

Primary 6 Mathematics: Chapter 1 Algebra

Section A Multiple-choice Questions

For each question, choose the correct answer and write its number in the brackets provided.

1 Which of the following is an algebraic expression? ()

- | | |
|-----------------------|---------------------|
| (1) $7 + 5 = 12$ | (2) $p + 7$ |
| (3) $4 \times 6 = 24$ | (4) $30 \div 5 = 6$ |

2 Which algebraic expression represents 8 less than n ? ()

- | | |
|-------------|-------------|
| (1) $8 - n$ | (2) $n - 8$ |
| (3) $n + 8$ | (4) $8n$ |

3 There are 6 bottles of juice in each carton. Mr Lee bought y cartons and 4 additional bottles of juice. How many bottles of juice did he buy altogether? ()

- | | |
|-----------------|--------------|
| (1) $6 + y + 4$ | (2) $6y + 4$ |
| (3) $10y$ | (4) $24y$ |

4 A total of q sweets is shared equally among 5 children. How many sweets does each child receive? ()

- | | |
|----------------|----------------|
| (1) $5q$ | (2) $q - 5$ |
| (3) $q \div 5$ | (4) $5 \div q$ |

5 Simplify $7m + 3m - 2m$. ()

- | | |
|-----------|-----------|
| (1) 8 | (2) $8m$ |
| (3) $12m$ | (4) $14m$ |

6 Simplify $12p + 5p - 7 + 2p$. ()

- | | |
|--------------|---------------|
| (1) $7p + 5$ | (2) $7p + 19$ |
| (3) $3p + 5$ | (4) $7p - 5$ |

7 Find the value of $4a + 7$ when $a = 3$. ()

- | | |
|--------|--------|
| (1) 15 | (2) 16 |
| (3) 19 | (4) 28 |

8 Find the value of $(3b + 6) \div 5$ when $b = 3$. ()

- | | |
|-------|--------|
| (1) 3 | (2) 5 |
| (3) 9 | (4) 15 |

9 Siti has x stickers. Her brother has 5 more stickers than she does. They have 29 stickers altogether. Which equation represents this information? ()

- | | |
|------------------------|-------------------|
| (1) $x + 5 = 29$ | (2) $2x = 29 + 5$ |
| (3) $x + (x + 5) = 29$ | (4) $5x + x = 29$ |

10 Find the value of k in $6k = 42$. ()

- (1) 6 (2) 7
(3) 8 (4) 36

11 Find the value of p in $4p + 3 = 31$. ()

- (1) 6 (2) 7
(3) 8 (4) 28

12 There are 74 adults and children at a concert. There are 10 more children than adults. If x represents the number of adults, how many adults are there? ()

- (1) 27 (2) 32
(3) 37 (4) 42

13 Which expression is equivalent to $3r + 8$ for all values of r ? ()

- (1) $3(r + 8)$ (2) $r + r + r + 4 + 4$
(3) $3r + 4$ (4) $r + 11$

14 Ben has \$20. He buys p pens at \$3 each. Which value of p is not possible? ()

- (1) 2 (2) 4
(3) 6 (4) 7

15 A pen costs \$ f . A book costs \$($f + 2$). The total cost of 3 pens and 2 books is \$29. What is the cost of one pen? ()

- (1) \$4 (2) \$5
(3) \$6 (4) \$7

Section B Short-answer Questions

16 A shelf has n books at first. Complete the table with an algebraic expression for the number of books on the shelf after each change.

Change	Number of books on the shelf
Number of books at first	n
Add 2 more books	
Remove 4 books	
Add 9 more books	

17 Write an algebraic expression for each statement.

- (a) The sum of 14 and h .
(b) 9 less than p .
(c) The product of 8 and q .
(d) Divide k by 6.

18 Cindy is 148 cm tall. Farah is h cm shorter than Cindy.

- (a)** Express Farah's height in terms of h .
- (b)** Express the total height of the two girls in terms of h . Give your answer in the simplest form.

19 Amir is a years old. His sister is 5 years older than he is.

- (a)** How old is his sister now in terms of a ?
- (b)** What will be the total age of Amir and his sister in 4 years' time? Give your answer in terms of a in the simplest form.

