

Easy-learn Maths Grade 7A

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Chapter 3. Algebra

Algebraic Expressions

Here we learn how we can use letters to represent numbers.

The following table shows the ages (in years) of Dora and her mother, Dorothy.

Dora's age (in years)	Dorothy's age (in years)
1	24
2	25
3	26
4	27
5	28

When Dora is 10 years old, how old will her mother be? Obviously $(10 + 23)$ years.

Let Dora's age be represented by x years.

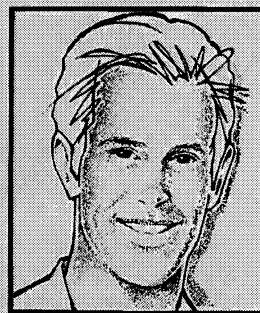
Dorothy is 23 years older than Dora. Therefore Dorothy's age is $(x + 23)$ years.

When $x = 10$, Dora is 10 years old. Dorothy will be $(x + 23) = (10 + 23) = 33$ years.

When $x = 15$, Dora is 15 years old. Dorothy will be $(x + 23) = (15 + 23) = 38$ years.

Look at the following table. It shows the cost of 1kg of fish.

1 kg fish	\$
1	8
2	16
3	24
4	32



How much will 10kg fish cost? Obviously $\$8 \times 10$

Let y be the number of kg of fish. The cost is $\$(8 \times y)$.

This can be written as $\$8y$ where we can omit the multiplication sign.

We cannot however write $\$y8$.

If $y = 10$, then $\$8y = \$(8 \times 10) = \$80$. This means that 10 kg of fish will cost \$80.

If $y = 13$, then $\$8y = \$(8 \times 13) = \$104$. This means that 10 kg of fish will cost \$104.

Algebraic Expressions

Set 3A. Write the correct answers on the lines provided.

1. William is n years old. Richard is 4 years older than William.

(a) In 5 years' time, William will be _____ years old.

(b) In 5 years' time, Richard will be _____ years old.

2. Jill is m years old. Her mother is 3 times as old.

(a) Her mother is _____ years old.

(b) Their total age is _____ years old.

3. Jessie bought 3 pens costing \$ w each and gave the cashier \$10.

Their cost is _____ and she should get back _____.

4. Keith weighs y kg. Mildred weighs 15 kg more. Nora weighs n kg less than Mildred.

(a) Mildred's weight is _____ kg.

(b) Nora's weight is _____ kg.

5. There are x boys and y girls at a party. Each boy donated \$3 and each girl donated

\$2. The total amount of donation collected is _____.

6. A rectangle measures x cm by y cm.

(a) The perimeter of the rectangle is _____ cm.

(b) The area of the rectangle is _____ sq. cm.

7. A square has side s cm.

(a) The perimeter of the square is _____ cm.

(b) The area of the square is _____ sq. cm.

8. Jason purchased 5 apples costing \$ a each. He also bought 8 pears costing \$ b each.

The apples cost \$ _____ and the pears cost \$ _____.

In all, Jason spent \$ _____.

Algebraic Expressions

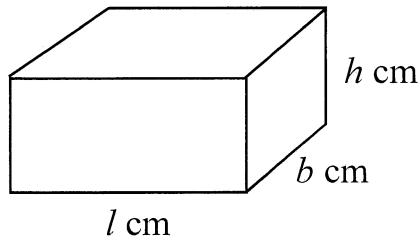
Set 3A. Write the correct answers on the lines provided.

9. Kenneth bought 7 apples. He gave $\$x$ to the cashier and received $\$y$ change.

(a) The 7 apples cost \$ _____ and each apple cost \$ _____.

(b) Each apple cost _____ cents.

10. A rectangular prism measures l cm by b cm by h cm.



The volume of the rectangular prism is _____ cu. cm.

11. Lydia has $\$p$. She bought 5 books costing $\$q$ each.

(a) The 5 books cost \$ _____.

(b) Lydia has left \$ _____.

12. Melany earns $\$2k$ a month. She spends $\$x$ on clothes and $\$y$ on food and saves the rest.

(a) Melany saves \$ _____ per month.

(b) In 10 months, Melany would have saved \$ _____.

13. Patrick, Paul and Peter weighs a kg, b kg and c kg respectively.

(a) Their total weight is _____ kg.

(b) Their average weight is _____ kg.

14. The average weight of Neil and Opal is m kg.

Their total weight is _____ kg.



Algebraic Expressions

Set 3A. Write the correct answers on the lines provided.

15. A pencil-box costs \$7 and 13 pens cost \$y.

The cost of 8 pencil-boxes is \$ _____ ; the cost of each pen is \$ _____.

