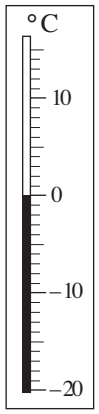
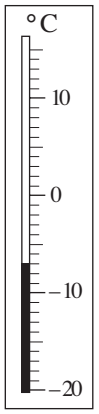
1

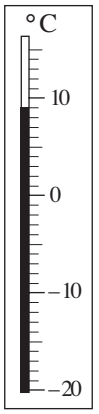
What temperature does each thermometer show?

a) 

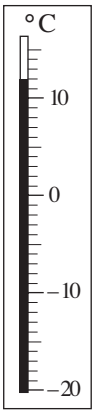
0 °C

b) 

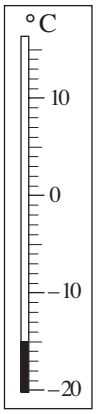
– 7 °C

c) 

9 °C

d) 

12 °C

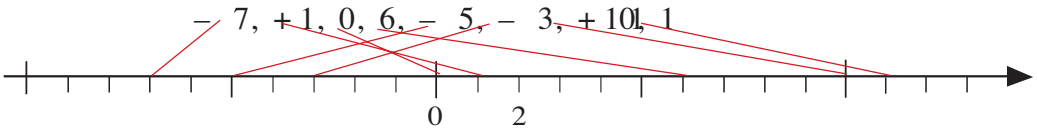
e) 

– 15 °C

2

a) Mark and label these numbers on the number line.

– 7, + 1, 0, 6, – 5, – 3, + 10, 1



b) Compare the numbers. Write the missing signs in the circles.

– 7 < + 1	0 > – 5	– 5 > – 7	– 7 < – 5
– 5 < 0	11 > 0	6 > – 3	6 < + 10
– 7 < – 3	11 > 6	0 > – 5	– 3 < + 10

3

What is the difference between the two temperatures? Answer with an operation.

a) On a January day at dawn the temperature was – 3 °C. At mid-day it was 11 °C.

11 °C – (– 3 °C) = 14 °C

b) In the Sahara Desert, the temperature was 43 °C at noon and – 4 °C at night.

43 °C – (– 4 °C) = 47 °C

c) In Eastern Siberia the summer temperature is sometimes 30 °C and the winter temperature is sometimes – 70 °C.

30 °C – (– 70 °C) = 100 °C

d) On Earth, the highest air temperature ever measured is 58 °C and the lowest ever measured is – 89 °C.

58 °C – (– 89 °C) = 147 °C

e) On the Moon, the temperature can be – 130 °C in the day and – 160 °C at night.

– 130 °C – (– 160 °C) = 30 °C

1

Work out the rule and complete the table. Write the rule in different ways.

a)

x	5	-3	2	14	-8	0	-140	479	40.5	12.3	$-\frac{5}{8}$	-0.72
y	-5	3	-2	-14	8	0	140	-479	-40.5	-12.3	$\frac{5}{8}$	0.72

y = opposite of x or $y = -x$ $\quad$ x = opposite of x or $x = -y$

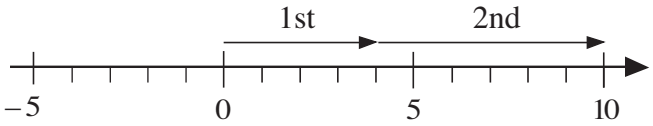
b)

u	6	-11	5	-93	41	164	-2.3	0	0	-10	-10	-0.15
v	6	11	5	93	41	164	2.3	0	0	10	10	0.15

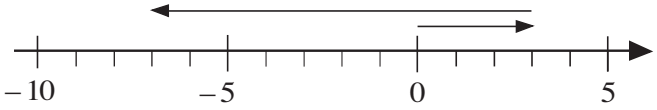
v = absolute value of u or $v = |u|$

2

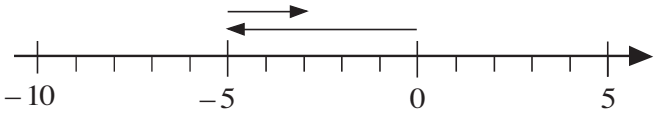
Write an addition about each diagram. e.g.

