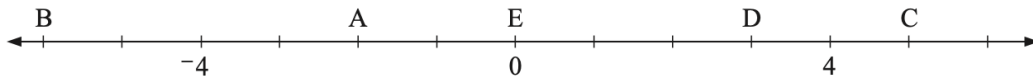


EXERCISE 3A

1 Copy and complete the following table:

	<i>Statement</i>	<i>Number</i>	<i>Opposite to statement</i>	<i>Number</i>
a	20 m above sea level	20	20 m below sea level	-20
b	45 km south of the city			
c	a loss of 2 kg in weight			
d	a clock is 2 min fast			
e	she arrives 5 min early			
f	a profit of \$4000			
g	2 floors above ground level			
h	10°C below zero			
i	an increase of \$400			
j	winning by 34 points			

3 If right is positive and left is negative, write the numbers for the positions of A, B, C, D and E using zero as the reference position.



4 Write these temperatures as positive or negative numbers. Zero degrees is the reference point.

- a** 11° above zero **b** 6° below zero **c** 8° below zero
d 29° above zero **e** 14° below zero

5 Write these gains or losses as positive or negative numbers:

- a** \$30 loss **b** \$200 gain **c** \$431 loss
d \$751 loss **e** \$809 gain

6 If north is the positive direction, write these directions as positive or negative numbers:

- a** 7 metres north **b** 15 metres south **c** 115 metres south
d 362 metres north **e** 19.6 metres south

7 If the ground floor (street level) is regarded as zero, write a positive or negative number for the following positions:

- a** 6 floors above ground level **b** 3 floors below ground level
c 29 floors above ground level **d** 7 floors below ground level
e 4 floors below ground level

8 If right is positive, write a number for the position from zero which is:

- a** 7 units left **b** 5 units right **c** 12 units left
d 9 units right **e** 23 units left

9 State the combined effect of the following:

- a** a withdrawal of \$7 followed by a deposit of \$10
b a \$7 withdrawal followed by a \$6 withdrawal
c a rise in temperature of 13°C followed by a fall of 8°C
d a fall of 12°C followed by a rise of 7°C
e a 4 km trip east followed by a 3 km trip west
f a 7 km trip south followed by a 7 km trip north
g going up 5 floors in a lift and then coming down 6 floors
h a loss in mass of 4 kg followed by a gain in mass of 2 kg.

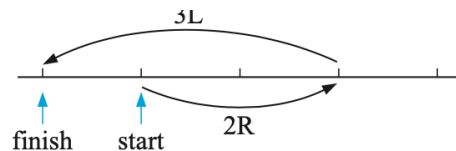


10 A baby boy weighed 3409 grams at birth. The record of his weight for the first five days showed the following:

- Day 1: 28 g loss Day 2: 15 g loss Day 3: 13 g loss
Day 4: 17 g gain Day 5: 29 g gain

13 Suppose $2R$ means a trip to the right 2 units and $3L$ means a trip to the left 3 units, then $2R + 3L = 1L$ is clearly the combined trip. Find the combined trip for the following:

- a** $2R + 4L$ **b** $5L + 1R$ **c** $3R + 2R$ **d** $5L + 4L$



14 Find the combined trip for the following:

- a** $4R + 2L$ **b** $1R + 3R + 5L$ **c** $7L + 8L + 4R$

15 If $4\uparrow$ means go upwards 4 units and $2\downarrow$ means go downwards 2 units, then clearly $4\uparrow + 2\downarrow = 2\uparrow$ is the combined effect. Find the combined effect of:

- a** $2\uparrow + 5\downarrow$ **b** $3\downarrow + 4\uparrow$ **c** $7\downarrow + 6\downarrow$

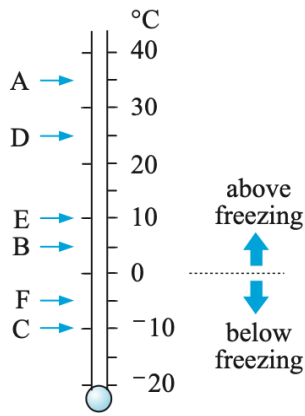
16 Find the combined effect of the following:

a $1 \uparrow + 2 \uparrow + 6 \downarrow$

b $9 \uparrow + 3 \downarrow + 6 \downarrow$

c $3 \downarrow + 4 \downarrow + 5 \uparrow$

17



The temperatures of cities A, B, C, D, E and F were recorded at 12 noon on a certain day last year.

a What was the temperature of each of the cities?

b How many °C is city D warmer than city:

- i** E **ii** B **iii** F **iv** C?

c How many °C is city C cooler than city:

- i** A **ii** E **iii** F **iv** B?

d What is the difference in temperature between:

- i** A and B **ii** D and E
iii E and C **iv** F and C
v B and F **vi** D and F?

