Sentences (b), (d) and (f) belong to another group. The general statement for this group is $(a \times b) \times c = a \times (b \times c)$.

Class Activity 7

Verify that the following sentences are true. Classify them into groups and write a general statement for each group.

1. $7 + 2 = 2 + 7$
2. $13 + 5 = 5 + 13$
3. $2 + 6 = 6 + 2$
4. $7 + 3 = 3 + 7$
5. $3 \times 2 = 2 \times 3$
6. $1 \times 5 = 5 \times 1$
7. $10 \times 1 = 1 \times 10$
8. $7 \times 8 = 8 \times 7$
9. $(3 + 4) + 5 = 3 + (4 + 5)$
10. $(2 + 3) + 8 = 2 + (3 + 8)$
11. $(15 + 5) + 4 = 15 + (5 + 4)$
12. $(7 + 8) + 9 = 7 + (8 + 9)$
13. $(1 \times 2) \times 3 = 1 \times (2 \times 3)$
14. $(5 \times 6) \times 9 = 5 \times (6 \times 9)$
15. $(3 \times 5) \times 8 = 3 \times (5 \times 8)$
16. $(2 \times 3) \times 4 = 2 \times (3 \times 4)$
17. $5 \times (3 + 4) = 5 \times 3 + 5 \times 4$
18. $6 \times (8 + 11) = 6 \times 8 + 6 \times 11$
19. $9 \times (8 + 5) = 9 \times 8 + 9 \times 5$
20. $2 \times (6 + 3) = 2 \times 6 + 2 \times 3$
21. $(7 + 2) \times 3 = 7 \times 3 + 2 \times 3$
22. $(6 + 5) \times 2 = 6 \times 2 + 5 \times 2$
23. $(9 + 1) \times 4 = 9 \times 4 + 1 \times 4$
24. $(7 + 5) \times 6 = 7 \times 6 + 5 \times 6$

The general statements obtained in the above class activity describe some basic arithmetic properties. We refer to these as **number laws**. It is useful to know their names for future references.

1. The commutative law of addition:

$$a + b = b + a$$

2. The commutative law of multiplication:

$$a \times b = b \times a$$

3. The associative law of addition:

$$(a + b) + c = a + (b + c)$$

4. The associative law of multiplication:

$$(a \times b) \times c = a \times (b \times c)$$

5. The distributive law of multiplication with respect to addition:

$$a \times (b + c) = (a \times b) + (a \times c)$$
$$(b + c) \times a = (b \times a) + (c \times a)$$

Exercise 1.9

answers on p. 419

1. Name the number law illustrated by each of the following sentences.

(a) $2 + 3 = 3 + 2$ **(b)** $(2 + 7) + 3 = 2 + (7 + 3)$

(c) $3 + (2 + 5) = (3 + 2) + 5$ **(d)** $7 \times 8 = 8 \times 7$

(e) $(9 \times 4) \times 3 = 9 \times (4 \times 3)$ **(f)** $7 \times (8 \times 5) = (7 \times 8) \times 5$

2. Express each of the following in the form of $(a \times b) + (a \times c)$ or $(b \times a) + (c \times a)$.

(a) $3 \times (4 + 5)$ **(b)** $3 \times (7 + 2)$ **(c)** $3 \times (8 + 4)$

(d) $(5 + 2) \times 4$ **(e)** $(3 + 1) \times 7$ **(f)** $(7 + 4) \times 11$

3. Copy and complete the following sentences.

(a) $3 \times \_\_\_\_ = 7 \times 3$

(b) $(7 \times 8) \times 3 = \_\_\_\_ \times (8 \times 3)$

(c) $5 + \_\_\_\_ = 6 + 5$

(d) $\_\_\_\_ \times (10 + 3) = (2 \times 10) + (2 \times 3)$

(e) $(58 + \_\_\_\_) \times 4 = (58 \times 4) + (20 \times 4)$

(f) $(3 + 4) + \_\_\_\_ = 3 + (4 + 5)$

4. Consider the following groups of statements. Check whether they are true, and then write a general statement for each group.

(a) $5 \times 1 = 1 \times 5 = 5$
$3 \times 1 = 1 \times 3 = 3$
$25 \times 1 = 1 \times 25 = 25$

(b) $8 + 0 = 0 + 8 = 8$
$5 + 0 = 0 + 5 = 5$
$11 + 0 = 0 + 11 = 11$

5. By inspection, match each expression in column *A* with one in column *B*. Give your reason.

For example, (a) is equal to (i) by the associative law of addition.

Column *A*	Column *B*
(a) $(3 + 2) + 4$	(i) $3 + (2 + 4)$
(b) $5 + (3 + 2)$	(ii) $(4 + 7) \times 2$
(c) $4 \times (3 + 7)$	(iii) $4 \times (6 + 3)$
(d) $(6 + 3) \times 4$	(iv) $5 + (2 + 3)$
(e) $(7 + 4) \times 2$	(v) $(1 + 2) \times 3 + (1 + 2) \times 4$
(f) $(9 \times 3) \times 2$	(vi) $(5 + 4) \times (3 \times 2)$
(g) $(1 + 2) \times (3 + 4)$	(vii) $(4 \times 3) + (4 \times 7)$
(h) $[(5 + 4) \times 3] \times 2$	(viii) $9 \times (3 \times 2)$
(i) $(5 + 3) + 6$	(ix) $6 + (5 + 3)$
(j) $12 + (3 + 5)$	(x) $(12 + 3) + 5$