a) 

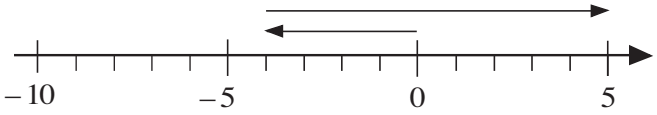
$(+4) + (+6) = 10$

b) 

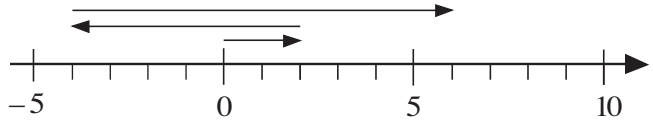
$(+3) + (-10) = -7$

c) 

$(-5) + (+2) = -3$

d) 

$(-4) + (+9) = 5$

e) 

$(+2) + (-6) + (+10) = 6$

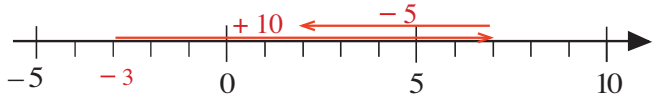
3

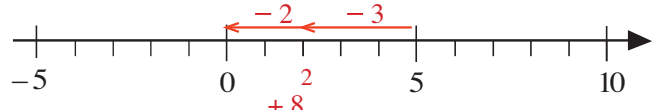
Fill in the missing number so that the equation is true. Show it on the number line.

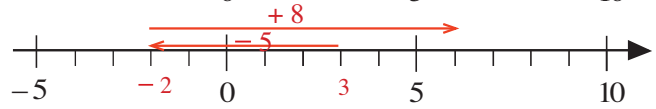
a) $5 + \boxed{4} = 9$ 

b) $-7 + \boxed{-2} = -9$ 

c) $\boxed{-7} + (-3) = -10$ 

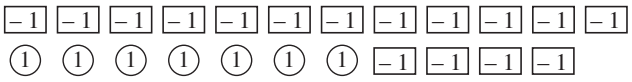
d) $-3 + \boxed{10} + (-5) = 2$ 

e) $5 + (-3) + \boxed{-2} = 0$ 

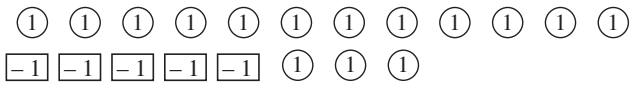
f) $3 + (-5) + \boxed{8} = 6$ 

1

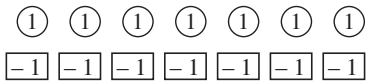
What is the balance? Write it as an addition.

a) 

$-16 + (+7) = -9$

b) 

$15 + (-5) = 10$

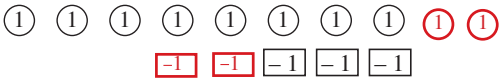
c) 

$7 + (-7) = 0$

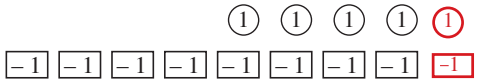
2

Change the diagrams so that the balance remains the same. Write an addition about it.

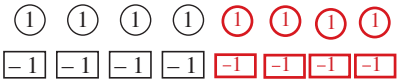
e.g.

a) 

$10 + (-5) = 5$

b) 

$5 + (-9) = 4$

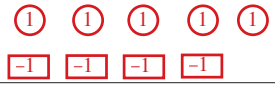
c) 

$8 + (-8) = 0$

3

Draw a diagram using (1) and [−1] for each operation. Fill in the missing number.

a) $5 + (-4) =$ 1



b) $-3 + (+3) =$ 0

c) $3 + (-8) =$ −5

4

Fill in the missing numbers.

a) 7 + (− 6) = 1

b) −10 + (+ 10) = 0

c) 15 + −13 = −2

d) 8 + (− 8) = 0

e) −8 + −3 = −11

f) 12 + (−7) = 5

g) $y + (-12) = -20$

$y =$ −8

h) $x + x + (-5) = 15$

$x =$ 10

i) −100 + 10 = −90

5

a) Solve the problem by writing an addition.