EXERCISE 3B

Draw a number line to help you with these answers.

1 Write the opposite of these numbers:

- | | | | | |
|--------------|--------------------------|-------------|----------------|------------------|
| a 8 | b -5 | c 0 | d 11 | e -2 |
| f 6.4 | g $-3\frac{1}{2}$ | h 56 | i -23 | j -23.6 |

2 Use a number line to:

- | | | |
|-----------------------------|-----------------------------|-----------------------------|
| a increase 2 by 3 | b increase -1 by 3 | c decrease 5 by 2 |
| d decrease -1 by 3 | e increase -4 by 3 | f increase -2 by 1 |
| g decrease 3 by 6 | h decrease -2 by 2 | i increase -3 by 5 |

3 Which is larger?

- | | | |
|--------------------|-----------------------|------------------------|
| a 5 or 10 | b 6 or -3 | c -4 or 4 |
| d 7 or -1 | e -6 or -2 | f -5 or -12 |

4 Which is smaller?

- | | | |
|-----------------------|--------------------|-------------------------|
| a 15 or 12 | b 8 or -2 | c -3 or 3 |
| d -7 or -9 | e -2 or 2 | f -6 or -6.5 |

5 Write *true* or *false* for the following:

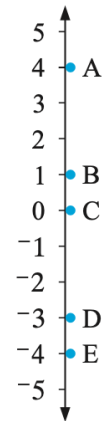
- | | | |
|--------------------|--------------------|---------------------|
| a $6 < -3$ | b $13 > -5$ | c $0 > -4$ |
| d $7 < -2$ | e $11 > -5$ | f $-8 > -1$ |
| g $-7 > -3$ | h $-17 < 1$ | i $-5 > -12$ |

6 Add $<$ or $>$ in the square to make each statement true:

- | | | |
|---------------------------|---------------------------|----------------------------|
| a $4 \square -1$ | b $-4 \square -11$ | c $8 \square -8$ |
| d $-1 \square -11$ | e $-6 \square -8$ | f $-9 \square -13$ |
| g $0 \square -8$ | h $-6 \square 0$ | i $-7 \square -5.5$ |

- 8** **a** Arrange in *ascending* order: $\{-3, 0, -4, -1, 4\}$
b Arrange in *descending* order: $\{-2, 2, 5, 0, -1\}$
- 9** Four friends have the following bank balances: Monica $-\$592$, Joey $\$311$, Rachel $\$852$ and Ross $-\$312$. Place them in order of richest to poorest.
- 10** The temperatures of five cities were: Sydney 12°C , New York -3°C , Mexico City 15°C , Moscow -7°C and London 0°C . Place them in order of coldest to hottest.
- 11** Arrange these numbers from smallest to largest:
- | | |
|--|--|
| a $-5, 8, -2$ | b $4, -3, -4, 0$ |
| c $2.5, -1.2, 4, -3.1$ | d $-9.5, -8.9, -10, -9.7$ |
| e $3\frac{1}{2}, -2\frac{1}{4}, 1, -1\frac{1}{5}$ | f $-\frac{1}{8}, -\frac{7}{8}, \frac{5}{8}, -\frac{3}{8}, -\frac{5}{8}$ |

- 12** This number line is vertical. As you go up the number line, the numbers increase, and as you go down, the numbers decrease. Write the directed number for each of the points marked on the number line, and write True or False for the following statements.



