1 Arithmetic Operations 算術運算

A. Four Basic Arithmetic Operations 四則運算

Operation 運算	Expression 算式	Word Phrase 文字表達	Result 結果
Addition 加法	$4 + 5$	Add 5 to 4 (or 4 plus 5) 4 加上 5	The sum is 9. 所得的和是 9。
Subtraction 減法	$9 - 7$	Subtract 7 from 9 (or 9 minus 7) 從 9 減去 7	The difference is 2. 所得的差是 2。
Multiplication 乘法	6×5	Multiply 6 by 5 (or 6 times 5) 6 乘以 5	The product is 30. 所得的積是 30。
Division 除法	$18 \div 6$	Divide 18 by 6 18 除以 6	The quotient is 3. 所得的商是 3。

The following are some rules in performing mixed operation.
以下為一些進行混合運計算時的法則。

1. If an expression contains brackets, perform the operations inside the brackets first.
若算式包含括號，應先處理括號內的運算。

2. **(a)** If an expression invovles addition and subtraction only (or multiplication and division only), perform the operation from left to right.
若算式只涉及加法和減法 (或只涉及乘法和除法)，則應從左至右進行運算。

(b) Otherwise, perform multiplcation and division before addition and subtaction.
否則，應先進行乘法和除法的運算，然後再進行加法和減法的運算。

Example 1

Find the value of each of the following expressions.
求下列各算式的值。

(a) $16 + 24 - 32$ **(b)** $9 \times 2 + 24 \div 4$

Solution

(a) $16 + 24 - 32 = 40 - 32$
$= \underline{\underline{8}}$

◀ Perform the operations from left to right.
由左至右計算。

(b) $9 \times 2 + 24 \div 4 = 18 + 6$
$= \underline{\underline{24}}$

◀ Perform the multiplication and the division first.
先處理乘法和除法運算。

Example 2

Write the following word phrases as arithmetic expressions, and calculate the answers.
把下列各題的文字寫成算式，並計算結果。

(a) Multiply 6 by the sum of 2 and 3.
6 乘以 2 與 3 的和。

(b) Subtract 18 from 42, and then divde the difference by 4.
從 18 減去 42，並把所得的差 除以 4。

Solution

(a) $6\times(2+3)=6\times5$
$=30$

◀ Perform the operation inside the brackets first.
先計算括號內的運算。

(b) $(42-18)\div4=24\div4$
$=6$

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?
把 52 本書平均放進 6 個膠箱。每個膠箱有多少本書？還剩下多少本書？

Solution

```
          8   ◀ quotient
divisor ▶ 6 ⟌ 5 2  ◀ dividend
          4 8
          4   ◀ remainder
```

Short division
```
6 ⟌ 5 2
    8 … 4
```

∵ $52 \div 6 = 8 \ldots 4$

∴ There are 8 books in each plastic box, and 4 books are left.

```
          8   ◀ 商
除數 ▶ 6 ⟌ 5 2  ◀ 被除數
          4 8
          4   ◀ 餘數
```

∵ $52 \div 6 = 8 \ldots 4$

∴ 每個膠箱有 8 本書，還剩下 4 本書。

Note: The symbol '∵' means 'because', while the symbol '∴' means 'therefore'.
符號「∵」的意思是「由於」，而符號「∴」的意思是「因此」。

The remainder must be less than the divisor.
餘數必定小於除數。

B. Multiples and Factors 倍數和因數

Mathematical term 數學詞彙	Example 例子
Multiple 倍數	(i) 6, 12, 18, 24, ··· are **multiples** of 6. (ii) 8, 16, 24, 32, ··· are **multiples** of 8.
Common multiple 公倍數	24, 48, 72, ··· are **common multiples** of 6 and 8.
Least Common Multiple (L.C.M.) 最小公倍數 (L.C.M.)	24 is the **L.C.M.** of 6 and 8.
Factor 因數	(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 公因數	1, 2 and 4 are the **common factors** of 8 and 12.
Highest Common Factor (H.C.F.) 最大公因數	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.

寫出 12 和 16 的首四個倍數，並求這兩個數的最小公倍數。

Solution

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

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

∴ L.C.M. of 12 and 16 = 48

12 的首四個倍數：12，24，36，**48**

16 的首四個倍數：16，32，**48**，64

∴ 12 和 16 的最小公倍數 = 48

Example 6

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

寫出 20、45 和 50 的因數，並求這三個數的最大公因數。

Solution

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

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

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

∴ H.C.F. of 20, 45 and 50 = 5

20 的因數： **1**，2，4，**5**，10，20

45 的因數： **1**，3，**5**，9，15，45

50 的因數： **1**，2，**5**，10，25，50

∴ 20、45 和 50 的最大公因數 = 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?

糖果一盒，可平均分給 6 名或 8 名小孩。問盒中最少有糖果多少粒？

Solution

Multiples of 6: 6, 12, 18, **24**, …

Multiples of 8: 8, 16, **24**, …

∴ L.C.M. of 6 and 8 = 24

∴ The minimum number of candies in the box is 24.

6 的倍數：6，12，18，**24**，…

8 的倍數：8，16，**24**，…

∴ 6 和 8 的最小公倍數 = 24

∴ 盒中最少有糖果 24 粒。

Knowing More

Prime Factors 質因數

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 6.

考慮 12 的因數。12 的因數有 1、2、3、4、6 和 12。2 和 3 既是質數，又是 12 的因數。

因此，2 和 3 稱為 12 的質因數。

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

每個合成數均可寫成質因數連乘式。

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

例如，90 寫成質因數連乘式如下：

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

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

$$\begin{array}{r} 2\overline{)90} \\ 3\overline{)45} \\ 3\overline{)15} \\ 5 \end{array}$$

Index Notation 指數記數法

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.

為簡單起見，數式 $3 \times 3 \times 3 \times 3$ 可寫成 3^4，讀作「3 的 4 次方」。這種寫法稱為指數記數法。

Expression 數式	Index notation 指數記數法		
	Expressed as 可寫成	Read as 讀作	
3×3	3^2	the square of 3 or 3 to the power 2	3 的平方 或 3 的 2 次方
$3 \times 3 \times 3$	3^3	the cube of 3 or 3 to the power 3	3 的立方 或 3 的 3 次方
$3 \times 3 \times 3 \times 3$	3^4	the 4th power of 3 or 3 to the power 4	3 的 4 次方
$3 \times 3 \times 3 \times 3 \times 3$	3^5	the 5th power of 3 or 3 to the power 5	3 的 5 次方

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

在 3^4 中，3 稱為底而 4 稱為指數。

$$3 \times 3 \times 3 \times 3 = 3^4$$

index/exponent (指數)

base (底)

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

同樣地，利用指數記數法，$2 \times 3 \times 3 \times 5$ 可寫成 $2 \times 3^2 \times 5$。

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 ÷ 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? _____

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.

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

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?

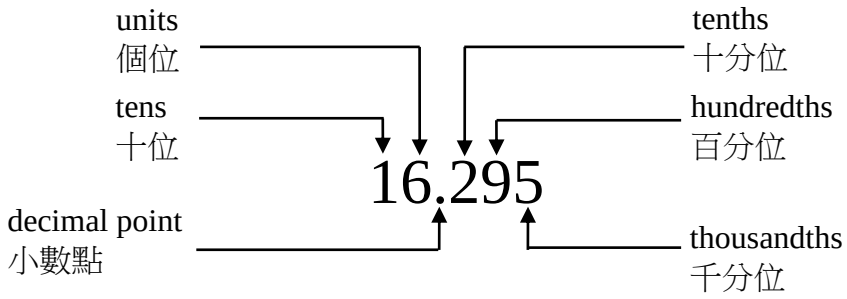
31. In a ferry pier, ferries *set off* for islands *A*, *B* and *C* every 25, 45 and 75 minutes respectively. At 10:00 a.m., ferries set off from the pier for all the three islands. When will they set off again at the same time if the ferry services end at 11:00 p.m. every day? *List* all the *possible*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

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

2 Decimals and Fractions 小數和分數

A. Conversion between Decimals and Fractions 小數與分數的互化

16.295 is a decimal, which can be read as sixteen point two nine five.
16.295 是一個小數，讀作十六點二九五。



Fractions can be classified into following three types:
分數可分為以下三類：

Proper fraction 真分數	**Improper fraction 假分數**	**Mixed fraction 帶分數**
The numerator is smaller than the denominator. 分子小於分母	The numerator is greater than or equal to the denominator. 分子大於或等於分母	An improper fraction which is written as a sum of a natural number and a proper fraction. 把假分數寫成自然數與真分數之和的形式
numerator 分子 → $\frac{3}{5}$ ← denominator 分母	$\frac{7}{4}$	integral part 整數部分 → $6\frac{2}{3}$ ← fractional part 分數部分
Read as : three-fifths / three over five 讀作： 五分之三	Read as : seven quarters / seven over four 讀作： 四分之七	Read as : six and two-thirds / six and two over three 讀作： 六又三分之二

Improper fractions can be converted into mixed fractions and vice versa.
假分數可化成帶分數，反之亦然。

e.g. $\frac{7}{4}=1\frac{3}{4}$

Example 1

Convert 0.45 into a fraction.

把 0.45 化成分數。

Solution

$$0.45 = \frac{\cancel{45}^{9}}{\cancel{100}_{20}}$$

$$= \frac{9}{20}$$

◀ Reduce the fraction to its simplest form.
進行約分，把分數化成最簡形式。

Example 2

Convert $\frac{3}{5}$ and $\frac{7}{25}$ into decimals.

把 $\frac{3}{5}$ 和 $\frac{7}{25}$ 化成小數。

Solution

Method 1: Expand the fractions
方法一：進行擴分

$$\frac{3}{5} = \frac{3\times 2}{5\times 2}$$

$$= \frac{6}{10}$$

$$= 0.6$$

$$\frac{7}{25} = \frac{7\times 4}{25\times 4}$$

$$= \frac{28}{100}$$

$$= 0.28$$

Method 2: Use division
方法二：利用除法

$$\frac{3}{5} = 3 \div 5$$

$$= 0.6$$

$$5\overline{)3.0}$$

$$\underline{3\ 0}$$

$$\frac{7}{25} = 7 \div 25$$

$$= 0.28$$

$$25\overline{)7.00}$$

$$\underline{5\ 0}$$

$$2\ 00$$

$$\underline{2\ 00}$$

Example 3

Arrange the following numbers in descending order.

把下列各數由大至小排列。

$1\frac{1}{4},\ 1\frac{3}{8},\ 1.125$

Solution

Method 1: Convert the numbers into fractions

方法一：把各數化成分數

$1\frac{1}{4}=1\frac{1\times 2}{4\times 2}=1\frac{2}{8}$

$1.125=1\frac{125}{1000}=1\frac{1}{8}$

$\because\quad 1\frac{3}{8}>1\frac{2}{8}>1\frac{1}{8}$ ◀ Compare the numerators. 比較分子的值。

$\therefore\quad 1\frac{3}{8}>1\frac{1}{4}>1.125$

Method 2: Convert the numbers into decimals

方法二：把各數化成小數

$1\frac{1}{4}=1+\frac{1}{4}=1+0.25=1.25$

$1\frac{3}{8}=1+\frac{3}{8}=1+0.375=1.375$

$\because\quad 1.375>1.25>1.125$

$\therefore\quad 1\frac{3}{8}>1\frac{1}{4}>1.125$

B. Basic Operations of Decimals and Fractions 小數和分數的運算

The following table shows some basic arithmetic operations of decimals.

下表所示為一些基礎的小數運算。

Addition 加法	**Subtraction 減法**
e.g. $2.08+3.42$ $=\underline{\underline{5.5}}$ 2.08 + 3.42 5.50	e.g. $5.4-2.25$ $=\underline{\underline{3.15}}$ 5.40 − 2.25 3.15
Multiplication 乘法	**Division 除法**
e.g. 8.12×3.4 $=\underline{\underline{27.608}}$ 8.12 × 3.4 24 360 + 3 248 27.608	e.g. $3.5\div 0.4$ $=(3.5\times 10)\div(0.4\times 10)$ $=35\div 4$ $=\underline{\underline{8.75}}$ 8.75 4)35.00 32 30 28 20 20

Example 4

Evaluate $2.5\times3.6\div1.5$.

計算 $2.5\times3.6\div1.5$。

Solution

$$2.5\times3.6\div1.5=9\div1.5$$
$$=(9\times10)\div(1.5\times10)$$
$$=90\div15$$
$$=\underline{\underline{6}}$$

◀
$$\begin{array}{r} 2.5 \\ \times\ 3.6 \\ \hline 7\ 50 \\ +\ 1_{1}50 \\ \hline 9.00 \end{array}$$

◀ Multiply both the divisor and the dividend by 10 so that the divisor becomes a whole number.
把除數和被除數同時乘以 10，使除數變成整數。

The following table shows some basic arithmetic operations of fractions.
下表所示為一些基礎的分數運算。

Addition 加法	**Subtraction 減法**
e.g. $\frac{1}{3}+\frac{1}{6}=\frac{2}{6}+\frac{1}{6}$ $=\frac{3}{6}$ $=\underline{\underline{\frac{1}{2}}}$	e.g. $3\frac{2}{5}-2\frac{1}{15}=3\frac{6}{15}-2\frac{1}{15}$ $=1\frac{5}{15}$ $=\underline{\underline{1\frac{1}{3}}}$
Multiplication 乘法	**Division 除法**
e.g. $3\frac{1}{3}\times\frac{1}{15}=\frac{\overset{2}{\cancel{10}}}{3}\times\frac{1}{\cancel{15}_{3}}$ $=\underline{\underline{\frac{2}{9}}}$	e.g. $\frac{5}{27}\div\frac{2}{9}=\frac{5}{\cancel{27}_{3}}\times\frac{\cancel{9}^{1}}{2}$ $=\underline{\underline{\frac{5}{6}}}$

If the multiplication and division of fractions involve mixed fractions, we should first change the mixed fractions into improper fractions.
若分數的乘法和除法中涉及帶分數，我們應先把帶分數化成假分數。

Example 5

Evaluate $2\frac{1}{4}+3\frac{3}{4}\div\frac{5}{6}$.