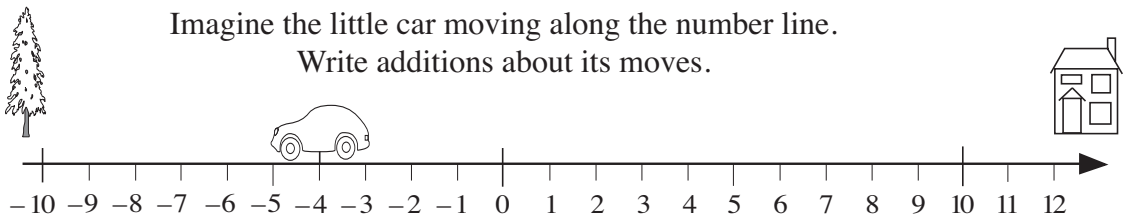
Sue has won £200 but she owes £100. What is her balance?

£200 + (− £100) = £100

b) Work out the answer to the addition. (Think of it as 'cash' and 'debt'.)

(+ 150) + (− 250) = −100

1



Imagine the little car moving along the number line.
Write additions about its moves.

a) The car is at (– 4) and faces the tree. Move it 3 units ahead.

– 4 + (– 3) = – 7

b) The car is at (+ 5) and faces the tree. Move it 5 units ahead.

+ 5 + (– 5) = 0 or 5 + (– 5) = 0

c) The car is at (– 3) and faces the house. Move it 5 units ahead.

– 3 + (+ 5) = + 2 (or 2)

d) The car is at (– 3) and faces the house. Move it 6 units ahead.

– 3 + (+ 6) = + 3 (or 3)

2

Use the idea of the car moving along the number line to help you calculate these sums.

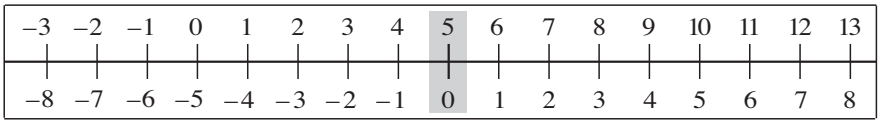
a) (– 5) + (+ 7) = +2 (or 2) (+ 6) + (– 8) = – 2 c) (– 3) + (+ 3) = 0

d) (– 5) + (– 2) = – 7 e) (+ 6) + (+ 3) = + 9 (or 9) f) (+ 4) + (– 4) = 0

3

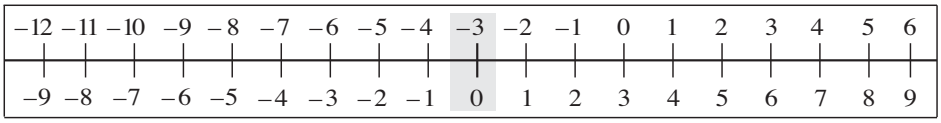
Use the number line pairs to help you calculate the sums.

a)



(+ 5) + (+ 6) = 11	(+ 5) + (+ 1) = 6	(+ 5) + (– 4) = 1
(+ 5) + (+ 5) = 10	(+ 5) + 0 = 5	(+ 5) + (– 5) = 0
(+ 5) + (+ 4) = 9	(+ 5) + (– 1) = 4	(+ 5) + (– 6) = – 1
(+ 5) + (+ 3) = 8	(+ 5) + (– 2) = 3	(+ 5) + (– 7) = – 2
(+ 5) + (+ 2) = 7	(+ 5) + (– 3) = 2	(+ 5) + (– 8) = – 3

b)



