For any updates of this book, please refer to the subject homepage:

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For mathematics problems consultation, please email to the following address:

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For Maths Corner Exercise, please obtain from the cabinet outside Room 309

F1A: Chapter 1A

Date	Task	Progress	
	Lesson Worksheet	○ Complete and Checked ○ Problems encountered ○ Skipped	(Full Solution)
	Book Example 1	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Book Example 2	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Book Example 3	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Consolidation Exercise	○ Complete and Checked ○ Problems encountered ○ Skipped	(Full Solution)
	Maths Corner Exercise 1A Level 1	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 1A Level 2	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 1A Level 3	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 1A Multiple Choice	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	E-Class Multiple Choice Self-Test	○ Complete and Checked ○ Problems encountered ○ Skipped	Mark: _____

1.1A Concept and Applications of Directed Numbers

> To identify two magnitudes in different directions, we can set:
> **(i)** one magnitude as positive and represent it by the '+' sign, and
> **(ii)** the other magnitude as negative and represent it by the '−' sign.
> e.g. If '+2 m' represents 2 m **above** sea level, then '−2 m' represents 2 m **below** sea level.

1. Complete the table below.

	Given situation	*Opposite situation*
(a)	'+1°C' represents an <u>increase</u> of 1°C.	'_____ °C' represents a <u>decrease</u> of 1°C.
(b)	'−3' represents 3 steps to the <u>left</u>.	'_____' represents 3 steps to the <u>right</u>.
(c)	'+10' represents a <u>gain</u> of 10 marks.	'−10' represents a _____ of 10 marks.
(d)	'−4 km' represents 4 km to the <u>west</u> of the school.	'+4 km' represents 4 km to the _____ of the school.

> **(a) Directed numbers** include:
>   **(i)** **positive numbers**—numbers with the '+' sign
>   **(ii)** **negative numbers**—numbers with the '−' sign
> **(b)** Two numbers with the same **numerical value** but different signs are called **opposite numbers**.
>   e.g. The opposite number of −6 is +6.

0 is neither positive nor negative. It is not a directed number.

◄ All natural numbers 1, 2, 3 ⋯, their opposite numbers −1, −2, −3 ⋯ and 0 are called **integers**.

2. Consider the following numbers.

$$0, +\frac{1}{4}, -7, -1.5, +3$$

(a) Which of them are positive numbers?
(b) Which of them are negative numbers?
(c) Which of them are integers?

3. Write down the opposite number of each of the following numbers.
  (a) −8
  (b) $+\frac{2}{5}$

⊖ Ex **1A** 4

Example 1	**Instant Drill 1**
Suppose −2 represents 2 levels below ground level. Use a directed number to represent 5 levels above ground level.	Suppose +8 km represents walking 8 km due north. Use a directed number to represent walking 4 km due south.
Negative number means 'below'. _____ number means 'above'.	_____ number means 'due north'. _____ number means 'due south'.
Sol 5 levels above ground level can be represented by +5.	**Sol** Walking 4 km due south can be represented by _____ .

4. Suppose −$1 900 represents a loss of $1 900. Use a directed number to represent a gain of $300.

5. If +$600 represents a deposit of $600 into a bank, what does −$1 000 represent?

> **(a)** Positive numbers can be used to represent an 'increase', 'going up', etc.
> **(b)** Negative numbers can be used to represent a 'decrease', 'going down', etc.

Example 2	**Instant Drill 2**
The length of a rectangle increases by 10 cm, and the width decreases by 5 cm. Use directed numbers to represent the changes in values.	A submarine first drops by 3 m and then rises by 4 m. Use directed numbers to represent the changes in values.
Sol An increase of 10 cm can be represented by +10 cm and a decrease of 5 cm can be represented by −5 cm.	**Sol** A drop of 3 m can be represented by _____ and a rise of 4 m can be represented by _____ .

6. In a supermarket, the price of each apple decreases by $1.2 and that of each orange increases by $0.7. Use directed numbers to represent the changes in values.

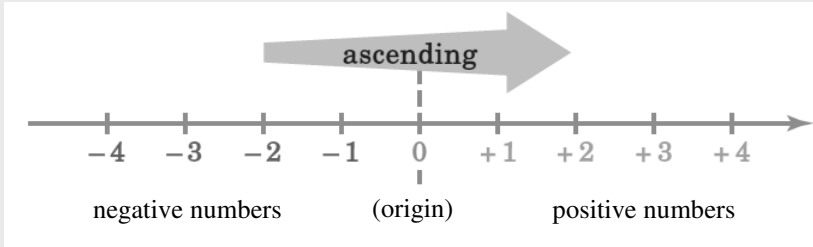7. The temperature rises by 5°C in the afternoon and drops by 9°C at night. Use directed numbers to represent the changes in values.

1.1B Arrangement of Directed Numbers on the Number Line

Directed numbers can be represented on a straight line in order of magnitude. The line is called the number line.

e.g. The horizontal number line is shown below.

◄ A number line can be extended endlessly towards the two directions.

Example 3

Write down the directed numbers represented by *A*, *B* and *C* on the number line below.

2 units

Each scale represents 2 units.
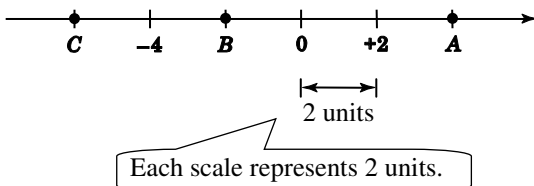
Sol From the number line, *A*: +4, *B*: −2, *C*: −6.

Instant Drill 3

Write down the directed numbers represented by *D* and *E* on the number line below.

____ unit

Each scale represents ____ unit.
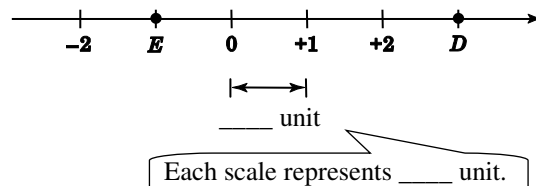
Sol From the number line, *D*: ____, *E*: ____.

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8. Write down the directed numbers represented by *M* and *N* on the number line below.

____ units

Each scale represents ____ units.
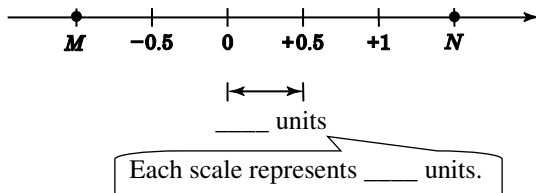
9. Write down the directed numbers represented by *P*, *Q* and *R* on the number line below.

Each scale represents ____ unit.
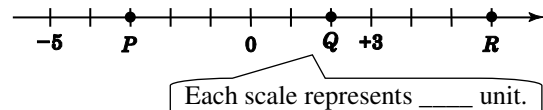
Example 4

On the given number line, mark the numbers +5, −3 and −1. Among them, which one is the smallest?
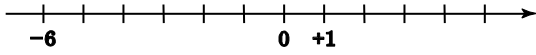
Sol
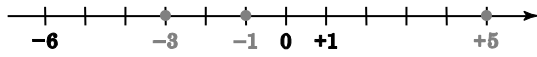
_____ is on the leftmost.
i.e. It is the smallest.

Among them, −3 is the smallest.

Instant Drill 4

On the given number line, mark the numbers −1, −2 and +1.5. Among them, which one is the greatest?
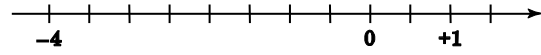
Sol
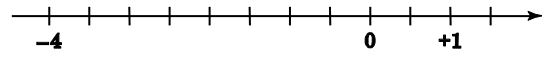
_____ is on the rightmost.
i.e. It is the greatest.

Among them, _____ is the greatest.

---

10. On the given vertical number line, mark the numbers +3, −4 and −3. Among them, which number is the smallest?
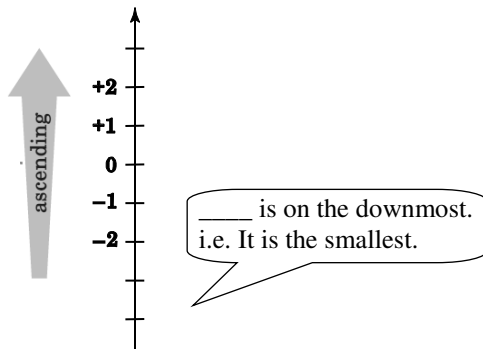
_____ is on the downmost.
i.e. It is the smallest.

11. Refer to the number line below.
   (a) Write down the directed numbers represented by *A*, *B* and *C*.
   (b) On the number line, mark the number +4. It is greater than some number(s) in **(a)**. What is/are the number(s)?


⊖ Ex **1A** 6–8

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12. Compare the numbers in each of the following groups, and use ' > ' or ' < ' to express the answers.
   (a) +3 _____ −1
   (b) +4 _____ −4
   (c) −3 _____ −2

Positions of the numbers on the number line:
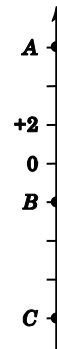
13. (a) Compare the numbers in each of the following groups, and use ' > ' or ' < ' to express the answers.
   (i) −6, 0
   (ii) $+\dfrac{1}{2}$, 0

   (b) Arrange the following numbers in ascending order.

   $+\dfrac{1}{2}$, −6, 0

⊖ Ex **1A** 9

14. Mandy records her change in weight every month. A positive number stands for a weight gain, and a negative number stands for a weight loss.

	June	*July*	*August*
Weight	−4 kg	+2 kg	−2 kg

    (a) Mandy's weight decreases by 1 kg in September. Use a directed number to represent the change in weight.

    (b) In which month, is the weight loss of Mandy the greatest? Explain your answer.

    (a) <u>A decrease of 1 kg can be represented by   .</u>   [Remember to write down the reason.]

    (b) Among −4, +2, −2 and _____, _____ is the smallest number.

       ∴ <u>In   , the weight loss of Mandy is the greatest.</u>

15. Suppose '+10' represents 10 marks higher than the pass mark and '−10' represents 10 marks lower than the pass mark. The test marks of a group of 6 students are as follows:

$$+35, 0, -7, -19, +6, +24$$

Ivan claims that only 3 of them pass the test. Do you agree? Explain your answer.

16. Suppose the time after noon is positive, and the time before noon is negative.

    (a) Describe the meaning of '0 hour'.

    (b) Use directed numbers to represent the following situations.

        (i) 3 p.m.   **(ii)** 7 a.m.

17. How many integers can be represented by the points between −2 and +7 (excluding −2 and +7) on a number line?

1 Directed Numbers

Level 1

1. In each of the following, use a directed number to represent the situation.

   (a) If −8 m represents 8 m below sea level, what can be used to represent 12 m above sea level?

   (b) If +15 represents 15 people entering a house, what can be used to represent 20 people leaving the house?

   (c) If −18 mL represents 18 mL of water flowing out from a tank, what can be used to represent 45 mL of water flowing out from a tank?

2. In each of the following, use a directed number to represent the situation opposite to the given one.

   (a) −$600 represents a decrease of $600 in profit.

   (b) +10 cm represents 10 cm to the east of a mailbox.

   (c) +0.5 kg represents a gain of 0.5 kg in weight.

3. In each of the following, use directed numbers to represent the changes in values.

   (a) Joe deposited $3 500 in an account yesterday and withdrew $3 000 from it today.

   (b) A basketball team gains 25 points in the first round of a game and loses 15 points in the second round.

   (c) The temperature of a room increased by 5°C in the afternoon and decreased by 3°C at night.

4. In each of the following, write down the opposite number of the given number.

   (a) −26 **(b)** +18 **(c)** +4.35 **(d)** $-\dfrac{4}{5}$

5. In each of the following, mark the number and its opposite number on the number line below.

   (a) +2 **(b)** −5 **(c)** +7

6. In each of the following, write down the directed numbers represented by the letters M, N, P on the number line.

   (a)

   (b)

   (c)

7. Draw a horizontal number line from −5 to +6 and mark the numbers −4, −2, 0, +3 and +5 on it.

8. Draw a vertical number line from −3 to +2 and mark the numbers −2.5, −1, +0.5 and +1.5 on it.

9. Refer to the number line below.
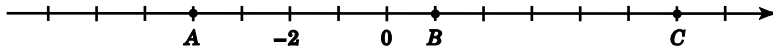
(a) Write down the directed numbers represented by *A*, *B* and *C*. Among them, which one is the greatest?

(b) On the number line, mark the numbers −1, +2, −6, +5 and +3. Among them, which one is the smallest?

10. Refer to the number line below.
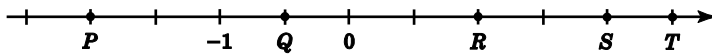
(a) Write down the directed numbers represented by *P*, *Q*, *R*, *S* and *T*.

(b) On the number line, mark the number +1.5. This number is greater than some numbers in **(a)**. What are these numbers?

11. Compare the numbers in each of the following groups, and use '>' or '<' to express the answers.

(a) +3 _____ 0

(b) +2.3 _____ −0.8

(c) $-\dfrac{3}{4}$ _____ $+\dfrac{3}{4}$

(d) −7 _____ −1

(e) −2 _____ −4.5

(f) $-5\dfrac{1}{5}$ _____ $-\dfrac{2}{5}$

12. How many integers can be represented by the points between −7 and +2 (including −7 and +2) on a number line?

13. How many integers can be represented by the points between −8 and +3 (excluding −8 and +3) on a number line?

14. The numbers represented by *M*, *N*, *P*, *Q*, *R* and *S* on a number line are $+3\dfrac{2}{7}$, −3, $-\dfrac{1}{4}$, +0.4, 0 and −7 respectively. How many points are there on the left and the right of the origin respectively?

15. Complete the following table.

	Situation	*Opposite situation*	*Meaning of 0*
(a)	+0.12 cm represents an increase of 0.12 cm in length.	_____ represents an decrease of 0.12 cm in length.	0 cm represents _____ _____ _____
(b)	−7 kg represents a decrease of 7 kg in David's weight.	+7 kg represents _____ _____	0 kg represents _____ _____
(c)	+18 represents a score higher than the passing score by 18.	_____ _____ _____	_____ _____ _____

16. The table below shows the profit / loss records of a shop in the last four days. A positive number stands for a profit, and a negative number stands for a loss.

	Wednesday	Thursday	Friday	Saturday
Amount	−$250	−$50	$0	+$100

(a) Describe the meaning of '−$250'.

(b) On which day did the shop make the highest profit?

(c) How much did the shop gain or lose on Friday?

17. Refer to the number line below.
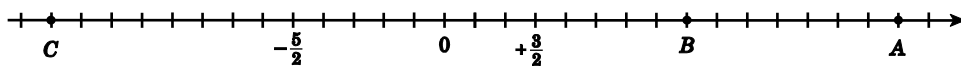
(a) Write down the directed numbers represented by *A*, *B* and *C*.

(b) How many integers are greater than *C* and smaller than *B*?

18. (a) Compare the directed numbers in each of the following groups, and use '>' or '<' to express the answers.

(i) $+3\frac{1}{2}, +2\frac{1}{3}$ (ii) $-5, +1.5$ (iii) $-3.6, -8.2$

(b) Arrange all the numbers of the groups in **(a)** in descending order.

19. In each of the following, arrange the numbers in ascending order.

(a) $+2.7, 0, -4, -1$ **(b)** $-4.3, +2.1, +1.2, -3.4$

(c) $-6, 0, +9, -7, +3$ **(d)** $+3\frac{1}{5}, -3.5, -1\frac{1}{3}, +4.1$

20. Three brothers, Tom, Joe and Ian, are measuring their weights. Suppose '+1 kg' represents 1 kg heavier than Ian, and '−1 kg' represents 1 kg lighter than Ian. For each of the following situations, determine who is the heaviest among the three brothers.

(a) Tom −2 kg, Joe +3 kg.   **(b)** Tom +4 kg, Joe +6 kg.

(c) Tom −1 kg, Joe −5 kg.

Consolidation Exercise 1A (Answer)

1. **(a)** +12 m   **(b)** −20   **(c)** −45 mL

2. **(a)** An increase of $600 in profit can be
represented by +$600.

   (b) 10 cm to the west of a mailbox can be
represented by −10 cm.

   (c) A loss of 0.5 kg in weight can be
represented by −0.5 kg.

3. **(a)** A deposit of $3 500 can be represented
by +$3 500. A withdrawal of $3 000
can be represented by −$3 000.

   (b) A gain of 25 points can be represented
by +25. A loss of 15 points can be
represented by −15.

   (c) An increase of 5°C can be represented
by +5°C. A decrease of 3°C can be
represented by −3°C.

4. **(a)** +26   **(b)** −18

   (c) −4.35   **(d)** $+\dfrac{4}{5}$

6. **(a)** *M*: −2, *N*: +2, *P*: +4

   (b) *M*: +6, *N*: −2, *P*: −8

   (c) *M*: −1.5, *N*: +0.5, *P*: +2.5

9. **(a)** *A*: −4, *B*: +1, *C*: +6; *C* (i.e. +6)

   (b) −6

10. **(a)** *P*: −2, *Q*: −0.5, *R*: +1, *S*: +2, *T*: +2.5

   (b) *P*, *Q* and *R* (i.e. −2, −0.5 and +1)

11. **(a)** >   **(b)** >   **(c)** <

   (d) <   **(e)** >   **(f)** <

12. 10   **13.** 10   **14.** left: 3, right: 2

15. **(a)** −0.12 cm; no change in length.

   (b) an increase of 7 kg in David's weight;
no change in David's weight.

   (c) −18 represents a score lower than the
passing score by 18.
0 represents a score equal to the passing
score.

16. **(a)** −$250 means a loss of $250.

   (b) Saturday

   (c) The shop had no gain or loss on Friday.

17. **(a)** *A*: +7.5, *B*: +4, *C*: −6.5

   (b) 10

18. **(a)** **(i)** $+3\dfrac{1}{2} > +2\dfrac{1}{3}$

   (ii) $-5 < +1.5$

   (iii) $-3.6 > -8.2$

   (b) $+3\dfrac{1}{2} > +2\dfrac{1}{3} > +1.5 > -3.6 > -5 > -8.2$

19. **(a)** $-4 < -1 < 0 < +2.7$

   (b) $-4.3 < -3.4 < +1.2 < +2.1$

   (c) $-7 < -6 < 0 < +3 < +9$

   (d) $-3.5 < -1\dfrac{1}{3} < +3\dfrac{1}{5} < +4.1$

20. **(a)** Joe   **(b)** Joe   **(c)** Ian

Date	Task	Progress	
		F1A: Chapter 1B	
	Lesson Worksheet	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	(Full Solution)
	Book Example 4	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 5	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 6	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 7	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 8	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 9	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 10	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)

	Book Example 11	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Book Example 12	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Consolidation Exercise	○ Complete and Checked ○ Problems encountered ○ Skipped	(Full Solution)
	Maths Corner Exercise 1B Level 1	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 1B Level 2	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 1B Level 3	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 1B Multiple Choice	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	E-Class Multiple Choice Self-Test	○ Complete and Checked ○ Problems encountered ○ Skipped	Mark: _____

1.2A Addition of Directed Numbers on a Number Line

On a horizontal number line, if we:

(a) **add a positive number** $+a$ to a given number, move the position of that number to the **right** by a units;

(b) **add a negative number** $-a$ to a given number, move the position of that number to the **left** by a units.

Example 1

Use a number line to find the results of the following expressions.

(a) $(+1) + (+4)$

(b) $(-2) + (-5)$

Sol **(a)**

On the number line, move 4 units to the right from +1.

$+ (+4)$

Answer

$$(+1) + (+4) = \underline{+5}$$

(b)

On the number line, move 5 units to the left from −2.

$+ (-5)$
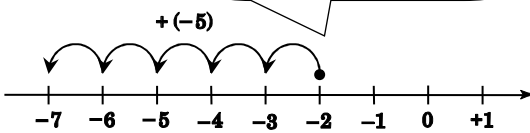
Answer

$$(-2) + (-5) = \underline{-7}$$

Instant Drill 1

Use a number line to find the results of the following expressions.

(a) $(-3) + (+5)$

(b) $0 + (-6)$

Sol **(a)**

On the number line, move ____ units to the _____ from −3.
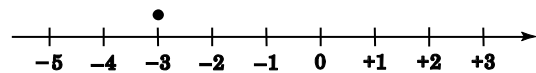
$$(-3) + (+5) = \underline{\hspace{2cm}}$$

(b)
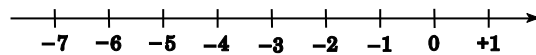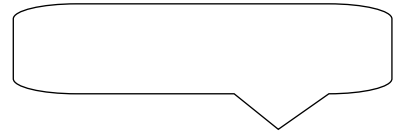
$$0 + (-6) = \underline{\hspace{2cm}}$$

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1. Use a number line to find the result of $(+5) + (+3)$.
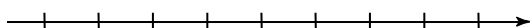
2. Use a number line to find the result of $(-4) + (-4)$.

⊖ Ex **1B** 1, 2
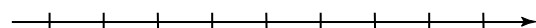
Example 2

A bus arrives at a stop. 2 passengers get on the bus and 7 passengers get off. Is the number of passengers more or less than before? By how many?

Positive number means 'passengers get on the bus'.
Negative number means 'passengers get off the bus'.

