1 Arithmetic Operations

A. Four Basic Arithmetic Operations

Operation	Expression	Word Phrase	Result
Addition	$4 + 5$	Add 5 to 4 (or 4 plus 5)	The sum is 9.
Subtraction	$9 - 7$	Subtract 7 from 9 (or 9 minus 7)	The difference is 2.
Multiplication	6×5	Multiply 6 by 5 (or 6 times 5)	The product is 30.
Division	$18 \div 6$	Divide 18 by 6	The quotient is 3.

The following are some rules in performing mixed operation.

1. If an expression contains brackets, perform the operations inside the brackets first.
2. **(a)** If an expression involves addition and subtraction only (or multiplication and division only), perform the operation from left to right.
   (b) Otherwise, perform multiplication and division before addition and subtraction.

Example 1

Find the value of each of the following expressions.

(a) $16+24-32$

(b) $9\times2+24\div4$

Solution

(a) $16+24-32$ ◀ Perform the operations from left to right.

$=40-32$

$=\underline{8}$

(b) $9\times2+24\div4$ ◀ Perform the multiplication and the division first.

$=18+6$

$=\underline{24}$

Example 2

Write the following word phrases as arithmetic expressions, and calculate the answers.

(a) Multiply 6 by the sum of 2 and 3.

(b) Subtract 18 from 42, and then divide the difference by 4.

Solution

(a) $6\times(2+3)$ ◀ Perform the operation inside the brackets first.

$=6\times5$

$=\underline{30}$

(b) $(42-18)\div4$

$=24\div4$

$=\underline{6}$

Example 3

52 books are packed evenly into 6 plastic boxes. How many books are there in each plastic box? How many books are left?

Solution

$$\begin{array}{r} 8 \\ 6\overline{)52} \\ \underline{48} \\ 4 \end{array}$$

8 ◀ quotient

divisor ▶ 6) 52 ◀ dividend

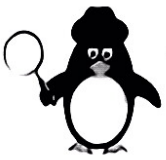
4 ◀ remainder

◀ Short division: $6\overline{)52}$ → $8 \ldots 4$

$\because$ $52\div6=8\ldots4$

$\therefore$ There are 8 books in each plastic box, and 4 books are left.

Note: The symbol '$\because$' means 'because', while the symbol '$\therefore$' means 'therefore'.



The remainder must be less than the divisor.

B. Multiples and Factors

Mathematical term	Example
Multiple	(i) 6, 12, 18, 24, ... are **multiples** of 6. (ii) 8, 16, 24, 32, ... are **multiples** of 8.
Common multiple	24, 48, 72, ... are **common multiples** of 6 and 8.
Least Common Multiple (L.C.M.)	24 is the **L.C.M.** of 6 and 8.
Factor	(i) 1, 2, 4 and 8 are the **factors** of 8. (ii) 1, 2, 3, 4, 6 and 12 are the **factors** of 12.
Common factor	1, 2 and 4 are the **common factors** of 8 and 12.
Highest Common Factor (H.C.F.)	4 is the **H.C.F.** of 8 and 12.

Example 5

Write down the first four multiples of 12 and 16, and find the L.C.M. of the two numbers.

Solution

First four multiples of 12: 12, 24, 36 and **48**

First four multiples of 16: 16, 32, **48** and 64

$\therefore$ L.C.M. of 12 and 16 = 48

Example 6

Write down the factors of 20, 45 and 50, and find the H.C.F. of the three numbers.

Solution

Factors of 20: **1**, 2, 4, **5**, 10 and 20

Factors of 45: **1**, 3, **5**, 9, 15 and 45

Factors of 50: **1**, 2, **5**, 10, 25 and 50

$\therefore$ H.C.F. of 20, 45 and 50 = 5

$20 = 1 \times 20$
$= 2 \times 10$
$= 4 \times 5$

Example 7

A box of candies can be evenly divided among either 6 or 8 kids. What is the minimum number of candies in the box?

Solution

Multiples of 6: 6, 12, 18, **24**, ...

Multiples of 8: 8, 16, **24**, ...

$\therefore$ L.C.M. of 6 and 8 = 24

$\therefore$ The minimum number of candies in the box is 24.

Knowing More

Prime Factors

Consider the factors of 12. The factors are 1, 2, 3, 4, 6 and 12. Among these factors, 2 and 3 are prime numbers. Therefore, 2 and 3 are called prime factors of 12.

Every composite number can be expressed as products of prime factors.

For example, 90 can be expressed as product of prime factors as follow:

$90 = 2 \times 3 \times 3 \times 5$

Short division is useful to find all the prime factors of a number.

$2\overline{)90}$
$3\overline{)45}$
$3\overline{)15}$
5

Index Notation

For simplicity, we can write the expression $3 \times 3 \times 3 \times 3$ as 3^4, read as '3 to the power 4'. This kind of expression is called index notation.