Thus the cost of 8 pencil-boxes and 1 pen is \$ _____.

16. Molly bought 4 oranges for \$x and 3 pears for \$y.

(a). Each orange costs \$ _____ and each pear costs \$ _____.

(b). The total cost of 20 oranges and 12 pears is \$ _____.

17. Sandra bought 2 kg of tomatoes for \$j per kg. and some eggs for \$1.80.

She gave the grocer \$20 and received some change. She received \$ _____.

***18.** Lily had \$12k. She bought a T-shirt for \$6k, a purse for \$k and a book for \$3.

Find the value of k if she was left with \$22.

Lily had \$ _____ at first.

19. Donna bought r apples and p oranges. If each apple costs \$d and each orange costs

\$m, then the total cost of Donna's purchase is \$ _____.

20. The average weight of k men is w kg and the average weight of n women is r kg.

(a) The total weight of the men is _____ kg.

(b) The total weight of the women is _____ kg.

(c) The average weight of the men and women is _____ kg.

21. The average weight of 5 girls is w kg.

Another girl who weighs 30 kg joins them.

The total weight of the 6 girls is _____ kg.

The average weight of the 6 girls is _____ kg.

Algebraic Expressions

Set 3A. Write the correct answers on the lines provided.

*22. Kenneth bought a toys for \$80. He then sold them at a profit of \$ b each.
Find the total selling price of the toys in terms of a and b .

*23. Mindy is x years old. Her father is y years older. What will their total age be in z years' time in terms of x , y and z ?

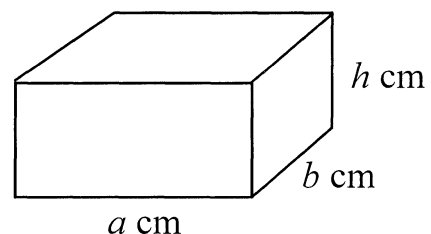
*24. Mike worked in a pizza restaurant and was paid \$ q an hour on a weekday and \$4 an hour on Saturday and Sunday.

(a) How much would he be paid for working y hours a day for a full week?

(b) If $q = 2.50$, how much will Mike get for working 5 hours a day for a full week?

*25. Patrick bought 7 apples. He gave \$ x to the cashier and received \$ m change.
Find the cost of each apple in cents.

*26. A rectangular prism measures a cm by b cm by h cm. Find the volume of water in the prism when it is $\frac{3}{4}$ full.



Algebraic Expressions

Set 3A. Write the correct answers on the lines provided.

- *27. Kelly has r peaches. She gives away s peaches and packs the remainder equally into u bags.

There are _____ peaches in each bag. (in terms of r , s and u)

- *28. Rachael paid $\$8p$ for 5 similar pants and 2 shirts. If each pair of pants cost $\$20$, find the cost of each shirt in terms of p .

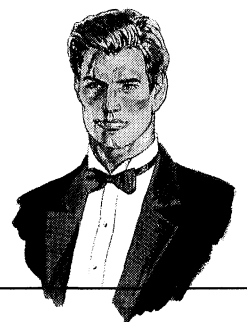
Each shirt costs \$ _____.

- *29. Admission tickets to a zoo costs $\$h$ for adults and $\frac{1}{2}$ price for children. During a school excursion, 60 children were accompanied by 3 teachers.

The total paid for the admission tickets was \$ _____.

- *30. Andy sold e cars at $\$k$ each and made a total profit of $\$30\,000$. Find the cost price of the cars in terms of e and k .

The cost price of each car is \$ _____.



Simplify Algebraic Expressions

We simplify algebraic expression by grouping all the like terms together and group all the same signs together, then we apply the rule:

(a) same sign; we add

(b) different sign; we subtract

Example 1: Simplify $4a + 3b + 2a + 5b$

$$\begin{aligned} & 4a + 3b + 2a + 5b \\ &= 4a + 2a + 3b + 5b \quad (\text{group all the same terms together}) \\ &= 6a + 8b \end{aligned}$$

Note: $6a$ means $+6a$, but we do not write the $+$ at the beginning of a statement. However, if it is $-6a$, then we have to write the '-' sign.

Example 2: Simplify $10b - 3b + 6b + 8b$

$$\begin{aligned} & 10b - 3b + 6b + 8b \\ &= 10b + 6b + 8b - 3b \quad (\text{gather all the same signs together}) \\ &= 24b - 3b \\ &= 21b \end{aligned}$$

Note; Here, we have $+24b - 3b$. Different sign we subtract and then follow the sign of the larger number. Here $+24$ is greater than -3 , so we take $+$ for the final answer.