計算 $2\frac{1}{4}+3\frac{3}{4}\div\frac{5}{6}$ 。

Solution

$$2\frac{1}{4}+3\frac{3}{4}\div\frac{5}{6}=2\frac{1}{4}+\frac{15}{4}\times\frac{6}{5}$$

◀ Express $3\frac{3}{4}$ as an improper fraction. 把 $3\frac{3}{4}$ 寫成假分數。

$$=2\frac{1}{4}+\frac{9}{2}$$

◀ Perform multiplication and division before addition and subtraction.
先乘除，後加減。

$$=2\frac{1}{4}+4\frac{1}{2}$$

$$=2\frac{1}{4}+4\frac{2}{4}$$

◀ Express the fractions in a common denominator.
通分，即把分數以相同分母表示。

$$=\underline{\underline{6\frac{3}{4}}}$$

Example 6

Harry bought a $\frac{3}{4}$ kg chocolate cake and ate $\frac{3}{5}$ of it. Find the weight of the remaining chocolate cake.

思朗買了一個重 $\frac{3}{4}$ kg 的巧克力蛋糕，並吃去蛋糕的 $\frac{3}{5}$ 。求餘下的巧克力蛋糕的重量。

Solution

Weight of the remaining chocolate cake
餘下的巧克力蛋糕的重量

$$=\frac{3}{4}\times\left(1-\frac{3}{5}\right)\text{ kg}$$

$$=\frac{3}{4}\times\frac{2}{5}\text{ kg}$$

$$=\underline{\underline{\frac{3}{10}\text{ kg}}}$$

Example 7

The selling price of a pen is \$6.3 and the selling price of a pencil is \$3.7. What is the total selling price of half a dozen pens and $1\frac{1}{3}$ dozen pencils?

一枝原子筆的售價為 \$6.3，一枝鉛筆的售價為 \$3.7。問半打原子筆和 $1\frac{1}{3}$ 打鉛筆的總售價是多少？

Solution

Total selling price 總售價

$$=\$\left(6.3\times12\times\frac{1}{2}+3.7\times12\times1\frac{1}{3}\right)$$

$$=\$\left(6.3\times6+3.7\times12\times\frac{4}{3}\right)$$

$$=\$(6.3\times6+3.7\times16)$$

$$=\$(37.8+59.2)$$

$$=\underline{\underline{\$97}}$$

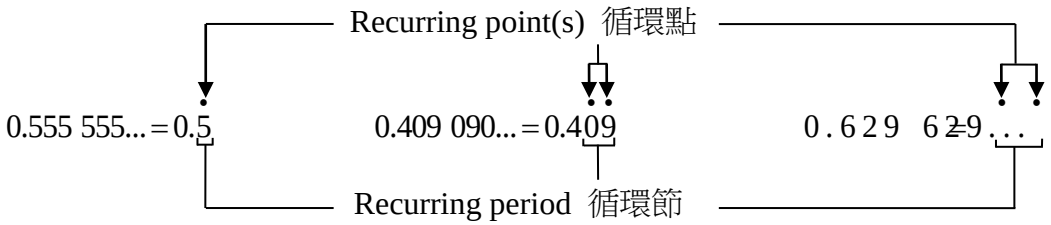
Knowing More

Recurring Decimals 循環小數

In a decimal, if a digit or a pattern of digits after the decimal point repeats continuously, the decimal is called a recurring decimal. For example: 0.**5**55…, 0.4**09** 09 …, 0.**629** 629… are recurring decimals.
當一個小數從小數點後的某個數位開始，有一個數字或一組數字不斷地重複出現，這個小數稱為循環小數。例如：0.**5**55…、0.4**09** 09 …、0.**629** 629… 都是循環小數。

In a recurring decimal, the repeated part is called the recurring period. It is indicated by the recurring point(s).
在循環小數中，不斷重複而相同的部分稱為循環節，我們會用循環點標示。

For example:



We can use recurring decimals to represent fractions as follows:
我們可以使用循環小數來表示分數，如下所示：

$$\frac{1}{3}=0.333...=0.\dot{3},\qquad \frac{8}{11}=0.7272...=0.\dot{7}\dot{2},\qquad \frac{11}{27}=0.407\ 407...=0.\dot{4}0\dot{7}$$

Key Terms / Phrases

Pronunciation

decimal	小數	thousandths	千分位	mixed fraction	帶分數
decimal point	小數點	fraction	分數	divisor	除數
units	個位	numerator	分子	dividend	被除數
tens	十位	denominator	分母	descending order	由大至小排列
tenths	十分位	proper fraction	真分數	ascending order	由小至大排列
hundredths	百分位	improper fraction	假分數	recurring decimals	循環小數

Useful Sentences

What fraction of the time is spent on studying?	花在學習上的時間佔幾分之幾？
What fraction of $\frac{7}{8}$ is $\frac{1}{2}$?	$\frac{1}{2}$ 是 $\frac{7}{8}$ 的幾分之幾？
Convert the following mixed fraction into an improper fraction.	把以下帶分數寫成假分數。
4.085 is read as three point zero seven five.	4.085 讀作四點零八五。
Which digit in 35.62 is in hundredths place?	在 35.62 這個數中，哪一個數字是在百分位？

Exercise 2

1. Consider the number 65.013. Determine whether each of the following is true for the number. Put a '✓' or a '×' in each of the boxes.

(a) '1' is in the hundredths place. ☐ **(b)** '1' in the number represents 10. ☐

(c) '6' in the number represents 60 000. ☐ **(d)** '0' is in the tenths place. ☐

(e) '5' in the number represents 50. ☐ **(f)** It is equal to $65\frac{13}{100}$. ☐

2. Reduce the following fractions into their simplest forms.

(a) $\frac{24}{80}$ _____ **(b)** $\frac{120}{135}$ _____ **(c)** $\frac{126}{42}$ _____

3. Convert the following decimals into fractions.

(a) 0.55 _____ **(b)** 3.75 _____ **(c)** 15.625 _____

4. Convert the following fractions into decimals.

(a) $\frac{98}{200}$ _____ **(b)** $3\frac{1}{8}$ _____ **(c)** $\frac{27}{25}$ _____

5. Compare the values of each of the following pairs of fractions. Put a '>' or '<' in each of the boxes.

(a) $\frac{4}{5} \square \frac{6}{7}$ **(b)** $\frac{11}{8} \square \frac{14}{11}$ **(c)** $\frac{5}{13} \square \frac{7}{17}$

6. Arrange each of the following sets of numbers in *ascending order*.

(a) 6.7, 8.03, 0.969, 10.34 _____

(b) 3.6, 3.06, 36, 30.6 _____

7. Arrange each of the following sets of numbers in descending order.

(a) $\frac{2}{3}$, $\frac{5}{6}$, $\frac{7}{12}$, $\frac{1}{2}$ _____

(b) 0.5, $\frac{1}{8}$, $1\frac{1}{16}$, 1.15, $1\frac{1}{4}$, 0.12 _____

Evaluate the following. **(8 – 19)**

8. $5.4-3.2+2.6$ _____

9. $19.8\div 0.33$ _____

10. $12.6\div 0.7-2.25\times 4$ _____

11. $(6.6\times 0.3-1.5)\times 4$ _____

12. $\frac{11}{30}+\frac{5}{6}-\frac{7}{10}$ _____

13. $\frac{7}{30}\times\frac{6}{7}\times\frac{10}{12}$ _____

14. $1\frac{19}{45}\div 32\div 1\frac{1}{7}$ _____

15. $\left(3-\frac{2}{5}\right)\div 2\frac{11}{35}$ _____

16. $\frac{7}{10}\div 1\frac{1}{2}-\frac{1}{6}\times\frac{2}{3}$ _____

17. $\frac{2}{3}\times\left(\frac{11}{12}-\frac{5}{6}\right)+\frac{5}{8}$ _____

18. $2.5\div 3\frac{3}{4}\times(2+0.75)$ _____

19. $0.25\times\left(2-\frac{7}{12}\right)\div 1\frac{1}{16}$ _____

ascending order 由小至大排列

Find the result of each of the following. **(20 – 22)**

20. 6.5 L orange juice is divided into 26 cups equally. How much orange juice is there in each cup in L? _____

21. Wendy is 35 years old and Jacky is 15 years old. What fraction of Wendy's age is Jacky's age? _____

22. A bag of *coconuts* weighs 10.5 kg. If we sell 5 bags of coconuts for $756, how much does one kilogram of coconuts cost? _____

Solve the following problems. Show your working steps clearly. **(23 – 26)**

23. Each box of apples costs $35.8. It costs $4.3 more than each box of oranges. Nelson pays $250 for 5 boxes of oranges. How much change should he get?

24. A bag of peanuts weighing $2\frac{4}{5}$ kg costs $30. Mary buys a bag of peanuts that weighs $4\frac{2}{3}$ kg. How much should she pay?

coconut 椰子

25. Red roses cost \$50.4 per dozen, yellow roses cost \$81.6 per dozen. How much do 5 red roses and 8 yellow roses cost?

26. Linda uses $\frac{1}{7}$ of a bag of flour to make some bread and $\frac{3}{5}$ of the rest of it to make some biscuits. What fraction of the flour is left?

3 Approximations 近似值

A. Unit Conversion 單位轉換

The following table shows some common unit conversion.
下表所示為一些常見的單位轉換。

Quantity 量	Example 例子	
Time 時間	1 minute (min) = 60 seconds (s)	1 分鐘 = 60 秒
	1 hour (h) = 60 minutes (min)	1 小時 = 60 分鐘
	1 day = 24 hours (h)	1 日 = 24 小時
Weight 重量	1 g = 1000 mg	1 克 = 1000 毫克
	1 kg = 1000 g	1 公斤 = 1000 克
Length 長度	1 cm = 10 mm	1 厘米 = 10 毫米
	1 m = 100 cm	1 米 = 100 厘米
	1 km = 1000 m	1 公里 = 1000 米
Capacity 容量	1 mL = 1 cm^3	1 毫升 = 1 立方厘米
	1 L = 1000 mL	1 公升 = 1000 毫升
	1 L = 1000 cm^3	1 公升 = 1000 立方厘米
	1 m^3 = 1000 L	1 立方米 = 1000 公升

Example 1

Express 60 cm in the following units.

試以下列各單位表示 60 cm。

(a) mm

(b) m

Solution

(a) 60 cm
$= 60 \times 10$ mm
$= \underline{\underline{600 \text{ mm}}}$

(b) 60 cm
$= \frac{60}{100}$ m
$= \underline{\underline{0.6 \text{ m}}}$

Example 2

Express 75 min in the following units.

試以下列各單位表示 75 min。

(a) s

(b) h

Solution

(a) 75 min
$= 75 \times 60$
$= \underline{\underline{4500}}$ s

(b) 75 min
$= \frac{75}{60}$ h
$= \underline{\underline{1.25 \text{ h}}}$

B. Approximate Value 近似值

Mathematical term 數學詞彙	Example 例子
Exact value 真確值	7.56 is the exact value of 2.1×3.6. 2.1×3.6 的真確值是 7.56。
Approximate value 近似值	7.6 is an approximate value of 7.56. 7.6 是 7.56 的一個近似值。

Rounding off is a method of finding an approximate value.
四捨五入法是取近似值的一種方法。

Take 17 825.364 as an example. It can be rounded off as follows:
以 17 825.364 為例，我們可利用四捨五入法取得以下的近似值：

Approximate value 近似值	Degree of accuracy 準確度
20 000	correct to the nearest ten thousand 準確至最接近的萬位
18 000	correct to the nearest thousand 準確至最接近的千位
17 800	correct to the nearest hundred 準確至最接近的百位
17 830	correct to the nearest ten 準確至最接近的十位

Approximate value 近似值	Degree of accuracy 準確度
17 825	correct to the nearest one 準確至最接近的個位
17 825.4	correct to the nearest tenth or correct to 1 decimal place 準確至最接近的十分位 或 準確至一位小數
17 825.36	correct to the nearest hundredth or correct to 2 decimal places 準確至最接近的百分位 或 準確至二位小數

Example 3

(a) Round off 98 467 to the nearest thousand.

把 98 467 捨入至最接近的千位。 ◀「捨入」表示四捨五入。

(b) Round off 4.29 to 1 decimal place.