Expression	Index notation	
	Expressed as	Read as
3×3	3^2	the square of 3 or 3 to the power 2
$3 \times 3 \times 3$	3^3	the cube of 3 or 3 to the power 3
$3 \times 3 \times 3 \times 3$	3^4	the 4th power of 3 or 3 to the power 4
$3 \times 3 \times 3 \times 3 \times 3$	3^5	the 5th power of 3 or 3 to the power 5

In 3^4, 3 is called the base and 4 is called the index or exponent.

$3 \times 3 \times 3 \times 3 = 3^4$ (4: index/exponent; 3: base)

Similarly, $2 \times 3 \times 3 \times 5$ can be written as $2 \times 3^2 \times 5$ in index notation.

Key Terms / Phrases

Pronunciation

addition	加法	difference	差	factor	因數
subtraction	減法	product	積	common factor	公因數
multiplication	乘法	quotient	商	highest common factor	最大公因數
division	除法	dividend	被除數	prime number	質數
plus	加	divisor	除數	composite number	合成數
minus	減	remainder	餘數	prime factor	質因數
times	乘	multiple	倍數	index notation	指數記數法
divide	除	common multiple	公倍數	base	底
sum	和	least common multiple	最小公倍數	index / exponent	指數

Useful Sentences

What is the product of 5 and 3?	5 和 3 的積是多少？
Divide 6 by 3, and then subtract 1 from the quotient.	把 6 除以 3，然後把所得的商減去 1。
Is 1485 divisible by 3?	1485 可被 3 整除嗎？
My brother's age is twice my age.	哥哥的年齡是我的兩倍。
The sum of two consecutive numbers is 29.	兩個連續數的和是 29。
The square of 8 is 64.	8 的平方是 64。
Evaluate the following expressions.	計算下列各數式。

Exercise 1

Write the following word phrases as arithmetic expressions, and calculate the answers. (1 – 9)

1. Add seventy to twelve. _____
2. Subtract one hundred and six from two thousand. _____
3. 97 minus 48 plus 23. _____
4. 30 times 5 minus 38. _____
5. Multiply the sum of 12 and 4 by 8. _____
6. Divide the sum of 35 and 17 by 13. _____
7. Subtract 14 from 30 and then add 20 to the result. _____

8. Add the product of 16 and 4 to the quotient of 28 divided by 4. _____

9. The difference between 50 and the quotient of 45 divided by 9. _____

Evaluate the following expressions. **(10 – 17)**

10. $67 + 22 - 79$ _____

11. $25 \times 14 \div 5$ _____

12. $5 + 144 \times 23$ _____

13. $342 - 26 \times 7$ _____

14. $15 \times 33 - 636 \div 2$ _____

15. $(42 - 18) \div 2 \times 3$ _____

16. $(38 + 46) - (24 + 19)$ _____

17. $(128 + 64 \div 8) \div 4$ _____

Determine whether the following are true or false. **(18 – 21)**

	True	False
18. The divisor in the expression $54 \div 9$ is 54.	☐	☐
19. The product of two *even numbers* is an *odd number*.	☐	☐
20. 50 is a multiple of 50.	☐	☐
21. 33 is a factor of 132.	☐	☐

22. Find the L.C.M. of the following sets of numbers.

(a) 7, 8 _____ (b) 18, 24 _____

(c) 30, 50 _____ (d) 15, 20, 40 _____

23. Find the H.C.F. of the following sets of numbers.

(a) 24, 30 _____ (b) 20, 36 _____

(c) 27, 54 _____ (d) 12, 18, 60 _____

Solve the following problems. **(24 – 27)**

24. Find the sum of two *consecutive numbers* if the smaller one is 43. _____

25. A *dozen* pack of noodles costs $36. Tony buys 5 packs of them. How much should he pay? _____

26. Soya milk costs $8 per *litre*. If Peter has $100 and wants to buy 17 litres soya milk, how much more money does he need? _____

27. 3 bags of rice weigh 15 kg in total. 2 bottles of cooking oil weigh 6 kg in total. How much heavier is a bag of rice than a bottles of cooking oil? _____

determine 決定 even number 偶數 odd number 奇數 consecutive numbers 連續數 dozen 一打 litre 公升

Solve the following problems. Show your working steps clearly. **(28 – 31)**

28. Candies cost $84 per 6 kg. Apple juice costs $8 per pack. Find the cost for 4 kg candies and 12 packs of apple juice.

29. 1 orange costs $4 and 1 watermelon costs $48. Martha pays $200 for 6 oranges and 2 watermelons. How much *change* should she get?

30. 80 toy cars and 64 teddy bears are shared evenly among some children. Each child gets the same numbers of toy cars and teddy bears as the others. What is the *maximum* number of children?

31. In a ferry pier, ferries *set off* for islands *A*, *B* and *C* every 25, 45 and 75 minutes respectively. At 10:00 a.m., ferries set off from the pier for all the three islands. When will they set off again at the same time if the ferry services end at 11:00 p.m. every day? *List* all the *possible* cases.

change 找回的零錢　maximum 最大的　set off 出發　list 列出　possible 可能的