- | | |
|--------------------------------|--------------------------------|
| a B is higher than D | b $A < E$ |
| c D is lower than A | d $B < C$ |
| e $C > E$ | f $C < B$ |
| g B and D are opposites | h A and E are opposites |
- 13** **a** Which number is furthest from 7?
i 3 or 15 **ii** 10 or -1 **iii** -20 or 28
- b** Which number is furthest from -3 ?
i 5 or -8 **ii** -10 or 6 **iii** 32 or -28

EXERCISE 3C

- 1** Calculate the following **additions** by moving to the **right** along a number line:
- | | | | |
|-------------------|--------------------|--------------------|--------------------|
| a $5 + 3$ | b $-5 + 3$ | c $4 + 2$ | d $-4 + 2$ |
| e $-7 + 7$ | f $-6 + 6$ | g $-8 + 8$ | h $-3 + 3$ |
| i $0 + 4$ | j $0 + 2$ | k $-9 + 10$ | l $-7 + 13$ |
| m $-5 + 8$ | n $-4 + 10$ | o $-1 + 9$ | p $-2 + 7$ |

3 Calculate the following by moving along a number line:

a $8 - 3$

b $-6 + 8$

c $-5 + 3$

d $-4 + 4$

e $-1 - 3$

f $0 - 5$

g $-9 + 9$

h $-4 + 1$

i $5 - 5$

j $-3 - 2$

k $3 - 7$

l $-2 + 6$

m $0 + 4$

n $-6 + 6$

o $0 - 3$

p $-8 - 1$

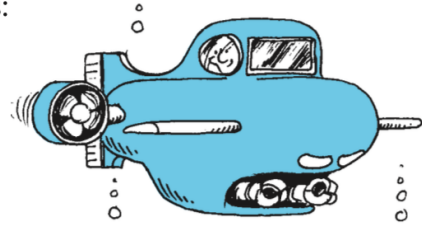
4 Use a number line to solve the following problems:

a A mini-submarine is 25 m below sea level and rises 18 m. What is its depth after rising?

b The temperature overnight was -8°C but has risen by 15° at noon. What is the temperature at noon?

c A bird gliding 12 m above sea level sees a fish and dives 14 m vertically down to catch it. At what depth was the fish?

d The temperature at dusk was 9°C and fell by 14°C during the night. What was the lowest temperature reached?



EXERCISE 3D

1 Simplify the following and then use a number line to find:

a $7 + -3$

b $7 - -3$

c $-7 + -3$

d $-3 + -7$

e $3 + -7$

f $3 - -7$

g $-3 - -7$

h $-7 - -3$

i $5 - 11$

j $11 - 5$

k $5 - -11$

l $11 - -5$

m $-5 + -11$

n $-5 - -11$

o $-11 + -5$

p $-11 - -5$

q $-6 + -1$

r $-2 + -4$

s $6 + -2$

t $-5 + -3$

u $2 + -6$

v $-6 + -4$

w $-6 + -13$

x $-15 + -5$

2 Harry keeps a record of his gambling wins or losses for 5 weeks.

Find his overall win or loss for the 5 weeks.

Week 1	wins	\$150
Week 2	loses	\$210
Week 3	loses	\$340
Week 4	wins	\$220
Week 5	loses	\$70

3 A tea lady working in a high rise building started her day on the ground floor. She then went up 7 floors, up 3 floors, down 5 floors, down 6 floors, up 4 floors, down 3 floors, up 8 floors. Which floor did she finish on?

4 Simplify if possible and find:

a $-4 + -3$

b $5 - -5$

c $-6 - 2$

d $4 - -8$

e $8 + -1$

f $7 - -11$

g $-2 + -1$

h $6 - 9$

i $-6 - 9$

j $-4 - -2$

k $16 + -25$

l $-16 - -25$

m $31 + -45$

n $56 - -12$

o $39 + -15$

p $-21 - -16$

5 Simplify and find:

a $2 - -1 + 7$

b $11 + -3 - -8$

c $-3 - -2 + -3$

d $-5 + -2 - -3$

e $6 - 11 - -5$

f $9 - 13 + -8$

g $-1 + 4 - -6$

h $2 + -3 - -5$

i $5 - -2 + -3$

j $6 - 6 - -1$

k $-7 - -2 + 3$

l $-5 - -2 + -6 - 11$

6 Queenstown recorded the following maximum temperatures for a week:

Mon 5°C , Tues -3° , Wed -7°C , Thurs 2°C , Fri 1°C , Sat -4°C , Sun -1°C .

What was the **average** daily maximum temperature for the week?