把 4.98 捨入至一位小數。

Solution

(a) 98 467 = 98 000 (correct to the nearest thousand)
(準確至最接近的千位)

(b) 4.98 = 5.0 (correct to 1 decimal place)
(準確至一位小數)

Example 4

(a) Round off 46.95 kg to the nearest kg.

把 46.95 kg 捨入至最接近的 kg。

(b) Round off 46.95 kg to the nearest 0.1 kg.

把 46.95 kg 捨入至最接近的 0.1 kg。

Solution

(a) 46.95 kg = 47 kg (correct to the nearest kg)
(準確至最接近的 kg)

(b) 46.95 kg = 47.0 kg (correct to the nearest 0.1 kg)
(準確至最接近的 0.1 kg)

Example 5

Express the following fractions in decimals and round off your results to 2 decimal places.
把下列各分數化成小數，並把答案捨入至二位小數。

(a) $\frac{1}{16}$ **(b)** $\frac{7}{8}$

Solution

(a) $\frac{1}{16} = 0.0625$

$= \underline{\underline{0.06}}$ (correct to 2 decimal places)
(準確至二位小數)

(b) $\frac{7}{8} = 0.875$

$= \underline{\underline{0.88}}$ (correct to 2 decimal places)
(準確至二位小數)

C. Solving Problems by Approximations 利用近似值解應用題

When handling problems involving numbers in daily life, we may use approximate values to do calculations to get a result close to the exact value.
在日常生活中，當處理涉及數字的問題時，我們可以用近似值估計出接近真確值的結果。

For example, if we have \$45 and each piece of cake costs \$4.8, about how many pieces of cake can we buy?
例如：若我們有 \$45，而每件蛋糕的售價為 \$4.8，我們約可購買多少件蛋糕呢？

Firstly, we can round off the cost of a piece of cake to the nearest dollar, i.e. \$5. Then, by computing $\frac{45}{5}$, we get 9. Therefore, we can buy about 9 pieces of cake. This is simpler than finding the exact value $\left(\text{i.e. } \frac{45}{4.8}\right)$.
首先，我們可把每件蛋糕的售價捨入至最接近的元，即 \$5。然後，計算 $\frac{45}{5}$，得出 9。因此，我們約可購買 9 件蛋糕。這樣計算比求出真確值 $\left(\text{即 } \frac{45}{4.8}\right)$ 較為簡單。

Example 6

There are 596 students joining the school picnic. If one coach can carry 40 students, estimate the number of coaches required to carry all the students.
已知某校共有 596 名學生參加學校旅行。若一輛旅遊巴士可接載 40 名學生，估算接載全部學生所需的旅遊巴士數量。

Solution

There are about 600 students joining the school picnic.
∴ The required number of coaches

$$\approx \frac{600}{40}$$
◀ The symbol '≈' means 'approximately equal to'.

$$= \underline{\underline{15}}$$

該校約有 600 名學生參加學校旅行。
∴ 所需的旅遊巴士數量

$$\approx \frac{600}{40}$$
◀ 符號「≈」表示「大約等於」。

$$= \underline{\underline{15}}$$

Example 7

Calvin walks 49 minutes from one end of a sidewalk to the other end. If he walks about 81.5 m in one minute, estimate the length of the sidewalk in km.
偉強由某段行人路的一端步行 49 分鐘至另一端。若他一分鐘可步行 81.5 m，估算該段行人路的長度，答案以 km 為單位。

Solution

Length of the sidewalk
該段行人路的長度

$$= 49 \times 81.5 \text{ m}$$
$$\approx 50 \times 80 \text{ m}$$
$$= 4000 \text{ m}$$
$$= \frac{4000}{1000} \text{ km}$$
$$= \underline{\underline{4 \text{ km}}}$$

Key Terms / Phrases

Pronunciation

unit conversion	單位轉換	rounding off	四捨五入法	estimate	估算
exact value	真確值	correct to	捨入至 / 準確至		
approximate value	近似值	degree of accuracy	準確度		

Useful Sentences

Round off the following numbers to 1 decimal place.	把下列各數捨入至一位小數。
Estimate the average number of students in a school.	估算每間學校的平均學生人數。
Estimate how many books Harry can buy.	估算思朗可買多少本書。
Estimate whether Amy can afford to buy 12 dresses.	估算雅文能否購買 12 條裙子。
The symbol '≈' means approximately equal to.	符號「≈」表示大約等於。

Exercise 3

1. Complete the following unit conversions.

(a) 100 min = _____ s

(b) 5 h = _____ min

(c) 1800 s = _____ h

(d) 1200 g = _____ kg

(e) 0.85 L = _____ mL

(f) 6 L = _____ cm^3

(g) 3.5 m^3 = _____L

(h) 150 m = _____cm

(i) 10 m = _____ mm

(j) 0.5 km = _____ cm

2. In each of the following, determine whether the underlined number is an exact value or an approximate value. Put a '✓' in the appropriate box.

	Exact value	Approximate value
(a) 5 kg equals 5000 g.	☐	☐
(b) Number of *passengers* of the train is around 900.	☐	☐
(c) The price of a shirt is $58.	☐	☐
(d) There are about 1200 students in the school.	☐	☐

3. Round off the following numbers to the required degree of accuracy.

Number	8637	742 218	37 425	99 999
Correct to the nearest ten thousand				
Correct to the nearest thousand				
Correct to the nearest hundred				
Correct to the nearest ten				

passenger 乘客

4. Round off the following numbers to the required degree of accuracy.

Number	3.4637	0.3389	6.406 92	0.9999
Correct to the nearest one				
Correct to 1 decimal place				
Correct to 2 decimal places				
Correct to 3 decimal places				

5. Round off the following fractions to the nearest one.

Fraction	$\frac{2}{3}$	$3\frac{1}{3}$	$1\frac{5}{8}$	$8\frac{7}{15}$	$\frac{15}{4}$
Correct to the nearest one					

6. **(a)** Round off 7.45 m to the nearest m. _____

(b) Round off 496 mL to the nearest 10 mL. _____

(c) Round off \$163.89 to the nearest \$0.1. _____

(d) Round off 7649 g to the nearest kg. _____

7. Round off each of the numbers in the following expressions to the nearest one first, and then find the approximate values of the expressions.

(a) $3.2 + 2.7$ _____ **(b)** $15.17 - 9.85$ _____

(c) 7.06×3.9 _____ **(d)** $19.8 \div 10.4$ _____

8. Round off each of the numbers in the following expressions to the nearest hundred first, and then find the approximate values of the expressions.

(a) $2283 - 1098$ _____ **(b)** $113 + 202 - 97$ _____

(c) 189×101 _____ **(d)** $999 \div 218$ _____

9. 6 pieces of toys cost \$117. Estimate the cost of one piece of toy. _____

10. A box weighs 59.7 kg. Estimate the total weight of 3 boxes. _____

Solve the following problems. Show your working steps clearly. **(11 – 15)**

11. If Raymond can type 38 English words in one minute, estimate the number of words that can be typed in two hours.

12. In a theatre, there are 89 seats in each row. If there are 71 rows in the theatre, about how many seats are there in the theatre?

13. A major shopping centre has approximately 49 780 visitors per day. Estimate the total number of visitors per month.

14. Polly has \$1605 as savings. If she spends \$80 every day, estimate the number of days needed for her to use up the savings.

15. The costs of photo frames *A*, *B* and *C* are \$40.2, \$69.6 and \$109.7 respectively. Estimate the total cost of 2 pieces of *A*, 3 pieces of *B* and 1 piece of *C*.

4 Basic Algebra and Simple Equations
基礎代數與簡易方程

A. Introduction to Algebra 認識代數

Mathematical term 數學詞彙	Meaning 意義	Example 例子
Algebraic symbol 代數符號	A symbol representing a value. We often use English letters as algebraic symbols. 代表某數值的符號。我們常用英文字母作為代數符號。	x, y, z
Algebraic expression 代數式	An expression that contains one or more algebraic symbols. 包含一個或以上代數符號的數式。	$7y - 5$, $\frac{3x}{2}$, $8a^2$

Word phrase 文字描述		Algebraic expression 代數式
Add 2 to a	a 加上 2	$a + 2$
The sum of x and b	x 與 b 的和	$x + b$
Subtract u from w	從 w 減去 u	$w - u$
3 times a	3 乘以 a	$3a$ ($3a$ represents $3 \times a$.)
The product of x and $2y$	x 與 $2y$ 的積	$2xy$
Divide c by 6	c 除以 6	$\frac{c}{6}$ ($\frac{c}{6}$ represents $c \div 6$.)
One-fourth of m minus 2	從 m 的四分之一減去 2	$\frac{m}{4} - 2$
The square of t	t 的平方	t^2

Example 1

Represent the following word phrases by algebraic expressions.

用代數式表示下列各句子。

(a) Add 3 to the product of y and 4.

把 y 與 4 的積加上 3。

(b) Divide the square of c by 5 and then add 4 to the result.

c 的平方除以 5 後，把所得的結果加上 4。

Solution

(a) The required algebraic expression

所求的代數式

$= y \times 4 + 3$

$= \underline{\underline{4y + 3}}$ ◀ $4y$ represents $y \times 4$. $4y$ 表示 $y \times 4$。

(b) The required algebraic expression

所求的代數式

$= c^2 \div 5 + 4$

$= \underline{\underline{\frac{c^2}{5} + 4}}$ ◀ $\frac{c^2}{5}$ represents $c^2 \div 5$. $\frac{c^2}{5}$ 表示 $c^2 \div 5$。

Example 2

There are 5 bags of chocolates in a box and each bag of chocolates weighs x g.

某盒子內有 5 包巧克力，每包巧克力重 x g。

(a) What is the total weight of 5 bags of chocolates?

問 5 包巧克力的總重量是多少？

(b) The box of chocolates are shared among 9 students evenly and no chocolates are left. What is the weight of chocolates does each student get?

現把該盒巧克力平分給 9 名學生，且沒有剩餘巧克力。問每名學生可分得的巧克力的重量是多少？

Solution

(a) Total weight of 5 bags of chocolates

5 包巧克力的總重量

$= 5 \times x$ g

$= \underline{\underline{5x \text{ g}}}$

(b) Weight of chocolates that each student gets
每名學生可分得的巧克力的重量

$= 5x \div 9$ g

$= \underline{\underline{\dfrac{5x}{9}}}$ g

B. Simple Equations 簡易方程

An equality that contains an unknown is called an equation. For example, $x + 2 = 5$ is an equation with an unknown x.
含有未知數的等式稱為方程。例如，$x + 2 = 5$ 是一個含有未知數 x 的方程。

Example 3

Solve $x - 5 = 13$.

解 $x - 5 = 13$ 。

Solution

$$x - 5 = 13$$
$$x - 5 + 5 = 13 + 5$$ ◀ Add 5 to both sides of the equation.
方程的左右兩方同時加上 5。
$$x = \underline{\underline{18}}$$

Example 4

Solve $3y + 6.5 = 9.8$.

解 $3y + 6.5 = 9.8$ 。

Solution

$$3y + 6.5 = 9.8$$
$$3y + 6.5 - 6.5 = 9.8 - 6.5$$ ◀ Subtract 6.5 from both sides of the equation.
方程的左右兩方同時減去 6.5。
$$3y = 3.3$$
$$\frac{3y}{3} = \frac{3.3}{3}$$ ◀ Divide both sides of the equation by 3.
方程的左右兩方同時除以 3。
$$y = \underline{\underline{1.1}}$$

Example 5

Solve $5(z-7)=40.$

解 $5(z-7)=40$ 。

Solution

$$5(z-7)=40$$

$$\frac{5(z-7)}{5}=\frac{40}{5}$$ ◀ Divide both sides of the equation by 5. 方程的左右兩方同時除以 5。

$$z-7=8$$

$$z-7+7=8+7$$ ◀ Add 7 to both sides of the equation. 方程的左右兩方同時加上 7。

$$z=\underline{\underline{15}}$$

C. Application of Equations 方程的應用

Steps of setting up an equation to solve a problem:

1. Identify the unknown in the problem.
2. Represent the unknown by a letter.
3. Set up an equation based on the given information.
4. Solve the equation.
5. Write down the answer to the problem.

建立方程來解決問題的步驟：

1. 確定問題中的未知數。
2. 用字母代表未知數。
3. 依題意建立方程。
4. 解方程。
5. 寫出問題的答案。

Example 6

There are y passengers on a bus. After $\frac{2}{5}$ of them get off, 33 passengers remain on the bus. Set up an equation to represent the situation.