(– 3) + (+ 5) = 2	(– 3) + 0 = – 3	– 3 + (– 5) = – 8
(– 3) + (+ 4) = 1	(– 3) + (– 1) = – 4	– 3 + (– 6) = – 9
(– 3) + (+ 3) = 0	(– 3) + (– 2) = – 5	– 3 + (– 7) = – 10
(– 3) + (+ 2) = – 1	(– 3) + (– 3) = – 6	– 3 + (– 8) = – 11
(– 3) + (+ 1) = – 2	(– 3) + (– 4) = – 7	– 3 + (– 9) = – 12

1

Complete the addition table. Use the table to complete these sums.

+	– 3	– 2	– 1	0	+ 1	+ 2	+ 3
– 3	– 6	– 5	– 4	– 3	– 2	– 1	0
– 2	– 5	– 4	– 3	– 2	– 1	0	+ 1
– 1	– 4	– 3	– 2	– 1	0	1	2
0	– 3	– 2	– 1	0	+ 1	+ 2	+ 3
+ 1	– 2	– 1	0	+ 1	+ 2	+ 3	+ 4
+ 2	– 1	0	+ 1	+ 2	+ 3	+ 4	+ 5
+ 3	0	+ 1	+ 2	+ 3	+ 4	+ 5	+ 6

a) + 3 + (– 1) = 2

b) – 1 + (– 2) = – 3

c) – 3 + (– 2) = – 5

d) + 3 + (– 3) = 0

e) 0 + (– 3) = – 3

f) + 2 + (– 3) = – 1

g) – 1 + 0 = – 1

2

Calculate as simply as possible.

a) 256 + 137 + 44 + 64 = (256 + 44) + (137 + 63 + 1) = 300 + 201 = 501

b) 125 + 49 + 151 + 50 = (125 + 50) + (49 + 151) = 175 + 200 = 375

c) 43 + 291 + 69 + 17 = (43 + 17) + (291 + 9 + 60) = 60 + 360 = 220

d) 299 + 163 + 87 + 113 = 300 + 162 + (87 + 113) = 462 + 200 = 662

e) 1324 + 9999 + 1001 = 1324 + (9999 + 1 + 1000) = 1324 + 11 000 = 12 324

3

Do the calculations as quickly as you can and check them.

a)

		3	2	4
	1	0	9	2
+			9	2
	1	5	0	8

b)

		5	9	2
			8	4
+	1	7	5	8
	2	4	3	4

c)

	2	0	0	7
		7	4	8
+	1	9	8	0
	4	7	3	5

d)

		6	2	4	7
	3	1	4	8	2
+		3	7	6	0
	4	1	4	8	9

4

Calculate as simply as possible.

a) 472 + 123 – 172 = (472 – 172) + 123 = 300 + 123 = 423

b) 89 + 111 – 27 + 30 = (89 + 111) + (30 – 27) = 200 + 3 = 203

c) 216 – 90 – 66 + 39 = (216 + 39) – (90 + 66) = 255 – 156 = 100 – 1 = 99

d) 426 + 117 – 125 – 67 = 426 – 125) + (117 – 67) = 301 + 50 = 351

e) 1725 + 310 – 525 + 90 = (1725 – 525) + (310 + 90) = 1200 + 400 = 1600

5

Do the calculations as quickly as you can and check them mentally with addition.

a)

	4	8	4	0
–	2	7	6	8
	2	0	7	2

b)

	5	7	2	8
–	1	7	4	2
	3	9	8	6

c)

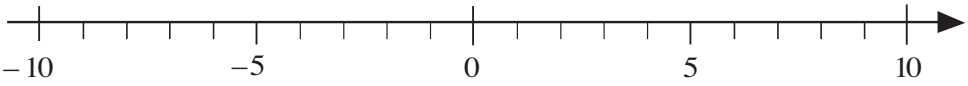
	3	0	0	0
–	1	6	4	2
	1	3	5	8

d)