Sol Change in the number of passengers

= [(+2) + (−7)]

= −5

+ (−7)

−5 −4 −3 −2 −1 0 +1 +2 +3

Answer
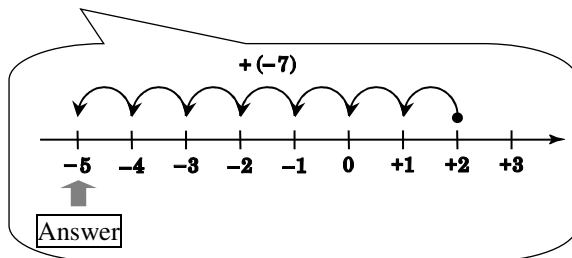
∴   The number of passengers is less than before by 5.

Instant Drill 2

Cindy throws a dress away first, and then buys 5 new dresses. Is the number of dresses more or less than before? By how many?

Positive number means '_____'.
Negative number means '_____'.

Sol Change in the number of dresses

= [(   ) + (   )]

= (   )

−4 −3 −2 −1 0 +1 +2 +3 +4
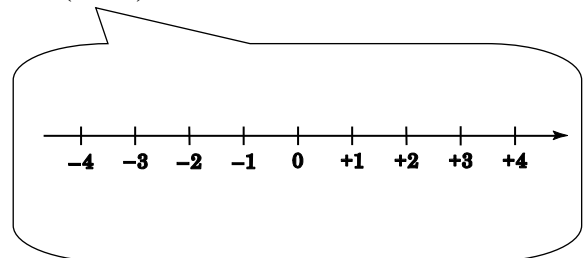
∴   The number of dresses is (more / less) than before by   .

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3. A lift moves down 3 floors, then moves up 4 floors. Is the final position of the lift above or below the original position? By how many floors?

Change in the position of the lift

=
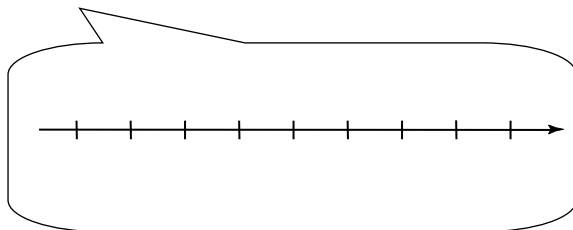
∴   The final position of the lift is _____ floor(s) (above / below) the original position.

4. The water level of a reservoir rises 2 mm, and then drops 6 mm. Is the final water level higher or lower than the original water level? By how many mm?
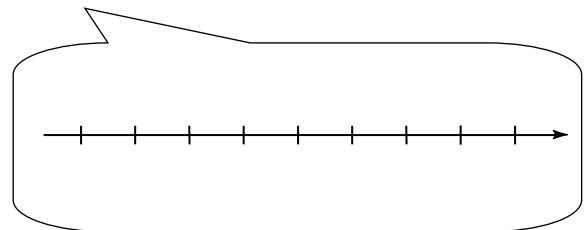
1.2B   Subtraction of Directed Numbers on a Number Line

> On a horizontal number line, if we:
> **(a)** **subtract a positive number** $+a$ from a given number, move the position of that number to the **left** by a units;
> **(b)** **subtract a negative number** $-a$ from a given number, move the position of that number to the **right** by a units.
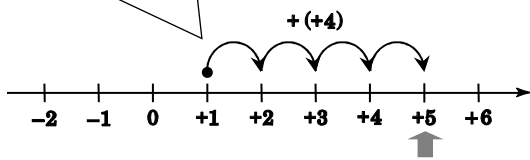
Example 3

Use a number line to find the results of the following expressions.

(a) $(+3) - (+6)$

(b) $(-2) - (-4)$

Sol **(a)**

On the number line, move 6 units to the left from +3.

$-(+6)$
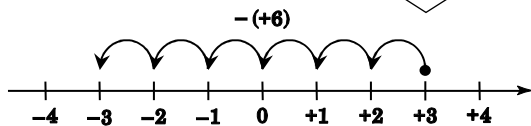
Answer

$(+3) - (+6) = \underline{-3}$

(b)

On the number line, move 4 units to the right from −2.

$-(-4)$
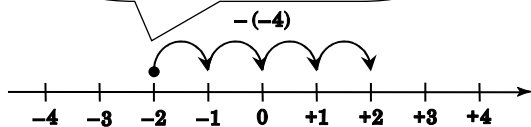
Answer

$(-2) - (-4) = \underline{+2}$

Instant Drill 3

Use a number line to find the results of the following expressions.

(a) $(-1) - (+5)$

(b) $(+4) - (-3)$

Sol **(a)**

On the number line, move ___ units to the _____ from −1.

$(-1) - (+5) = $ _____

(b)
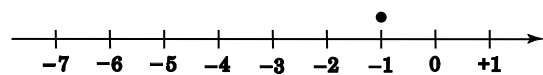
On the number line, move ___ units to the _____ from ___.

$(+4) - (-3) = $ _____

---
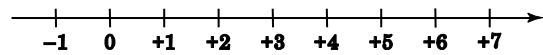
5. Use a number line to find the result of $(+1) - (+7)$.

6. Use a number line to find the result of $(-3) - (-8)$.

⊖ Ex **1B** 3, 4

Example 4	**Instant Drill 4**
In a test, Kitty scores 4 marks more than Simon, and Ted scores 5 marks more than Simon. Is Kitty's score higher or lower than Ted's? By how many marks?	Mike is 2 cm shorter than Lily, and Peggy is 6 cm shorter than Lily. Is Mike taller or shorter than Peggy? By how many cm?
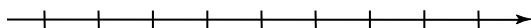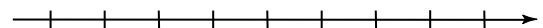
Example 4

In a test, Kitty scores 4 marks more than Simon, and Ted scores 5 marks more than Simon. Is Kitty's score higher or lower than Ted's? By how many marks?

Sol The scores that Kitty's is higher than Ted's

$= [(+4) - (+5)]$ mark

$= -1$ mark ◄ '-1 mark higher' means '1 mark lower'.
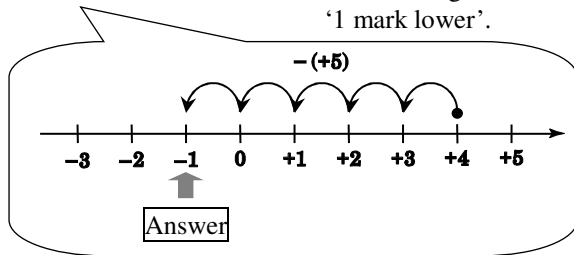
∴ Kitty's score is 1 mark lower than Ted's.

Instant Drill 4

Mike is 2 cm shorter than Lily, and Peggy is 6 cm shorter than Lily. Is Mike taller or shorter than Peggy? By how many cm?

Sol The height that Mike is taller than Peggy

$= [(\quad) - (\quad)]$ cm

$= (\quad)$ cm
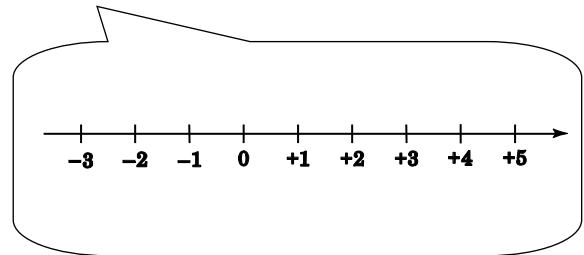
∴ Mike is _____ cm (taller / shorter) than Peggy.

---

7. Ken is 5 years older than Mandy, and Flora is 7 years older than Mandy. Is Ken older or younger than Flora? By how many years?

Number of years that Ken is older than Flora

=
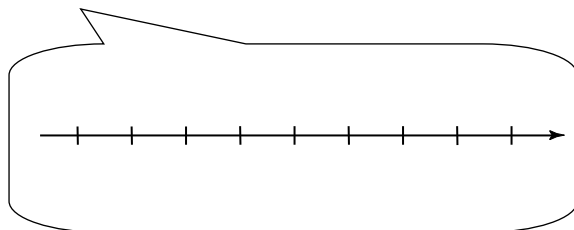
∴ Ken is _____ years (older / younger) than Flora.

8. The local time in Hong Kong is 4 hours behind the time in New Zealand, and the local time in Japan is 3 hours behind the time in New Zealand. By how many hours is the local time in Hong Kong ahead of/behind the time in Japan?
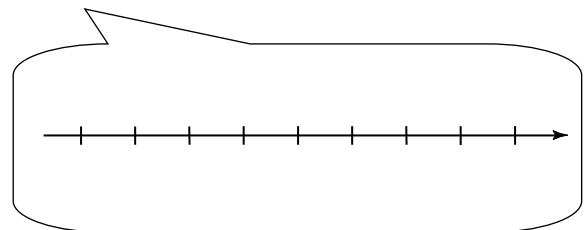
1.2C Addition and Subtraction of Directed Numbers by Removing Brackets

I. Rules for Removing Brackets

$$+(+a) = +a \qquad -(+a) = -a$$
$$+(-a) = -a \qquad -(-a) = +a$$

9. Remove the brackets of each of the following.

(a) $+(+6)$ (b) $-(-2)$

(c) $+(-5)$ (d) $-(+7)$

(e) $-(+10)$ (f) $+(+18)$

(g) $-\left(-\dfrac{3}{4}\right)$ (h) $+(-1.5)$

II. Operations after Removing Brackets

For two numbers having the **same sign** after removing the brackets, <u>keep the sign unchanged, and add the two numerical values.</u>

e.g. **(i)** $+9 + 1 = +(9 + 1) = \underline{10}$ ⟨The '+' sign before +10 can be omitted.⟩

　　　(ii) $-9 - 1 = -(9 + 1) = \underline{-10}$

◄ The 'numerical value' of a number indicates the size of the number without positive or negative sign.

10. Evaluate the following expressions.

(a) $+5 + 2$ (b) $-1 - 12$

For two numbers having **different signs** after removing the brackets, <u>take the sign of the number with larger numerical value, and find the difference between the two numerical values.</u>

e.g. **(i)** $-9 + 1 = -(9 - 1) = \underline{-8}$ ⟨$\because$ 9 > 1 $\therefore$ Take the '−' sign from −9.⟩

　　　(ii) $+9 - 1 = +(9 - 1) = \underline{8}$

11. Evaluate each of the following expressions.

(a) $-3 + 4$ (b) $+6 - 10$

Example 5	**Instant Drill 5**
First remove the brackets, then evaluate the following expressions.	First remove the brackets, then evaluate the following expressions.
(a) $(+2) - (+5)$	**(a)** $(+8) - (-3)$
(b) $(-19) + (-6)$	**(b)** $(-5) + (+15)$
Sol **(a)** $(+2) - (+5) = 2 - 5$	**Sol** **(a)** $(+8) - (-3) = 8 \ (+ / -) \ 3$
$\qquad = \underline{-3}$ $-(5 - 2)$	$\qquad = \underline{}$
(b) $(-19) + (-6) = -19 - 6$	**(b)** $(-5) + (+15) = -5 \ (+ / -) \ 15$
$\qquad = \underline{\underline{-25}}$ $-(19 + 6)$	$\qquad = \underline{}$

First remove the brackets, and then evaluate the following expressions. **[Nos. 12–15]**

12. (a) $(+6) + (+5)$

$\quad$ **(b)** $(-7) - (+23)$

$\quad$ **(c)** $(-10) - (-24)$

13. (a) $(+4) - (+9)$

$\quad$ **(b)** $(-17) + (+5)$

$\quad$ **(c)** $(+18) - (-22)$

Ex **1B** 5–9

14. (a) $(-5) - (+8.3)$

$\quad$ **(b)** $(+0.7) + (-6.9)$

15. (a) $\left(-\dfrac{3}{4}\right) + \left(-\dfrac{1}{4}\right)$

$\quad$ **(b)** $\left(+1\dfrac{2}{3}\right) - \left(+\dfrac{1}{3}\right)$

$$1\frac{2}{3} = \frac{3 \times (\ \ ) + (\ \ )}{3} = \frac{(\ \ )}{3}$$

16. The table below shows the scores of Keith and Jeff in two rounds of a game.

	1st round	*2nd round*
Keith	−49	+28
Jeff	+75	−63

Who has a higher total score? Explain your answer.

Total score of Keith =

Total score of Jeff =

∵ _____ < _____   ◁ Remember to write down the reason.

∴ _____ has a higher total score.

17. Refer to the number line below.
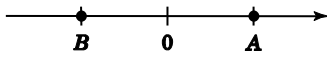
(a) (i) Is the number represented by *A* positive or negative?

(ii) Is the number represented by *B* positive or negative?

(b) Is the result of the expression *A* − *B* always positive? Explain your answer.

18. First remove the brackets, and then evaluate the following expressions.

(a) $(+4) + (−3) − (−8)$ **(b)** $(−16) − (+9) − (+25)$

19. The original remaining stored value of Sam's Octopus card is −$7.2. Sam adds $50 to his Octopus card first, and then uses the card to pay $6 for a can of orange juice. What is the final remaining stored value in his Octopus card?

1 Directed Numbers

Level 1

Use a number line to find the result of each of the following expressions. **[Nos. 1–2]**

1. **(a)** $(+3) + (-9)$ **(b)** $(-2) + (+7)$ **(c)** $(-4) + (+3)$

2. **(a)** $(-8) + (+2)$ **(b)** $(-5) + (+5)$ **(c)** $(-6) + (-1)$

Use a number line to find the result of each of the following expressions. **[Nos. 3–4]**

3. **(a)** $(-2) - (+5)$ **(b)** $(+3) - (+4)$ **(c)** $(-7) - (+1)$

4. **(a)** $(-3) - (-2)$ **(b)** $0 - (-6)$ **(c)** $(-8) - (-4)$

First remove the brackets, then evaluate the following expressions. **[Nos. 5–12]**

5. **(a)** $(+6) + (-15)$ **(b)** $(-2) + (-18)$ **(c)** $(-9) + (+23)$

6. **(a)** $(-4) + (-10)$ **(b)** $(-11) + (-12)$ **(c)** $(+12) + (-20)$

7. **(a)** $(-7) - (+27)$ **(b)** $(-45) - (+18)$ **(c)** $(+5) - (+19)$

8. **(a)** $(+23) - (-15)$ **(b)** $(-5) - (-16)$ **(c)** $(-13) - (+34)$

9. **(a)** $(+2.8) + (-3.4)$ **(b)** $(-4.2) - (+3)$ **(c)** $(-7) + (-1.7)$

10. **(a)** $(-1.8) - (-5.6)$ **(b)** $(-8.9) + (+6.4)$ **(c)** $(-3.7) + (-2.5)$

11. **(a)** $\left(+\dfrac{3}{2}\right) - \left(+\dfrac{7}{2}\right)$ **(b)** $\left(-5\dfrac{2}{7}\right) + \left(-2\dfrac{5}{7}\right)$ **(c)** $\left(-\dfrac{1}{5}\right) - \left(-\dfrac{1}{10}\right)$

12. **(a)** $\left(-\dfrac{2}{3}\right) + \left(+\dfrac{1}{6}\right)$ **(b)** $\left(+3\dfrac{1}{4}\right) - \left(-5\dfrac{1}{8}\right)$ **(c)** $\left(-1\dfrac{1}{2}\right) - \left(+2\dfrac{1}{6}\right)$

13. Represent each of the following word phrases by an expression and evaluate the expression.

(a) Add -8 to $+6$. **(b)** Add -1 to -4.

(c) Subtract $+3$ from -5. **(d)** Subtract -2 from -7.

14. A lift moves down 5 floors from the platform and then moves up 9 floors. Is the final position of the lift above or below the platform? At which floor does the lift stop?

15. Leo is 5 cm shorter than Matthew, and Hugo is 3 cm shorter than Matthew. Is Hugo taller or shorter than Leo? By how many cm?

16. A submarine descends 28 m in the sea, then rises 15 m.

Explain **(a)** Is the submarine above the starting point? Explain your answer.

(b) What is the distance between the submarine and the starting point?

17. In a test, Amanda's score is 7 marks higher than Billy's, and Ken's score is 10 marks lower than Billy's. What is the difference between the scores of Amanda and Ken?

Level 2

First remove the brackets, then evaluate the following expressions. **[Nos. 18–19]**

18. (a) $(-1) + (-4) + (-3)$ **(b)** $(+7) + (-2) + (-6)$

(c) $(+8) - (+5) - (-2)$ **(d)** $(-3) - (-7) - (+6)$

(e) $(-7) + (+16) - (-25)$ **(f)** $(+17) - (-17) + (+18)$

19. (a) $(+1) - (-8) + (+4) - (+6)$ **(b)** $(-2) + (+3) - (+1) - (-8)$

(c) $(-7) - (+12) + (-6) + (+15)$ **(d)** $(+4) - (-15) - (+6) - (-23)$

Evaluate the following expressions. **[Nos. 20–23]**

20. (a) $(-2) + [(-3) - (+4)]$ **(b)** $(-7) + [(-5) - (-9)]$

(c) $(+5) - [(+9) - (-1)]$ **(d)** $(-4) - [(-8) + (-6)]$

(e) $(+13) - [(-12) + (-2)]$ **(f)** $(-26) + [(+12) - (-2)]$

21. (a) $(-16.5) + (+4.5) - (+8)$ **(b)** $(-6.2) + (-6.2) - (-2.4)$

(c) $(-23.6) - [(-11.5) + (-5.1)]$ **(d)** $(+13.4) + [(-17.9) - (-3.5)]$

22. (a) $\left(-3\frac{1}{4}\right) - \left(+3\frac{1}{4}\right) + (-6)$ **(b)** $\left(+\frac{3}{7}\right) - \left(-\frac{11}{7}\right) - (-15)$

(c) $\left(-\frac{1}{2}\right) - \left(-1\frac{1}{4}\right) - (-3)$ **(d)** $\left(+\frac{1}{3}\right) - \left(-\frac{1}{4}\right) + \left(-5\frac{7}{12}\right)$

23. (a) $\left(-\frac{2}{3}\right) + \left[\left(-1\frac{1}{3}\right) - (-5)\right]$ **(b)** $\left(+5\frac{5}{8}\right) - \left[\left(+4\frac{1}{8}\right) - \left(-2\frac{3}{8}\right)\right]$

(c) $(-4.6) - \left(+9\frac{2}{5}\right) + (-20)$ **(d)** $(+3.2) + \left(-\frac{9}{5}\right) - \left(+1\frac{3}{10}\right)$

24. Marvin lost 4 kg in February and lost a further 3 kg in March. However, he gained 6 kg in April. Find the difference between the weight of Marvin in February and that in April.

25. The initial temperature of a glass of water is 18°C. Later, the temperature decreases by 20°C and then increases by 17°C.

(a) What is the final temperature of the glass of water?

Explain (b) It is known that water changes into ice when its temperature is below 0°C. Based on the result in (a), does the glass of water change into ice finally? Explain your answer.

26. The profit / loss records of a company in the last three months were as follows:

The first month: a profit of $2 800 000.

The second month: a loss of $4 650 000.

The third month: a profit of $3 200 000.

What was the overall profit or loss of the company?

27. Eric is doing a climbing exercise. From the marked point, he starts to climb up or down. The order is as follows:

130 cm down, 150 cm up, 95 cm down, 65 cm up

Explain (a) Does Eric return to the marked point finally? Explain your answer.

(b) If Eric continues to climb 70 cm up, how can he get back to the marked point?

28. In a laboratory, the temperature of a liquid is changed in the following order:

decreased by 4.3°C, decreased by 5.4°C, increased by 3.4°C, increased by 6.5°C

Explain (a) Peter claims that the final temperature of the liquid is higher than the initial temperature. Do you agree? Explain your answer.

(b) Peter wants to change the final temperature of the liquid back to the initial temperature. What should he do?

29. The age differences of four children, compared with Sam's age, are shown below:

	Winnie	Ella	Fiona	Cherry
Age difference (*year*)	+1	+2	−3	−4

In the table, '+1' means Winnie is 1 year older than Sam.

(a) (i) By how many years is Fiona older / younger than Ella?

(ii) By how many years is Winnie older / younger than Cherry?

(b) If the age of Cherry is 6, what is the age of Ella?