巴士上有 y 名乘客，其中的 $\frac{2}{5}$ 下車後，車上還有乘客 33 名。試建立一個方程表示上述情況。

Solution

The fraction of passengers remained $=1-\frac{2}{5}$

$$=\frac{3}{5}$$

$\therefore$ The required equation is $\frac{3}{5}y=33.$

餘下乘客所佔的分數 $=1-\frac{2}{5}$

$$=\frac{3}{5}$$

$\therefore$ 所求的方程是 $\frac{3}{5}y=33$ 。

Example 7

There are 15 chickens and n pigs in a farm. Altogether they have 98 feet. Find the value of n.
已知農場裏有 15 隻雞和 n 頭豬，而牠們共有 98 隻腳。求 n 的值。

Solution

Based on the given information, we can set up an equation as follows:
依題意，我們可建立以下的方程：

$$2\times 15 + 4n = 98$$
$$30 + 4n = 98$$
$$30 + 4n - 30 = 98$$
$$4n = 68$$
$$\frac{4n}{4} = \frac{68}{4}$$
$$n = 17$$

◀ A chicken has two feet and a pig has four.
1 隻雞有 2 隻腳，而 1 頭豬有 4 隻腳。

	Number 數目	Number of feet 腳的數目
Chicken 雞	15	2×15
Pig 豬	n	$4n$

Example 8

Leo has eight \$0.5 coins and some \$0.2 coins. If these coins can just exchange for two \$10 banknotes, how many \$0.2 coins does Leo have?
小明有 8 枚 5 角硬幣和若干枚 2 角硬幣。若這些硬幣剛好可兌換 2 張 10 元鈔票，問小明有 2 角硬幣多少枚？

Solution

Let x be the number of \$0.2 coins that Leo has.
設小明有 x 枚 2 角硬幣。

$$0.5\times 8 + 0.2\times x = 2\times 10$$
$$4 + 0.2x = 20$$
$$4 + 0.2x - 4 = 20 - 4$$
$$0.2x = 16$$
$$\frac{0.2x}{0.2} = \frac{16}{0.2}$$
$$x = 80$$

∴ Leo has 80 \$0.2 coins.
小明有 80 枚 2 角硬幣。

◀

Type of coins 硬幣種類	Number of coins 硬幣數目	Value of the coins 硬幣總額
\$ 0.5	8	$\$0.5 \times 8$
\$ 0.2	x	$\$0.2x$

Pronunciation

Key Terms / Phrases

algebra	代數	unknown	未知數	let	設
algebraic symbol	代數符號	equation	方程		
algebraic expression	代數式	solve	解		

Useful Sentences

Which of the following are algebraic expression?	下列哪些是代數式？
Set up an equation in x.	建立一個以 x 為未知數的方程。
Express the total area of the figure in terms of y.	以 y 表示圖形的總面積。
The number equals half the product of b and c.	該數等於 b 與 c 的積的一半。
Find the value of the unknown in each equation.	求各方程中的未知數的值。
The number of boys is half that of the girls in the class.	班中男生人數是女生人數的一半。
Find how many more boys than girls there are.	求男生比女生多出的數目。
My uncle's age is 4 times that of his son.	伯父的年齡是他的兒子的四倍。
What are their present ages?	他們現年多少歲？

Exercise 4

1. In each of the following, determine whether it is an algebraic expression or an equation. Put a '✓' in the *appropriate* box.

		Algebraic expression	Equation
(a)	$5b+4$		
(b)	$7c+3=17$		
(c)	$3d^2+8d=1$		
(d)	x^2-100		
(e)	$\frac{2}{3}m-6n=7$		

appropriate 適當的

Represent the following word phrases by algebraic expressions. **(2 – 5)**

2. Add a to 10. _____

3. Subtract b from 7. _____

4. Multiply 5 by c. _____

5. Divide 4 by d. _____

Fill in the blanks with suitable algebraic expressions. **(6 – 10)**

6. The old bus fare is \$5.5. It is increased by \$$a$. The new bus fare is \$_____.

7. Henry weighs b kg. He is 10 kg heavier than his friend. Henry's friend weighs _____ kg.

8. Each box contains y cakes. If Betty buys 3 boxes of cakes, then she has _____ cakes.

9. A bag contains 50 sweets. It is shared among k children evenly and no sweets are left. Each child gets _____ sweets.

10. If the length of a square is m cm, then the total area of 25 squares is _____ cm^2.

Solve the following equations. **(11 – 22)**

11. $a+13=20$ $a=$ _____

12. $b-50=123$ $b=$ _____

13. $3c=57$ $c=$ _____

14. $\frac{d}{5}=12$ $d=$ _____

15. $7e-27=36$ $e=$ _____

16. $4f+21=41$ $f=$ _____

17. $3(g+7)=36$ $g=$ _____

18. $\frac{h-3}{4}=8$ $h=$ _____

19. $0.7w=4.9$ $w=$ _____

20. $\frac{x}{2.6}=1.5$ $x=$ _____

21. $5y+1.9=9.4$ $y=$ _____

22. $\frac{z-0.23}{6}=0.73$ $z=$ _____

Set up an algebraic equation to represent each of the following situations. **(23 – 28)**

23. Nicole has x stamps and Tom has 25 stamps. They have 59 stamps altogether. _____

24. Annie is 15 years old now. She was y years old last year. _____

25. There are p dogs and 12 cats. There are 7 more dogs than cats. _____

26. The hourly wage of Peter is \$130. He worked for z hours last week and earned \$3380. _____

27. Each exercise book costs \$$d$. Kive has \$100. After buying 4 exercise books, Kive has \$16 left. _____

28. The length of a rectangle is 12 cm. The width of the rectangle is shorter than its length by a cm. The perimeter of the rectangle is 42 cm. _____

Solve the following problems using equations. Show your working steps clearly. **(29 – 33)**

29. 3 times 17 is equal to the sum of t and 16. What is the value of t?

30. Edward has a pack of sweets. After eating 9 sweets, he gives away the rest to 8 of his friends. If each friend gets 7 sweets, how many sweets are there *originally*?

originally 原來

31. Five bottles of milk cost \$4.4 more than four bottles of juice. If one bottle of milk costs \$5.2, find the cost of one bottle of juice.

32. Four years ago, the age of Paul was twice that of John. John is 18 years old now. How old is Paul now?

33. Miss Cheung spends $\frac{1}{8}$ of her *savings* on personal *ornaments* and $\frac{5}{6}$ on clothing.

If her savings still has \$130 left, find the original amount of her savings.

savings 儲蓄 ornament 飾物

5 Percentages 百分數

A. Concept of Percentages 百分數的概念

A percentage is a fraction with 100 as its denominator.

For example, $20\% = \frac{20}{100}$ and $125\% = \frac{125}{100}$.

◀ Percentages are often expressed in % (percent).
百分數通常以 % 表示。

百分數是分母為 100 的分數。

例如：$20\% = \frac{20}{100}$ 和 $125\% = \frac{125}{100}$。

Note that $100\% = \frac{100}{100} = 1$ and 1 (or 100%) means the whole.

注意：$100\% = \frac{100}{100} = 1$ 和 1 (或 100%) 表示整體 / 全部。

Convert a fraction into a percentage 把分數化成百分數	**Convert a percentage into a fraction** 把百分數化成分數
(a) $\frac{1}{5} = \frac{1}{5} \times 100\% = 20\%$ **(b)** $1\frac{1}{10} = \frac{11}{10} \times 100\% = 110\%$ ◀ Alternatively (另一方法), $\frac{1}{5} = \frac{1 \times 20}{5 \times 20} = \frac{20}{100} = 20\%$	**(a)** $75\% = \frac{75}{100} = \frac{3}{4}$ **(b)** $160\% = \frac{160}{100} = \frac{8}{5} = 1\frac{3}{5}$
Convert a decimal into a percentage 把小數化成百分數	**Convert a percentage into a decimal** 把百分數化成小數
(a) $0.5 = 0.5 \times 100\% = 50\%$ ◀ 0.5 = 50% **(b)** $1.2 = 1.2 \times 100\% = 120\%$	**(a)** $25\% = \frac{25}{100} = 0.25$ ◀ 25% = 0.25 **(b)** $140\% = \frac{140}{100} = 1.4$

Example 1

(a) Convert $\frac{3}{8}$ and 0.37 into percentages.

把 $\frac{3}{8}$ 和 0.37 化成百分數。

(b) Hence, arrange $\frac{3}{8}$, 0.37 and 38% in descending order.

由此，把 $\frac{3}{8}$、0.37 和 38% 由大至小排列。

Solution

(a) $\frac{3}{8} = \frac{3}{8} \times 100\% = 37.5\%$

$0.37 = 37\%$

◀ Move the decimal point 2 digits to the right and add the % sign.
把小數點向右移兩個位，並加上「%」。

(b) $\because$ 38% > 37.5% > 37%

$\therefore$ 38% > $\frac{3}{8}$ > 0.37

Example 2

(a) Convert $33\frac{1}{3}\%$ into a fraction.

把 $33\frac{1}{3}\%$ 化成分數。

(b) Convert 12.5% into a decimal.
把 12.5% 化成小數。

Solution

(a) $33\frac{1}{3}\% = \frac{100}{3}\%$

$= \frac{100}{3} \times \frac{1}{100}$

$= \frac{1}{3}$

(b) $12.5\% = 0.125$

◀ Move the decimal point 2 digits to the left and remove the % sign.
把小數點向左移兩個位，並移除「%」。

Example 3

Find the values of the following expressions. Express your answers in percentages.

求下列各式的值，並以百分數表示答案。

(a) 38% + 83%

(b) 1 + 12.5%

(c) 97% – 79%

(d) 1 – 80%

Solution

(a) $38\% + 83\% = (38 + 83)\%$
$= \underline{\underline{121\%}}$

(b) $1 + 12.5\% = 100\% + 12.5\%$ ◀ 1 = 100%
$= (100 + 12.5)\%$
$= \underline{\underline{112.5\%}}$

(c) $97\% - 79\% = (97 - 79)\%$
$= \underline{\underline{18\%}}$

(d) $1 - 80\% = 100\% - 80\%$
$= (100 - 80)\%$
$= \underline{\underline{20\%}}$

Example 4

Find the values of the following expressions.

求下列各式的值。

(a) $22 \times 50\%$

(b) $30 \div 25\%$

Solution

(a) $22 \times 50\% = 22 \times \frac{50}{100}$ ◀ Convert percentages into fractions.
把百分數化成分數。
$= 22 \times \frac{1}{2}$
$= \underline{\underline{11}}$

(b) $30 \div 25\% = 30 \div \frac{25}{100}$
$= 30 \div \frac{1}{4}$
$= 30 \times 4$
$= \underline{\underline{120}}$

B. Applications of Percentages 百分數的應用

In the primary school, we learnt about the percentage of a part to the whole.
在小學階段，我們已學習：

$$\text{Percentage of the part} = \frac{\text{part}}{\text{whole}} \times 100\%$$

$$\text{部分所佔的百分數} = \frac{\text{部分}}{\text{全部}} \times 100\%$$

Example 5

There are 40 books on a shelf. 8 of them are English books. Find the percentage of English books on the shelf.
書架上有 40 本書，其中 8 本是英文書。求書架上英文書所佔的百分數。

Solution

The required percentage
所求的百分數

$$= \frac{8}{40} \times 100\%$$
$$= \underline{\underline{20\%}}$$

Example 6

Kelly has 160 marbles. 30 of them are red marbles, 70 of them are blue marbles and the rest are green marbles.
子珊有 160 粒彈珠，其中有 30 粒紅色彈珠和 70 粒藍色彈珠，餘下的是綠色彈珠。

(a) What percentage of the marbles are blue marbles?
藍色彈珠的數量佔全部彈珠的百分之幾？

(b) What percentage of marbles are green marbles?
綠色彈珠的數量佔全部彈珠的百分之幾？

Solution

(a) The required percentage
所求的百分數

$$= \frac{70}{160} \times 100\%$$
$$= \underline{\underline{43.75\%}}$$

(b) Number of green marbles
綠色彈珠的數量

$$= 160 - 30$$
$$= 60$$

The required percentage
所求的百分數

$$= \frac{60}{160} \times 100\%$$
$$= \underline{\underline{37.5\%}}$$

When the value of the whole and the percentage of a part to the whole are given, we can find the value of the part.
當知道全部的數值和部分所佔的百分數時，我們便可求得部分的數值。

Part = whole × percentage of the part
部分 = 全部 × 部分所佔的百分數

Example 7

There are 680 students in a hall. If 62.5% of them are girls, find the number of girls.
某禮堂內有 680 名學生。若 62.5% 的學生是女生，求女生的人數。

Solution

Number of girls
女生的人數

$$= 680 \times 62.5\%$$
$$= 680 \times \frac{62.5}{100}$$
$$= \underline{\underline{425}}$$

Example 8

In a school, there are 500 students, among whom 15% go to school on foot, 62% go to school by MTR, and the rest go to school by bus. Find the number of students who go to school by bus.
某校有 500 名學生，其中 15% 的學生步行上學，62% 的學生乘港鐵上學，其餘的學生均乘巴士上學。求乘巴士上學的學生人數。

Solution

Percentage of students who go to school by bus
乘巴士上學的學生所佔的百分數
$=1-15\%-62\%$
$=23\%$
The required number of students
所求的學生人數
$=500\times 23\%$
$=500\times\frac{23}{100}$
$=\underline{\underline{115}}$

Example 9

Solve the equation $y\times 60\%=9$.
解方程 $y\times 60\%=9$。

Solution

$y\times 60\%=9$
$y\times\frac{60}{100}=9$
$y\times\frac{3}{5}=9$
$y\times\frac{3}{5}\times\frac{5}{3}=9\times\frac{5}{3}$
$y=\underline{\underline{15}}$

Key Terms / Phrases

Pronunciation

percentage 百分數 descending order 由大至小排列 ascending order 由小至大排列

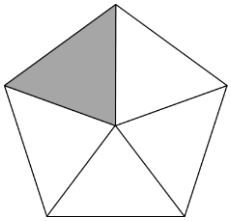
Useful Sentences

80% is read as eighty per cent.	80% 讀作百分之八十。
Express '150 m out of 250 m' in percentages.	以百分數表示「250 m 中的 150 m」。
If 60% of a number is 42, find the number.	若某數的 60% 等於 42，求該數。
Harry has $14, which is 35% less than what Amy has.	思朗有款項 $14，他的款項比雅文少 35%。
The library occupies 8% of the area of the school.	圖書館佔學校面積的 8%。
What percentage of the figure is shaded?	陰影部分佔全圖的百分之幾？

Exercise 5

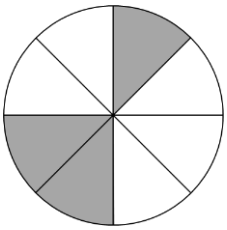
1. In each of the following, what percentage of the figure is shaded?