Example 3: Simplify $3c + c - 6c - 8c$

$$\begin{aligned} & 3c + c - 6c - 8c \\ &= 4c - 14c \\ &= -10c \end{aligned}$$

Note: Add all the positives together $3c + c = +4c$.

Add all the negatives together $-6c - 8c = -14c$.

Different sign we subtract. $+4c - 14c = -10c$

Here we adopt the minus sign as the sign next to the larger number is a negative.

Do you know why $-6c - 8c = -14c$?

If you owe \$6 and you borrow another \$8, altogether you would owe \$14.

All the negatives are added together and we adopt the negative sign to show the total amount owed.

Example 4: Simplify $7r - 3r + q - 8r - q + 6q$

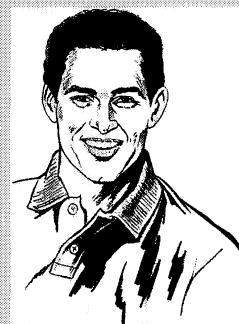
$$\begin{aligned} & 7r - 3r + q - 8r - q + 6q \\ &= 7r - 3r - 8r + q - q + 6q \\ &= 7r - 11r + 6q \\ &= -4r + 6q \\ &= 6q - 4r \end{aligned}$$

Note: The preferred answer is the one starting with a positive.

Example 5: Simplify $11x + 3y - 5x - 8x - 9y$

$$\begin{aligned} & 11x + 3y - 5x - 8x - 9y \\ &= 11x - 5x - 8x + 3y - 9y \\ &= 11x - 13x - 6y \\ &= -2x - 6y \end{aligned}$$

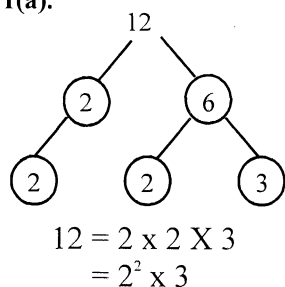
Note: In this instance, we have both negative. The answer can also be $-6y - 2x$



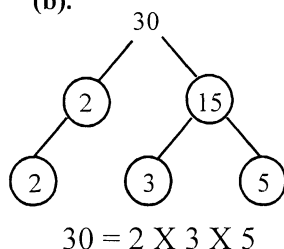
Answers to Easy-learn Maths Grade 7A

Set 2E. (page 21 Tto 23)

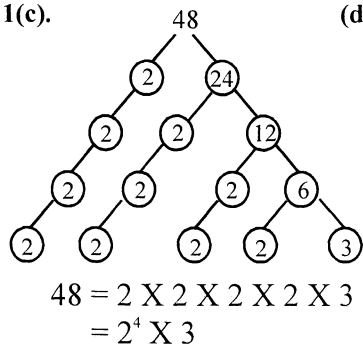
1(a).



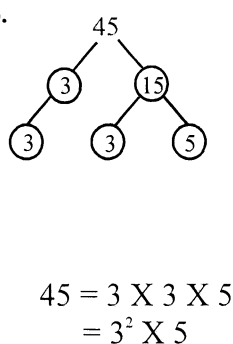
(b).



1(c).



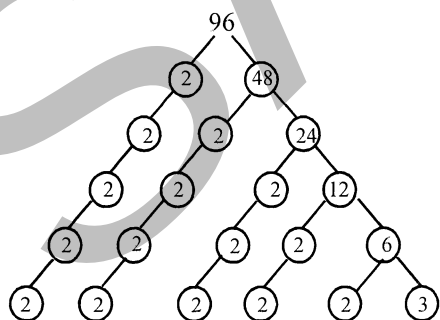
(d).



2. (a). $2^3 \times 7$ (b). $2^2 \times 7$ (c). $2^2 \times 3 \times 7$
 (d). $2^2 \times 5^2$ (e). 3×7^2 (f). $3^2 \times 5^2$
 (g). $2^3 \times 3^2 \times 5$ (h). $2^7 \times 5$
 (i). $2^2 \times 3^3$ (j). $2^2 \times 3^2 \times 7$ (k). $2^2 \times 3^4$
 (l). $2^6 \times 3$ (m). 2^8 (n). $3^4 \times 7$

Set 2F. (page 23 to 25)

1. 144 2. 3280 3. 30 4. 16 266; 16 300 5. 50
 6. 14 204 710 7. ten thousand, 30 000 8. 5^3 9. 2000
 10. hundred thousand
 11. 50 12. 1 13. 4500 14. 32 15. 234 16. 18 17. 96
 18. prime numbers are: 83, 89, 97; sum = 269
 19. $2^3 \times 7^2$ 20. 24
 21. 6, 12, 18, 24, 30, 36, 42, 48
 22. 648 23. $2^4 \times 3^2$ 24. 5, 7, 17
 25. 18, 21, 24, 45 26. $3^2 \times 5 \times 7$
 27.