Consolidation Exercise 1B (Answer)

1. **(a)** −6 **(b)** +5 **(c)** −1
2. **(a)** −6 **(b)** 0 **(c)** −7
3. **(a)** −7 **(b)** −1 **(c)** −8
4. **(a)** −1 **(b)** +6 **(c)** −4
5. **(a)** −9 **(b)** −20 **(c)** 14
6. **(a)** −14 **(b)** −23 **(c)** −8
7. **(a)** −34 **(b)** −63 **(c)** −14
8. **(a)** 38 **(b)** 11 **(c)** −47
9. **(a)** −0.6 **(b)** −7.2 **(c)** −8.7
10. **(a)** 3.8 **(b)** −2.5 **(c)** −6.2
11. **(a)** −2 **(b)** −8 **(c)** $-\dfrac{1}{10}$
12. **(a)** $-\dfrac{1}{2}$ **(b)** $8\dfrac{3}{8}$ **(c)** $-3\dfrac{2}{3}$
13. **(a)** (+6) + (−8), −2
    (b) (−4) + (−1), −5
    (c) (−5) − (+3), −8
    (d) (−7) − (−2), −5
14. It stops at the 4th floor above the platform.
15. Hugo is 2 cm taller than Leo.
16. **(a)** no **(b)** 13 m
17. 17 marks
18. **(a)** −8 **(b)** −1 **(c)** 5
    (d) −2 **(e)** 34 **(f)** 52

19. **(a)** 7 **(b)** 8
    (c) −10 **(d)** 36
20. **(a)** −9 **(b)** −3 **(c)** −5
    (d) 10 **(e)** 27 **(f)** −12
21. **(a)** −20 **(b)** −10
    (c) −7 **(d)** −1
22. **(a)** $-12\dfrac{1}{2}$ **(b)** 17
    (c) $3\dfrac{3}{4}$ **(d)** −5
23. **(a)** 3 **(b)** $-\dfrac{7}{8}$
    (c) −34 **(d)** 0.1
24. 1 kg
25. **(a)** 15°C **(b)** no
26. A profit of $1 350 000
27. **(a)** no
    (b) He should climb 60 cm down.
28. **(a)** yes
    (b) He should decrease the final temperature by 0.2°C.
29. **(a) (i)** 5 years younger
    (ii) 5 years older
    (b) 12

	F1A: Chapter 1C		
Date	Task	Progress	
	Lesson Worksheet	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	(Full Solution)
	Book Example 13	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 14	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 15	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 16	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 17	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 18	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Consolidation Exercise	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	(Full Solution)
	Maths Corner Exercise 1C Level 1	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	Teacher's Signature _____ ( )

	Maths Corner Exercise 1C Level 2	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	Teacher's Signature	_____ ( )
	Maths Corner Exercise 1C Level 3	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	Teacher's Signature	_____ ( )
	Maths Corner Exercise 1C Multiple Choice	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	Teacher's Signature	_____ ( )
	E-Class Multiple Choice Self-Test	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	Mark: _____	

Book 1A | **Lesson Worksheet 1C** (Refer to §1.3)

1.3A Multiplication of Directed Numbers

For positive numbers $+a$, $+b$ and negative numbers $-a$, $-b$,

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

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

◄ The product of two numbers is **positive** if their signs are the **same**, and **negative** if their signs are **different**.

Example 1

Evaluate the following expressions.

(a) $(+4) \times (+5)$

(b) $(-2) \times (+8)$

Sol **(a)** $(+4) \times (+5) = +(4 \times 5)$ ⟨Positive for the same sign⟩

$= \underline{20}$ ⟨Negative for different signs⟩

(b) $(-2) \times (+8) = -(2 \times 8)$

$= \underline{-16}$

Instant Drill 1

Evaluate the following expressions.

(a) $(-2) \times (-3)$

(b) $(+7) \times (-4)$

Sol **(a)** $(-2) \times (-3) = (+ / -) [2 \times (\quad)]$

$= \underline{\quad\quad}$

(b) $(+7) \times (-4) = (+ / -) [(\quad) \times (\quad)]$

$= \underline{\quad\quad}$

---

1. Evaluate the following expressions.

(a) $(+5) \times (+9)$

(b) $(-8) \times (+4)$

(c) $(-10) \times (-1)$

2. Evaluate the following expressions.

(a) $(-2) \times (-12)$

(b) $(+30) \times (-6)$

(c) $(-4) \times (+15)$

⊖ Ex **1C** 1

3. Evaluate $(-10) \times \left(-\dfrac{2}{5}\right)$.

4. Evaluate $(+0.3) \times (-0.1)$.

Example 2	**Instant Drill 2**
Evaluate $(-3) \times (-10) \times (-7)$.	Evaluate $(-5) \times (+2) \times (+9)$.
Sol $\quad (-3) \times (-10) \times (-7)$	**Sol** $\quad (-5) \times (+2) \times (+9)$
$\quad = +(3 \times 10) \times (-7)$	$\quad = (+ / -) \; [(\quad) \times (\quad)] \times (+9)$
$\quad = (+30) \times (-7)$	$\quad =$
$\quad = -(30 \times 7)$	
$\quad = \underline{-210}$	

5. Evaluate $(-3) \times (+2) \times (-7)$.

6. Evaluate $(+25)(-4)(-1)$.

$(+25)(-4)(-1)$ means
$(+25) \times (-4) \times (-1)$.

28

1.3B   Division of Directed Numbers

For positive numbers $+a$, $+b$ and negative numbers $-a$, $-b$,

$$\frac{(+a)}{(+b)} = +\left(\frac{a}{b}\right) \qquad\qquad \frac{(+a)}{(-b)} = -\left(\frac{a}{b}\right)$$

$$\frac{(-a)}{(-b)} = +\left(\frac{a}{b}\right) \qquad\qquad \frac{(-a)}{(+b)} = -\left(\frac{a}{b}\right)$$

◄ The product of two numbers is **positive** if their signs are the **same**, and **negative** if their signs are **different**.

Example 3

Evaluate the following expressions.

(a) $\dfrac{(+24)}{(-4)}$

(b) $(-36) \div (-9)$

Sol **(a)** $\dfrac{(+24)}{(-4)} = -\left(\dfrac{24}{4}\right)$ ⟵ [Negative for different signs]

$\qquad\qquad = \underline{-6}$

(b) $(-36) \div (-9) = +(36 \div 9)$ ⟵ [Positive for the same sign]

$\qquad\qquad\qquad = \underline{\underline{4}}$

Instant Drill 3

Evaluate the following expressions.

(a) $\dfrac{(+14)}{(+7)}$

(b) $(-40) \div (+2)$

Sol **(a)** $\dfrac{(+14)}{(+7)} = (+ / -)\left[\dfrac{14}{(\ \ )}\right]$

$\qquad\qquad = \underline{\underline{}}$

(b) $(-40) \div (+2) = (+ / -)\,[(\ \ ) \div (\ \ )]$

$\qquad\qquad\qquad = \underline{\underline{}}$

---

7. Evaluate the following expressions.

   (a) $(-27) \div (-3)$

   (b) $(+56) \div (-7)$

   (c) $(+88) \div (+8)$

8. Evaluate the following expressions.

   (a) $(+42) \div (-6)$

   (b) $(-90) \div (+5)$

   (c) $(-144) \div (-12)$

⊖ Ex **1C** 4, 5(a)–(b)

Example 4

Evaluate $\left(-\dfrac{4}{9}\right) \div \left(+\dfrac{2}{3}\right)$.

Sol $\left(-\dfrac{4}{9}\right) \div \left(+\dfrac{2}{3}\right)$

$= -\left(\dfrac{4}{9} \div \dfrac{2}{3}\right)$

$= -\left(\dfrac{4}{9} \times \dfrac{3}{2}\right)$ Change '÷' to '×', and turn the fraction $\dfrac{2}{3}$ upside down.

$= -\dfrac{2}{3}$

Instant Drill 4

Evaluate $\left(-\dfrac{1}{4}\right) \div \left(-\dfrac{1}{2}\right)$.

Sol $\left(-\dfrac{1}{4}\right) \div \left(-\dfrac{1}{2}\right)$

$= (+/-)\left[\dfrac{1}{4} \div \dfrac{(\quad)}{2}\right]$

$=$

---

9. Evaluate $\left(+2\dfrac{1}{4}\right) \div \left(-\dfrac{3}{8}\right)$.

$2\dfrac{1}{4} = \dfrac{4 \times (\quad) + (\quad)}{4} = \dfrac{(\quad)}{4}$

10. Evaluate $\left(-1\dfrac{3}{4}\right) \div \left(-2\dfrac{1}{2}\right)$.

---

11. Evaluate $(-7) \div (+0.1)$.

12. Evaluate $(-3.2) \div (-0.4)$.

1.3C   Mixed Operations of Directed Numbers

Rules of mixed operations:
(a) Evaluate the expression inside the innermost pair(s) of brackets first.
(b) Perform multiplication and division first, followed by addition and subtraction.
When only addition/subtraction (or only multiplication/division) are involved,
perform the operations from left to right.

Example 5	**Instant Drill 5**
Evaluate the following expressions.	Evaluate the following expressions.
(a) $18 \div (-6) \times (-3)$	**(a)** $(-24) \div 6 \div (-2)$
(b) $18 \div [(-6) \times (-3)]$	**(b)** $(-24) \div [6 \div (-2)]$
Sol **(a)** $\mathbf{18 \div (-6) \times (-3)}$ Perform the operations from left to right. $= (-3) \times (-3)$ $= \underline{9}$ **(b)** $18 \div [\mathbf{(-6) \times (-3)}]$ Perform the operations inside the brackets first. $= 18 \div (+18)$ $= \underline{1}$	**Sol** **(a)** $\mathbf{(-24) \div 6 \div (-2)}$ $= (\quad\quad) \div (-2)$ $= \underline{\quad\quad}$ **(b)** $(-24) \div [\mathbf{6 \div (-2)}]$ $= (-24) \div (\quad\quad)$ $= \underline{\quad\quad}$

13. Evaluate $(-6) \times (+7) \div (+3)$.

14. Evaluate $(-20) \div (-4) \times (-5)$.

15. Evaluate $(-8) \div [(-2) \times 4]$.

16. Evaluate $(+10) \div [(-30) \div (-6)]$.

Example 6	**Instant Drill 6**
Evaluate $-5 + 4 \times (-2)$.	Evaluate $7 - (-15) \div 3$.
Sol $-5 + \mathbf{4 \times (-2)}$ *(Perform multiplication first, followed by addition.)*	**Sol** $7 - \mathbf{(-15) \div 3}$
$= -5 + (-8)$	$= 7 - ($ $)$
$= \underline{-13}$	$= \underline{\qquad}$

17. Evaluate $(-6) \times 3 - 9$.

18. Evaluate $(-8) - (+25) \div (-5)$.

⊖ Ex **1C** 8, 9

19. Evaluate $(+2)(-3) - (-1)(-7)$.

20. Evaluate $4 + (-6) \div (+3) - (-1)$.

⊖ Ex **1C** 10

21. Evaluate $(-16) \div [8 + (-4)]$.

22. Evaluate $10 - (-7 + 5) \div (-2)$.

⊖ Ex **1C** 11, 12

23. In the first round of a singing contest, 4 judges give Hazel −2 points each, while the remaining 2 judges give Hazel +3 points each. If the participant who gets positive points in total can win a prize, will Hazel win the prize? Explain your answer.

Total points of Hazel

= [4 × (　　　) + 2 × (　　　)] points

=

∵ _____ is a (positive / negative) number.

∴ Hazel (will / will not) win the prize.

24. A hawker sold 15 apples at a loss of \$1 each, and sold 8 oranges at a profit of \$1.5 each. Does he make a profit or loss on the whole? Explain your answer.

Suppose a positive number represents a profit, and a _____ number represents a loss.

🎧 Level Up Questions

25. Evaluate $1 - \dfrac{5 + (-17)}{(+2)(-3)}$.

26. A test consists of 25 multiple-choice questions. The marks are given according to the following table.

	Each corrected answer	*Each wrong answer*	*Each unanswered question*
Mark	+3	−2	−1

George gets 10 correct answers and 8 wrong answers in the test. Find his score in the test.

Number of unanswered questions is ____.

1 Directed Numbers

Level 1

Evaluate the following expressions. **[Nos. 1–11]**

1. **(a)** $(+7) \times (-4)$ **(b)** $(-2) \times (-3)$ **(c)** $(-6) \times 0$

2. **(a)** $(-2) \times (+3) \times (+4)$ **(b)** $(+8) \times (-1) \times (-7)$ **(c)** $(+2)(-4)(-5)$

3. **(a)** $(+18) \times \left(-\dfrac{4}{9}\right)$ **(b)** $\left(+\dfrac{5}{6}\right) \times (-24)$ **(c)** $(-2.5) \times (-0.4)$

4. **(a)** $(-35) \div (+5)$ **(b)** $\dfrac{(+42)}{(-7)}$ **(c)** $(-6) \div (-66)$

5. **(a)** $(+96) \div (-3)$ **(b)** $\dfrac{(-84)}{(-4)}$ **(c)** $\left(+2\dfrac{5}{6}\right) \div \left(-5\dfrac{2}{3}\right)$

6. **(a)** $(-5.4) \div (+6)$ **(b)** $(-12) \div (-0.4)$ **(c)** $\dfrac{(+3.5)}{(-0.5)}$

7. **(a)** $(+32) \times (+5) \div (-8)$ **(b)** $(+12) \div (-6) \times 9$ **(c)** $\dfrac{(-24)}{(-4)} \times 8$

8. **(a)** $(-2) + (-14) \times (+7)$ **(b)** $4 \times (-8) - (-25)$ **(c)** $(-3)(-5) - (-2)(+7)$

9. **(a)** $(-63) \div 7 + 8$ **(b)** $(+16) \div (-4) - (-16)$ **(c)** $(+23) - (-39) \div (+3)$

10. **(a)** $(-4)(+5) + (-9) \div 3$ **(b)** $(+8) - (-2)(+7) - 20$ **(c)** $(-15) + (-35) \div (-7) - (-10)$

11. **(a)** $(-13 + 8) \times (-6)$ **(b)** $[(-15) + (+3)] \div 4$ **(c)** $72 \div [(-9 + 3) \times (-2)]$

12. Represent each of the following word phrases by an expression and evaluate the expression.
    (a) Multiply -3 by $+8$.
    (b) Add -3 to the product of -2 and $+5$.
    (c) Divide -14 by -2.
    (d) Divide $+6$ by the sum of $+1$ and -4.

13. Mr Lee loses \$12 in selling a basketball and gains \$19 in selling a football. One day he sells 20 basketballs and 10 footballs. What is his overall gain or loss?

14. City B is 150 km to the west of city A. Philip travels 24 km due west each day from city A. Suppose a positive number represents travelling due east. Use a directed number to represent Philip's position

   (a) from city A after 5 days,

   (b) from city B after 5 days.

15. Donald uses his Octopus card to pay for three boxes of chocolate. Each box costs $7. If the remaining stored value in his Octopus card after the payment is −$6, what is the remaining stored value in his Octopus card before the payment?

Evaluate the following expressions. **[Nos. 16–24]**

16. (a) $(-15) \times \left(-\dfrac{1}{3}\right) \times (+16)$ **(b)** $\left(+\dfrac{2}{7}\right) \times (-21) \times (-15)$ **(c)** $\left(-\dfrac{5}{54}\right) \times (-6) \times \left(-\dfrac{9}{10}\right)$

17. (a) $(+256) \div (-32) \div (+24)$ **(b)** $\left(-\dfrac{7}{10}\right) \div \left(+\dfrac{3}{4}\right) \div \left(-1\dfrac{2}{5}\right)$ **(c)** $(+4.2) \div (-0.7) \div (-4)$

18. (a) $(+55) \div (-11) \times (-3)$ **(b)** $\dfrac{(+4)(-14)}{(-168)}$ **(c)** $\dfrac{(-35)}{(-5)(-4)}$

19. (a) $(+2.3) \times (-3) \div (-69)$ **(b)** $[(-12) + 7] \times (-1.4)$ **(c)** $(-8 - 7) \times 0.6 \div 4.5$

20. (a) $\left[\left(-\dfrac{1}{4}\right) + 2\right] \times (-8)$ **(b)** $10 \div \left[(-1) - \left(-\dfrac{2}{3}\right)\right]$ **(c)** $(-7) + 2\dfrac{2}{5} \times \left(-\dfrac{5}{6}\right)$

21. (a) $\dfrac{(-7 - 5) \times (-3)}{9}$ **(b)** $\dfrac{4 - 13}{-19 - 8}$ **(c)** $\dfrac{(+2.5) \times (-6)}{-5}$

22. (a) $2 + \dfrac{23 - (-25)}{(-2)(+3)}$ **(b)** $-5 - \dfrac{-22 - 26}{-7 + 19}$ **(c)** $3 + \dfrac{-21 + 66}{-6 - 9}$

23. (a) $(-4) \times [0.25 + (-3)]$ **(b)** $[(-23) - 1 \div 10] \div (-7)$ **(c)** $4.5 \div [(-1.2) + 3 \div 10]$

24 (a) $\dfrac{(+4.5)}{(-3.2)} \times \dfrac{(-4)}{(-9)}$ **(b)** $\left(-4\dfrac{1}{3}\right) \div \left(+1\dfrac{6}{7}\right) - \dfrac{1}{3}$ **(c)** $6 - (-1.5) + (+9) \times \left(-\dfrac{5}{6}\right)$

25. In a quiz, each candidate has to answer 15 questions and the marks obtained from each question are shown below:

	Correct answer	Incorrect answer	Unanswered question
Marks	4	−3	0

(a) John answers 5 questions correctly and answers 8 questions incorrectly. What is his final score?

(b) Paul obtains 16 marks from questions answered correctly and his final score is −8 marks.

(i) How many questions does he answer incorrectly?

(ii) How many unanswered questions does he have?

26. In a game, each player has to draw 10 balls from a box, and the points awarded are shown below:

	Red ball	White ball	Green ball
Points	−1	0	3

Tracy draws 5 red balls, 3 white balls and 2 green balls.

(a) (i) How many points does Tracy get from the red balls?

(ii) How many points does Tracy get finally?

Explain (b) Walter plays the game and he draws 7 red balls from the box. Is it possible that Walter gets higher points than Tracy? Explain your answer.

Consolidation Exercise 1C (Answer)

1. **(a)** −28   **(b)** 6   **(c)** 0
2. **(a)** −24   **(b)** 56   **(c)** 40
3. **(a)** −8   **(b)** −20   **(c)** 1
4. **(a)** −7   **(b)** −6   **(c)** $\dfrac{1}{11}$
5. **(a)** −32   **(b)** 21   **(c)** $-\dfrac{1}{2}$
6. **(a)** −0.9   **(b)** 30   **(c)** −7
7. **(a)** −20   **(b)** −18   **(c)** 48
8. **(a)** −100   **(b)** −7   **(c)** 29
9. **(a)** −1   **(b)** 12   **(c)** 36
10. **(a)** −23   **(b)** 2   **(c)** 0
11. **(a)** 30   **(b)** −3   **(c)** 6
12. **(a)** $(-3) \times (+8)$, −24
    (b) $(-2) \times (+5) + (-3)$, −13
    (c) $(-14) \div (-2)$, 7
    (d) $(+6) \div [(+1) + (-4)]$, −2
13. He loses $50.
14. **(a)** −120 km   **(b)** +30 km

15. $15
16. **(a)** 80   **(b)** 90   **(c)** $-\dfrac{1}{2}$
17. **(a)** $-\dfrac{1}{3}$ **(b)** $\dfrac{2}{3}$ **(c)** 1.5
18. **(a)** 15   **(b)** $\dfrac{1}{3}$ **(c)** $-\dfrac{7}{4}$
19. **(a)** 0.1   **(b)** 7   **(c)** −2
20. **(a)** −14   **(b)** −30   **(c)** −9
21. **(a)** 4   **(b)** $\dfrac{1}{3}$ **(c)** 3
22. **(a)** −6   **(b)** −1   **(c)** 0
23. **(a)** 11   **(b)** 3.3   **(c)** −5
24. **(a)** $-\dfrac{5}{8}$ **(b)** $-2\dfrac{2}{3}$ **(c)** 0
25. **(a)** −4 marks
    (b) (i) 8   **(ii)** 3
26. **(a) (i)** −5 points   **(ii)** 1 point
    (b) yes

F1A: Chapter 2A

Date	Task	Progress	
	Lesson Worksheet	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	(Full Solution)
	Book Example 1	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 2	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 3	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 4	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 5	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Consolidation Exercise	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	(Full Solution)
	Maths Corner Exercise 2A Level 1	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 2A Level 2	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 2A Level 3	◯ Complete and Checked ◯ Problems encountered	Teacher's Signature _____ ( )

		◯ Skipped		
	Maths Corner Exercise 2A Multiple Choice	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	Teacher's Signature	_____ ( )
	E-Class Multiple Choice Self-Test	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	Mark: _____	

2.1A Using Letters to Represent Numbers

In algebra, we use letters to represent numbers.

2.1B Algebraic Expressions

(a) Algebraic expressions are expressions formed by numbers, letters and operation signs (such as $+, -, \times, \div$).

e.g. a, $x - y$ and $3T - 5q + 1$.

(b) Addition: $a + b$

Subtraction: $a - b$

Multiplication: $a \times b$ or $a \cdot b$ or ab

Division: $a \div b$ or $\dfrac{a}{b}$ ◀ $b \neq 0$

Index notation: for any positive integer n,

$$\underbrace{a \times a \times \cdots \times a}_{n \text{ times}} = a^n.$$

◀ a is called the base and n is called the index.

Example 1	**Instant Drill 1**
Represent each of the following word phrases by an algebraic expression.	Represent each of the following word phrases by an algebraic expression.
(a) Add 8 to m.	**(a)** Subtract y from x.
(b) Divide K by 3.	**(b)** Multiply a by p.
Sol (a) The required expression is $m + 8$.	**Sol (a)** The required expression is _____.
(b) The required expression is $\dfrac{K}{3}$.	**(b)** The required expression is _____.

Represent each of the following word phrases by an algebraic expression. **[Nos. 1–4]**

1. (a) The square of x

'The square of x' means 'x to the power 2'.

(b) Subtract y from the square of x.

2. (a) The sum of h and k

(b) Divide the sum of h and k by 5.

3. Subtract an unknown number from 14, and then multiply the difference by 3.

> Represent the unknown number by a letter first.

Let x be the unknown number. Then the required expression is _____.

4. Divide an unknown number by 18, and then add 11 to the quotient.

Example 2

Use word phrases to describe the following algebraic expressions.

(a) $p - 2$

(b) $a \times b^3$

> 'b to the power 3' means 'the cube of b'.