(a)



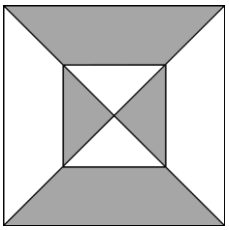
_____

(b)



_____

(c)



_____

2. Complete the following table.

Percentage	85%			12.5%	
Fraction		$\frac{1}{4}$			$3\frac{1}{5}$
Decimal			0.7		

3. **(a)** Arrange $\frac{1}{8}$, 12% and 0.1 in descending order. _____

(b) Arrange 46%, 4.6 and $4\frac{2}{5}$ in ascending order. _____

4. Find the values of the following expressions. Express your answers in percentages.

(a) 40% + 25% _____ **(b)** 1 – 30% _____

5. Find the values of the following expressions.

(a) $150 \times 54\%$ _____ **(b)** $80 \div 64\%$ _____

6. Solve the following equations. Express your answers in decimals if necessary.

(a) $a + 20\% = 1$ _____ **(b)** $\frac{b}{3} = 50\%$ _____

(c) $c \times 175\% = 21$ _____ **(d)** $d \times (1 - 65\%) = 14$ _____

7. What is 45% of 160? _____

8. What percentage of 52 is 13? _____

9. 150% of a number is 72. Find the number. _____

10. There are 80 passengers in a bus, 56 passengers are adults. What percentage of the passengers are adults? _____

11. A kind of fruit juice contains 35% orange juice. How much orange juice does 180 mL fruit juice contain? _____

12. Polly has a saving of $4500. If she spends 6% of her saving on a dress, how much is the dress? _____

13. There are 18 girls and 22 boys in a class. What percentage of the class are boys? _____

14. There are 50 balls in a bag, where 8 of them are white and the rest are black. Find the percentage of black balls in the bag. _____

15. A wire is 30 cm long. If 19.2% of the wire is cut away, find the length of the remaining part. _____

16. There are 20 questions in a Mathematics exercise. Jimmy answers 15% of them incorrectly. How many questions does Jimmy answer correctly? _____

17. Peter has 40 square stamps and 10 triangular stamps.

(a) What percentage of stamps are square in shape? _____

(b) What percentage of stamps are triangular in shape? _____

Solve the following problems. Show your working steps clearly. **(18 – 21)**

18. There is 600 mL of coffee in a cup. If 150 mL of milk is added and stirred to make a drink, what is the percentage of milk in the drink?

19. After Tina has eaten 23% of a box of candies, 154 candies are left.

(a) What percentage of the candies is left?

(b) What is the original number of candies in the box?

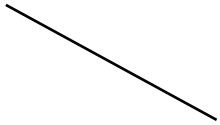
20. Karen has 150 books, among which 10% are Japanese books, 36% are English books and the rest are Chinese books. How many Chinese books does Karen have?

21. There are 40 members in a school choir. 28 of them are from S1, 8 of them are from S2 and the rest are from S3. Find the percentage of S3 members in the school choir.

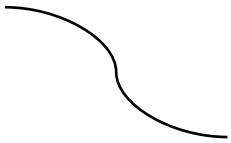
6 Shape and Space 圖形與空間

A. Lines and Angles 線和角

Type of Lines 線的種類

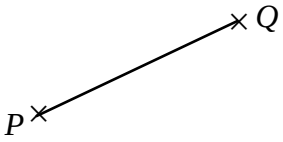


Straight line 直線

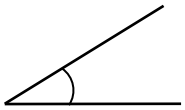


Curve 曲線

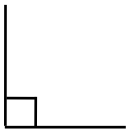
Note: A line segment is a part of a line which has two end points and a fixed length. If a line segment has *P* and *Q* as its end points, the line segment can be named as *PQ* (or *QP*).
線段是直線的一部分，它有兩個端點及有固定的長度。若已知 *P* 和 *Q* 是線段的兩個端點，該線段可以記為 *PQ* (或 *QP*)。



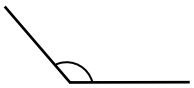
Type of Angles 角的種類



Acute angle
銳角
(Greater than 0° and less than 90°
大於 0° 且小於 90°)

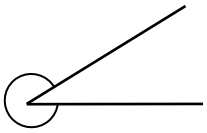


Right angle
直角
(90°)

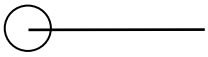


Obtuse angle
鈍角
(Greater than 90° and less than 180°
大於 90° 且小於 180°)

Straight angle
平角
(180°)



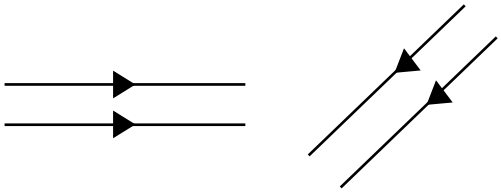
Reflex angle
反角
(Greater than 180° and less than 270°
大於 180° 且小於 270°)



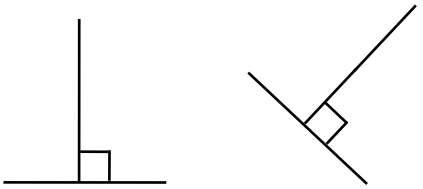
Round angle
周角
(360°)

Note: The unit in measuring the size of an angle is degree and the symbol for degree is '°'.
量度角的大小的單位是度，其符號是「°」。

Parallel Lines and Perpendicular Lines 平行線和垂直線



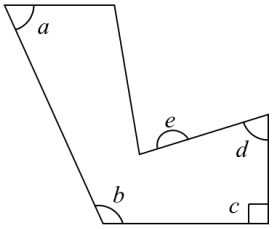
Parallel lines 平行線



Perpendicular lines 垂直線

Example 1

Name the types of angles marked in the figure.
寫出圖中已標示的各角的類別。

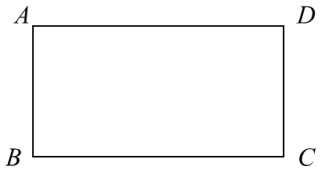


Solution

a: acute angle 銳角
b: obtuse angle 鈍角
c: right angle 直角
d: acute angle 銳角
e: straight angle 平角

Example 2

In the figure, *ABCD* is a rectangle. Name all the line segments which satisfy each of the following conditions:
在圖中，*ABCD* 是一個長方形。試寫出滿足以下條件的所有線段的名稱。



(a) parallel to *AD*
與 *AD* 平行的邊

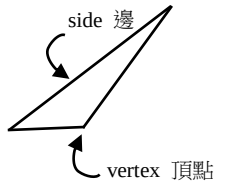
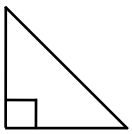
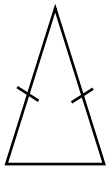
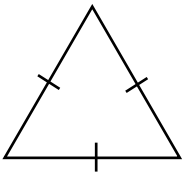
(b) perpendicular to *CD*
與 *CD* 互相垂直的邊

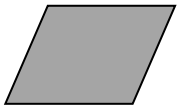
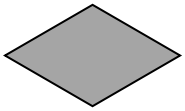
Solution

(a) *BC*

(b) *AD* and *BC*
AD 和 *BC*

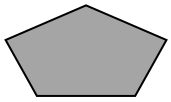
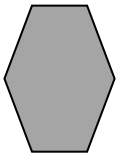
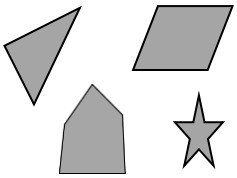
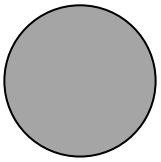
B. Plane Figures 平面圖形

Triangles 三角形			
			
Scalene triangle 不等邊三角形	Right-angled triangle 直角三角形	Isosceles triangle 等腰三角形	Equilateral triangle 等邊三角形

Quadrilaterals and their properties 四邊形及其性質		
	Square 正方形	• Four sides are equal. 四邊長度相等 • Four angles are right angles. 四個角都是直角 • Two pairs of opposite sides are parallel. 兩組對邊平行
	Rectangle 長方形	• Two pairs of opposite sides are equal. 兩組對邊長度相等 • Four angles are right angles. 四個角都是直角 • Two pairs of opposite sides are parallel. 兩組對邊平行
	Parallelogram 平行四邊形	• Two pairs of opposite sides are equal. 兩組對邊長度相等 • Two pairs of opposite sides are parallel. 兩組對邊平行
	Rhombus 菱形	• Four sides are equal. 四邊長度相等 • Two pairs of opposite sides are parallel. 兩組對邊平行
	Trapezium 梯形	• Only one pair of opposite sides is parallel. • 只有一組對邊平行

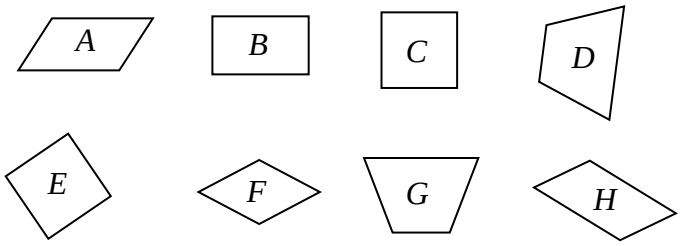
Note that: 注意：

1. All squares are rectangles.
   所有正方形皆是長方形。
2. All squares, rectangles and rhombuses are parallelograms.
   所有正方形、長方形和菱形皆是平行四邊形。
3. All squares are rhombuses.
   所有正方形皆是菱形。

Other 其他			
			
Pentagon 五邊形	Hexagon 六邊形	Polygon(s) 多邊形	Circle 圓形

Example 3

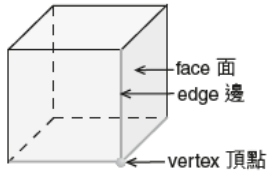
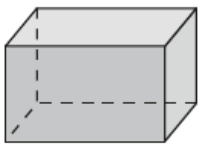
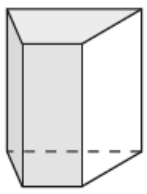
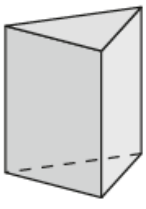
Classify the following quadrilaterals.
把以下的四邊形分類。

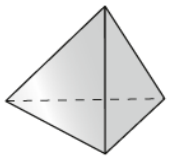
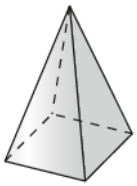


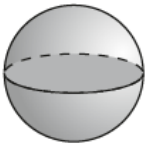
Solution

Square:	*C* and *E*	正方形：	*C* 和 *E*
Rectangle:	*B*	長方形：	*B*
Parallelogram:	*A* and *H*	平行四邊形：	*A* 和 *H*
Rhombus:	*F*	菱形：	*F*
Trapezium:	*D* and *G*	梯形：	*D* 和 *G*

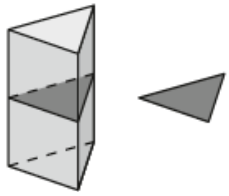
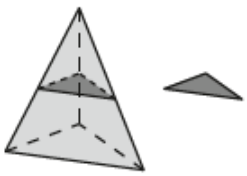
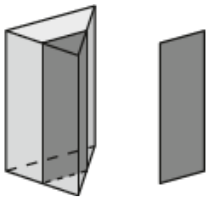
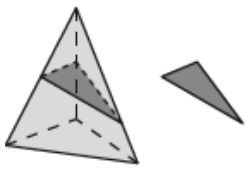
C. Solids 立體圖形

Prism 角柱			
			
Cube 正方體	Cuboid 長方體	Quadrilateral prism 四角柱	Triangular prism 三角柱

Pyramid 角錐	
	
Triangular pyramid 三角錐	Quadrilateral pyramid 四角錐

Others 其他		
		
Cylinder 圓柱	Cone 圓錐	Sphere 球體

A cylinder does not have a vertex, while a sphere has neither a vertex nor an edge.
圓柱是沒有頂點的，而球體則沒有頂點和邊。

Cross-section of solids 立體圖形的橫切面			
Cutting a prism or a pyramid in a direction parallel to the bases **沿平行於底的方向切割角柱和角錐**		**Cutting a prism or a pyramid in other angles** **以其他角度切割角柱和角錐**	
			
The cross-section has the same shape and size as the base of the prism. 橫切面與角柱的底部形狀和大小相同。	The cross-section has the same shape but different sizes as the base of the pyramid. 橫切面與角錐的底部形狀相同，但大小不同。	Many different kinds of cross-sections will be obtained. 所得的橫切面可以有不同的形狀。	

All cross-sections of a sphere are circles.
球體的任何橫切面都是圓形。

◀ 橫切面又稱為截面。

Example 4

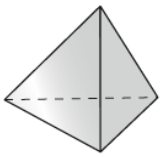
Write down the numbers of vertices, edges and faces of the following solids.
寫出下列各立體圖形的頂點、邊和面的數目。

(a) Triangular pyramid 三角錐

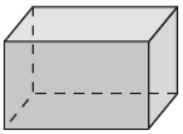
(b) Cuboid 長方體

Solution

(a) Number of vertices: 4 | 頂點的數目：4
Number of edges: 6 | 邊的數目：6
Number of faces: 4 | 面的數目：4

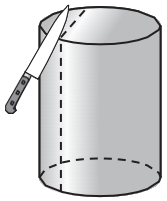


(b) Number of vertices: 8 | 頂點的數目：8
Number of edges: 12 | 邊的數目：12
Number of faces: 6 | 面的數目：6



Example 5

In the figure, if we cut the cylinder along the dotted line, what is the shape of the cross-section? Draw the cross-section.
在圖中，若沿虛線切割圓柱，問所得的橫切面的形狀是甚麼？試繪畫該橫切面。



Solution

The cross-section is a rectangle.
所得的橫切面是一個長方形。

Key Terms / Phrases

Pronunciation

line	線	quadrilateral	四邊形	face	面
angle	角	polygon	多邊形	prism	角柱
plane figure	平面圖形	circle	圓形	pyramid	角錐
vertex	頂點	solid	立體圖形	sphere	球體
side	邊	edge	邊	cross-section	橫切面
triangle	三角形				

Useful Sentences

Write down the types of angle in the figure.	寫出圖中各角的類別。
All squares, rectangles and rhombusees are parallelograms.	所有正方形、長方形和菱形皆是平行四邊形。
$\angle ABC$ is read as angle *ABC*.	$\angle ABC$ 讀作角 *ABC*。
The cross-section of the solid is a square.	立體的橫切面是一個正方形。

Exercise 6

1. *Translate* the following terms into Chinese.