Multiplication and division

EXERCISE 3E

1 Simplify:

a 2×3

b 2×-3

c -2×3

d -2×-3

e 8×-2

f 8×2

g -8×2

h -8×-2

i 7×11

j -7×-11

k 7×-11

l -7×11

m 0×3

n -2×0

o -3×-6

p -5×-5

2 Determine the missing integer for each of the following:

a $-2 \times \square = -16$

b $-2 \times \square = 16$

c $5 \times \square = 10$

d $-5 \times \square = 10$

e $\square \times 4 = -12$

f $\square \times -4 = 12$

g $-4 \times \square = 20$

h $-4 \times \square = -20$

i $3 \times \square = -15$

j $-3 \times \square = -15$

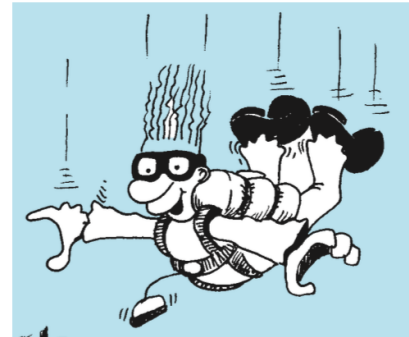
k $\square \times -6 = 18$

l $\square \times -6 = -18$

3 Use a negative sign as appropriate in the following questions and solve:

a A gambler loses \$8 per race for seven successive races. How much did she lose?

b A skydiver falls 200 metres per second for 30 seconds. How many metres did he fall?



4 Simplify:

a $3 \times -2 \times 5$

b $-2 \times -1 \times -3$

c $-1 \times 3 \times -4$

d $(-7)^2$

e $(-1)^3$

f $4 \times -1 \times -5$

g $5 \times -2 \times -4$

h $-7 \times -2 \times 2$

i $(-2)^3$

j -2×5^2

k $-2 \times (-3)^2$

l $(-2)^2 \times -6$

5 Do $(-2)^2$ and -2^2 have the same value?

6 Calculate:

a $(-1)^2$

b $(-1)^3$

c $(-1)^4$

d $(-1)^5$

e $(-1)^6$

f $(-1)^7$

What do you notice?

7 Using the results of question 6 find:

a $(-1)^{26}$

b $(-1)^{87}$

c $(-1)^{\text{even number}}$

d $(-1)^{\text{odd number}}$

EXERCISE 3F

1 Calculate:

a $14 \div 7$

b $14 \div -7$

c $-14 \div 7$

d $-14 \div -7$

e $30 \div 5$

f $-30 \div -5$

g $-30 \div 5$

h $30 \div -5$

i $8 \div 8$

j $8 \div -8$

k $-8 \div 8$

l $-8 \div -8$

m $24 \div 4$

n $24 \div -4$

o $-24 \div -4$

p $-24 \div 4$

2 Calculate:

a $\frac{12}{3}$

b $\frac{-12}{3}$

c $\frac{12}{-3}$

d $\frac{-12}{-3}$

e $\frac{22}{2}$

f $\frac{22}{-2}$

g $\frac{-22}{2}$

h $\frac{-22}{-2}$

i $\frac{18}{9}$

j $\frac{18}{-9}$

k $\frac{-18}{-9}$

l $\frac{-18}{9}$

The fraction bar acts like a division sign!



3 Find the missing integer for each of the following:

a $24 \div \square = -4$

b $24 \div \square = 4$

c $-18 \div \square = 9$

d $-18 \div \square = -9$

e $-27 \div \square = -3$

f $-27 \div \square = 3$

g $\square \div -5 = 7$

h $\square \div -5 = -7$

i $\square \div -2 = -8$

j $\square \div -2 = 8$

k $\square \div 3 = -5$

l $\square \div -3 = 5$

m $\square \div -4 = -4$

n $\square \div -4 = 4$

o $7 \div \square = -7$

p $-7 \div \square = 7$

q $\square \div \square = 1$

r $\square \div \square = -1$

EXERCISE 3G

1 Find the answers, using the order of operations rules:

a $3 + -7 \times 2$

b $-2 - 3 \times -4$

c $-4 - 18 \div 3$

d $(5 - 10) \times (3 - 5)$

e $-10 + 2 \times -4$

f $3 \times -4 + -5 \times -2$

g $(8 - 12) \times 3 - 7$

h $8 - 12 \times (3 - 7)$

i $8 - 12 \times 3 - 7$

j $7 - 2 \times -3 + 4 \times -5$

2 Mac Ltd. makes a \$70 000 loss per month for four months and then a \$40 000 profit for each of the next eight months. What was the year's result?