Sol **(a)** Subtract 2 from p.

(b) Multiply a by the cube of b.

Instant Drill 2

Use word phrases to describe the following algebraic expressions.

(a) $x^2 + 4$

(b) $3P \div Q$

Sol **(a)** Add 4 to _____.

(b)

Use word phrases to describe the following algebraic expressions. **[Nos 5–6]**

5. $5(h + 3)$

6. $\dfrac{7 - a}{b}$

7. Rose and Nancy have 28 pencils altogether. If Rose has r pencils, use an algebraic expression to represent the number of pencils that Nancy has.

8. May has 10 boxes of candies. Each box contains s candies. Use an algebraic expression to represent the number of candies that May has.

2.1C Simplification of Algebraic Expressions

I. Terms of Algebraic Expressions

> An algebraic expression can be divided into parts by the '+' or '−' sign.
>
> Each part, together with the '+' or '−' sign before it, is called a term.
>
> e.g. **(a)** The expression $a + 1$ has 2 terms.   ◀ a ⋮ $+1$
>
>   **(b)** The expression $-3y - 5 \times z + 1$ has 3 terms.   ◀ $-3y$ ⋮ $-5 \times z$ ⋮ $+1$

9. For each of the following algebraic expressions, write down the number of terms.

   (a) $3a - 1$ **(b)** $4b + 9a + 6$

   (c) $-x^2 + 8x - 2 + y$ **(d)** $-2y \div 5 + 4x + y$ ⊝ Ex **2A** 6

> Consider the terms in an algebraic expression.
>
> **(a)** Constant terms: Terms that are numbers only.
>
>   e.g. In the expression $x - 3$, -3 is a constant term.
>
> **(b)** Like terms: All terms that contain the same letter with the same index.
>
>   e.g. $2x$ and $-5x$ are like terms.
>
> $3y^2$ and $8y^2$ are like terms.
>
> -6 and 9 are like terms.   ◀ Both are constant terms.
>
> **(c)** Unlike terms: Terms that are **NOT** like terms.
>
>   e.g. x and y are unlike terms.   ◀ They contain different letters.
>
> y and y^2 are unlike terms.   ◀ They contain different indices of y.

10. For each of the following pairs of terms, determine whether they are like terms.

    (a) $9, 11$ **(b)** $6x, 6$

    (c) $2y, -5y$ **(d)** $-8k, \dfrac{k}{7}$

    (e) ab, a^2 **(f)** a^2, b^2

    (g) $-ab, -a^2b$ **(h)** $7mn^2, 4n^2m$

11. Complete the following table.

	Algebraic expression	Constant term(s)	All the like terms	A pair of unlike terms
(a)	$p + 3 - 2p$			
(b)	$3q^2 - 5 + 4q - 7q + 1$			
(c)	$r^2 + 2rs - 7 + 5r + 6r^2$			

⊝ Ex **2A** 7, 8

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II. Combining Like Terms

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Example 3

Simplify the following algebraic expressions.

(a) $2x + 5x$　　　　**(b)** $4y - 9y$

$\boxed{\text{Sol}}$ **(a)** $\quad 2x + 5x$

$\qquad = (2 + 5)x$

$\qquad = \underline{7x}$

　　(b) $\quad 4y - 9y$

$\qquad = (4 - 9)y$

$\qquad = \underline{-5y}$

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Instant Drill 3

Simplify the following algebraic expressions.

(a) $x + 9x$　　　　**(b)** $11y - 7y$

$\boxed{\text{Sol}}$ **(a)** $\quad x + 9x$

$\qquad = [(\quad) + (\quad)]x$

$\qquad =$

　　(b) $\quad 11y - 7y$

$\qquad = [(\quad) - (\quad)]y$

$\qquad =$

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12. Simplify $3x - 5x + x$.

13. Simplify $4s + 7s - 6s - 2s$.

> To simplify algebraic expressions involving addition or subtraction:
>
> **Step ①**: Group the like terms together.
>
> **Step ②**: Combine the like terms.

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Example 4

Simplify $7a + 3 + 8a$.

$\boxed{\text{Sol}}\quad 7a + 3 + 8a$　　（Identify the like terms first.）

$\quad = 7a + 8a + 3$　　◄ Step ①

$\quad = (7 + 8)a + 3$　　◄ Step ②

$\quad = \underline{15a + 3}$　　◄ $15a$ and 3 are unlike terms, and cannot be simplified.

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Instant Drill 4

Simplify $13d - 5 - 6d$.

$\boxed{\text{Sol}}\quad 13d - 5 - 6d$

$\quad = 13d - \underline{\qquad}$　　◄ Step ①

$\quad = (\qquad)d - 5$　　◄ Step ②

$\quad =$

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14. Simplify $2x + 3 + 4x - 5$.

（Like terms: $2x$ and ____ ; ____ and ____ .）

$\quad 2x + 3 + 4x - 5$

$= 2x + \underline{\qquad}$　　◄ Step ①

$= (\qquad)x + (\qquad)$　　◄ Step ②

$=$

15. Simplify $-8h + 2 + 9 + h$.

16. Simplify $15p + 6q - 2p - 4q$.

17. Simplify $4x - 10y + 7y - 8x$.

Example 5

Simplify the following algebraic expressions.

(a) $7y \times 3$ **(b)** $18r \div 2$

Sol **(a)** $\quad 7y \times 3$

$\quad\quad = (7 \times 3)y$

$\quad\quad = \underline{21y}$

    (b) $\quad 18r \div 2$

$\quad\quad = \dfrac{18r}{2}$

$\quad\quad = \underline{\underline{9r}}$

Instant Drill 5

Simplify the following algebraic expressions.

(a) $6 \times 4p$ **(b)** $3q \div 12$

Sol **(a)** $\quad 6 \times 4p$

$\quad\quad = [(\quad) \times (\quad)]p$

$\quad\quad =$

    (b) $\quad 3q \div 12$

$\quad\quad = \dfrac{(\quad\quad)}{(\quad\quad)}$

$\quad\quad =$

---

18. Simplify $2a \times 8 \times 3b$.

$\quad 2a \times 8 \times 3b$

$= (\quad\quad\quad)a \times 3b$

$=$

19. Simplify $10m \times 2 \div 5n$.

20. Simplify $7k + 3k \times 2 - 4k$.

$\quad 7k + 3k \times 2 - 4k$

$= 7k + (\quad\quad)k - 4k$ Multiplication and division first, then addition and subtraction.

$=$

21. Simplify $2r - 7 + 8r \div 2$.

22. Consider an algebraic expression $12x^2 + 8x - 7y - 3$. Determine whether each of the following claims is true or not. Explain your answer.

(a) The number of terms is 4.

(b) The constant term is 3.

(c) $12x^2$ and $8x$ are like terms.

(a) There are ____ terms. They are _____.

∴ The claim (is / is not) true.

(b) The constant term is ____.

∴ The claim (is / is not) true.

(c) ∵ They contain (the same letter / different letters) with (the same index / different indices).

∴

---

❶ **Level Up Questions**

23. (a) Write down the constant term and all the like terms in the algebraic expression $4x - 6y - z + 13 + 5x - y + 1$.

(b) Simplify $4x - 6y - z + 13 + 5x - y + 1$.

24. Simplify the following algebraic expressions.

(a) $4p + 2p \times 3 \times p - 5 \times p^2$

(b) $x + 8y \div 2 + 1 - 7x + 5y \times 3 - 3$

2 Using Algebra to Solve Problems (I)

Consolidation Exercise 2A

Represent each of the following word phrases by an algebraic expression. **[Nos. 1–3]**

1. **(a)** Add 12 to x. **(b)** Subtract 7 from y.
    (c) Multiply u by 5. **(d)** Divide 6 by v.

2. **(a)** Add 3 to the product of p and 5.
    (b) Multiply 6 by the sum of x and y.
    (c) Divide q by 4, and then subtract the quotient from 7.
    (d) Subtract 4 from m, and then divide the difference by q.

3. **(a)** Add 1 to the square of an unknown number.
    (b) Multiply an unknown number by 5, and then add 2 to the product.
    (c) Subtract an unknown number from 10, and then divide the difference by 3.

Use word phrases to describe the following algebraic expressions. **[Nos. 4–5]**

4. **(a)** $p + 6$ **(b)** $q - 4$
    (c) $r \times 5 + 8$ **(d)** $1 - s \div 2$

5. **(a)** $9 \times (x + 3)$ **(b)** $\dfrac{7}{10 - y}$
    (c) $5 \times a + 2 \times b$ **(d)** $p - q^3$

6. For each of the following algebraic expressions, list out all the terms and write down the   number of terms.

    (a) $4 + m - n + 7$ **(b)** $2x - 2x^2 + 3y - z$

    (c) $\dfrac{a}{6} - b \times 8 - 15$ **(d)** $10 \times p - q \div 9 + 7$

For each of the algebraic expressions in **Nos. 7–8**, write down

(a) all the constant terms, **(b)** a pair of like terms, **(c)** a pair of unlike terms.

7. $5y + 6 - y$ 8. $-4v + 7 - 3 + 5 \times v$

Simplify the following algebraic expressions. **[Nos. 9–16]**

9. **(a)** $a + 3a$ **(b)** $8b - 4b + 2b$

10. (a) $6p + 2p + q$　　　　　　　　　　　**(b)** $8u + 9 - 3u$

11. (a) $4x + y - 5x + 7$　　　　　　　　　**(b)** $6m - 2n + 10 - 4n$

12. (a) $2m + 8n + 6m - 3n$　　　　　　　　**(b)** $7p - 5q + q - 9q$

13. (a) $5r + 1 - 4s + 6 + 7s$　　　　　　　**(b)** $3d - 12e + 8 - 8d + 10e$

14. (a) $3x \times 6 \times 2y$　　　　　　　　　**(b)** $7 \times 4p \div 14q$

15. (a) $4a \times 3 - 8a$　　　　　　　　　　**(b)** $15m - 6 - 18m \div 3$

16. (a) $2x + 5 + 8x \div 4 - 2$　　　　　　　**(b)** $7y - 12y \div 3 + 8 - 2 \times 5y$

17. There are m goldfish in a tank originally. If 8 more goldfish are put into the tank, find the number of goldfish in the tank now.

18. Daniel watches a movie with 6 friends in a cinema. If each movie ticket costs x, find the total amount paid by them.

19. The price of a football is $580. Evan and George buy the football and share the payment. If Evan pays p, how much does George pay?

20. Three consecutive even numbers are arranged in an ascending order. If the middle number is N, what are the number to the left and the number to the right of the middle number?

21. The height of a triangle is h cm and the base is b cm. Find the area of the triangle.

22. The weight of Samson is w kg. Jack is 3 times as heavy as Samson. After finishing a fitness programme, Jack loses 8 kg of weight.
(a) Find the weight of Jack before the programme.
(b) Find the weight of Jack after the programme.

23. Laura's monthly salary is $15 000. Nancy's monthly salary is x less than Laura's.
(a) Find Nancy's monthly salary.
(b) Nancy spends one third of her monthly salary to buy a computer. Find the price of the computer.

24. Each pudding costs $5 and each cupcake costs $8. Paul buys m puddings and n cupcakes.

   (a) What is the total amount paid by Paul?

   (b) If Paul pays with a $100 note, how much is the change?

25. Andrew has m boxes of oranges and each contains 3 dozen oranges. He also has some boxes of apples and each contains n apples. If the number of boxes of apples is $\dfrac{4}{5}$ of that of oranges, how many fruit does Andrew have in total?

Level 2

26. Represent each of the following word phrases by an algebraic expression.

   (a) Add the product of x and y to the square of an unknown number.

   (b) Subtract 5 from an unknown number, and then divide the difference by the cube of another unknown number.

   (c) Add 6 to an unknown number, and then divide the sum by the result of subtracting another unknown number from 4.

27. Use word phrases to describe the following algebraic expressions.

   (a) $\dfrac{m - 4 \times n}{6}$
                                         (b) $\dfrac{y^3}{x} + z^2$

For each of the algebraic expressions in **Nos. 28–31**, write down

(a) the number of terms,   **(b)** all the constant terms,   **(c)** all the like terms.

28. $-\dfrac{4m}{5} + 27 + 5m - 14$
                              29. $-3p + 6q - 8 + 9q - 1$

30. $-5m^2 + 10 - 4m + 2m^2 + 8m$
                31. $7a^3b - 6ab^3 - 4ba^3 + 2$

Simplify the following algebraic expressions. **[Nos. 32–37]**

32. (a) $x + 3x - 5y + 7y - 4z - 2z$
             (b) $2\ell - 3m + 8m - 4n - 5n - 6\ell$

33. (a) $3a - 2b + 5c - 2a + 3b - 4c$
         (b) $-6 - 4p + 7q - 3 - 10q + 8p$

34. (a) $x \times 7 \times y + 4y \times x \times 2$
             (b) $2a \div 6 \div b - a \times 9 \div 3b$

35. (a) $6m + 3n - 5 - m - 8n \div 4$
              (b) $-9p + 3q + 2 \times 4p - 6q + p$

36. (a) $u \times 2u - 2u + 6u^2 - 5u$
               (b) $-s \times t \times s + 6t \times s^2 \div 2$

37. (a) $12c \div 3d + 10 \div 5d \times c$
              (b) $4r \times r + 2 \times 3s - 7r^2 - 6s \div 3$

38. Tim, Venus and Wilson buy a gift and they share the payment. Suppose Tim's share is $t. Venus's share is half of Tim's, while Wilson's share is one third of Tim's. How much is the gift?

39. The number of pages of a fiction book is m. The number of pages of a dictionary is 12 less than two times that of the fiction book. Find the total number of pages of the two books.

40. The width of a rectangle is w cm. The length is 3 cm longer than the width.
   (a) Find the length of the rectangle.
   (b) Find the perimeter of the rectangle.

41. Dennis is x years old now. Peter's age is 5 less than 4 times Dennis's.
   (a) How old is Peter now?
   (b) Find the sum of their ages n years later.

42. Angela has 10 coins. Each coin is either a $2 coin or a $5 coin. It is given that the number of $2 coins is x.
   (a) Find the number of $5 coins.
   (b) Find the total value of the 10 coins.

43. A test consists of 40 questions. 5 marks are given for each correct answer, while 3 marks are deducted for each wrong answer or unanswered question. Use an algebraic expression to represent the total marks of a candidate in the test.

Open-ended **44.** Set up an algebraic expression satisfying all the conditions below.
   I.   The number of terms is 6.
   II. The constant term is 3.
      III. There are two pairs of like terms.

Consolidation Exercise 2A (Answer)

1. **(a)** $x + 12$ **(b)** $y - 7$

   (c) $5u$ **(d)** $\dfrac{6}{v}$

2. **(a)** $5p + 3$ **(b)** $6(x + y)$

   (c) $7 - \dfrac{q}{4}$ **(d)** $\dfrac{m - 4}{q}$

3. **(a)** $x^2 + 1$ **(b)** $5x + 2$

   (c) $\dfrac{10 - x}{3}$

4. **(a)** Add 6 to p.
   (b) Subtract 4 from q.
   (c) Add 8 to the product of r and 5.
   (d) Divide s by 2, and then subtract the quotient from 1.

5. **(a)** Multiply 9 by the sum of x and 3.
   (b) Subtract y from 10, and then divide 7 by the difference.
   (c) Add the product of 2 and b to the product of 5 and a.
   (d) Subtract the cube of q from p.

6. **(a)** terms: 4, m, $-n$, 7; number of terms: 4
   (b) terms: $2x$, $-2x^2$, $3y$, $-z$; number of terms: 4
   (c) terms: $\dfrac{a}{6}$, $-b \times 8$, -15; number of terms: 3
   (d) terms: $10 \times p$, $-q \div 9$, 7; number of terms: 3

7. **(a)** 6   **(b)** $5y$ and $-y$
   (c) $5y$ and 6, $-y$ and 6 (any pair)

8. **(a)** 7, -3
   (b) $-4v$ and $5 \times v$, 7 and -3 (any pair)
   (c) $-4v$ and 7, $-4v$ and -3, $5 \times v$ and 7, $5 \times v$ and -3 (any pair)

9. **(a)** $4a$ **(b)** $6b$
10. **(a)** $8p + q$ **(b)** $5u + 9$
11. **(a)** $-x + y + 7$ **(b)** $6m - 6n + 10$
12. **(a)** $8m + 5n$ **(b)** $7p - 13q$
13. **(a)** $5r + 7 + 3s$ **(b)** $-5d - 2e + 8$
14. **(a)** $36xy$ **(b)** $\dfrac{2p}{q}$
15. **(a)** $4a$ **(b)** $9m - 6$
16. **(a)** $4x + 3$ **(b)** $-7y + 8$
17. $m + 8$ 18. $\$7x$
19. $\$(580 - p)$
20. number to the left: $N - 2$; number to the right: $N + 2$

21. $\dfrac{bh}{2}$ cm²

22. **(a)** $3w$ kg   **(b)** $(3w - 8)$ kg

23. **(a)** $\$(15\,000 - x)$ **(b)** $\$\dfrac{15\,000 - x}{3}$

24. **(a)** $\$(5m + 8n)$
   (b) $\$[100 - (5m + 8n)]$ (or $\$(100 - 5m - 8n)$)

25. $36m + \dfrac{4}{5}mn$

26. **(a)** $z^2 + xy$ **(b)** $\dfrac{x - 5}{y^3}$

   (c) $\dfrac{x + 6}{4 - y}$

27. **(a)** Subtract the product of 4 and n from m, and then divide the difference by 6.
   (b) Divide the cube of y by x, and then add the square of z to the quotient.

28. **(a)** 4   **(b)** 27, -14
   (c) $-\dfrac{4m}{5}$ and $5m$, 27 and -14

29. **(a)** 5   **(b)** $-8, -1$
   (c) $6q$ and $9q$, -8 and -1

30. **(a)** 5   **(b)** 10
   (c) $-5m^2$ and $2m^2$, $-4m$ and $8m$

31. **(a)** 4   **(b)** 2
   (c) $7a^3b$ and $-4ba^3$

32. **(a)** $4x + 2y - 6z$ **(b)** $-4\ell + 5m - 9n$
33. **(a)** $a + b + c$ **(b)** $4p - 3q - 9$
34. **(a)** $15xy$ **(b)** $-\dfrac{8a}{3b}$
35. **(a)** $5m + n - 5$ **(b)** $-3q$
36. **(a)** $8u^2 - 7u$ **(b)** $2s^2t$
37. **(a)** $\dfrac{6c}{d}$ **(b)** $-3r^2 + 4s$
38. $\$\dfrac{11t}{6}$ 39. $3m - 12$

40. **(a)** $(w + 3)$ cm
   (b) $2(2w + 3)$ cm (or $(4w + 6)$ cm)
41. **(a)** $4x - 5$ **(b)** $5x + 2n - 5$
42. **(a)** $10 - x$ **(b)** $\$[2x + 5(10 - x)]$
43. $5m - 3(40 - m)$
   (Let m be the number of correct answers.)
   or $5(40 - n) - 3n$ (Let n be the total number of wrong answers and unanswered questions.)
44. $4x - 5y + 6x - 7y + z + 3$
   (or other reasonable answers)

F1A: Chapter 2B

Date	Task	Progress	
	Lesson Worksheet	○ Complete and Checked ○ Problems encountered ○ Skipped	(Full Solution)
	Book Example 6	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Book Example 7	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Book Example 8	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Book Example 9	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Consolidation Exercise	○ Complete and Checked ○ Problems encountered ○ Skipped	(Full Solution)
	Maths Corner Exercise 2B Level 1	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 2B Level 2	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 2B Level 3	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 2B Multiple Choice	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	E-Class Multiple Choice Self-Test	○ Complete and Checked ○ Problems encountered ○ Skipped	Mark: _____

2.2A   Introduction to Algebraic Equations

(a) An algebraic equation consists of two expressions connected by an equal sign '=' with one or more unknowns.

e.g. $y = 4$, $x + 3y = 1$ and $x^2 - 5 = y$.

(b) The value of the unknown that can make both sides of the equation equal is called the solution (or root) of the equation.

Example 1	Instant Drill 1
Determine whether 4 is the solution of the equation $x + 1 = 5$.	Determine whether –2 is the solution of the equation $3x = -6$.
Sol When $x = 4$, L.H.S. = $4 + 1 = 5$ R.H.S. = 5 ∵ L.H.S. = R.H.S. ∴ <u>4 is the solution of the equation</u> <u>$x + 1 = 5$.</u>	**Sol** When $x = -2$, L.H.S. = $3 \times ($ $) =$ R.H.S. = ∵ L.H.S. (= / ≠) R.H.S. ∴ <u>–2 (is / is not) the solution of the</u> <u>equation $3x = -6$.</u>

2.2B   Solving Simple Linear Equations in One Unknown

(a) A linear equation in one unknown is an equation containing only one unknown with index 1.

e.g. $y = -5$ and $x + 4 = 2$.

(b) Transposing a term

(i) If $x - a = b$,   **(ii)** If $x + a = b$,

then $x = b + a$.   then $x = b - a$.

> When a term is moved to the other side, the sign of the term changes.