20 A notebook costs \$ x . A file costs \$3 less than the notebook.

- (a)** Express the cost of the file in terms of x .
- (b)** Find the total cost of 2 such notebooks and 3 such files in terms of x . Give your answer in the simplest form.

21 There are b beads in each of 8 boxes. There are another 15 loose beads. How many beads are there altogether? Give your answer in terms of b .

22 A total of n stickers is shared equally among 4 children. One of the children uses 6 of her stickers. How many stickers does she have left? Give your answer in terms of n .

23 There are k red flags, $(k + 3)$ blue flags and $(2k - 1)$ green flags in a hall. Find the total number of flags in terms of k . Give your answer in the simplest form.

24 A teacher has 5 packets of stickers. There are p stickers in each packet. She gives away 12 stickers. Find the number of stickers she has left in terms of p .

25 A pen and a pencil case cost \$ t altogether. The pencil case costs \$6 more than the pen. Find the cost of the pen in terms of t .

26 Simplify each algebraic expression.

- (a)** $6a + 5a$
- (b)** $14b - 9b$
- (c)** $3c + 4c - 2c$
- (d)** $20d - 7d - 5d$

27 Simplify each algebraic expression.

- (a)** $4 + 7m + 9 + 2m$
- (b)** $15n - 6 + 4n - 9$
- (c)** $12p + 8 - 5p + 3 - p$
- (d)** $8q + 30 - 5q - 12$

28 Fill in each box with the correct algebraic expression.

- (a) $9p = 4p + \square$
 (b) $15q - \square = 7q$
 (c) $3h + \square + 5 = 8h + 5$
 (d) $\square + 7r - 3 = 10r - 3$

29 Two of the expressions below are equivalent to $6x + 5$. Circle them and explain how you know.

A $4x + 2x + 3 + 2$ B $8x - 2x + 5$ C $6x + 10$ D $5x + x + 4$

30 Daniel writes $y + y = y^2$. Explain Daniel's error and write the correct simplified expression.

31 There are 4 boxes of red clips and 3 boxes of blue clips. Each box contains c clips. There are also 7 loose red clips and 2 loose blue clips. Find the total number of clips in terms of c . Give your answer in the simplest form.

32 Find the missing number.

$$18m + 7 - \square m - 2 = 11m + 5$$

33 Complete the table.

Algebraic expression	$x = 4$	$x = 8$
$x + 5$		
$3x$		
$(x + 4) \div 2$		
$5x - 6$		

34 Consider the expression $7d + 4 - 2d + 9$.

- (a) Simplify the expression.
 (b) Find its value when $d = 6$.

35 Find the value of $(4p - 8) \div 2$ when $p = 7$.

36 A child's ticket costs \$ b . An adult's ticket costs \$ $(b + 6)$.

- (a) Find the total cost of 2 adult tickets and 3 child tickets in terms of b . Give your answer in the simplest form.
 (b) Find the total cost when $b = 8$.

37 A small crate contains n bottles. A large crate contains $3n$ bottles. Five loose bottles are placed beside each crate.

- (a) Find the total number of bottles in terms of n . Give your answer in the simplest form.
 (b) Find the total number of bottles when $n = 11$.

38 Mrs Lim had 120 sweets. She gave away w sweets and packed the remaining sweets equally into 5 bags.

- (a) How many sweets were packed into each bag in terms of w ?
- (b) How many sweets were packed into each bag when $w = 20$?

39 One box contains k red counters. A second box contains twice as many red counters. There are also 5 green counters.

- (a) Find the total number of counters in terms of k . Give your answer in the simplest form.
- (b) Find the total number of counters when $k = 12$.

40 Find the value of each expression when $m = 6$.

- (a) $3m + 7$
- (b) $5m - 5$
- (c) What do you notice about the two values? Are $3m + 7$ and $5m - 5$ equivalent expressions? Explain by finding their values when $m = 4$.

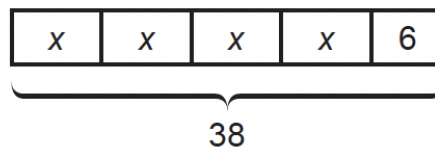
41 Find the value of each letter.