(a) parallel lines _____ **(b)** rectangles _____

(c) pyramid _____ **(d)** cylinder _____

(e) rhombus _____ **(f)** isosceles triangle _____

2. Translate the following terms into English.

(a) 垂直線 _____ **(b)** 正方形 _____

(c) 正方體 _____ **(d)** 角柱 _____

(e) 球體 _____ **(f)** 多邊形 _____

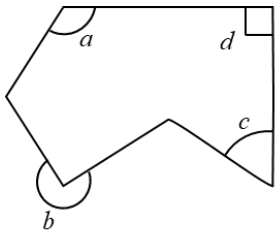
3. Write down the types of angles in the following figure.

a: _____

b: _____

c: _____

d: _____



4. Which of the following quadrilaterals have four equal sides? Put a '✓' or a '×' in each of the boxes.

(a) Square ☐ **(b)** Rhombus ☐

(c) Rectangle ☐ **(d)** Trapezium ☐

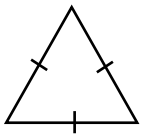
5. Which of the following quadrilaterals have two pairs of parallel opposite sides? Put a '✓' or a '×' in each of the boxes.

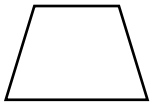
(a) Rectangle ☐ **(b)** Rhombus ☐

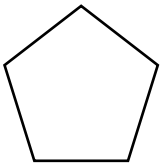
(c) Parallelogram ☐ **(d)** Trapezium ☐

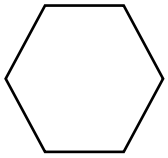
translate 翻譯

6. Name the following plane figures.

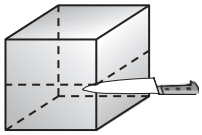
(a)  _____

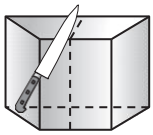
(b)  _____

(c)  _____

(d)  _____

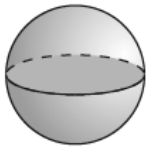
7. Draw the cross-section obtained when each of the following solids is cut along the dotted line.

(a) 

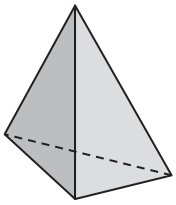
(b) 

8. Name the following solids.

(a)  _____

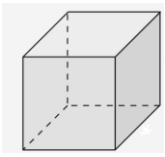
(b)  _____

(c)  _____

(d)  _____

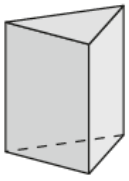
9. The solid figure on the right is a _____.

It has _____ vertices, _____ edges and _____ faces.



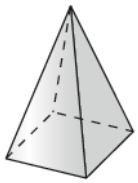
10. The solid figure on the right is a _____.

It has _____ vertices, _____ edges and _____ faces.



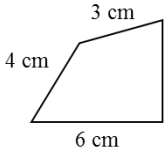
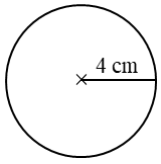
11. The solid figure on the right is a _____.

It has _____ vertices, _____ edges and _____ faces.



7 Perimeters, Areas and Volumes
周界、面積和體積

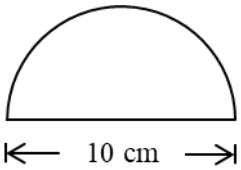
A. Perimeters of Plane Figures 平面圖形的周界

Plane figure 平面圖形	Perimeter 周界	Example 例子
Polygon 多邊形	Perimeter = sum of the lengths of all sides 周界 = 圖形各邊長之和	 Perimeter 周界 $=(3+4+6+5)$ cm $=18$ cm
Circle 圓	Circumference 圓周 = diameter × π = 直徑 × π = 2 × radius × π = 2 × 半徑 × π	 Circumference 圓周 $=2\times4\times\pi$ cm $=2\times4\times3.14$ cm $=25.12$ cm $\left(\text{Take } \pi=3.14 \text{ or } \frac{22}{7}.\right)$

Note: mm, cm, m and km are some common units for perimeter.
mm、cm、m 和 km 是一些常用來表示周界的單位。

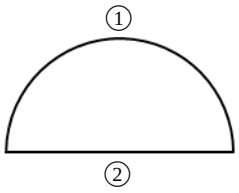
Example 1

Find the perimeter of a semi-circle with diameter 10 cm. (Take $\pi = 3.14$.)
已知一個半圓的直徑是 10 cm，求它的周界。(取 $\pi = 3.14$。)



Solution

Consider the figure.



Length of part ① $=\frac{1}{2}\times10\times3.14$ cm
$=15.7$ cm

Length of part ② $=10$ cm

∴ Perimeter $=(15.7+10)$ cm
$=\underline{\underline{25.7 \text{ cm}}}$

參看附圖。

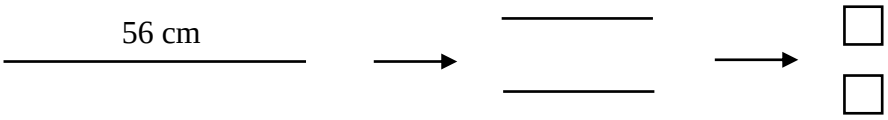
部分 ① 的長度 $=\frac{1}{2}\times10\times3.14$ cm
$=15.7$ cm

部分 ② 的長度 $=10$ cm

∴ 周界 $=(15.7+10)$ cm
$=\underline{\underline{25.7 \text{ cm}}}$

Example 2

A metal wire with a length of 56 cm is cut into two pieces, which are bent into two identical squares, as shown in the figure. Find the length of the side of each square.
如圖所示，把一條長 56 cm 的金屬線剪成兩段，並屈曲成兩個大小相同的正方形。求每個正方形的邊長。



Solution

Let x cm be the length of each square.

Length of each piece of wire $= \frac{56}{2}$ cm $= 28$ cm

$\therefore \quad x \times 4 = 28$

$x = \frac{28}{4}$

$x = 7$

$\therefore$ The length of each square is 7 cm.

設每個正方形的邊長為 x cm。

每段金屬線的長度 $= \frac{56}{2}$ cm $= 28$ cm

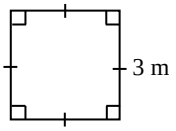
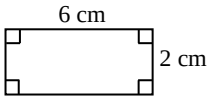
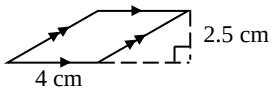
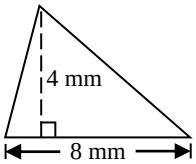
$\therefore \quad x \times 4 = 28$

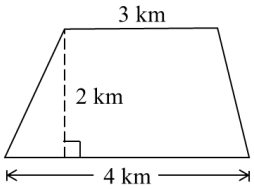
$x = \frac{28}{4}$

$x = 7$

$\therefore$ 每個正方形的邊長是 7 cm。

B. Areas of Plane Figures 平面圖形的面積

Plane Figure 平面圖形	Area 面積	Example 例子
Square 正方形	length × length 邊長 × 邊長	 Area 面積 $= 3 \times 3\ \text{m}^2$ $= 9\ \text{m}^2$
Rectangle 長方形	length × width 長 × 闊	 Area 面積 $= 6 \times 2\ \text{cm}^2$ $= 12\ \text{cm}^2$
Parallelogram 平行四邊形	base × height 底 × 高	 Area 面積 $= 4 \times 2.5\ \text{cm}^2$ $= 10\ \text{cm}^2$
Triangle 三角形	$\frac{1}{2}$ × base × height $\frac{1}{2}$ × 底 × 高	 Area 面積 $= \frac{1}{2} \times 8 \times 4\ \text{mm}^2$ $= 16\ \text{mm}^2$

Trapezium 梯形	$\frac{1}{2}\times$ (upper base + lower base) $\times$ height $\frac{1}{2}\times$ (上底 + 下底) $\times$ 高		Area 面積 $=\frac{1}{2}\times(3+4)\times 2\ \text{km}^2$ $=7\ \text{km}^2$

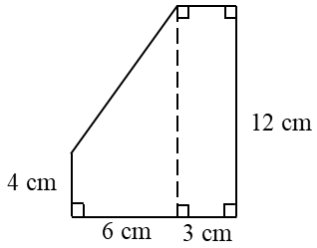
Note: mm^2, cm^2, m^2 and km^2 are some common units for area.

mm^2、cm^2、m^2 和 km^2 是一些常用來表示面積的單位。

Example 3

Find the area of the figure.

求右圖的面積。



Solution

Area of the trapezium $=\frac{1}{2}\times(4+12)\times 6\ \text{cm}^2=48\ \text{cm}^2$

Area of the rectangle $=3\times 12\ \text{cm}^2=36\ \text{cm}^2$

$\therefore$ Area of the figure $=(48+36)\ \text{cm}^2$

$=\underline{\underline{84\ \text{cm}^2}}$

梯形的面積 $=\frac{1}{2}\times(4+12)\times 6\ \text{cm}^2=48\ \text{cm}^2$

長方形的面積 $=3\times 12\ \text{cm}^2=36\ \text{cm}^2$

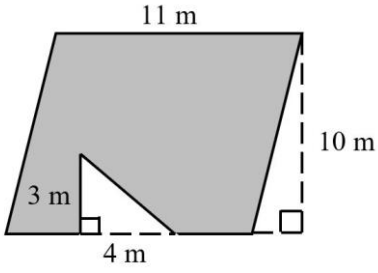
$\therefore$ 圖形的面積 $=(48+36)\ \text{cm}^2$

$=\underline{\underline{84\ \text{cm}^2}}$

Example 4

Find the area of the shaded region.

求圖中陰影部分的面積。



Solution

Area of the triangle $=\frac{1}{2}\times 4\times 3\ \text{m}^2=6\ \text{m}^2$

Area of the parallelogram $=11\times 10\ \text{m}^2=110\ \text{m}^2$

$\therefore$ Area of the shaded region $=(110-6)\ \text{m}^2$

$=\underline{\underline{104\ \text{m}^2}}$

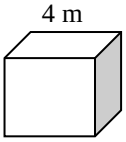
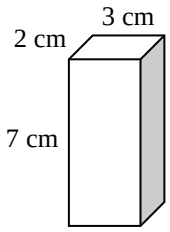
三角形的面積 $=\frac{1}{2}\times 4\times 3\ \text{m}^2=6\ \text{m}^2$

平行四邊形的面積 $=11\times 10\ \text{m}^2=110\ \text{m}^2$

$\therefore$ 陰影部分的面積 $=(110-6)\ \text{m}^2$

$=\underline{\underline{104\ \text{m}^2}}$

C. Volumes of Simple Solids 簡單立體圖形的體積

Solid 立體圖形	Volume 體積	Example 例子
Cube 正方體	length × length × length 邊長 × 邊長 × 邊長	 Volume 體積 $= 4 \times 4 \times 4 \text{ m}^3$ $= 64 \text{ m}^3$
Cuboid 長方體	length × width × height 長 × 闊 × 高	 Volume 體積 $= 3 \times 2 \times 7 \text{ cm}^3$ $= 42 \text{ cm}^3$

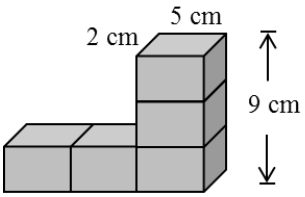
Note:

1. mm^3, cm^3, m^3, km^3, mL and L are some common units for volume.
   mm^3、cm^3、m^3、km^3、mL 和 L 是一些常用來表示體積的單位。
2. The volume of an object is the space that the object occupies.
   The capacity of a container is the amount of liquid that the container can hold.
   體積是指物體所佔空間的大小。容量是指容器能盛載的液體的多少。

Other than the volume of a solid, we may also consider the areas of its faces. The sum of areas of all the faces is called the total surface area of the solid.
除了考慮立體圖形的體積外，我們還會考慮立體每個面的面積，而這些面積的總和稱為立體的總表面面積。

Example 5

The solid in the figure is formed by 5 identical cuboids. Find the volume of the solid.
圖中的立體由 5 個大小相同的長方體組成。求該立體的體積。



Solution

Height of a cuboid $= 9 \div 3 \text{ cm} = 3 \text{ cm}$
Volume of a cuboid $= 5 \times 2 \times 3 \text{ cm}^3 = 30 \text{ cm}^3$

$\therefore$ Volume of the solid $= 30 \times 5 \text{ cm}^3$
$= \underline{\underline{150 \text{ cm}^3}}$

每個長方體的高 $= 9 \div 3 \text{ cm} = 3 \text{ cm}$
每個長方體的體積 $= 5 \times 2 \times 3 \text{ cm}^3 = 30 \text{ cm}^3$

$\therefore$ 該立體的體積 $= 30 \times 5 \text{ cm}^3$
$= \underline{\underline{150 \text{ cm}^3}}$

Example 6

The length, the width and the height of a rectangular container are 50 cm, 30 cm and 45 cm respectively. If the container is fully filled with apple juice, how many glasses, each with a capacity of 250 cm^3, can the juice fill?