Example 2	Instant Drill 2
Solve the following equations.	Solve the following equations.
(a) $x + 3 = 9$ **(b)** $x - 2 = 11$	**(a)** $x + 8 = 6$ **(b)** $x - 7 = 1$
Sol (a) $x + 3 = 9$ $x = 9 - 3$ $= \underline{6}$ **(b)** $x - 2 = 11$ $x = 11 + 2$ $= \underline{13}$ *Checking:* When $x = 6$, L.H.S. = $6 + 3 = 9$ = R.H.S. ∴ 6 is the solution of the equation.	**Sol (a)** $x + 8 = 6$ $x = 6$ _____ $=$ **(b)** $x - 7 = 1$ $x = 1$ _____ $=$

1. Solve the equation $x + 5 = -10$.

2. Solve the equation $-12 = 4 - x$.

$-12 = 4 - x$

$-12 + x = 4$ *Move $-x$ to the left.*

$=$

⊖ Ex **2B** 1, 2

Conversion of multiplication (or division) operation

(i) If $ax = b$,

then $x = b \div a = \dfrac{b}{a}$.

(ii) If $\dfrac{x}{a} = b$,

then $x = b \times a = ab$.

Convert the multiplication (or division) to the other side to become division (or multiplication).

Example 3	**Instant Drill 3**
Solve the following equations.	Solve the following equations.
(a) $4x = 32$ **(b)** $\dfrac{x}{2} = -7$	**(a)** $8x = 24$ **(b)** $\dfrac{x}{5} = 10$
Sol (a) $4x = 32$ $x = \dfrac{32}{4}$ $= \underline{\underline{8}}$ **(b)** $\dfrac{x}{2} = -7$ $x = -7 \times 2$ $= \underline{\underline{-14}}$	**Sol (a)** $8x = 24$ $x =$ **(b)** $\dfrac{x}{5} = 10$ $x =$

---

3. Solve the equation $7y = -21$.

4. Solve the equation $\dfrac{3x}{2} = 9$.

⊖ Ex **2B** 3, 4

5. Solve the equation $-2d + 1 = 13$.

$-2d + 1 = 13$

$-2d = 13$ ____

Move the constant term +1 to the right.

$=$

6. Solve the equation $7 - 3v = 16$.

⊖ Ex **2B** 5–8, 17, 18

7. Solve the equation $4 \times (w - 5) = 8$.

$4 \times (w - 5) = 8$

$w - 5 =$

Convert the multiplication to become division.

8. Solve the equation $\dfrac{k + 2}{9} = 3$.

⊖ Ex **2B** 9–16

2.2C Solving More Complicated Equations

I. Equations with Like Terms

Example 4	**Instant Drill 4**
Solve the equation $x + 3x = 24$.	Solve the equation $7a - 5a = 18$.
Sol $x + 3x = 24$	**Sol** $7a - 5a = 18$
$4x = 24$ — Combine the like terms: $x + 3x = (1 + 3)x = 4x$	$(\quad)a = 18$ — Combine the like terms.
$x = \dfrac{24}{4}$	$=$
$= \underline{6}$	

9. Solve the equation $8y - 20 = 3y$.

$8y - 20 = 3y$

$8y \underline{\quad} = 20$ — After transposing terms, each side contains only one type of like terms.

$=$

10. Solve the equation $5p = 28 - 9p$.

Example 5	**Instant Drill 5**
Solve the equation $4x + 6 = 2x + 7$.	Solve the equation $9y + 3 = y - 2$.
Sol $4x + 6 = 2x + 7$	**Sol** $9y + 3 = y - 2$
$4x - 2x = 7 - 6$ — After transposing terms, each side contains only one type of like terms.	$9y \underline{\quad} = -2 \underline{\quad}$
$2x = 1$	$(\quad)y = \underline{\quad}$
$x = \dfrac{1}{2}$	$=$

11. Solve the equation $2r - 7 + r = 8$.

12. Solve the equation $17s + 3 = 2s - 27$.

13. Solve the equation $-q + 4 = 22 + 5q$.

14. Solve the equation $-n - 16 = 6 - 12n$.

⬆ Level Up Questions

Solve the following equations. **[Nos. 15–18]**

15. $-7 \times (8x - 3) = -14$

16. $\dfrac{5y + 4}{2} = -8$

17. $3w - 8w + 3 = w + 1$

18. $12k - 17 + k = -3k + 15$

2 Using Algebra to Solve Problems (I)

Consolidation Exercise 2B

Solve the following equations. **[Nos. 1–30]**

1. $x + 3 = 8$

2. $y - 6 = -4$

3. $u + \dfrac{1}{4} = \dfrac{3}{4}$

4. $v - \dfrac{1}{3} = \dfrac{1}{5}$

5. $5p = -30$

6. $\dfrac{q}{-8} = -2$

7. $\dfrac{4m}{7} = 8$

8. $\dfrac{-5n}{3} = 10$

9. $7a + 4 = 25$

10. $3b - 10 = 2$

11. $6 + 2c = 0$

12. $-d + 9 = 8$

13. $8 - m = -9$

14. $7 = 55 - 6n$

15. $4 \times (e - 5) = 8$

16. $(-1) \times (f + 7) = 2$

17. $(-3) \times (2 + h) = -6$

18. $-(k - 4) = 9$

19. $\dfrac{x}{6} + 9 = 2$

20. $\dfrac{y}{8} - 1 = -5$

21. $\dfrac{m + 4}{7} = -2$

22. $6 = \dfrac{9 - n}{4}$

23. $\dfrac{s - 8}{-3} = -1$

24. $-\dfrac{t + 4}{2} = 3$

25. $\dfrac{5}{3} - 2a = \dfrac{4}{3}$

26. $2b - \dfrac{3}{7} = -\dfrac{10}{7}$

27. $3x + \dfrac{1}{2} = \dfrac{1}{5}$

28. $\dfrac{3}{5} - 4y = \dfrac{1}{7}$

29. $15 + 6x - 4 = 29$

30. $7 = 19 - 5y + 8$

Solve the following equations. **[Nos. 31–40]**

31. $8d - d = 49$

32. $c + 2c = -3$

33. $2x - 8 = x$

34. $-3y = 24 + 5y$

35. $-6 + 2u + 7u = -12$

36. $d - 17 - 5d = 35$

37. $3Q - 5 = 4Q - 8$

38. $12t + 7 = 7t - 13$

39. $4x + 22 = 1 - 2x$

40. $-p - 16 = -10p + 8$

Level 2

Solve the following equations. **[Nos. 41–60]**

41. $0.2x + 3.9 = 1.5$

42. $7 - 1.3y = 1.8$

43. $u + 2u + 3u = 9$

44. $2v - 7v - 5v = 30$

45. $2 \times (4m + 7) = 6$

46. $-3 \times (2n - 1) = 15$

47. $4 = \dfrac{3k}{5} + 2$

48. $8 - \dfrac{7h}{4} = 1$

49. $\dfrac{9x+1}{8} = 8$

50. $\dfrac{3 - 4N}{5} = 11$

51. $2x + 3 = 1.6x + 9$

52. $-5.2 - 3.1y = 2.9y + 7.4$

53. $-8 + 4m + 7 = 13 + 6m$

54. $0.7 - 9k = 2k - 4 + 5.8$

55. $14r + 19 - 5r = 33 + 2r$

56. $S - 4 = 8S + 16 - 5S$

57. $8w - 12 + 4w = 9 + 5w$

58. $1.5 + 0.2x + 3.1 = -1.6x + 0.4$

59. $2y - 4 - 7y + 9 = 10y$　　**60.** $-6m - 29 - 5m + 8m = 7m + 41$

Consolidation Exercise 2B (Answer)

1. 5

2. 2

3. $\dfrac{1}{2}$

4. $\dfrac{8}{15}$

5. −6

6. 16

7. 14

8. −6

9. 3

10. 4

11. −3

12. 1

13. 17

14. 8

15. 7

16. −9

17. 0

18. −5

19. −42

20. −32

21. −18

22. −15

23. 11

24. −10

25. $\dfrac{1}{6}$

26. $-\dfrac{1}{2}$

27. $-\dfrac{1}{10}$

28. $\dfrac{4}{35}$

29. 3

30. 4

31. 7

32. −1

33. 8

34. −3

35. $-\dfrac{2}{3}$

36. −13

37. 3

38. −4

39. $-\dfrac{7}{2}$

40. $\dfrac{8}{3}$

41. −12

42. 4

43. $\dfrac{3}{2}$

44. −3

45. −1

46. −2

47. $\dfrac{10}{3}$

48. 4

49. 7

50. −13

51. 15

52. −2.1

53. −7

54. −0.1

55. 2

56. −10

57. 3

58. $-\dfrac{7}{3}$

59. $\dfrac{1}{3}$

60. −7

58

F1A: Chapter 2C

Date	Task	Progress	
	Lesson Worksheet	○ Complete and Checked ○ Problems encountered ○ Skipped	(Full Solution)
	Book Example 10	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Book Example 11	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Book Example 12	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Book Example 13	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Consolidation Exercise	○ Complete and Checked ○ Problems encountered ○ Skipped	(Full Solution)
	Maths Corner Exercise 2C Level 1	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 2C Level 2	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 2C Level 3	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 2C Multiple Choice	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	E-Class Multiple Choice Self-Test	○ Complete and Checked ○ Problems encountered ○ Skipped	Mark: _____

Cont'd 2.2C   Solving More Complicated Equations

II. Equations with Brackets

> Distributive law of multiplication:
>
> **(a)** $a(b + c) = ab + ac$
>
> **(b)** $(b + c)a = ba + ca$

1. In each of the following, remove the brackets by the distributive law of multiplication.

(a) $3(2x + 1) = 3(2x) + 3(+1)$

$\quad\quad = $

(b) $3(2x - 1) = 3(\quad) + 3(\quad)$

$\quad\quad = $

(c) $-3(2x + 1) = -3(\quad) - 3(\quad)$

$\quad\quad = $

(d) $-3(2x - 1) = -3(\quad) - 3(\quad)$

$\quad\quad = $

Example 1

Solve the equation $4(x - 3) = x$.

Sol $4(x - 3) = x$

$\quad 4x - 12 = x$

$\quad 4x - x = 12$

$\quad\quad 3x = 12$

$\quad\quad x = \dfrac{12}{3}$

$\quad\quad\quad = \underline{\underline{4}}$

⌐ Step ①: Remove the brackets.
  i.e. $4(x - 3) = 4(x) + 4(-3)$
  $= 4x - 12$

◄ Step ②: Transpose terms.

◄ Step ③: Combine the like terms.

Instant Drill 1

Solve the equation $6(x + 1) = 5x$.

Sol $\quad\quad 6(x + 1) = 5x$ ⟨ Remove the brackets first.

$\quad (\quad) + (\quad) = 5x$

$\quad\quad\quad\quad = $

---

2. Solve the equation $2(x + 4) - x = 10$.

$2(x + 4) - x = 10$

$\underline{\quad\quad\quad} - x = 10$

$\quad\quad = $

3. Solve the equation $3(y - 1) - 2y = 7$.

4. Solve the equation $9(y + 4) = y - 4$.

5. Solve the equation $4(2x - 5) = 7 + 5x$.

⊖ Ex **2C** 1–8

III. Equations with Fractions

To simplify an equation with one fraction or fractions of the **same** denominator, first multiply both sides of the equation by the denominator.

Example 2

Solve the equation $x = \dfrac{x}{2} + 6$.

Sol

$$x = \frac{x}{2} + 6$$

> The denominator is **2**. Multiply both sides of the equation by **2**.

$$2(x) = 2\left(\frac{x}{2} + 6\right)$$

> $2\left(\dfrac{x}{2} + 6\right) = \cancel{2}\left(\dfrac{x}{\cancel{2}}\right) + 2(6)$
> $= x + 12$

$$2x = x + 12$$
$$2x - x = 12$$
$$x = \underline{12}$$

Instant Drill 2

Solve the equation $a - \dfrac{a}{8} = 7$.

Sol

$$a - \frac{a}{8} = 7$$

> The denominator is **8**. Multiply both sides of the equation by ____.

$$(\quad) \times \left(a - \frac{a}{8}\right) = (\quad) \times 7$$

$$=$$

---

6. Solve the equation $5 = \dfrac{m}{3} - 2m$.

7. Solve the equation $4 - \dfrac{5y}{6} = -y$.

---

8. Solve the equation $\dfrac{p}{5} + \dfrac{8}{5} = p$.

$$\frac{p}{5} + \frac{8}{5} = p$$

> ∵ Both denominators are **5**.
> ∴ Multiply both sides of the equation by **5**.

$$(\quad)\left(\frac{p}{5} + \frac{8}{5}\right) = (\quad) \times p$$

$$=$$

9. Solve the equation $2 + \dfrac{3u}{4} = \dfrac{u}{4}$.

To simplify an equation with fractions of different denominators, first multiply both sides of the equation by the **L.C.M. of all the denominators.**

Example 3

Solve the equation $\dfrac{3x}{4} = 10 + \dfrac{x}{2}$.

Sol

∵ The L.C.M. of the denominators 2 and 4 is **4**.
∴ Multiply both sides of the equation by **4**.

$$\frac{3x}{4} = 10 + \frac{x}{2}$$

$$4\left(\frac{3x}{4}\right) = 4\left(10 + \frac{x}{2}\right)$$

$$3x = 40 + 2x$$

$$3x - 2x = 40$$

$$x = \underline{40}$$

◄ $4\left(10 + \dfrac{x}{2}\right)$

$= 4(10) + \overset{2}{4}\left(\dfrac{x}{\cancel{2}}\right)$

$= 40 + 2x$

Instant Drill 3

Solve the equation $\dfrac{2x}{3} - 1 = \dfrac{x}{6}$.

Sol

∵ The L.C.M. of the denominators 3 and 6 is ___.
∴ Multiply both sides of the equation by ___.

$$\frac{2x}{3} - 1 = \frac{x}{6}$$

$$(\quad)\left(\frac{2x}{3} - 1\right) = (\quad)\left(\frac{x}{6}\right)$$

$$=$$

---

10. Solve the equation $\dfrac{x}{2} + \dfrac{4}{3} = 1$.

∵ The L.C.M. of 2 and 3 is **6**.
∴ Multiply both sides of the equation by ___.

11. Solve the equation $\dfrac{x}{5} + \dfrac{x}{2} = 14$.

∵ The L.C.M. of 5 and 2 is ___.
∴ Multiply both sides of the equation by ___.

12. Solve the equation $\dfrac{v}{4} = 2v - \dfrac{7}{3}$.

13. Solve the equation $\dfrac{h}{2} - 6 = \dfrac{h}{8} - 3$.

Solve the following equations. **[Nos. 14–17]**

14. $2(y + 7) + 3 = 4y + 1$

15. $\dfrac{4r}{5} - 1 = 8 - \dfrac{r}{10}$

16. $\dfrac{2u + 1}{3} = \dfrac{u}{4} + 2$

17. $\dfrac{x - 2}{3} = \dfrac{x - 4}{5}$

2 Using Algebra to Solve Problems (I)

Level 1

Solve the following equations. **[Nos. 1–18]**

1. $2(x + 5) + 1 = 7$

2. $3 - (y + 1) = 5$

3. $1 - (8 - u) = 6$

4. $7 - 3(v - 2) = 10$

5. $3(2x - 1) + 2 = \dfrac{1}{5}$

6. $4 - 5(3 + v) = \dfrac{1}{4}$

7. $4(h + 3) - h = 0$

8. $6(m + 7) + 5m = 9$

9. $7(v - 4) + v = 12$

10. $7k - 5(6 - k) = 0$

11. $8a - 3(a + 6) = 27$

12. $5n - 2(9 - 4n) = 8$

13. $3(a - 2) = a$

14. $-2(2b + 9) = 6b$

15. $8(x + 1) = 5x - 1$

16. $3(2x - 3) = x + 11$

17. $7(2s + 5) = -1 - 4s$

18. $4 - 6(3t - 1) = 7t$

Solve the following equations. **[Nos. 19–36]**

19. $8 + \dfrac{a}{5} = a$

20. $c = 3 + \dfrac{c}{4}$

21. $7 - \dfrac{b}{3} = 2b$

22. $\dfrac{x}{2} - \dfrac{x}{8} = 9$

23. $-\dfrac{y}{5} - \dfrac{y}{3} = 4$

24. $\dfrac{k}{7} + 6 = \dfrac{3k}{7}$

25. $\dfrac{p - 2}{3} = p$

26. $\dfrac{5q + 9}{4} = 2q$

27. $10 + \dfrac{m}{7} = \dfrac{m}{2}$

28. $\dfrac{5n}{8} - 3 = \dfrac{n}{4}$

29. $\dfrac{5}{6}p = \dfrac{3p}{4} + 2$

30. $2 + \dfrac{5}{12}x = \dfrac{7}{12}x - 3$

31. $\dfrac{9u}{10} + 1 = \dfrac{4u}{5} - 3$

32. $\dfrac{2t}{3} - 6 = 5 - \dfrac{t}{4}$

33. $\dfrac{S+4}{2} = \dfrac{S-2}{5}$

34. $\dfrac{x-8}{5} = \dfrac{5-3x}{4}$

35. $\dfrac{b-2}{7} + 2b = 4$

36. $\dfrac{4x-1}{8} + 6 = \dfrac{2+x}{8}$

Level 2

Solve the following equations. **[Nos. 37–48]**

37. $\dfrac{3(5x-4)}{7} = 9$

38. $\dfrac{6(8+y)}{5} = -2y$

39. $5(m-3) = 2(4m+9)$

40. $8(2-r) - 3(2r+5) = -20$

41. $-2(7+2n) = 3(n-6) + 39$

42. $4(2k-1) - 5(3-5k) = 3$

43. $3[2(p+4)+5] = -9$

44. $5 - 2[8 - 3(1-q)] = 10$

45. $6[7+5(q-2)] = -5q + 10$

46. $7(t-5) = 4[4-2(t-3)]$

47. $3[2(7p-8) - 6p] = 1 - 4p$

48. $4[1 - 2(5-3x)] = 2[3(7x-4) + 6x] - 9$

Solve the following equations. **[Nos. 49–56]**

49. $u + \dfrac{u}{2} + \dfrac{u}{4} = 14$

50. $\dfrac{u}{2} + \dfrac{2u}{3} - \dfrac{3u}{4} = 10$

51. $\dfrac{5}{4}k + 3 = \dfrac{7+2k}{6}$

52. $4 - \dfrac{8t-9}{5} = \dfrac{t}{3}$

53. $\dfrac{8(1-m)}{3} + \dfrac{10m+7}{2} = 5$

54. $\dfrac{n}{4} + \dfrac{5}{12} = \dfrac{10-n}{3}$

55. $\dfrac{4u-7}{5} - \dfrac{1}{2} = \dfrac{u-5}{3}$

56. $\dfrac{p+3}{8} + \dfrac{p+4}{6} = \dfrac{2-p}{4}$

Consolidation Exercise 2C (Answer)

1. -2

2. -3

3. 13

4. 1

5. $\dfrac{1}{5}$

6. $-\dfrac{9}{4}$

7. -4

8. -3

9. 5

10. $\dfrac{5}{2}$

11. 9

12. 2

13. 3

14. $-\dfrac{9}{5}$

15. -3

16. 4

17. -2

18. $\dfrac{2}{5}$

19. 10

20. 4

21. 3

22. 24

23. $-\dfrac{15}{2}$

24. 21

25. -1

26. 3

27. 28

28. 8

29. 24

30. 30

31. -40

32. 12

33. -8

34. 3

35. 2

36. -15

37. 5

38. -3

39. -11

40. $\dfrac{3}{2}$

41. -5

42. $\dfrac{2}{3}$

43. -8

44. $-\dfrac{5}{2}$

45. $\dfrac{4}{5}$

46. 5

47. $\dfrac{7}{4}$

48. $-\dfrac{1}{10}$

49. 8

50. 24

51. -2

52. 3

53. $-\dfrac{1}{2}$

54. 5

55. $\dfrac{1}{2}$

56. -1

	F1A: Chapter 2D		

Date	Task	Progress	
	Lesson Worksheet	○ Complete and Checked ○ Problems encountered ○ Skipped	(Full Solution)
	Book Example 14	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Book Example 15	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Book Example 16	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Consolidation Exercise	○ Complete and Checked ○ Problems encountered ○ Skipped	(Full Solution)
	Maths Corner Exercise 2D Level 1	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 2D Level 2	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 2D Level 3	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 2D Multiple Choice	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	E-Class Multiple Choice Self-Test	○ Complete and Checked ○ Problems encountered ○ Skipped	Mark: _____

2.3 Formulating Equations to Solve Problems

> **Step①**: Read the question carefully and identify the unknown in the question.
> **Step②**: Choose a letter to represent the unknown, and
> express the other quantities in terms of the letter.
> **Step③**: Set up an equation according to the information in the question.
> **Step④**: Solve the equation.
> **Step⑤**: Write down the answer to the question clearly.

Example 1	Instant Drill 1
Subtracting 2 from the product of a number and 6, the difference obtained is 16. Find the number.	Adding 3 to the result of dividing a number by 5, the sum obtained is 14. Find the number.

Example 1

Subtracting 2 from the product of a number and 6, the difference obtained is 16. Find the number.

$\boxed{\text{Sol}}$ Let x be the number. ◀ **Steps ① and ②**

$6x - 2 = 16$ ◀ **Step ③**

$6x = 16 + 2$

$6x = 18$

$x = \dfrac{18}{6}$

$= 3$ ◀ **Step ④**

∴ The number is 3. ◀ **Step ⑤**

Instant Drill 1

Adding 3 to the result of dividing a number by 5, the sum obtained is 14. Find the number.