- (a) $a + 17 = 45$
- (b) $5b = 60$
- (c) $3c + 8 = 29$

42 Some stickers are shared equally among 6 pupils. Each pupil receives 7 stickers. Let d be the total number of stickers.

- (a) Write an equation involving d .
- (b) Find the value of d .

43 The bar model represents the equation $4x + 6 = 38$. Find the value of x .



44 The sum of two numbers is 68. The greater number is 12 more than the smaller number. Let x be the smaller number.

- (a) Write an equation involving x .
- (b) Find the two numbers.

45 Alice has x bracelets. Bernice has 4 times as many bracelets as Alice. They have 55 bracelets altogether. How many bracelets does Alice have?

46 Ravi thinks of a number. He multiplies the number by 6 and then subtracts 5. His answer is 37. Find the number.

47 A shop had 7 boxes of bottles. There were x bottles in each box. After 11 bottles were sold, 45 bottles remained. Find the value of x .

48 A rope is 85 cm long. It is cut into three pieces measuring $3r$ cm, $(r + 5)$ cm and r cm. Find the length of the shortest piece.

49 A school bought 4 packets of pencils and 3 packets of erasers. There were p pencils in each packet and 8 erasers in each packet. There were 64 items altogether.

- (a) Write an equation involving p .
- (b) Find the number of pencils in each packet.
- (c) How many more pencils than erasers were bought altogether?

50 A ribbon 72 cm long is cut into 5 equal long pieces and 2 equal short pieces. Each long piece is x cm long and each short piece is 6 cm long. Find the length of each long piece.

Section C Structured and Problem-solving Questions

51 A bicycle rental shop charges a fixed fee of \$5 and \$3 for each hour of rental.

- (a) Find the total rental charge for h hours in terms of h .
- (b) Rina paid \$26 to rent a bicycle. Write an equation involving h .
- (c) For how many hours did she rent the bicycle?

52 A store has 4 trays of red beads and 2 trays of blue beads. Each tray contains k beads. There are also 5 loose beads.

- (a) Write an algebraic expression for the total number of beads, showing the red and blue beads separately.
- (b) Simplify the expression in part (a).
- (c) Find the total number of beads when $k = 9$.

53 The perimeter of a rectangular noticeboard is $8p$ cm. Its breadth is 6 cm.

- (a) Find the length of the noticeboard in terms of p . Give your answer in the simplest form.
- (b) Find the length of the noticeboard when $p = 5$.

54 Ravi took t seconds to complete a race. Ken took 12 seconds longer than Ravi. Mei took 8 seconds less than Ravi.

- (a) Express the time taken by Ken and Mei separately in terms of t .
- (b) Find the total time taken by the three runners in terms of t . Give your answer in the simplest form.
- (c) Find their total time when $t = 70$.

55 A florist placed p flowers in each of 5 vases and had 7 flowers left. She later added 3 more flowers to each vase.

- (a) Find the total number of flowers she had at first in terms of p .
- (b) Find the total number of flowers after she added the extra flowers. Give your answer in the simplest form.
- (c) Find the final number of flowers when $p = 8$.

56 The table shows the prices of three items at a café.

Item	Price
Drink	\$d
Sandwich	\$(d + 4)
Fruit cup	\$(d - 1)

- (a) A group bought 2 sandwiches and 3 drinks for \$38. Write an equation involving d .
 (b) Find the price of one drink.
 (c) Find the total cost of one drink, one sandwich and one fruit cup.

57 A father is 4 times as old as his son. His daughter is 3 years older than his son. Their total age is 63 years.

- (a) Let the son's age be x years. Express the ages of the father and daughter in terms of x .
 (b) Find the son's age.
 (c) How old will the father be in 5 years' time?

58 The sum of 3 numbers is 72. The second number is 4 more than the first number. The third number is 4 more than the second number. Use algebra to find the greatest number.

59 An isosceles triangle has two equal sides of $(x + 5)$ cm each and a base of $2x$ cm. Its perimeter is 50 cm.

- (a) Write an algebraic expression for its perimeter in terms of x . Give your answer in the simplest form.
 (b) Write an equation involving x and find its value.
 (c) Find the lengths of the three sides.

