 9 - 10$
$= -3 + 7 - 8 + 9 - 10$
$= 4 - 8 + 9 - 10$
$= -4 + 9 - 10$
$= 5 - 10 = -5$

(b)

Way 1: $1 – 1 + 1 – 1 + 1 – 1 + 1 – 1 + 1 – 1 = (1 – 1) + (1 – 1) + (1 – 1) + (1 – 1) + (1 – 1)$
$= 0 + 0 + 0 + 0 + 0 = 0.$

Way 2: $1 – 1 + 1 – 1 + 1 – 1 + 1 – 1 + 1 – 1 = 1 + 1 + 1 + 1 + 1 – 1 – 1 – 1 – 1 – 1$
$= (1 + 1 + 1 + 1 + 1) – (1 + 1 + 1 + 1 + 1)$
$= 5 – 5 = 0.$

Way 3: $1 – 1 + 1 – 1 + 1 – 1 + 1 – 1 + 1 – 1 = 0 + 1 – 1 + 1 – 1 + 1 – 1 + 1 – 1$
$= 1 – 1 + 1 – 1 + 1 – 1 + 1 – 1$
$= 0 + 1 – 1 + 1 – 1 + 1 – 1$
$= 1 – 1 + 1 – 1 + 1 – 1$
$= 0 + 1 – 1 + 1 – 1$
$= 1 – 1 + 1 – 1$
$= 0 + 1 – 1$
$= 1 – 1 = 0.$

4. Compare the following pairs of expressions using '<', '>' or '=' or by reasoning.

(a) 49 – 7 + 8 ___ 49 – 7 + 8
(b) 83 x 42 – 18 ___ 83 x 40 – 18
(c) 145 – 17 x 8 ___ 145 – 17 x 6
(d) 23 x 48 – 35 ___ 23 x (48 – 35)
(e) (16 – 11) x 12 ___ -11 x 12 + 16 x 12
(f) (76 – 53) x 88 ___ 88 x (53 – 76)
(g) 25 x (42 + 16) ___ 25 x (43 + 15)
(h) 36 x (28 – 16) ___ 35 x (27 – 15)

Solution:

(a) 49 – 7 + 8 ___ 49 – 7 + 8
Both sides are exactly the same.
$\therefore$ 49 – 7 + 8 $=$ 49 – 7 + 8

(b) 83 x 42 – 18 ___ 83 x 40 – 18
3486 – 18 __ 3320 – 18
3468 $\geq$ 3302.
$\therefore$ 83 x 42 – 18 $\geq$ 83 x 40 – 18

(c) 145 – 17 x 8 ___ 145 – 17 x 6
145 – 136 __ 145 – 102
9 $\leq$ 43
$\therefore$ 145 – 17 x 8 $\leq$ 145 – 17 x 6

(d) 23 x 48 – 35 ___ 23 x (48 – 35)
1104 – 35 __ 23 $\times$ 13
1069 $\geq$ 299
$\therefore$ 23 x 48 – 35 $\geq$ 23 x (48 – 35)

(e) (16 – 11) x 12 ___ -11 x 12 + 16 x 12

5×12 __ -132 + 192

60 $\underline{=}$ 60

∴ (16 – 11) x 12 $\underline{=}$ -11 x 12 + 16 x 12

(f) (76 – 53) x 88 ___ 88 x (53 – 76)

23×88 __ 88×-23

2024 $\underline{\geq}$ -2024

∴ (76 – 53) x 88 $\underline{\geq}$ 88 x (53 – 76)

(g) 25 x (42 + 16) ___ 25 x (43 + 15)

25×58 __ 25×58

1450 $\underline{=}$ 1450

∴ 25 x (42 + 16) $\underline{=}$ 25 x (43 + 15)

(h) 36 x (28 – 16) ___ 35 x (27 – 15)

36×12 __ 35×12

432 $\underline{\geq}$ 420

∴ 36 x (28 – 16) $\underline{\geq}$ 35 x (27 – 15)

5. Identify which of the following expressions are equal to the given expression without computation. You may rewrite the expressions using terms or removing brackets. There can be more than one expression which is equal to the given expression.

(a) 83 – 37 – 12

(i) 84 – 38 – 12

(ii) 84 – (37 + 12)

(iii) 83 – 38 – 13

(iv) -37 + 83 – 12

(b) 93 + 37 × 44 + 76

(i) 37 + 93 x 44 + 76

(ii) 93 + 37 x 76 + 44

(iii) (93 + 37) x (44 + 76)

(iv) 37 x 44 + 93 + 76

Solution:

(a) 83 – 37 – 12

(i) 84 – 38 – 12 contains different terms than the given expression. Therefore, it is not equal to the original expression.

(ii) 84 – (37 + 12) = 84 – 37 – 12 which is same as the given expression.

(iii) 83 – 38 – 13 contains different terms than the given expression. Therefore, it is not equal to the original expression.

(iv) -37 + 83 – 12 = 83 – 37 – 12 which is same as the given expression.

∴ (a) is equal to (ii) and (iv).

(b) 93 + 37 × 44 + 76 = 93 + (37 × 44) + 76
(i) 37 + 93 x 44 + 76 = 37 + (93 x 44) + 76. The multiplication uses different numbers than the given expression. Therefore, it is not equal to the original expression.

(ii) 93 + 37 x 76 + 44 = 93 + (37 x 76) + 44. The multiplication uses different numbers than the given expression. Therefore, it is not equal to the original expression.

(iii) (93 + 37) x (44 + 76). The grouping and operation order are different than the given expression. Therefore, it is not equal to the original expression.

(iv) 37 x 44 + 93 + 76 = (37 × 44) + 93 + 76 which can be rearranged as 93 + (37 × 44) + 76. Therefore, it is equal to the original expression.
∴ (b) is equal to (iv).

5. Choose a number and create ten different expressions having that value.
Solution:
Number chosen: 7
(i) 3 + (9 – 5)
(ii) (10 – 5) + 2
(iii) 2 × 3 + 1
(iv) (11 – 8) + (15 – 11)
(v) (8 × 2) – 9
(vi) 5 + (6 – 4)
(vii) 2 + (9 – 4)
(viii) (12 × 2) – 17
(ix) 3 + (8 – 4)
(x) (7 × 2) – 7