$\boxed{\text{Sol}}$ Let x be the number. ◀ **Steps ① and ②**

( ) + 3 = 14 ◀ **Step ③**

=

◀ **Step ④**

∴ The number is ___. ◀ **Step ⑤**

---

1. If the sum of two consecutive integers is 17, find the smaller integer.

> The two integers follow each other in order.
> e.g. 2 and 3; –1 and –2.

Let x be the smaller integer.

Then, the larger integer is _____.

$x + ($ ___ $) = 17$

=

2. If the sum of two consecutive odd numbers is 24, find the larger number.

> The two odd numbers follow each other in order. Their difference is 2.
> e.g. ___ and ___ are consecutive odd numbers.

⊖ Ex **2D** 1–4

Example 2	Instant Drill 2

Example 2

Peter bought 8 game cards for $30 and got $6 for the change. Find the price of a game card.

Sol Let x be the price of a game card.

$$30 - 8x = 6$$
$$-8x = 6 - 30$$
$$-8x = -24$$
$$x = \frac{-24}{-8}$$
$$= 3$$

∴ The price of a game card is $3.

Instant Drill 2

Lucy wants to buy 7 exercise books but she is $3 short. Given that Lucy has $60, find the price of an exercise book.

Sol Let x be the price of an exercise book.

$$(\quad)x - 60 = (\quad)$$
$$=$$

∴ The price of an exercise book is _____ .

Example 3

Ken's weight is 3 times Mandy's. If their total weight is 128 kg, find the weight of Mandy.

Sol Let x kg be the weight of Mandy.

Then, Ken weighs $3x$ kg.

$$x + 3x = 128$$
$$4x = 128$$
$$x = \frac{128}{4}$$
$$= 32$$

	Weight
Mandy	x kg
Ken	$3x$ kg
Total:	128 kg

∴ Mandy weighs 32 kg.

Instant Drill 3

The number of apples is 4 times that of pears. There are 50 apples and pears altogether. Find the number of pears.

Sol Let x be the number of pears.

Then, the number of apples is _____ .

$$x + (\quad) = 50$$
$$=$$

	Quantity
Pear	x
Apple	
Total:	50

∴ The number of pears is _____ .

---

3. Tom's savings is $30 more than Ann's. If their total savings is $150, find Ann's savings.

Let x be Ann's savings.

Then, Tom's savings is $(\qquad)$.

	Savings
Ann	x
Tom	$(\quad)$
Total:	$150

4. Johnny's height is 6 cm more than twice Parco's height. If the difference of their heights is 92 cm, find the height of Parco.

	Height
Johnny	( ) cm
Parco	x cm
Difference:	( ) cm

⊖ Ex **2D** 5–15

69

Example 4

The age of Jimmy now is two times that of Wendy. 1 year later, the sum of their ages will be 50. Find the age of Wendy now.

Sol

	Now	1 year later
Wendy	x	$x + 1$
Jimmy	$2x$	$2x + 1$

Let x be the age of Wendy now.

Then, Jimmy is $2x$ years old now.

1 year later, age of Wendy $= x + 1$

age of Jimmy $= 2x + 1$

$(x + 1) + (2x + 1) = 50$

$x + 1 + 2x + 1 = 50$

$3x + 2 = 50$

$3x = 50 - 2$

$3x = 48$

$x = \dfrac{48}{3}$

$= 16$

$\therefore$ Wendy is 16 years old now.

Instant Drill 4

James is 5 years older than Hugo. 3 years ago, the sum of their ages was 35. Find the age of Hugo now.

Sol

	Now	3 years ago
Hugo	x	$x - ($ $)$
James		

Let x be the age of Hugo now.

Then, James is (   ) years old now.

3 years ago,

age of Hugo =

age of James =

(   ) + (   ) = 35

=

$\therefore$ Hugo is   years old now.

---

5. May's father is 43 years old now. 5 years later, he will be 4 times as old as May. Find the age of May now.

	Now	5 years later
May	x	$x + ($ $)$
Father	43	$43 + ($ $)$

6. Vincent originally has 45 candies and Cindy has 13 candies. Later, Vincent gives n candies to Cindy, and then they have the same number of candies. Find n.

	Original number	New number
Vincent		
Cindy		

⊖ Ex **2D** 16, 17

7. Joyce's marks in the second test are 1.5 times that in the first test. The total marks she got in the two tests are 140 marks. If she gets more than 80 marks in the second test, her mother will give her a prize. Can she get the prize? Explain your answer.

Let _____ marks be Joyce's marks in the first test.

Then, she gets _____ marks in the second test.

∵ _____ (< / >) 80 marks

Remember to write down the reason.

∴ She (can / cannot) get the prize.

8. The price of 1 sandwich is $5 higher than that of 1 bottle of juice. The total price of 2 sandwiches and 3 bottles of juice is $40. Kenny has $5.5, does he have enough money to buy 1 bottle of juice? Explain your answer.

9. Given that the sum of three consecutive integers is 42, find the smallest integer.
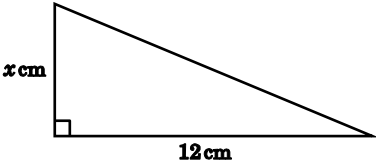
10. There are a total of 17 $1 coins and $2 coins in a purse. Their total value is $28. Find the numbers of $1 and $2 coins.

2 Using Algebra to Solve Problems (I)

| Consolidation Exercise 2D |

1. The result of adding 7 to the product of x and 3 is 16. Find x.

2. When y is divided by -2, and 5 is subtracted from the quotient, the result is 4. Find y.

3. The sum of $\dfrac{2}{5}$ of an unknown number r and 9 is equal to r. Find r.

4. A club had m members yesterday. After 8 new members join the club today, the club now has 30 members. Find m.

5. A jar of k lucky stars are shared among 24 students. After each student gets 5 lucky stars, no lucky star is left. Find k.

6. In the figure, the area of the right-angled triangle is 30 cm². Find x.

7. There are p dogs and some cats in a pet shop. The number of cats is 5 more than 3 times the number of dogs.
    (a) Express the number of cats in terms of p.
    (b) If the number of cats is 50, find p.

8. Alan pays with two $20 notes to buy 3 hamburgers at the same price. If the change is $5.5, find the price of each hamburger.

9. Brian spends $59 to buy 4 packs of potato chips and 3 bottles of soft drink. The price of each pack of potato chips is $8. If the prices of the three bottles of soft drink are the same, find the price of each bottle of soft drink.

10. Susan's grandfather is now 66 years old. Two years ago, he was 8 times as old as Susan. Find Susan's present age.

11. The sum of two numbers is 37, and their difference is 10. Find the smaller number.

12. Lester has $24 more than Mark. If they have $70 in total, how much does Mark have?

13. In a class, the number of male students doubles that of female students. If there are 36 students in the class, find the number of female students.

14. The area of a rectangle is 4 times that of another rectangle. Moreover, the area of the large rectangle is 12 cm^2 greater than that of the small rectangle. Find the area of the small rectangle.

15. In a month, Carrie's expenditure on rent is $400 less than twice the food cost. It is given that the sum of the food cost and the expenditure on rent is $8 600. Find the food cost.

16. A tower is 80 m higher than a hospital. If the height of the tower is 6 times the height of the hospital, find the height of the tower.

17. A teacher watches a football match with 5 students. A student ticket is $20 less expensive than an adult ticket. If they spend a total of $320 on the tickets, find the price of an adult ticket.

18. In a bakery, an apple pie costs $5 more than an egg tart. Sam spends $28 to buy 2 apple pies and 4 egg tarts. How much does an egg tart cost?

19. There are some toys in a store. After selling $\dfrac{4}{7}$ of the toys, the owner buys 8 new toys so that there are 20 toys in the store finally. Find the original number of toys in the store.

20. Eason plans to buy a smart phone. He saves one third of his weekly pocket money. After 4 weeks, he needs to save $180 more. After 6 weeks, his savings is $50 more than the price of the smart phone. Find his weekly pocket money.

21. Paul has 7 times as many stamps as Tina. If Paul gives Tina 12 stamps, they have the same number of stamps. How many stamps do they have altogether?

22. At 5 p.m., Henry and Gordon have made 60 and 20 cranes respectively. Henry can make 30 cranes per hour while Gordon can make 40 cranes per hour. When will they get the same number of cranes?

23. In a class, $\dfrac{2}{3}$ of the students apply to join a language course. Before the start of the course, 5 students withdraw and each of the remaining students has to pay $400 as the course fee. If the total course fee collected is $7 600, how many students are there in the class?

24. If the sum of three consecutive odd numbers is 33, find the largest number.

25. Ben, Cathy and David buy a gift and they share the payment. Ben's share is 2 times Cathy's, while Cathy's share is 2 times David's. If the gift costs $560, find David's share.

26. Three children are playing a game. Francis gets 130 points more than George, and Hilary gets 90 points less than George. Francis and Hilary get 400 points in total.
(a) How many points does George get?
(b) How many points do the three children get in total?

27. A box of 160 cookies are shared among the students in a class. After each boy gets 3 cookies and each girl gets 4 cookies, no cookie is left. If the number of boys is 2 more than the number of girls, find the number of students in the class.

28. In a book fair, Kenny spends $390 to buy a fiction book, a photo book and a travel guide. The price of the fiction book is half of the price of the photo book, while the price of the travel guide is two thirds of the price of the photo book. What is the price of the travel guide?

29. Jason has some coins, including $1 coins, $2 coins and $5 coins. The number of $1 coins is 4 times the number of $5 coins, while the number of $2 coins is 6 times the number of $5 coins. If the total value of the coins is $84, find the numbers of $1 coins, $2 coins and $5 coins.

30. The sum of two numbers A and B is 25. If one fourth of A is 1 more than one third of B, find the number A.

31. In a stationery store, a ball pen is sold at $7 and a fountain pen is sold at $11. Emily spends $80 to buy 8 pens. How many ball pens does she buy?

32. A fast food shop sells ham sandwiches and egg sandwiches only. A ham sandwich is sold for $14 and an egg sandwich is sold for $9. In a morning, the shop sells 50 sandwiches and receives $640. Find the number of egg sandwiches sold.

33. In a test, 3 marks are given for each correct answer, while 1 mark is deducted for each wrong answer or unanswered question. There are 20 questions in the test and Noel gets 32 marks. How many questions does Noel answer correctly?

Explain **34.** Among the 140 S1 students in a school, $\frac{2}{5}$ of the boys and $\frac{1}{3}$ of the girls wear glasses. It is given that there are 51 S.1 students wearing glasses. A student claims that in S.1, there are more boys than girls wearing glasses. Do you agree? Explain your answer.

35. Mrs Chan wants to buy some apples from a supermarket. She finds that:
   I.   If she buys 9 apples in brand A, she will have $9 left.
   II. If she buys a dozen apples in brand B, she will have $3 left.
   It is given that each apple in brand A costs $0.7 more than that in brand B. Let x be the price of each apple in brand A.
   (a) According to **I**, express the amount that Mrs Chan has in terms of x.
   (b) According to **II**, express the amount that Mrs Chan has in terms of x.
   (c) Hence, find x.

36. A teacher shares some pencils among a class of students. The teacher finds that:
   I.   If each student gets 4 pencils, then 15 pencils are left.
   II. If three students are absent, then each student can get 5 pencils with a pencil left.
   Find the total number of pencils.

Explain **37.**   In a hospital, the number of male patients is 20 more than $\frac{3}{5}$ of the total number of patients, while the number of female patients is 55 more than $\frac{1}{4}$ of the total number of patients. Is it possible that the total number of patients in the hospital is more than 400? Explain your answer.

Consolidation Exercise 2D (Answer)

1. 3

2. −18

3. 15

4. 22

5. 120

6. 5

7. **(a)** $3p + 5$ **(b)** 15

8. $11.5

9. $9

10. 10

11. 13.5

12. $23

13. 12

14. 4 cm^2

15. $3 000

16. 96 m

17. $70

18. $3

19. 28

20. $345

21. 32

22. 9 p.m.

23. 36

24. 13

25. $80

26. **(a)** 180 points **(b)** 580 points

27. 46

28. $120

29. $1 coins: 16, $2 coins: 24, $5 coins: 4

30. 16

31. 2

32. 12

33. 13

34. yes

35. **(a)** $(9x + 9)$ **(b)** $(12x − 5.4)$
(c) 4.8

36. 131

37. Yes

F1A: Chapter 3A

Date	Task	Progress	
	Lesson Worksheet	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	(Full Solution)
	Book Example 1	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 2	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Book Example 3	◯ Complete ◯ Problems encountered ◯ Skipped	(Video Teaching)
	Consolidation Exercise	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	(Full Solution)
	Maths Corner Exercise 3A Level 1	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 3A Level 2	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 3A Level 3	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 3A Multiple Choice	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	Teacher's Signature _____ ( )
	E-Class Multiple Choice Self-Test	◯ Complete and Checked ◯ Problems encountered ◯ Skipped	Mark: _____

3.1   Formulae

> A formula is an equality that shows the relation among quantities (variables).
>
> The variable alone on one side of the formula is called the subject of the formula.
>
> e.g.   **(a)** In the formula $A = \dfrac{1}{2}bh$, A, b and h are variables,
>
> and A is the subject of the formula.
>
> area = A
>
> h
>
> b
>
> **(b)** $2A$, $x + y$ and $3b = 0$ are not formulae.
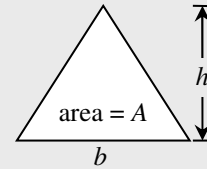
1. Determine whether each of the following is a formula. If yes, put a '✓' in the box and write down its
    subject on the space provided. If not, put a '✗' in the box.

    (a) $S = 30h$ ☐ _____

    (b) $3 + 2\pi r$ ☐ _____

    (c) $365d$ ☐ _____

    (d) $c = 7$ ☐ _____

    (e) $A = 5(x - y)$ ☐ _____

    (f) $P = x^2 + 12x$ ☐ _____

    ⊖ Ex **3A** 1–6

> Method of substitution:
>
> If the values of all the variables in a formula are given except one, then the
>
> unknown value can be found by substituting all the given values into the formula.

Example 1	**Instant Drill 1**
Consider the formula $y = 90 - x$. If $x = 13$, find the value of y.	Consider the formula $P = 4r$. If $r = 15$, find the value of P.
Sol When $x = 13$,	**Sol** When $r = ($ $)$,
$y = 90 - 13$	$P = ($ $) \times ($ $)$
$= \underline{77}$	$= \underline{\hspace{2cm}}$

2. Consider the formula $A = 6s - 2$. If $s = 5$,
    find the value of A.

    When $s = ($ $)$,

    $A = 6($ $) - 2$

    $=$

    ⊖ Ex **3A** 7–10

3. Consider the formula $F = ma$. If $m = 10$ and $a = 4$, find the value of F.

    When $m = ($ $)$ and $a = ($ $)$,

    $F = ($ $) \times ($ $)$

    $=$

4. Consider the formula $y = 3x + c$. If $c = 7$ and $x = -2$, find the value of y.

5. It is given that the area (B cm^2) of a figure can be calculated by the formula $B = s^2 - 4$. If $s = 9$, find the area of the figure.

When $s = ($ $)$,

$B =$

Example 2

Consider the formula $A = 55 + P$. If $A = 62$, find the value of P.

Sol When $A = 62$,

$62 = 55 + P$

$P = 62 - 55$

$\quad = \underline{7}$

Instant Drill 2

Consider the formula $T = 40 - W$. If $T = 28$, find the value of W.

Sol When $T = ($ $)$,

$($ $) = 40 - ($ $)$

$\quad\quad\quad = $

---

6. Consider the formula $P = 8v$. If $P = 128$, find the value of v.

When $P = ($ $)$,

$($ $) = ($ $) \times ($ $)$

$\quad\quad\quad = $

7. Consider the formula $h = \dfrac{80}{w}$. If $h = 16$, find the value of w.

8. Consider the formula $X = 3(Y + 4)$. If $X = 21$, find the value of Y.

9. It is known that the price P of n cakes can be calculated by the formula $P = 25n$. Celina pays \$300 for some cakes. How many cakes does she buy?

Example 3

The figure shows a triangle.

x cm x cm

x cm
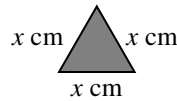
(a) Write down the formula for the perimeter (P cm) of the triangle in terms of x.

(b) If $x = 6$, find the perimeter of the triangle.

Sol **(a)** The required formula is

$$P = x + x + x$$

i.e. $\underline{P = 3x}$

(b) When $x = 6$,

$P = 3 \times 6$

$\quad = 18$

∴ The perimeter of the triangle is 18 cm.

Instant Drill 3

The figure shows a rectangle.

x cm

y cm
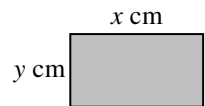
(a) Write down the formula for the area (A cm^2) of the rectangle in terms of x and y.

(b) If $x = 5$ and $y = 3$, find the area of the rectangle.

Sol **(a)** The required formula is

$$A = (\quad) \times (\quad)$$

i.e. $A = $ _____

(b) When $x = (\quad)$ and $y = (\quad)$,

$A = $

∴ The area of the rectangle is

_____ .

---

10. A box contains m books. Now, 7 more books are put into the box and there are P books altogether.

(a) Express P in terms of m.

(b) If there are 15 books in the box originally, how many books are there in the box now?

(a) The required formula is

$$P = (\quad\quad) + (\quad\quad)$$

(b) When $(\quad) = (\quad)$,

$P = $

11. It is given that there are d days in w weeks.

(a) Express d in terms of w.

(b) How many days are there in 6 weeks?
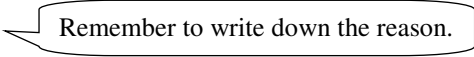
There are _____ days in a week.

12. Consider the formula $x = \dfrac{200 - y}{z}$. If $y = 130$ and $z = 14$, determine whether the value of x is less than 6. Explain your answer.

When $y = 130$ and $z = 14$,

∵ _____ (< / >) 6 ⟵ Remember to write down the reason.

∴ <u>The value of x (is / is not) less than 6.</u>

13. The price of a pear is $9 and the price of a lime is $5.

   (a) The total price of m pears and n limes is A. Express A in terms of m and n.

   (b) If Amy has $20, does she have enough money to buy 2 pears and 1 lime? Explain your answer.

14. Consider the formula $x = 2y + 3z$. If $x = 105$ and $y = 15$, find the value of z.

15. It is known that the price P of a set of roses can be calculated by the formula $P = 40 + 8h$, where h is the number of roses in the set.

   (a) Yvonne buys a set with 6 roses. Find the amount she needs to pay.

   (b) Cindy pays $136 for a rose set. Find the number of roses in the set.

3 Using Algebra to Solve Problems (II)

Level 1

1. Determine whether each of the following is a formula. If yes, write down its subject.

    (a) $5ab$

    (b) $E = mc^2$

    (c) $Z = 8x^2 - 3xy$

    (d) $6q - p$

    (e) $S = 6h$

    (f) $0 = 4t - 5$

2. Consider the formula $m = 90 + n$. If $n = 45$, find the value of m.

3. Consider the formula $P = 4a$. If $a = 8$, find the value of P.

4. Consider the formula $d = \dfrac{h}{24}$. If $h = 96$, find the value of d.

5. Consider the formula $h = \dfrac{1}{4k}$. If $k = 25$, find the value of h.

6. Consider the formula $m = -5n$. If $n = -20$, find the value of m.

7. Consider the formula $x = 25 - 2y$. If $y = 7$, find the value of x.

8. Consider the formula $p = \dfrac{2+q}{3}$. If $q = -8$, find the value of p.

9. Consider the formula $a = 3(-4 + b)$. If $b = 5$, find the value of a.

10. Consider the formula $c = -6(2 + 3d)$. If $d = -4$, find the value of c.

11. Consider the formula $k = \dfrac{7r - 3}{8}$. If $r = -3$, find the value of k.

12. Consider the formula $y = (x + 2)(x - 2)$. If $x = 8$, find the value of y.

13. Consider the formula $S = \dfrac{1}{2}(n^2 + n)$. If $n = 9$, find the value of S.

14. Consider the formula $z = (2w + 3)(3w - 1)$. If $w = \dfrac{1}{2}$, find the value of z.

15. Consider the formula $C = V - P$. If $V = 1\,200$ and $P = 800$, find the value of C.

16. Consider the formula $a = \dfrac{F}{m}$. If $F = -6$ and $m = 2$, find the value of a.

17. Consider the formula $P = 2(\ell + w)$. If $\ell = 5$ and $w = -8$, find the value of P.

18. Consider the formula $c = 2a + 5d$. If $a = -1$ and $d = 7$, find the value of c.

19. Consider the formula $x = \dfrac{1}{b} + \dfrac{1}{c}$. If $b = 2$ and $c = -3$, find the value of x.

20. Consider the formula $m = (h - k)^2$. If $h = 4$ and $k = -6$, find the value of m.

21. Consider the formula $H = -5K$. If $H = -35$, find the value of K.

22. Consider the formula $V = 2 + E - F$. If $V = 12$ and $E = 18$, find the value of F.

23. The cost ($\$C$) of printing a name card is given by the formula $C = 18 + \dfrac{250}{m}$, where m is the number of cards printed. Find the cost of printing each name card when 125 cards are printed.