一個長方體形容器的長、闊和高分別為 50 cm、30 cm 和 45 cm。若該容器盛滿蘋果汁，問蘋果汁共可注滿多少個容量為 250 cm^3 的杯子？

Solution

Volume of juice = capacity of the rectangular container

$= 50 \times 30 \times 45 \text{ cm}^3$

$= 67\ 500 \text{ cm}^3$

Number of glasses that can be filled $= 67\ 500 \div 250$

$= \underline{\underline{270}}$

蘋果汁的體積 = 長方體形容器的容量

$= 50 \times 30 \times 45 \text{ cm}^3$

$= 67\ 500 \text{ cm}^3$

可注滿杯子的數目 $= 67\ 500 \div 250$

$= \underline{\underline{270}}$

Example 7

A rectangular aquarium 90 cm long and 60 cm wide is filled with some water. If an object with a volume of 27 000 cm^3 is put into the aquarium and is completely immersed in the water, find the rise in water level.

一個長 90 cm、闊 60 cm 的長方體形水族箱盛有一些水。若把一件體積為 27 000 cm^3 的物件放入水族箱，並完全浸沒於水中，求水位上升的幅度。

Solution

Let h cm be the rise in water level.

∵ Volume of water above the original water level = volume of the object

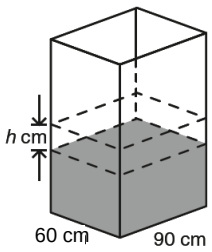
∴ $90 \times 60 \times h = 27\ 000$

$5400h = 27\ 000$

$\dfrac{5400h}{5400} = \dfrac{27\ 000}{5400}$

$h = 5$

∴ The rise in water level is 5 cm.



設水位上升的幅度為 h cm。

∵ 上升的水的體積 = 物件的體積

∴ $90 \times 60 \times h = 27\ 000$

$5400h = 27\ 000$

$\dfrac{5400h}{5400} = \dfrac{27\ 000}{5400}$

$h = 5$

∴ 水位上升的幅度是 5 cm。

Key Terms / Phrases

Pronunciation

perimeter	周界	area	面積	capacity	容量
circumference	圓周	volume	體積		

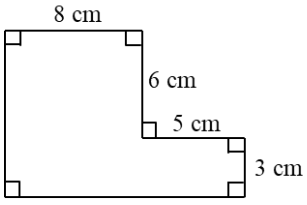
Useful Sentences

Find the radii of the two circles in the figure.	求圖中兩個圓形的半徑。
Find the area of the polygon correct to 2 decimal places.	求多邊形的面積，答案須準確至二位小數。
Express the perimeter of the quadrilateral in terms of x.	以 x 表示四邊形的周界。
Find the time required for the pipe to fill up the tank.	求喉管注滿容器所需的時間。
Find the difference in circumference of the two concentric circles.	求兩個同心圓的圓周的差。

Exercise 7

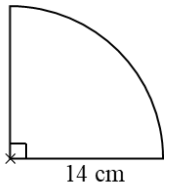
Find the perimeter of each of the following figures. **(1 – 2)**

1.



_____ cm

2.

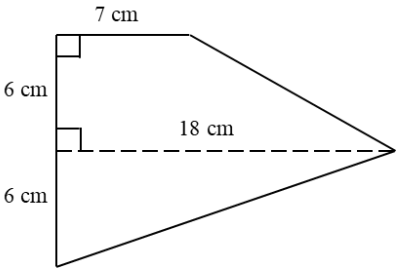


$\left(\text{Take } \pi = \frac{22}{7}.\right)$

_____ cm

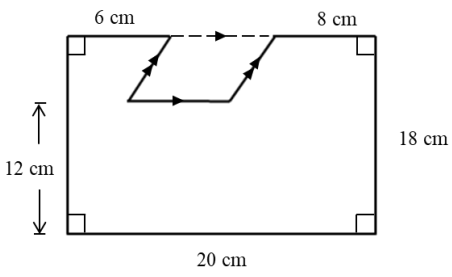
Find the area of each of the following figures. **(3 – 4)**

3.



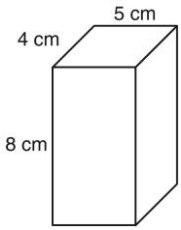
_____ cm^2

4.

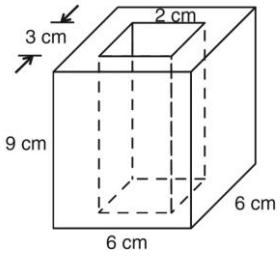


_____ cm^2

Find the volume of each of the following solids. **(5 – 6)**

5. 

_____ cm^3

6. 

_____ cm^3

7. The length and the width of a rectangular playground are 40 m and 30 m respectively. Sam runs 12 times around the playground. Find the total distance he runs.

_____

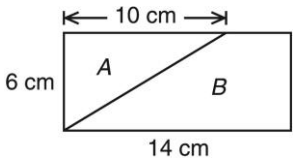
8. The radius of a *monocycle* wheel is 35 cm. How many revolutions will the wheel make in travelling 440 m? $\left(\text{Take } \pi = \frac{22}{7}.\right)$

_____

9. Raymond wants to install some *fences* all around his *circular* farm. If the radius of the farm is 140 m and each fence is 22 m long, how many fences can be installed? $\left(\text{Take } \pi = \frac{22}{7}.\right)$

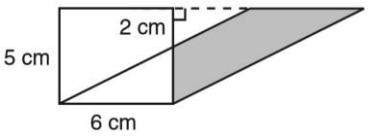
_____

10. In the figure, a rectangular court is divided into two parts. What is the difference in area between part *A* and part *B*?



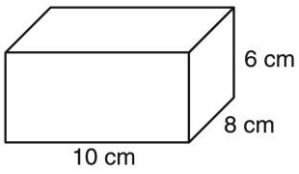
_____

11. The figure consists of a rectangle and a parallelogram. Find the area of the shaded region.



_____

12. Harry wants to cut out a cube from the rectangular block as shown in the figure. The size of the cube should be as large as possible. What is the volume of the cube?



_____

monocycle 單輪車 fence 圍欄 circular 圓形的

13. A rectangular tank 80 cm long, 70 cm wide and 60 cm tall is initially full of water. After a few hours, $\frac{3}{4}$ of the water has gone. How much water is left? _____

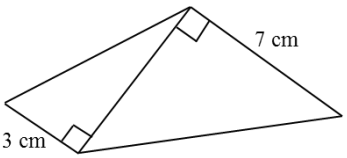
14. There is a cuboid of volume 560 cm^3. If the length and the height of the cuboid are 20 cm and 7 cm respectively, what is the width of the cuboid? _____

15. A rectangular tank 160 cm long and 80 cm wide is filled with some water. John puts a cube with side 40 cm long into the water. What is the rise in water level if the cube is completely immersed? _____

Solve the following problems. Show your working steps clearly. **(16 – 19)**

16. The circumference of a circular pool is 31.4 m. The path around it is 1 m wide. Find the length of the *outer boundary* of the path. (Take $\pi = 3.14$.)

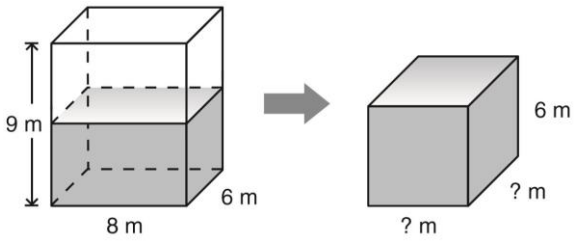
17. In the figure, the quadrilateral is made up of two right-angled triangles. The area of the smaller triangle is 9 cm^2. Find the area of the quadrilateral.



outer boundary 外圍

18. A *cubical* tank with side 10 cm long contains water to a depth of 5 cm. After 50 *identical* marbles are put into the water, the depth of water with all the marbles completely immersed in the water becomes 6 cm. Find the volume of each marble.

19. The length, the breadth and the height of a rectangular tank are 8 m, 6 m and 9 m respectively. The tank is full of water at first. Then Sam pours half of the water into a rectangular container with a square base. The water completely fills up the container without overflow. If the height of the container is 6 m, find the length of its base.

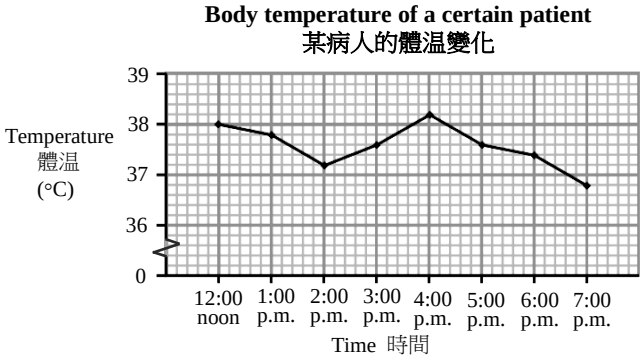


cubical 正方體形的 identical 相同的

8 Data Handling 數據處理

A. Different Statistical Charts 不同的統計圖表

Statistical chart	Example
Pictogram 象形圖	**The most favourite sport among the students** **同學們最喜愛的運動** Football 足球 Basketball 籃球 Swimming 游泳 Others 其他 Each picture stands for 10 people 每個圖像代表 10 人
Bar chart 棒形圖	**Favourite ride in Ocean Park for S1A students** **中一甲班學生最喜愛的海洋公園機動遊戲** Number of students 學生人數 0, 2, 4, 6, 8, 10 The Dragon 瘋狂過山車 Crazy Galleon 沖天搖擺船 Ferris Wheel 摩天巨輪 The Eagle 翻天飛鷹 Flying Swing 飛天鞦韆
Compound bar chart 複合棒形圖	**Favourite colour for S1 students** **中一級學生最喜愛的顏色** Number of students 學生人數 0, 5, 10, 15, 20 Boy 男生 Girl 女生 Blue 藍色 Green 綠色 Black 黑色 Red 紅色 Colour 顏色

Broken line graph 折線圖	

In general, bar chart is used to show the actual frequency of each item, while broken line graph is used to show how data change over a period of time or predict the trend of data.
一般來說，棒形圖用於顯示每項數據的實際頻數，而折線圖用於顯示數據在一段時間內的變化或預測數據的趨勢。

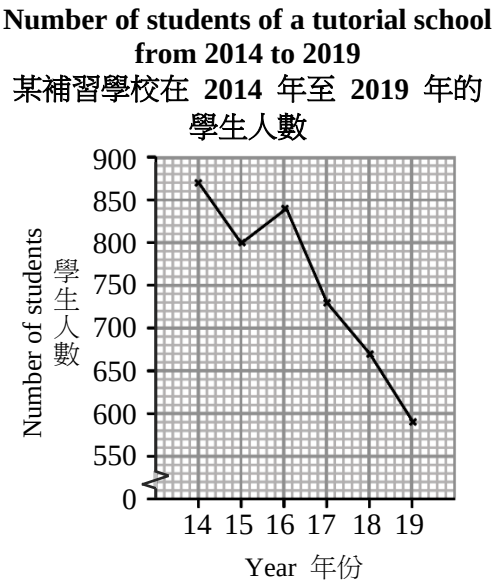
B. Applications of Statistical Charts 統計圖表的應用

Example 1

The broken line graph on the right show the number of students of a tutorial school from 2014 to 2019.
右方的折線圖所示為某補習學校由 2014 年至 2019 年的學生人數。

(a) In which years was the number of students more than 800?
哪些年份的學生人數多於 800？

(b) Between which 2 consecutive years did the number of students drop most sharply? What is the decrease in number?
哪兩年間的學生人數跌幅最大？人數減少了多少？