28. 630 29. $2^2 \times 5^2$ 30. $2^3 \times 3^4$

Set 3A. (page 27)

- 1(a). $(n+5)$ (b). $(n+4)+5 = (n+9)$
 2(a). $3m$ (b). $(m+3m)$
 3. $\$3w$, $\$(10-3w)$
 4(a). $(y+15)$ (b). $(y+15-n)$
 5. $\$(3x+2y)$
 6(a). $(2x+2y)$ (b). xy
 7(a). $4s$ (b). $s \times s$
 8. $5a$; $8b$; $(5a+8b)$
 9(a). $x-y$; $(x-y) \div 7$ (b). $(x-y) \times 100 \div 7$
 10. $l \times b \times h$ or $l b h$
 11(a). $5q$ (b). $(p-5q)$
 12(a). $(2k-x-y)$ (b). $(2k-x-y) \times 10$
 13(a). $(a+b+c)$ (b). $(a+b+c) \div 3$
 14. $2m$
 15. 56 ; $y \div 13$ or $\frac{y}{13}$; $(56 + \frac{y}{13})$
 16(a). $\frac{x}{4}$, $\frac{y}{3}$ (b). $\frac{x}{4} \times 20 + \frac{y}{3} \times 12 = 5x + 4y$
 17. $(20-2j-1.80)$; $(18.20-2j)$ *18. 60 19. $(rd+pm)$
 20(a). kw (b). nr (c). $\frac{kw+nr}{k+n}$ 21. $(5w+30)$; $\frac{5w+30}{6}$
 *22. $\$(80+ab)$ *23. $(2x+y+2z)$ years
 *24(a). $\$(5yq+8y)$ (b). $\$102.50$ *25. $100 \frac{(x-m)}{7}$ cents
 *26. $\frac{3}{4} abh \text{ cm}^3$ *27. $\frac{r-s}{u}$ *28. $(4p-50)$
 *29. $33h$ *30. $(ek-30\,000) \div e$

Set 3B. (page 33)

1. 19 2. 3 3. $3y+4$ 4. $7a+15$ 5. $2a-4$
 6. $7s+6$ 7. $7n-2m$ 8. $3-7x$ 9. $6r+6$ 10. $6a+13$
 11. $2-8h$ 12. $3a+2b-6$ 13. $13p+5q+5$
 14. $3h+6k+6$ 15. $6x+2$ 16. $8x-8y+30$ 17. $12q-21p+21$

Set 3C. (page 34)

1. $4ab$ 2. $40ab$ 3. $-24a$ 4. $5b$ 5. $8a-6b$ 6. $15y^2$
 7. $16y^3$ 8. $120t^3$ 9. 4 10. $6n$ 11. $16a$ 12. $100-3a^3$

Set 3D. (page 36)

1. $15-k^2+2k$ 2. k^2+12k 3. $3mn^2-2mn$ 4. $40-6m-3n$
 5. $6+20p-65r$ 6. $13m-8$ 7. $11ac-15ab$ 8. $15b-3a$
 9. $10-15ac$ 10. $11c-11a$ 11. $-2-3w$ or $-3w-2$
 12. $4m+15$ 13. $3g-21$ 14. $2ac-ab$ 15. $8b-24a$ 16. $34+3p$
 17. $19w-41$ 18. $18g+60$ 19. $-21h-42$ 20. $32-4u$

Set 3E. (page 38)

1. 135 2. 186 3. 4 4. -252 5. 59 6. $5\frac{1}{3}$ 7. 7
 8. $15\frac{1}{3}$ 9. 168 10. 101 11. 204

Set 3F. (page 39 to 41)

1. $10f+5$ 2. $78-18y$ 3. $20n-150$ 4. $62d-36$
 5. 12 6. $9y \text{ cm}$ 7. $4y \text{ cm}$ 8. 6 9. 55

10. $\$(20 + \frac{b}{3})$ 11. $\$ \frac{8y}{x}$

- 12(a). $(3x+20)$ (b). $\frac{y}{2}-8x$ (c). $3k-60$ (d). $(50m+200f)$ cents
 *13. $32x^2$ *14. $\$(y+12)$ *15. $\$15p$