3 Debbies Dresses show the following sales record over a six week period:

Week 1, \$1214 profit; Week 2, \$867 profit; Week 3, \$126 loss;

Week 4, \$992 profit; Week 5, \$543 loss; Week 6, \$2150 profit.

a What is Debbie's overall profit or loss during this period?

b What is Debbie's average weekly earnings during this period?

4 The temperature of a bottle of water is 18°C . The bottle is placed in a freezer that cools the water at 5° per hour. What is its temperature after 4 hours?

5 To explore for gold, a mining company uses a drilling rig to take core samples from below the ground. Gold samples were found at the following levels:

a Which sample is closest to ground level?

b Which sample is the deepest?

c What is the difference in depth between sample B and D?

d The cost of drilling is \$60 per m. What was the cost of taking sample A?

e What was the average depth of the gold samples?

Sample	Level
A	-113 m
B	-42 m
C	-119 m
D	-78 m

Answers




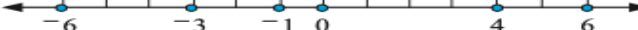
EXERCISE 3A

Statement	Directed number	Opposite to statement	Directed number
20 m above sea level	20	20 m below sea level	-20

b	45 km south of the city	-45	45 km north of the city	45
c	a loss of 2 kg in weight	-2	a gain of 2 kg in weight	2
d	a clock is 2 minutes fast	2	a clock is 2 minutes slow	-2
e	she arrives 5 minutes early	-5	she arrives 5 minutes late	5
f	a profit of \$4000	4000	a loss of \$4000	-4000
g	2 floors above ground level	2	2 floors below ground level	-2
h	10°C below zero	-10	10°C above zero	10
i	an increase of \$400	400	a decrease of \$400	-400
j	winning by 34 points	34	losing by 34 points	-34

- 2 lift 1, car -3, parking attendant -2, rubbish skip -5
 3 A -2, B -6, C 5, D 3, E 0
 4 a 11 b -6 c -8 d 29 e -14
 5 a -30 b 200 c -431 d -751 e 809
 6 a 7 b -15 c -115 d 362 e -19.6
 7 a 6 b -3 c 29 d -7 e -4
 8 a -7 b 5 c -12 d 9 e -23
 9 a deposit of \$3 b \$13 withdrawal c 5°C rise
 d 5°C fall e 1 km east
 f remain in same position g 1 floor down
 h 2 kg loss
 10 a Day 1: -28 g Day 2: -15 g Day 3: -13 g
 Day 4: 17 g Day 5: 29 g b 3399 g
 11 3 km east 12 \$124
 13 a 2L b 4L c 5R d 9L
 14 a 2R b 1L c 11L
 15 a 3↓ b 1↑ c 13↓
 16 a 3↓ b 0 c 2↓
 17 a A 35°C, B 5°C, C -10°C, D 25°C, E 10°C,
 F -5°C
 b i 15°C ii 20°C iii 30°C iv 35°C
 c i 45°C ii 20°C iii 5°C iv 15°C
 d i 30°C ii 15°C iii 20°C iv 5°C
 v 10°C vi 30°C

EXERCISE 3B

- 1 a -8 b 5 c 0 d -11 e 2 f -6.4
 g $3\frac{1}{2}$ h -56 i 23 j 23.6
 2 a 5 b 2 c 3 d -4 e -1 f -1
 g -3 h -4 i 2
 3 a 10 b 6 c 4 d 7 e -2 f -5
 4 a 12 b -2 c -3 d -9 e -2 f -6.5
 5 a false b true c true d false e true
 f false g false h true i true
 6 a $4 > -1$ b $-4 > -11$ c $8 > -8$
 d $-1 > -11$ e $-6 > -8$ f $-9 > -13$
 g $0 > -8$ h $-6 < 0$ i $-7 < -5.5$
 7 a 
 b 
 c 
 d 