Solution

(a) The number of students was more than 800 in 2014 and 2016.
2014 年和 2016 年的學生人數多於 800。

(b) The number of students drooped most sharply between 2016 and 2017. The decrease in number is 110.
2016 年至 2017 年間的學生人數跌幅最大。人數減少了 110 名。

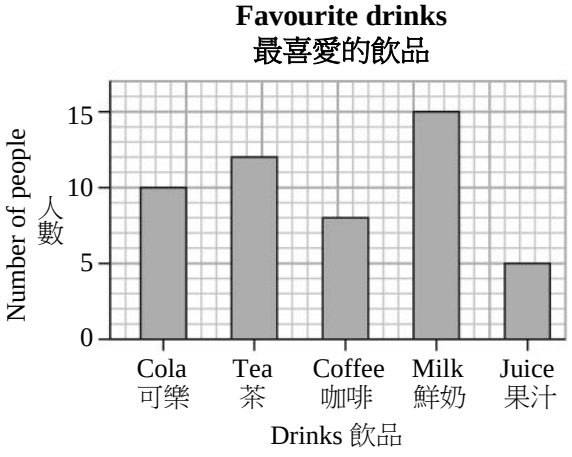
Example 2

Mary interviews some of her friends to find out their favourite drinks and draws the frequency table below.
美儀訪問了一些朋友，以找出他們最喜愛的飲品，並製作了以下的頻數表。

Drink 飲品	Cola 可樂	Tea 茶	Coffee 咖啡	Milk 鮮奶	Juice 果汁
Number of people 人數	10	12	8	15	5

Draw a bar chart to present the data.
繪畫一個棒形圖來表示有關的資料。

Solution



- Give a title to the bar chart.
  為棒形圖訂立一個標題。

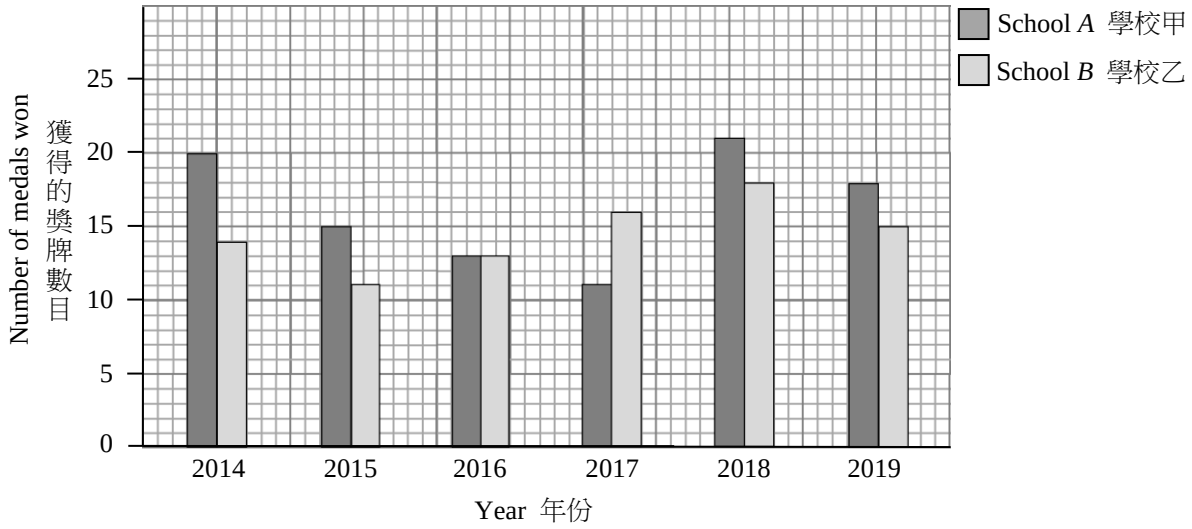
Example 3

The compound bar chart below shows the numbers of medals won by school *A* and school *B* on the Sports Days in the past 6 years.

以下複合棒形圖所示為學校甲和學校乙在過去 6 年的運動會中獲得的獎牌數目。

Number of medals won by school *A* and school *B* on Sports Day

學校甲和學校乙在運動會中獲得的獎牌數目



(a) In which year did school *B* win the least number of medals?
學校乙在哪一年獲得最少獎牌？

(b) In which year were the numbers of medals won by school *A* and school *B* the same?
學校甲和學校乙在哪一年獲得的獎牌數目相同？

(c) What was the total number of medals won by school *A* and school *B* in 2018?
學校甲和學校乙在 2018 年獲得的獎牌總數目是多少？

Solution

(a) From the chart, school *B* won the least number of medals in 2015.
從圖可見，學校乙在 2015 年獲得最少獎牌。

(b) From the chart, the numbers of medals won by school *A* and school *B* were the same in 2016.
從圖可見，學校甲和學校乙在 2016 年獲得的獎牌數目相同。

(c) From the chart, the number of medals won by school *A* in 2018 is 21 and the number of medals won by school *B* in 2018 is 18.
從圖可見，學校甲在 2018 年獲得的獎牌數目是 21，而學校乙在 2018 年獲得的獎牌數目是 18。

∴ Total number of medals 獎牌總數目
= 21 + 18
= 39

Pronunciation

Key Terms / Phrases

statistical chart	統計圖表	broken line graph	折線圖
pictogram	象形圖	frequency table	頻數表
bar chart	棒形圖	title	標題
compound bar chart	複合棒形圖		

Useful Sentences

A company conducted a survey to find out the average income of its customers.	某公司進行了一項調查，找出顧客的平均收入。
The following data show the heights of 40 students.	以下數據為 40 名學生的身高。
Draw a compound bar chart to present the above data.	繪畫一複合棒形圖來表達上述數據。
Is a broken line graph suitable for presenting the above data	以折線圖表達上述數據是否合適。

Exercise 8

1. Which type of statistical chart is more suitable for presenting each of the following sets of data? Put a '✓' in the appropriate box.

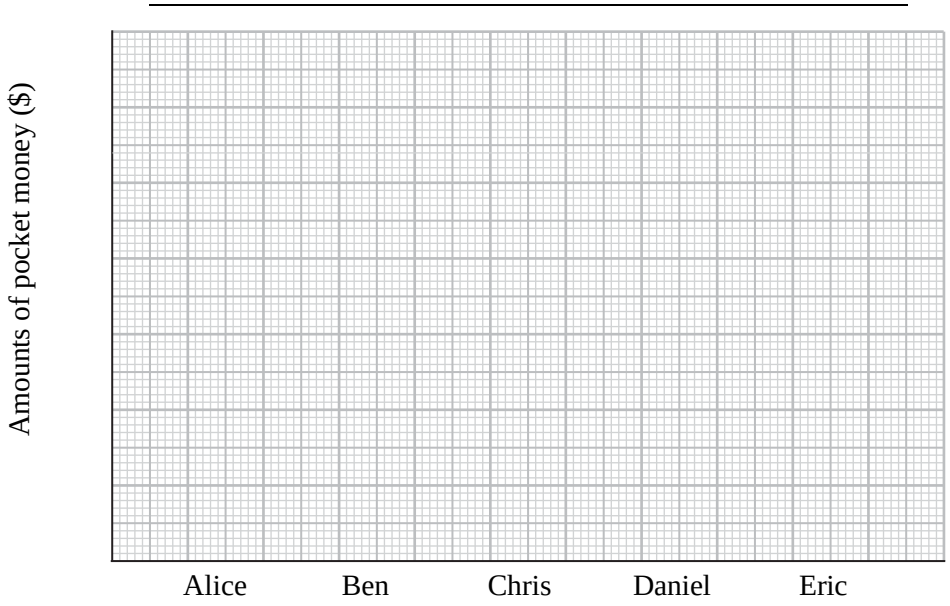
	Bar chart	**Broken line graph**
(a) The daily income of a cinema last week	☐	☐
(b) The change in temperature in a district on a certain day	☐	☐
(c) The *ingredients* of a certain type of health food	☐	☐
(d) The number of students in after-school classes this year	☐	☐
(e) Mandy's height in the past ten years	☐	☐

ingredient 成分

2. The table below shows the amounts of pocket money of 5 students in a week.

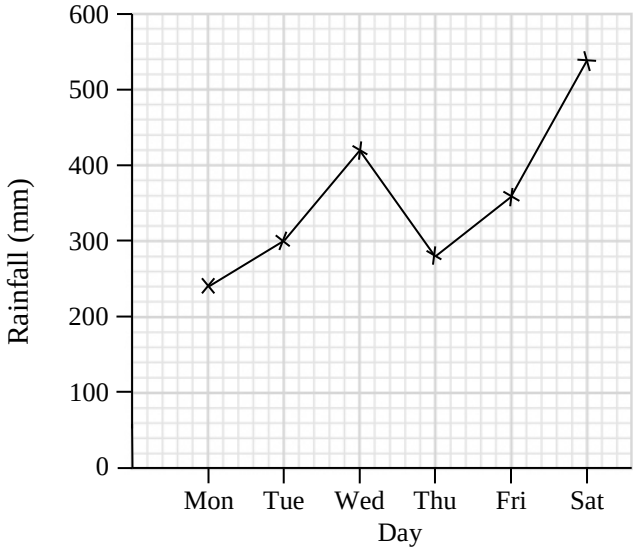
Student	Alice	Ben	Chris	Daniel	Eric
Amounts of pocket money ($)	600	550	680	440	390

Draw a bar chart to present the above data.



3. The following broken line graph shows the rainfall of a city from Monday to Saturday.

The rainfall of a city from Monday to Saturday

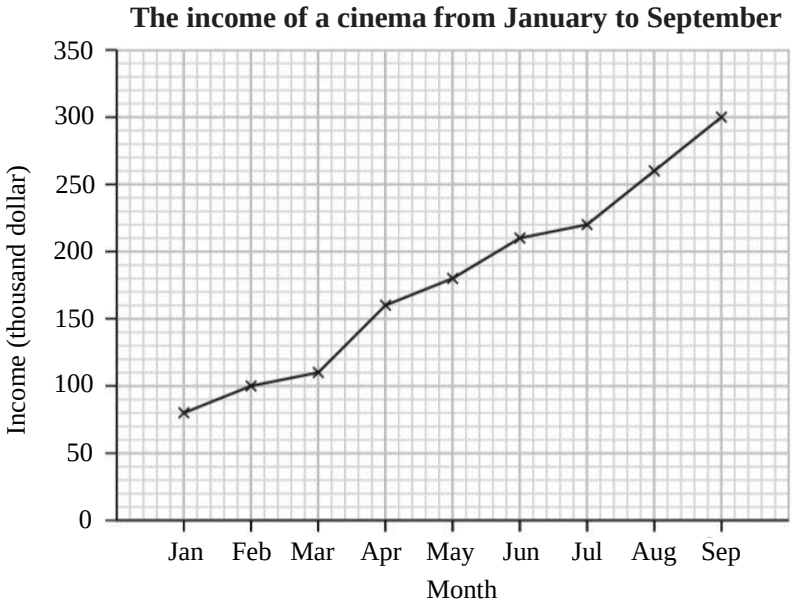


(a) The minimum rainfall occurred in _____. There was only _____ of rain.

(b) The maximum rainfall occurred in _____. There was _____ of rain.

(c) The total rainfall recorded from Monday to Saturday is _____.

4. The following broken line graph shows the income of a cinema from January to September.

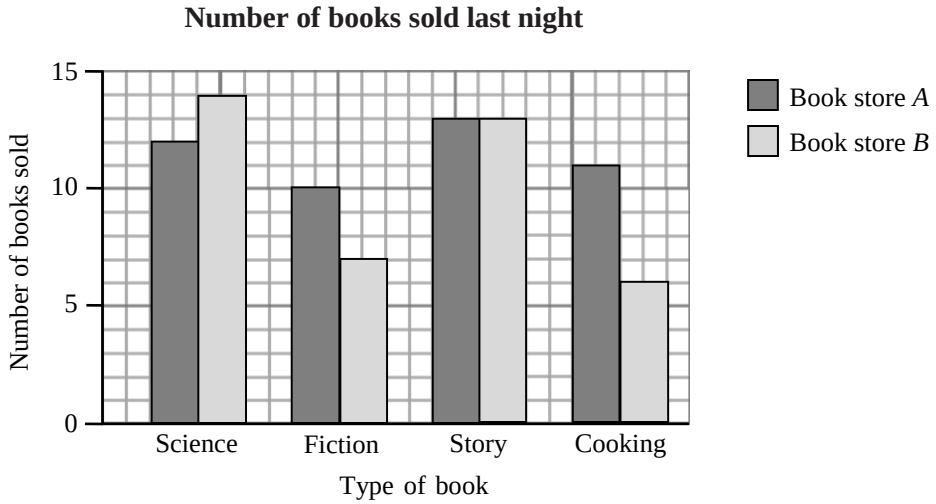


(a) How much was the income of the cinema in July? _____

(b) In which month did the cinema have the highest income? _____

(c) Between which two months did the cinema have the highest increase in income? _____

5. The compound bar chart below shows the number of books sold at book stores *A* and *B* last night.



(a) What was the type of book in which book stores *A* and *B* are most different in terms of sales volume last night? _____

(b) What was the total number of fictions sold last night? _____

(c) Which book store sold more books last night? How many books did it sell? _____