24. The figure shows an equilateral triangle.
   (a) Write down the formula for the perimeter (P cm) of the triangle in terms of a.
   (b) If $a = 5$, find the perimeter of the triangle.

a cm
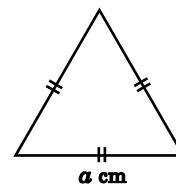
25. The capacity of a paper cup is 250 mL and the volume of a bottle of juice is 2.5 L. It is given that H paper cups can be fully filled by K bottles of juice without overflow.
   (a) Express H in terms of K.
   (b) How many paper cups can be fully filled by 6 bottles of juice without overflow?

Level 2

26. Consider the formula $S = \dfrac{1}{6} n(n + 1)(2n + 1)$. If $n = 10$, find the value of S.

27. Consider the formula $A = u(v - 5)$. If $u = 3.5$ and $v = -3$, find the value of A.

28. Consider the formula $P = \dfrac{1}{2} kx^2$. If $k = 50$ and $x = -2$, find the value of P.

29. Consider the formula $y = mx + c$. If $m = 2$, $x = 3$ and $c = 4$, find the value of y.

30. Consider the formula $Z = ab + bc + ca$. If $a = -1$, $b = 5$ and $c = -2$, find the value of Z.

31. Consider the formula $M = x(y + 2) - z$. If $x = 2$, $y = -6$ and $z = 7$, find the value of M.

32. Consider the formula $V = \dfrac{nRT}{P}$. In each of the following cases, find the value of V.

(a) $n = 4$, $R = 1$, $T = 5$, $P = 2$ (b) $n = 3$, $R = 2$, $T = -4$, $P = 6$

33. Consider the formula $A = \dfrac{n(m+n)}{m(n-m)}$. In each of the following cases, find the value of A.

(a) $m = 1$, $n = 2$ (b) $m = -2$, $n = -6$

34. Consider the formula $F = \dfrac{9(C+32)}{5}$. If $F = 18$, find the value of C.

35. Consider the formula $K = -3mv^2$. If $K = 48$ and $v = 6$, find the value of m.

36. Consider the formula $y = kx - 3b$. If $y = -24$, $k = 8$ and $b = 12$, find the value of x.

37. A test consists of section A and section B. The final score (S) of a student in the test can be calculated by the formula $S = n + 2m$, where n is the number of correct answers in section A and m is the number of correct answers in section B.

(a) Joe answers 7 questions in section A and 8 questions in section B correctly. Find his final score in the test.

(b) Peter answers 6 questions in section A correctly and his final score is 24. How many questions does he answer correctly in section B?

Explain **38.** In a factory, the cost ($\$C$) of making a T-shirt is calculated by the formula $C = 60 + \dfrac{8\,400}{K}$, where K is the number of T-shirts made.

(a) Can the cost of each T-shirt be $100? Explain your answer.

(b) What is the highest cost of each T-shirt? Explain your answer.

39. The figure shows a triangle.

(a) Write down the formula for the area (A cm^2) of the triangle in terms of m, n and h.

(b) (i) If $m = 6$, $n = 4$ and $h = 5$, find the area of the triangle.

    (ii) If $A = 55$, $m = 5$ and $n = 3$, find the height of the triangle.
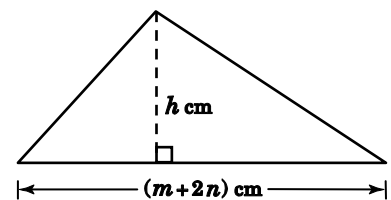
40. The prices of three snacks in a shop are shown below.

	A box of chocolates	A bottle of tea	A bag of chips
Price	$8	$4.5	$6

Suppose a customer buys x boxes of chocolates, y bottles of tea and z bags of chips.

(a) Write down the total amount ($\$A$) paid by the customer in terms of x, y and z.

Explain (b) Alfred claims that $100 is enough for him to buy 4 boxes of chocolates, 8 bottles of tea and 5 bags of chips. Do you agree? Explain your answer.

Consolidation Exercise 3A (Answer)

1. **(a)** no   **(b)** yes, E **(c)** yes, Z
   (d) no   **(e)** yes, S **(f)** no
2. 135   3. 32   4. 4
5. $\dfrac{1}{100}$ 6. 100   7. 11
8. −2   9. 3   10. 60
11. −3   12. 60   13. 45
14. 2   15. 400   16. −3
17. −6   18. 33   19. $\dfrac{1}{6}$
20. 100   21. 7   22. 8
23. $20
24. **(a)** $P = 3a$ **(b)** 15 cm
25. **(a)** $H = 10K$ **(b)** 60

26. 385   27. −28   28. 100
29. 10   30. −13   31. −15
32. **(a)** 10   **(b)** −4
33. **(a)** 6   **(b)** 6
34. −22   35. $-\dfrac{4}{9}$ 36. $\dfrac{3}{2}$
37. **(a)** 23   **(b)** 9
38. **(a)** yes   **(b)** $8 460
39. **(a)** $A = \dfrac{1}{2}h(m + 2n)$
    (b) (i) 35 cm²   **(ii)** 10 cm
40. **(a)** $A = 8x + 4.5y + 6z$
    (b) yes

F1A: Chapter 3B

Date	Task	Progress	
	Lesson Worksheet	○ Complete and Checked ○ Problems encountered ○ Skipped	(Full Solution)
	Book Example 4	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Book Example 5	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Consolidation Exercise	○ Complete and Checked ○ Problems encountered ○ Skipped	(Full Solution)
	Maths Corner Exercise 3B Level 1	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 3B Level 2	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 3B Level 3	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 3B Multiple Choice	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	E-Class Multiple Choice Self-Test	○ Complete and Checked ○ Problems encountered ○ Skipped	Mark: _____

3.2 Algebraic Inequalities

(a) An algebraic inequality consists of two expressions connected by an inequality sign with one or more unknowns.

(b)

Inequality sign	Meaning	Example
>	is greater than	$x > 2$
<	is less than	$y < 5$
≥	is greater than or equal to	$p \geq 7$
≤	is less than or equal to	$q \leq 10$

It also means 'is not less than' or 'is at least'.

It also means 'is not greater than' or 'does not exceed'.

1. Determine whether each of the following is true.

    (a) $5 \leq 8$ **(b)** $0 \geq 9$ **(c)** $-4 \geq -4$ **(d)** $-7 \leq -6$

Example 1

Use an inequality to represent 'the product of w and 8 is greater than 32'.

Sol The required inequality is $8w > 32$.

Instant Drill 1

Use an inequality to represent 'the result of dividing x by 9 is less than or equal to 5'.

Sol The required inequality is _____.

Use an inequality to represent each of the following. **[Nos. 2–5]**

2. The result of subtracting 20 from y is less than 15.

    The required inequality is _____.

3. The sum of x and 4 is greater than or equal to 9.

    ⊖ Ex **3B** 1, 2

4. The price of a shirt is $\$p$ and the total price of 3 shirts is not greater than \$300.

    The required inequality is _____.

5. A box contains 12 moon cakes. After serving q moon cakes, there are more than 8 left.

    ⊖ Ex **3B** 6, 7

All values that satisfy the inequality are called the solutions of the inequality.

e.g. 10 is a solution of $x > 1$.

Note: 3 is a solution of $x \leq 3$, but not a solution of $x < 3$.

Open-ended

6. In each of the following, write down three possible values of x that can satisfy the given inequality.

    (a) $x < 10$

        Three possible values of x are _____ _____.

    (b) $x \geq -6$

Example 2	**Instant Drill 2**
(a) Use an inequality to represent that 'the sum of n and 10 is not greater than 17'.	**(a)** Use an inequality to represent that 'the product of m and 3 is greater than 30'.
(b) Determine whether 7 is a solution of the inequality in **(a)**.	**(b)** Determine whether 10 is a solution of the inequality in **(a)**.
Sol **(a)** The required inequality is $n + 10 \leq 17$.	**Sol** **(a)** The required inequality is _____ .
(b) When $n = 7$,	**(b)** When $m = ($ $)$,
L.H.S. $= 7 + 10 = 17$	L.H.S. $=$
R.H.S. $= 17$	R.H.S. $=$
$\because$ L.H.S. $\leq$ R.H.S.	$\because$ L.H.S. _____ R.H.S.
$\therefore$ 7 is a solution of the inequality in **(a)**.	$\therefore$ 10 (is / is not) a solution of the inequality in **(a)**.

7. Paul has $\$x$ originally. After buying a can of coke for $7, he still has more than $12.

    (a) Use an inequality to represent the above situation.

    (b) Is it possible that Paul has $20 originally? Explain your answer.

    (a) $\because$ Amount left $> \$($ $)$

        $\therefore$ The required inequality is

        _____ .

    (b)

8. The hourly wage of Dick is $35. After working y hours, he gets a total income of less than $250.

    (a) Use an inequality to represent the above situation.

    (b) Is it possible that Dick works 6 hours? Explain your answer.

$\ominus$ Ex **3B** 3, 4, 8

9. **(a)** Use an inequality to represent that 'if x decreases by 2, the result does not exceed 26'.

    Open-ended **(b)** Write down a number that can satisfy the inequality in **(a)**.

    (a) The required inequality is

        _____ .

    (b) The number is _____ .

Guess: $x =$ ___
Checking: When $x =$ ___ , L.H.S. $=$
                R.H.S. $=$
    L.H.S. ___ R.H.S.
    $\therefore$ ___ satisfies the inequality.

10. Lily has w stickers originally. After buying 3 stickers, she has not less than 10 stickers.

    (a) Use an inequality to represent the above situation.

    Open-ended **(b)** Write down one possible number of stickers that Lily has originally.

$\ominus$ Ex **3B** 5, 9, 10

11. Mandy rides her bicycle for 20 km every hour. She rides more than 50 km in x hours.

    (a) Use an inequality to represent the above situation.
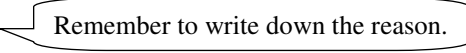
    (b) Is it possible that Mandy only rides for 2 hours? Explain your answer.

    (a) <u>The required inequality is   .</u>

    (b) When $x = ($ $)$,

        L.H.S. =

        R.H.S. =

        ∵   L.H.S. _____ R.H.S. ⟵ Remember to write down the reason.

        ∴   <u>It (is / is not) possible that Mandy only rides for 2 hours.</u>

12. Tim has eight $2 coins and y $5 coins. It is known that the total value of these coins does not exceed $70.

    (a) Use an inequality to represent the above situation.

    (b) Is it possible that Tim has ten $5 coins? Explain your answer.

13. It is given that the result of adding 3 to the product of 2 and k is less than 20.

    (a) Use an inequality to represent the above situation.

    Open-ended **(b)** Write down one possible <u>integer</u> that can satisfy the inequality in **(a)**.

14. The price of a piece of sushi is $3 and the price of a pack of lemon tea is $4. Tony spends at least $50 to buy n packs of lemon tea and 9 pieces of sushi.

    (a) Use an inequality to represent the above situation.

    Open-ended **(b)** Write down two possible numbers of packs of lemon tea that Tony buys.

3 Using Algebra to Solve Problems (II)

Level 1

1. Set up an inequality to represent each of the following.
   (a) The sum of 2 and a is greater than 25.
   (b) The result of subtracting y from 11 is less than 16.
   (c) The product of 5 and x is less than or equal to 13.
   (d) One third of b is not less than -5.

2. It is given that the result of subtracting 3 from m is greater than or equal to -2.
   (a) Set up an inequality to represent the above situation.
   (b) Determine whether each of the following numbers is a solution of the inequality in **(a)**.
      (i) 12   **(ii)** -4 **(iii)** 1

3. It is given that the product of 4 and t is less than 48.
   (a) Set up an inequality to represent the above situation.
   (b) Determine whether each of the following numbers satisfies the inequality in **(a)**.
      (i) -25 **(ii)** 14   **(iii)** 12

4. It is given that the result of dividing h by 4 is not less than 3.
   (a) Set up an inequality to represent the above situation.
   _{Open-ended} **(b)** Write down three integers that can satisfy the inequality in **(a)**.

5. It is given that the sum of k and 5 is greater than 10.
   (a) Set up an inequality to represent the above situation.
   _{Open-ended} **(b)** Write down two even numbers that can satisfy the inequality in **(a)**.

6. Daniel's weight is 80 kg. After losing x kg, his weight is less than 72 kg. Use an inequality to represent the situation.

7. John counts the total number of books on 4 bookshelves. He finds that there are f books on each bookshelf. If the total number of books is not more than 300, use an inequality to represent the situation.

8. The area of the triangle in the figure is greater than 30 cm². Use an inequality to represent the situation.

9. Alex has pocket money of \$$x$. Cathy's pocket money is two times Alex's. It is given that Cathy's pocket money is at most \$600.
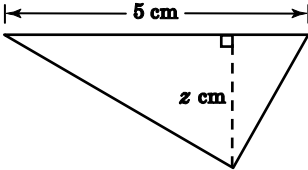
(a) Use an inequality to represent the above situation.

(b) Is it possible that Alex has pocket money of $280? Explain your answer.

10. Sally travels 65 km in one hour. She spends t hours in travelling more than 390 km.

   (a) Use an inequality to represent the above situation.

(b) Write down two possible values of t.

11. Marco divides n stamps into two groups evenly. There are at least 23 stamps in each group.

   (a) Is n an odd number or an even number?

   (b) Use an inequality to represent the above situation.

(c) Write down three possible values of n.

Level 2

12. Set up an inequality to represent each of the following.

   (a) p times 7 is greater than the sum of 5 and q.

   (b) r minus 3 is less than the result of dividing -3 by s.

   (c) The result of adding 5 to the square of x exceeds 19.

13. It is given that the result of adding 12 to the product of 5 and k is not less than 62.

   (a) Set up an inequality to represent the above situation.

   (b) Determine whether each of the following numbers is a solution of the inequality in **(a)**.

   (i) -6 **(ii)** 11 **(iii)** 17

14. It is given that the result of adding 5 to half of y is not greater than the product of 3 and y.

   (a) Set up an inequality to represent the above situation.

   (b) Determine whether each of the following numbers is a solution of the inequality in **(a)**.

   (i) -2 **(ii)** 0 **(iii)** 2

15. It is given that the result of subtracting 1 from one third of x is less than x.

   (a) Set up an inequality to represent the above situation.

   (b) Determine whether each of the following numbers is a solution of the inequality in **(a)**.

   (i) -1 **(ii)** $-\dfrac{3}{2}$ **(iii)** -2

16. It is given that the result of subtracting 7 from the product of 2 and b exceeds b.

   (a) Set up an inequality to represent the above situation.

(b) Write down two odd numbers that can satisfy the inequality in **(a)**.

17. It is given that the length and the width of a rectangle are a cm and b cm respectively. If the perimeter of the rectangle is greater than 16 cm, use an inequality to represent the situation.

18. In a shop, the prices of a pen and an eraser are $13 and $8 respectively. Sandy spends less than $50 to buy a pen and t erasers.

(a) Use an inequality to represent the above situation.

Explain **(b)** Is it possible that she has bought 5 erasers? Explain your answer.

19. Patrick has four $10 stamps, eight $2 stamps and p 50¢ stamps. It is known that the total value of these stamps is less than $76.

(a) Use an inequality to represent the above situation.

Explain **(b)** Can each of the following values be the number of 50¢ stamps? Explain your answer.

    (i) 30   **(ii)** 45

20. Mr Chan has distributed at least 250 candies to m S1A students and $(m - 5)$ S1B students. Each S1A student gets 3 candies and each S1B student gets 5 candies.

(a) Use an inequality to represent the above situation.

Explain **(b)** Can each of the following values be the number of S1A students? Explain your answer.

    (i) 34   **(ii)** 35

21. The table below shows the prices and the quantities of three items that Catherine wants to buy from a supermarket.

Price	$x	$(x + 18)$	$(x + 6)$
Quantity	4	2	3

It is known that she has $600, which is enough to pay for the items shown in the table.

(a) Use an inequality to represent the above situation.

Explain **(b)** Among the three items, is it possible that the most expensive item costs $80? Explain your answer.

22. Robert has p $10 notes and $(18 - p)$ $20 notes. It is known that the total value of these notes is less than $300.

(a) Use an inequality to represent the above situation.

Explain **(b)** Is it possible that Robert has

    (i) four $10 notes?   **(ii)** five $20 notes?

    Explain your answer.

Consolidation Exercise 3B (Answer)

1. **(a)** $2 + a > 25$ **(b)** $11 - y < 16$

   (c) $5x \le 13$ **(d)** $\dfrac{b}{3} \ge -5$

2. **(a)** $m - 3 \ge -2$

   (b) (i) yes   **(ii)** no   **(iii)** yes

3. **(a)** $4t < 48$

   (b) (i) yes   **(ii)** no   **(iii)** no

4. **(a)** $\dfrac{h}{4} \ge 3$

   (b) 13, 14, 15 (any three integers greater than or equal to 12)

5. **(a)** $k + 5 > 10$

   (b) 6, 8

   (any two even numbers greater than 5)

6. $80 - x < 72$

7. $4f \le 300$

8. $\dfrac{5z}{2} > 30$

9. **(a)** $2x \le 600$ **(b)** yes

10. **(a)** $65t > 390$

    (b) 7, 8 (any two numbers greater than 6)

11. **(a)** even number   **(b)** $\dfrac{n}{2} \ge 23$

    (c) 46, 48, 50 (any three even numbers greater than or equal to 46)

12. **(a)** $7p > 5 + q$ **(b)** $r - 3 < -\dfrac{3}{s}$

    (c) $x^2 + 5 > 19$

13. **(a)** $5k + 12 \ge 62$

    (b) (i) no   **(ii)** yes   **(iii)** yes

14. **(a)** $5 + \dfrac{y}{2} \le 3y$

    (b) (i) no   **(ii)** no   **(iii)** yes

15. **(a)** $\dfrac{x}{3} - 1 < x$

    (b) (i) yes   **(ii)** no   **(iii)** no

16. **(a)** $2b - 7 > b$

    (b) 9, 11

    (any two odd numbers greater than 7)

17. $2(a + b) > 16$

18. **(a)** $13 + 8t < 50$ **(b)** no

19. **(a)** $56 + 0.5p < 76$

    (b) (i) yes   **(ii)** no

20. **(a)** $8m - 25 \ge 250$

    (b) (i) no   **(ii)** yes

21. **(a)** $9x + 54 \le 600$ **(b)** no

22. **(a)** $360 - 10p < 300$

    (b) (i) no   **(ii)** yes

Date	Task	Progress	
	Lesson Worksheet	○ Complete and Checked ○ Problems encountered ○ Skipped	(Full Solution)
	Book Example 6	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Book Example 7	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Book Example 8	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Book Example 9	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Consolidation Exercise	○ Complete and Checked ○ Problems encountered ○ Skipped	(Full Solution)
	Maths Corner Exercise 3C Level 1	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 3C Level 2	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 3C Level 3	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 3C Multiple Choice	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	E-Class Multiple Choice Self-Test	○ Complete and Checked ○ Problems encountered ○ Skipped	Mark: _____

F1A: Chapter 3C

3.3A Introduction to Sequences

A list of numbers arranged in order is called a sequence. The symbols a_1, a_2, a_3, $\cdots$ are used to represent the 1st term, the 2nd term, the 3rd term, $\cdots$ of a sequence respectively.

e.g. In the sequence 3, 6, 9, 12, $\cdots$,

$a_1 = 3$, $a_2 = 6$, $a_3 = 9$, $\cdots$

Example 1

Write down the 6th term and the 7th term of the sequence 1, 3, 5, 7, 9, $\cdots$.

Sol

1   3   5   7   9 $\cdots$
+ 2 + 2 + 2 + 2

From the 2nd term onwards, any term = its preceding term + 2

The 6th term = 9 + 2 = <u>11</u>

The 7th term = 11 + 2 = <u>13</u>

Instant Drill 1

Write down the 6th term and the 7th term of the sequence 14, 11, 8, 5, 2, $\cdots$.

Sol

14   11   8   5   2 $\cdots$
– ( ) – ( ) – ( ) – ( )

From the 2nd term onwards, any term = its preceding term – (   )

The 6th term = 2 – (   ) = _____

The 7th term =

---

1. Write down the next two terms of the sequence 6, 12, 24, 48, $\cdots$.

6   12   24   48 $\cdots$

_____

From the 2nd term onwards, any term = its preceding term _____
The 5th term = 48 _____ = _____
The 6th term =

The next two terms are _____ and _____ .

2. Write down the next two terms of the sequence 9, 3, 1, $\dfrac{1}{3}$, $\cdots$.

9   3   1 $\dfrac{1}{3}$ $\cdots$

_____ _____ _____

3. Write down the next two terms of the sequence 5, –5, 5, –5, $\cdots$.

5   –5   5   –5 $\cdots$
× (   ) × (   ) × (   )

4. Write down the next two terms of the sequence 7, $\dfrac{7}{2}$, $\dfrac{7}{3}$, $\dfrac{7}{4}$, $\cdots$.

$7 = \dfrac{7}{1}$

⊖ Ex **3C** 1–6

5. The following figures are formed by dots. Write down the numbers of dots in the next two figures.

The numbers of dots in the figures form a sequence:

2, 4, (   ), (   ), $\cdots$

Observe the pattern of the numbers of dots in the figures.

⊖ Ex **3C** 8

3.3C General Term of a Sequence

> We may use an algebraic expression to represent the general term a_n (i.e. the nth term) of a sequence.

Example 2

The general term of a sequence is $a_n = n + 5$. Find the first two terms of the sequence.

Sol Substitute $n = 1, 2$ into $a_n = n + 5$ respectively. We have

(First two terms means the 1st term and 2nd term.)