60 Alan has x cards. Ben has 3 times as many cards as Alan. Chloe has 12 more cards than Alan. They have 92 cards altogether.

- (a) Write an equation involving x .
 (b) Find the number of cards each child has.

61 A red ribbon is r cm long. A blue ribbon is 5 cm longer than twice the length of the red ribbon. The two ribbons have a total length of 65 cm.

- (a) Express the length of the blue ribbon in terms of r .
 (b) Find the length of each ribbon.
 (c) Find the difference between their lengths.

62 Meijun had \$ x . Jane had 3 times as much money as Meijun. Jane spent \$140 and Meijun spent \$20. They then had equal amounts of money left. Draw a before-and-after model and find the amount of money Jane had at first.

63 Jar A contains n beads. Jar B contains 14 more beads than Jar A. Another 25 beads have not been placed into either jar. Jar B contains 38 beads.

- (a) Find the value of n .
 (b) How many beads are there altogether?

64 Three parcels have a total mass of 32 kg. Two identical large parcels each have a mass that is 4 kg more than the small parcel. Let the mass of the small parcel be p kg.

- (a) Express the mass of one large parcel in terms of p .
- (b) Write an equation involving p .
- (c) Find the mass of one large parcel.

65 A travel card contains \$50. Each train journey costs \$4.

- (a) Express the amount left on the card after r journeys.
- (b) Find the amount left after 8 journeys.
- (c) What is the greatest possible whole-number value of r ? Explain your answer.

66 Four students simplify $8a + 5 - 3a + 2$.

Aisha: $5a + 7$ Bala: $5a + 3$ Chen: $8a - 3a + 7a$ Dina: $10a - 3a$

- (a) Who is correct?
- (b) Explain one error made by another student.
- (c) Substitute $a = 4$ into the original expression and the correct simplified expression to check the answer.

67 The sum of the expressions in each row, column and diagonal of the square is $3x$.

$x + 3$	$\square$	$x + 1$
$x - 2$	x	$\square$
$\square$	$x + 4$	$x - 3$

- (a) Fill in the three empty boxes.
- (b) Find the nine numbers in the square when $x = 8$.
- (c) Use one row or column to explain why the sum is $3x$ for any value of x .

68 Machine A packs marbles into 4 boxes with k marbles in each box and adds 6 loose marbles. Machine B packs marbles into 2 boxes with $2k$ marbles in each box and adds 6 loose marbles.

- (a) Write an algebraic expression for the number of marbles packed by each machine.
- (b) Explain why the two machines always pack the same number of marbles.
- (c) How many marbles does each machine pack when $k = 7$?

69 A school has 8 boxes of pencils. Each box contains p pencils. There are also 12 loose pencils. All the pencils are shared equally among 6 classes, and each class receives 14 pencils.

- (a) Write an equation involving p .
- (b) Find the number of pencils in each box.
- (c) Find the total number of pencils in the 8 boxes, excluding the loose pencils.

70 A bookshop had 5 cartons of notebooks and 18 loose notebooks. Each carton contained x notebooks. The bookshop sold 2 full cartons and 6 loose notebooks. It packed all the remaining notebooks equally into 3 boxes, with 24 notebooks in each box.

- (a)** Express the number of notebooks remaining after the sale in terms of x . Give your answer in the simplest form.
- (b)** Write an equation involving x and find its value.
- (c)** How many notebooks did the bookshop have at first?



Answers

Questions 1–10

Question	Answer
1	(2)
2	(2)
3	(2)
4	(3)
5	(2)
6	(1)
7	(3)
8	(1)
9	(3)
10	(2)

Questions 11–20

Question	Answer
11	(2)
12	(2)
13	(2)
14	(4)
15	(2)
16	$n + 2$; $n - 2$; $n + 7$
17	(a) $14 + h$ (b) $p - 9$ (c) $8q$ (d) $k \div 6$
18	(a) $148 - h$ cm (b) $296 - h$ cm
19	(a) $a + 5$ years (b) $2a + 13$ years
20	(a) $\$(x - 3)$ (b) $\$(5x - 9)$