	2	1	3	0	5
–		1	4	8	8
	1	9	8	1	7

1

a) Find the **reductant** and **subtrahend** on the number line. Read the difference.



i) $8 - (+3) = +5$ ii) $8 - 0 = +8$ iii) $4 - (-2) = +6$ iv) $0 - (-5) = +5$

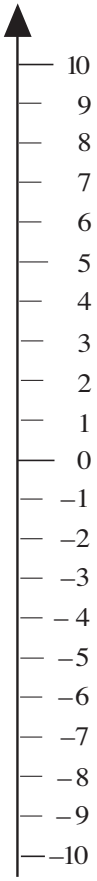
$+3 - (+8) = -5$ $0 - (+8) = -8$ $-2 - (+4) = -6$ $-5 - 0 = -5$

b) Compare the two numbers. Which is more? How much more?

i) $+8$ [>] $+3$ ii) $+4$ [>] -2 iii) 9 [>] 8 iv) -5 [<] 0

2

Write a subtraction to work out the difference, then check it with an addition.



a) $3°C$ is greater than $-6°C$ by [9] °C

So $3 - (-6) = 9$ *Check:* $9 + (-6) = 3$

b) $-6°C$ is less than $3°C$ by [9] °C

So $-6 - (+3) = -9$ *Check:* $-9 + (+3) = -6$

c) 4 is less than 7 by [3]

So $4 - (+7) = -3$ *Check:* $-3 + (+7) = +4$

d) 7 is greater than 4 by [3]

So $+7 - (+4) = +3$ *Check:* $+3 + (+4) = +7$

e) -8 is less than -2 by [6]

So $= -8 - (-2) = -6$ *Check:* $-6 + (2) = -8$

f) -2 is greater than -8 by [6]

So $-2 - (-8) = +6$ *Check:* $+6 + (-8) = -2$

3

Do the subtractions, then check with an addition.

		Check:			*Check:*
a)	$3 - (+4) = -1$	$-1 + (+4) = +3$	b)	$(-3) - (+1) = -4$	$-4 + (+1) = -3$
	$3 - (+3) = 0$	$0 + (+3) = +3$		$(-3) - 0 = -3$	$-3 + 0 = -3$
	$3 - (+2) = 1$	$+1 + (+2) = +3$		$(-3) - (-1) = -2$	$-2 + (-1) = -3$
	$3 - (+1) = 2$	$+2 + (+1) = +3$		$(-3) - (-2) = -1$	$-1 + -2 = -3$
	$3 - 0 = 3$	$+3 + 0 = +3$		$(-3) - (-3) = 0$	$0 + (-3) = (-3)$
	$3 - (-1) = 4$	$+4 + (-1) = +3$		$(-3) - (-4) = 1$	$+1 + (-4) = -3$

1

Draw diagrams using ① and [–1] to model each problem, then write the operation.

a) Paula had £7, then she spent £6. How much did she have left? £1

① ① ① ① ① ① ①
[–1] [–1] [–1] [–1] [–1] [–1]

+ 7 – (+ 6) = + 1 (1 + (+ 6) = + 7)

b) Roy owed £7 but then £4 of his debt was cancelled. What is his balance now? –£3

[–1] [–1] [–1] [–1] [–1] [–1] [–1]
① ① ① ①

– 7 – (– 4) = – 3 (– 3 + (– 4) = – 7)

c) Lee had £3, then he spent £3. What is his balance now? £0

① ① ①
[–1] [–1] [–1]

+ 3 – (+ 3) = 0 (0 + (+ 3 = + 3)

d) Tina was £4 in debt, then £4 of her debts were cancelled. What is her balance now? £0

[–1] [–1] [–1] [–1]
① ① ① ①

4 – (– 4) = 0 (0 + (– 4) = – 4)

2

Draw diagrams using ① and [–1] to help you work out the differences.