- 8 a $\{-4, -3, -1, 0, 4\}$ b $\{5, 2, 0, -1, -2\}$
 9 Rachel \$852, Joey \$311, Ross $-\$312$, Monica $-\$592$
 10 Moscow -7°C , New York -3°C , London 0°C ,
 Sydney 12°C , Mexico City 15°C
 11 a $-5, -2, 8$ b $-4, -3, 0, 4$
 c $-3.1, -1.2, 2.5, 4$
 d $-10, -9.7, -9.5, -8.9$
 e $-2\frac{1}{4}, -1\frac{1}{5}, 1, 3\frac{1}{2}$ f $-\frac{7}{8}, -\frac{5}{8}, -\frac{3}{8}, -\frac{1}{8}, \frac{5}{8}$
 12 A 4, B 1, C 0, D -3 , E -4 a true b false
 c true d false e true f true g false
 h true
 13 a i 15 ii -1 iii -20
 b i 5 ii 6 iii 32
 14 a 19, 23 b $-2, -3$ c $-1, -4$ d 1, 5
 15 a 6 b 10 c 8 d 6 e -2 f 0
 g -4 h -1

EXERCISE 3C

- 1 a 8 b -2 c 6 d -2 e 0 f 0 g 0
 h 0 i 4 j 2 k 1 l 6 m 3 n 6
 o 8 p 5
 2 a 3 b -11 c -3 d -13 e -6 f -3
 g -4 h -10 i -3 j 3 k 1 l -1
 m -4 n -7 o -2 p -6
 3 a 5 b 2 c -2 d 0 e -4 f -5 g 0
 h -3 i 0 j -5 k -4 l 4 m 4 n 0
 o -3 p -9
 4 a 7 m below sea level b 7°C
 c 2 m below sea level d -5°C
 5 a -2 b -6 c 2 d -3 e -2 f -2
 g -8 h -7 i -3 6 \$23
 7 a 3 b 0 c -7 d -2 e -5 f -1

EXERCISE 3D

- 1 a 4 b 10 c -10 d -10 e -4 f 10
 g 4 h -4 i -6 j 6 k 16 l 16
 m -16 n 6 o -16 p -6 q -7 r -6
 s 4 t -8 u -4 v -10 w -19 x -20
 2 loses \$250 3 8th floor
 4 a -7 b 10 c -8 d 12 e 7 f 18
 g -3 h -3 i -15 j -2 k -9 l 9
 m -14 n 68 o 24 p -5
 5 a 10 b 16 c -4 d -4 e 0 f -12
 g 3 h 4 i 4 j 1 k -2 l -20
 6 -1°C

EXERCISE 3E

- 1 a 6 b -6 c -6 d 6 e -16 f 16
 g -16 h 16 i 77 j 77 k -77 l -77
 m 0 n 0 o 18 p 25
 2 a 8 b -8 c 2 d -2 e -3 f -3
 g -5 h 5 i -5 j 5 k -3 l 3
 3 a \$56 b 6000 m
 4 a -30 b -6 c 12 d 49 e -1 f 20
 g 40 h 28 i -8 j -50 k -18 l -24
 5 $(-2)^2 = 4$, $-2^2 = -4$, no
 6 a 1 b -1 c 1 d -1 e 1 f -1
 -1 raised to even power equals 1,
 -1 raised to odd power equals -1
 7 a 1 b -1 c 1 d -1

EXERCISE 3F

1 a 2 b -2 c -2 d 2 e 6 f 6 g -6

h -6 i 1 j -1 k -1 l 1 m 6 n -6
o 6 p -6

2 a 4 b -4 c -4 d 4 e 11 f -11
g -11 h 11 i 2 j -2 k 2 l -2

3 a -6 b 6 c -2 d 2 e 9 f -9
g -35 h 35 i 16 j -16 k -15
l -15 m 16 n -16 o -1 p -1
q any integer, except 0 r no solution

4 a \$80 000 b -3°C per hour

EXERCISE 3G

1 a -11 b 10 c -10 d 10 e -18 f -2
g -19 h 56 i -35 j -7

2 \$40 000 profit 3 a \$4554 profit b \$759

4 -2°C

5 a B b C c 36 m d \$6780 e 88 m

6 a -1 b -1 c -2 d 2 e -3 f 3
g -9 h 3