Questions 21–30

Question	Answer
21	$8b + 15$
22	$n \div 4 - 6$
23	$4k + 2$
24	$5p - 12$
25	$\$(t - 6) \div 2$
26	(a) $11a$ (b) $5b$ (c) $5c$ (d) $8d$
27	(a) $9m + 13$ (b) $19n - 15$ (c) $6p + 11$ (d) $3q + 18$
28	(a) $5p$ (b) $8q$ (c) $5h$ (d) $3r$
29	A and B; both simplify to $6x + 5$.
30	$y + y$ means two groups of y , so the correct simplified expression is $2y$. y^2 means $y \times y$.

Questions 31–40

Question	Answer
31	$7c + 9$
32	7
33	$x = 4$: 9, 12, 4, 14; $x = 8$: 13, 24, 6, 34
34	(a) $5d + 13$ (b) 43
35	10
36	(a) $\$(5b + 12)$ (b) \$52
37	(a) $4n + 10$ (b) 54
38	(a) $(120 - w) \div 5$ (b) 20
39	(a) $3k + 5$ (b) 41
40	(a) 25 (b) 25 (c) They are equal when $m = 6$, but not equivalent. When $m = 4$, the values are 19 and 15.



Questions 41–50

Question	Answer
41	(a) $a = 28$ (b) $b = 12$ (c) $c = 7$
42	(a) $d \div 6 = 7$, or $d = 6 \times 7$ (b) $d = 42$
43	$x = 8$
44	(a) $x + (x + 12) = 68$ (b) 28 and 40
45	11
46	7
47	8
48	16 cm
49	(a) $4p + 3 \times 8 = 64$, or $4p + 24 = 64$ (b) 10 pencils (c) 16 more pencils
50	12 cm

Questions 51–60

Question	Answer
51	(a) $\$(3h + 5)$ (b) $3h + 5 = 26$ (c) 7 hours
52	(a) $4k + 2k + 5$ (b) $6k + 5$ (c) 59
53	(a) $(4p - 6)$ cm (b) 14 cm
54	(a) Ken: $t + 12$ s; Mei: $t - 8$ s (b) $3t + 4$ s (c) 214 s
55	(a) $5p + 7$ (b) $5p + 22$ (c) 62
56	(a) $2(d + 4) + 3d = 38$, or $5d + 8 = 38$ (b) \$6 (c) \$21
57	(a) Father: $4x$ years; daughter: $x + 3$ years (b) 10 years (c) 45 years
58	28
59	(a) $4x + 10$ cm (b) $4x + 10 = 50$, $x = 10$ (c) 15 cm, 15 cm and 20 cm
60	(a) $x + 3x + (x + 12) = 92$ (b) Alan: 16; Ben: 48; Chloe: 28

Questions 61–70

Question	Answer
61	(a) $2r + 5$ cm (b) red: 20 cm; blue: 45 cm (c) 25 cm
62	Meijun had \$60; Jane had \$180 at first. The difference in the amounts spent is \$120, which represents 2 equal units.
63	(a) $n = 24$ (b) 87 beads
64	(a) $p + 4$ kg (b) $p + (p + 4) + (p + 4) = 32$ (c) 12 kg
65	(a) $\$(50 - 4r)$ (b) \$18 (c) 12 journeys; 13 journeys would cost \$52, which is more than the card value.
66	(a) Aisha (b) Answers vary; for example, Bala combined the constants incorrectly. (c) Both expressions have value 27 when $a = 4$.
67	(a) Top middle: $x - 4$; middle right: $x + 2$; bottom left: $x - 1$. (b) 11, 4, 9 / 6, 8, 10 / 7, 12, 5. (c) For example, $(x - 2) + x + (x + 2) = 3x$.
68	(a) Machine A: $4k + 6$; Machine B: $2k + 2k + 6 = 4k + 6$ (b) Both have 4 groups of k and 6 loose marbles. (c) 34
69	(a) $(8p + 12) \div 6 = 14$, or $8p + 12 = 84$ (b) 9 (c) 72
70	(a) $3x + 12$ (b) $3x + 12 = 72$, $x = 20$ (c) 118 notebooks