$a_1 = 1 + 5 = 6$

$a_2 = 2 + 5 = 7$

$\therefore$ The first two terms are 6 and 7.

Instant Drill 2

The general term of a sequence is $a_n = 10 - n$. Find the first two terms of the sequence.

Sol Substitute $n = (\quad), (\quad)$ into

$a_n = 10 - n$ respectively. We have

$a_{(\quad)} = 10 - (\quad) =$

$a_{(\quad)} =$

$\therefore$ The first two terms are ___ and ___.

---

6. The general term of a sequence is $a_n = 7n$. Find the 12th term of the sequence.

(The 12th term $= a_{(\quad)}$)

Substitute $n = (\quad)$ into $a_n = 7n$. We have

$a_{(\quad)} =$

$\therefore$ The 12th term is ___.

7. The general term of a sequence is $a_n = \dfrac{1}{n+1}$.

Find the 8th term of the sequence.

⊖ Ex **3C** 9, 10

Example 3

Express the general term of the sequence 0, 1, 2, 3, $\cdots$ in terms of n.

(Try to find an algebraic expression to represent the nth term.)

Sol $a_1 = 0 = \mathbf{1} - 1$

$a_2 = 1 = \mathbf{2} - 1$

$a_3 = 2 = \mathbf{3} - 1$

$a_4 = 3 = \mathbf{4} - 1$

$\vdots$

$a_n = \mathbf{n} - 1$

$\therefore$ The general term is $a_n = n - 1$.

Instant Drill 3

Express the general term of the sequence 4, 3, 2, 1, $\cdots$ in terms of n.

Sol $a_1 = 4 = (\quad) - \mathbf{1}$

$a_2 = 3 = (\quad) - \mathbf{2}$

$a_3 = 2 = (\quad) - (\quad)$

$a_4 = 1 = (\quad) - (\quad)$

$\vdots$

$a_n =$ ___

$\therefore$ The general term is $a_n =$ ___.

---

8. Express the general term of the sequence 10, 11, 12, 13, $\cdots$ in terms of n.

$a_1 = 10 = (\quad) + \mathbf{1}$

$a_2 = 11 = (\quad) + \mathbf{2}$

$a_3 = 12 = (\quad\quad)$

$a_4 = 13 = (\quad\quad)$

$\vdots$

$a_n =$ ___

$\therefore$ The general term is $a_n =$ ___.

9. Express the general term of the sequence

$\dfrac{1}{2}, \dfrac{1}{4}, \dfrac{1}{6}, \dfrac{1}{8}, \cdots$ in terms of n.

($2 = 2 \times 1, 4 = 2 \times 2, 6 = 2 \times (\quad), \cdots$)

⊖ Ex **3C** 11–14

10. The general term of a sequence is $4n - 5$. Determine whether each of the following numbers is a term of the sequence. Explain your answer.

(a) 19 **(b)** 25

(a) Suppose that the kth term of the sequence is 19.

$$4k - 5 = (\qquad)$$
$$= $$

> Step ①: Suppose that the kth term is 19.
> Step ②: Check if k is a positive integer. If yes, then the kth term is 19; otherwise, 19 is not a term of the sequence.
> Step ③: Write down the conclusion.

∴ <u>19 (is / is not) a term of the sequence.</u>

(b) Suppose that the kth term of the sequence is ____.

11. Write down the next three terms of the sequence 1, 3, 7, 13, 21, ⋯.

> 1   3   7   13   21 ⋯
> + 2   + 4   +( )   +( )

12. The following figures are formed by dots.

(a) Express the number of dots in the nth figure in terms of n.

(b) Find the number of dots in the 11th figure.

(a) The numbers of dots in the figures form a sequence:

$$4, 7, (\qquad), (\qquad), \cdots$$
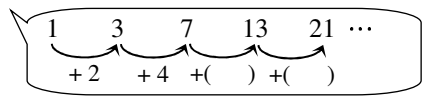
$a_1 = 4 = 1 + (\qquad) = 1 + (\qquad) \times \mathbf{1}$

$a_2 = 7 = 1 + 3 + (\qquad) = 1 + (\qquad) \times \mathbf{2}$

$a_3 = $

(b)

3 Using Algebra to Solve Problems (II)

Consolidation Exercise 3C

1. For each of the following sequences, determine whether it is an arithmetic sequence or a geometric sequence.
   (a) 8, 13, 18, 23, 28
   (b) 7, 14, 28, 56, 112, 224
   (c) 10, −100, 1 000, −10 000, 100 000
   (d) −10, −11, −12, −13, −14, −15

2. Write down the next two terms of each of the following sequences.
   (a) 3, 7, 11, 15, ⋯
   (b) −8, −6, −4, −2, ⋯
   (c) 56, 50, 44, 38, ⋯
   (d) 2, 6, 18, 54, ⋯

3. It is given that 14 and 19 are the 2nd term and the 3rd term of an arithmetic sequence respectively. Find the 4th term and the 5th term of the sequence.

4. It is given that 4 and −8 are the 5th term and the 6th term of a geometric sequence respectively. Find the 7th term and the 8th term of the sequence.

5. It is given that 55 and 89 are the 10th term and the 11th term of the Fibonacci sequence respectively. Find the 12th term of the sequence.

6. The sequence of square numbers is shown below. Write down the next two terms.
   1, 4, 9, 16, 25, 36, 49, ⋯

7. The sequence of triangular numbers is shown below. Write down the next two terms.
   1, 3, 6, 10, 15, 21, 28, ⋯

8. The following figures are formed by sticks. Write down the numbers of sticks in the next three figures.

In each of the following, a_n is the general term of a sequence. Find the first three terms and the 11th term of the sequence. **[Nos. 9–12]**

9. $a_n = n + 3$

10. $a_n = \dfrac{n}{4}$

11. $a_n = 3n - 7$

12. $a_n = \dfrac{5}{2n}$

13. Match each of the following sequences with its corresponding general term.

Sequences		*General terms*
3, 4, 5, 6, 7, $\cdots$ •	•	$a_n = 3n + 4$
3, 5, 7, 9, 11, $\cdots$ •	•	$a_n = 4n + 3$
7, 10, 13, 16, 19, $\cdots$ •	•	$a_n = n + 2$
7, 11, 15, 19, 23, $\cdots$ •	•	$a_n = 2n + 1$

Find the general term of each of the following sequences. **[Nos. 14–17]**

14. 9, 16, 23, 30, $\cdots$

15. $-2.5, -5, -7.5, -10, \cdots$

16. 5, 25, 125, 625, $\cdots$

17. $\dfrac{1}{11}, \dfrac{2}{11}, \dfrac{3}{11}, \dfrac{4}{11}, \cdots$

Level 2

Write down the next three terms of each of the following sequences. **[Nos. 18–19]**

18. $-1, \dfrac{1}{3}, -\dfrac{1}{6}, \dfrac{1}{10}, -\dfrac{1}{15}, \dfrac{1}{21}, \cdots$

19. 100, 20, 4, 0.8, $\cdots$

20. The general term of a sequence is $a_n = \dfrac{1}{3n + 2}$. Find

   (a) the first 3 terms of the sequence,

   (b) the 10th term of the sequence.

21. Consider the sequence 5, 13, 21, 29, $\cdots$.

   (a) Find the 5th and the 6th terms of the sequence.
   Hence, find the general term of the sequence.

   (b) Find the 18th term of the sequence.

22. Consider the sequence 2, 8, 18, 32, $\cdots$.

   (a) Find the general term of the sequence.

   (b) Using the result of **(a)**, find the 10th term of the sequence.

   Explain **(c)** Determine whether 128 is a term of the sequence. Explain your answer.

Open-ended **23.** Write down two different sequences with simple patterns such that the 2nd term and the 4th term of each sequence are 1 and 9 respectively.

24. The following figures are formed by squares.
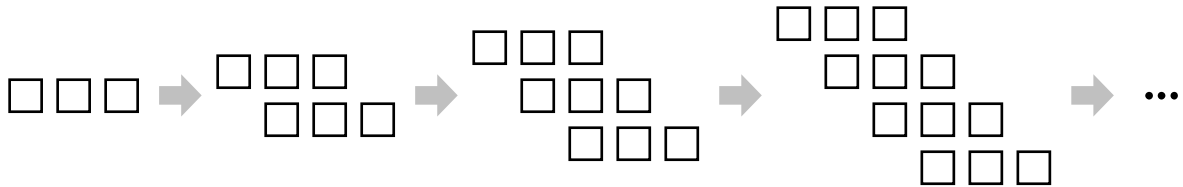
(a) Write down the numbers of squares in the next two figures.

(b) Express the number of squares in the nth figure in terms of n.

(c) (i) Find the number of squares in the 28th figure.

Explain (ii) Determine whether a figure may consist of 124 squares. Explain your answer.

25. The following figures are formed by dots.
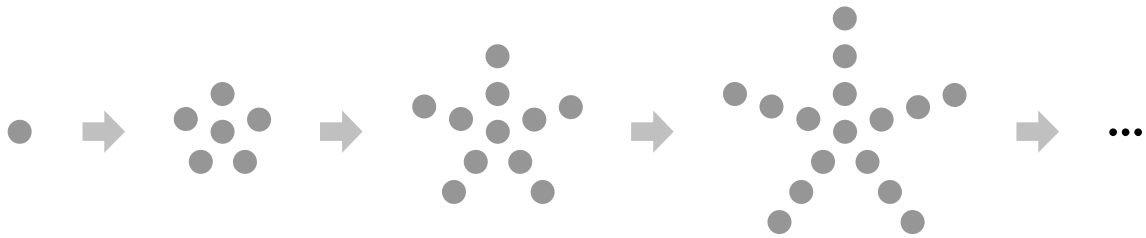
(a) Express the number of dots in the nth figure in terms of n.

(b) Find the number of dots in the 8th figure.

Explain (c) Ben claims that he can use exactly 76 dots to form one of the figures. Do you agree? Explain your answer.

26. Observe the pattern in the following figures.
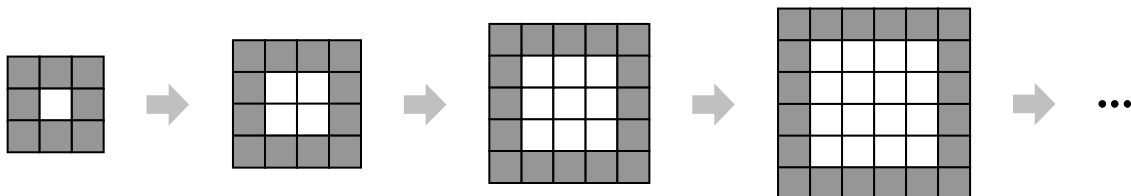
(a) Draw the next figure.

(b) In the nth figure, let G_n and W_n be the numbers of grey small squares and white small squares respectively.

(i) Complete the table below.
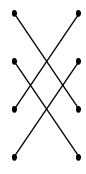
n	1	2	3	4	5
G_n					
W_n					

(ii) Express G_n and W_n in terms of n.

Explain (c) Zoe claims that there are exactly 102 grey small squares in one of the figure. Do you agree? Explain your answer.

Consolidation Exercise 3C (Answer)

1. **(a)** arithmetic   **(b)** geometric
   (c) geometric   **(d)** arithmetic
2. **(a)** 19, 23   **(b)** 0, 2
   (c) 32, 26   **(d)** 162, 486
3. the 4th term = 24, the 5th term = 29
4. the 7th term = 16, the 8th term = −32
5. 144   **6.** 64, 81
7. 36, 45   **8.** 26, 31, 36
9. the first 3 terms: 4, 5, 6; the 11th term = 14
10. the first 3 terms: $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}$; the 11th term = $\frac{11}{4}$
11. the first 3 terms: −4, −1, 2; the 11th term = 26
12. the first 3 terms: $\frac{5}{2}, \frac{5}{4}, \frac{5}{6}$; the 11th term = $\frac{5}{22}$
13.

Sequences		*General terms*
3, 4, 5, 6, 7, ⋯		$a_n = 3n + 4$
3, 5, 7, 9, 11, ⋯		$a_n = 4n + 3$
7, 10, 13, 16, 19, ⋯		$a_n = n + 2$
7, 11, 15, 19, 23, ⋯		$a_n = 2n + 1$

14. $7n + 2$ **15.** $-2.5n$
16. 5^n **17.** $\frac{n}{11}$
18. $-\frac{1}{28}, \frac{1}{36}, -\frac{1}{45}$
19. 0.16, 0.032, 0.006 4
20. **(a)** $\frac{1}{5}, \frac{1}{8}, \frac{1}{11}$ **(b)** $\frac{1}{32}$
21. **(a)** the 5th term = 37, the 6th term = 45, the general term = $8n - 3$
    (b) 141
22. **(a)** $2n^2$ **(b)** 200   **(c)** yes
23. −3, 1, 5, 9; $\frac{1}{3}$, 1, 3, 9
    (or other reasonable answers)
24. **(a)** 15, 18   **(b)** $3n$
    (c) (i) 84   **(ii)** no
25. **(a)** $5n - 4$ **(b)** 36   **(c)** yes
26. **(b) (i)**

n	1	2	3	4	5
G_n	8	12	16	20	24
W_n	1	4	9	16	25

   (ii) $G_n = 4n + 4$, $W_n = n^2$
   (c) no

F1A: Chapter 3D			
Date	Task	Progress	
	Lesson Worksheet	○ Complete and Checked ○ Problems encountered ○ Skipped	(Full Solution)
	Book Example 10	○ Complete ○ Problems encountered ○ Skipped	(Video Teaching)
	Consolidation Exercise	○ Complete and Checked ○ Problems encountered ○ Skipped	(Full Solution)
	Maths Corner Exercise 3D Level 1	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 3D Level 2	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 3D Level 3	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	Maths Corner Exercise 3D Multiple Choice	○ Complete and Checked ○ Problems encountered ○ Skipped	Teacher's Signature _____ ( )
	E-Class Multiple Choice Self-Test	○ Complete and Checked ○ Problems encountered ○ Skipped	Mark: _____

3.4 Simple Idea of Functions

> The 'input-process-output' relation between numbers is called a function relation.
>
> For each input value, we can obtain the corresponding output value by substitution.
>
> e.g. Consider the function $y = 2x + 4$.
>
> When $x = 5$, $y = 2(5) + 4 = 14$.
>
> input　process　output
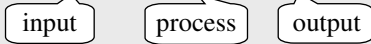
Example 1

It is known that y is a function of x, and $y = x + 4$. Find the value of y when x is

(a) 4,

(b) –4.

Sol **(a)** When $x = 4$, $y = 4 + 4$

　　　　　　　$= \underline{8}$

(b) When $x = –4$, $y = –4 + 4$

　　　　　　　$= \underline{0}$

Instant Drill 1

It is known that y is a function of x, and $y = 3 – x$. Find the value of y when x is

(a) 10,

(b) –3.

Sol **(a)** When $x = (\quad)$, $y = (\quad) – (\quad)$

　　　　　　　　　$=$

(b) When $x = (\quad)$, $y =$

---

1. It is known that y is a function of x, and $y = 7x$. Find the value of y when x is

(a) 9, **(b)** –2.

2. It is known that y is a function of x, and $y = 6 + 5x$. Find the value of y when x is

(a) 7, **(b)** –5.

3. It is known that y is a function of x, and $y = 5x – 2$. For each value of x given in the table, write down the corresponding value of y.

x	2	4	6	8
y				

When $x = 2$, $y = 5(\quad) – 2 = (\quad)$
When $x = 4$, $y =$
　　　⋮

4. It is known that y is a function of x, and $y = x^2 – 9$. For each value of x given in the table, write down the corresponding value of y.

x	–3	–1	0	4
y				

5. Mr Chan spends $\$T$ on transportation for d days. It is known that T is a function of d, and $T = 12d$. Mr Chan claims that he spends more than $260 on transportation for 22 days. Do you agree? Explain your answer.

Substitute $d = ($ $)$ into $T = 12d$. We have

$T =$

> Find the total amount that Mr Chan spends on transportation for 22 days, i.e. $d = ($ $)$.

∵ _____ (< / >) $260

> Remember to write down the reason.

∴ The claim (is / is not) agreed.

ⓘ Level Up Questions

6. It is known that y is a function of x, and $y = \dfrac{x}{x-2}$ (where $x \neq 2$). For each value of x given in the table, write down the corresponding value of y.

x	−2	0	1	4
y				

7. It is known that y is a function of x, and $y = 4(x - 3)$. Find the value of y when x is

  (a) 1,   **(b)** 3.5,   **(c)** $\dfrac{3}{4}$.

8. Some oranges are arranged into several rows. There are n oranges in the mth row. It is known that n is a function of m, and $n = (m + 2)(m + 3)$. How many oranges are there in the 5th row?

3 Using Algebra to Solve Problems (II)

Consolidation Exercise 3D

In each of the following, y is a function of x. Find the value of y according to the value of x given in the brackets. **[Nos. 1–8]**

1. $y = x - 2$ $\qquad (x = 8)$

2. $y = 24 - x$ $\qquad (x = -10)$

3. $y = 5x$ $\qquad (x = -4)$

4. $y = \dfrac{x}{12}$ $\qquad (x = 3)$

5. $y = 4x + 17$ $\qquad (x = -5)$

6. $y = 13 - 7x$ $\qquad (x = 4)$

7. $y = -3 + \dfrac{x}{2}$ $\qquad (x = 6)$

8. $y = \dfrac{3x + 1}{4}$ $\qquad (x = -7)$

In each of the following, y is a function of x. For each value of x given in the table, write down the corresponding value of y. **[Nos. 9–14]**

9. $y = x + 16$

x	−2	−1	0	1
y				

10. $y = 6x - 9$

x	−2	0	2	4
y				

11. $y = 15 - 4x$

x	−3	−2	4	6
y				

12. $y = \dfrac{x + 5}{3}$

x	−8	−5	1	10
y				

13. $y = x^2 - 16$

x	−5	−2	0	4
y				

14. $y = \dfrac{1 + x^2}{2}$

x	−3	−1	5	9
y				

In each of the following, y is a function of x. For each value of x below, write down the corresponding value of y. **[Nos. 15–16]**

(a) −5 $\qquad$ **(b)** $\dfrac{1}{4}$ $\qquad$ **(c)** 1.3

15. $y = 5(4x + 3)$

16. $y = \dfrac{7}{x - 2}$ (where $x \neq 2$)

In each of the following, y is a function of x. For each value of x given in the table, write down the corresponding value of y. **[Nos. 17–20]**

17. $y = 3 + x(x + 6)$

x	-2	-1.5	0	2.5
y				

18. $y = \dfrac{8 - x}{x}$ (where $x \neq 0$)

x	-4	-2	2	8
y				

19. $y = \dfrac{x + 4}{2 - x}$ (where $x \neq 2$)

x	-4	-1	0	1.5
y				

20. $y = \dfrac{-12}{(x + 1)(x + 2)}$ (where $x \neq -1$ and $x \neq -2$)

x	-3	-1.5	1	2
y				

21. Every day, a shopkeeper records the profit ($\$P$) and the number ($n$) of customers. It is given that P is a function of n, and $P = 550n - 2\,000$. If there are 7 customers on a certain day, find the profit made by the shop.

22. A solid is formed by some blocks, and there are y blocks in the xth layer. It is known that y is a function of x, and $y = x^2 + (x + 1)^2$. How many blocks are there in the 9th layer?

23. The table below shows the relation between the weight (W g) of a box of goods and the number (n) of goods in the box.

Number of goods in the box (n)	1	2	3	4	5	6
Weight (W g)	350	500	650	800	950	1 100

(a) Write down the function relation between W and n.
(*Hint: Consider the sequence* 350, 500, 650, 800, 950, 1 100, ⋯.)

(b) If there are 24 goods in the box, find the weight of the box of goods.

24. Leo is going to buy a bottle of milk and n cans of pet food. The table below shows the relation between n and the total amount ($\$A$) Leo has to pay.

Number of cans of pet food (n)	1	2	3	4	5	6
Total amount ($\$A$)	41.5	68	94.5	121	147.5	174

(a) Write down the function relation between A and n.
(*Hint: Consider the sequence* 41.5, 68, 94.5, 121, 147.5, 174, ⋯.)

(b) If Leo has $230, at most how many cans of pet food can he buy?

Consolidation Exercise 3D

1. 6   **2.** 34   **3.** −20   **4.** $\dfrac{1}{4}$

5. −3   **6.** −15   **7.** 0   **8.** −5

9.

x	−2	−1	0	1
y	14	15	16	17

10.

x	−2	0	2	4
y	−21	−9	3	15

11.

x	−3	−2	4	6
y	27	23	−1	−9

12.

x	−8	−5	1	10
y	−1	0	2	5

13.

x	−5	−2	0	4
y	9	−12	−16	0

14.

x	−3	−1	5	9
y	5	1	13	41

15. (a) −85   **(b)** 20   **(c)** 41

16. (a) −1   **(b)** −4   **(c)** −10

17.

x	−2	−1.5	0	2.5
y	−5	−3.75	3	24.25

18.

x	−4	−2	2	8
y	−3	−5	3	0

19.

x	−4	−1	0	1.5
y	0	1	2	11

20.

x	−3	−1.5	1	2
y	−6	48	−2	−1

21. $1 850   **22.** 181

23. (a) $W = 150n + 200$ **(b)** 3 800 g

24.   **(a)** $A = 26.5n + 15$ **(b)** 8