a) (+ 6) – (+ 4) = + 2

① ① [①] ① ① ①

b) – 6 – (– 4) = 2

[–1] [–1] [–1] [–1] [–1] [–1]

c) (+ 5) – (+ 5) = 0

[①] ① ① ① ① ①

d) (– 6) – (– 6) = 0

[–1] [–1] [–1] [–1] [–1] [–1]

3

Fill in the missing amounts in the questions. Solve them in your exercise book.

a) Sue's starting balance was £2, as she had £5 in cash and was [£ 3] in debt. Then she spent £5. How much is her balance now? – £3

b) Rob's starting balance was – £3, as he had [£ 2] in cash and was £5 in debt. Then he spent £2. How much is his new balance? – £5

c) Billy's starting balance was – £3, as he had £1 in cash and was [£ 4] in debt. Then £4 of his debts were cancelled. How much is his balance now? + £1

d) Mary's starting balance was [£ 2], as she had £5 in cash and was £3 in debt. Then £3 of her debts were repaid. What is her balance now? + £5

4

Show the subtractions using the cash and debt model. Complete the calculations.

a) (+ 3) – (– 4) = + 7

b) (+ 3) – (+ 8) = – 5

c) (– 2) – (– 5) = + 3

d) (– 2) – (+ 3) = – 5

e) 0 – (+ 4) = – 4

f) 0 – (– 4) = + 4

1

Do the subtractions. Use the number line to help you.

a) $+9-(+2) = +7$

b) $+3-(+6) = -3$

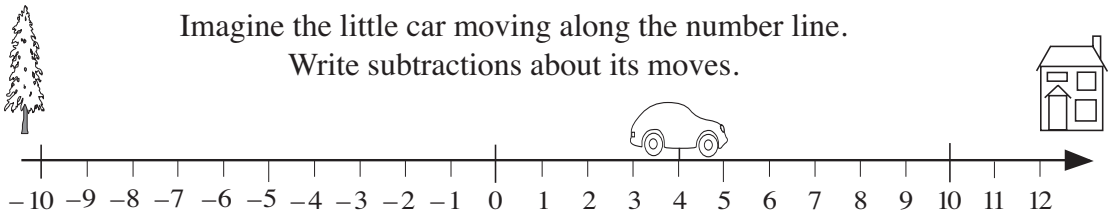
c) $-5-(-2) = -3$

d) $+2-(-5) = +7$

e) $-1-(+2) = -3$

f) $-1-(-8) = +7$

2



Imagine the little car moving along the number line.
Write subtractions about its moves.

a) The car is at (+ 4) and faces the house. Move it 3 units backwards.

$+4-(+3) = +1$

b) The car is at (+ 4) and faces the house. Move it 7 units backwards.

$+4-(+7) = -3$

c) The car is at (– 5) and faces the tree. Move it 3 units backwards.

$-5-(-3) = -2$

d) The car is at (+ 3) and faces the tree. Move it 4 units backwards.

$+3-(+4) = -1$

3

Do the subtractions and join them to the matching car.

a) $(+8)-(+2) = +6$

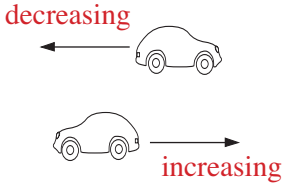
b) $(-8)-(-2) = -6$

c) $(+2)-(+8) = -6$

d) $(-2)-(-8) = +6$

e) $(+4)-(+3) = +1$

f) $(-4)-(-3) = -1$



4

Do each calculation, then join it to the matching car.

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

b) $(+3)+(-5) = -2$

c) $(+3)+(+2) = +5$

d) $(+3)+0 = +3$

e) $(-4)+(+1) = -3$

f) $(-4)+(+6) = +2$

g) $(-4)+(-3) = -7$

h) $(-4)+0 = -4$

i) $0+(+2) = +2$

j) $0+(-3) = -3$

k) $(+3)-(+1) = +2$

l) $(+3)-(+5) = -2$

m) $(+3)-(-2) = +5$

n) $(+3)-0 = +3$

o) $(-4)-(-1) = -3$

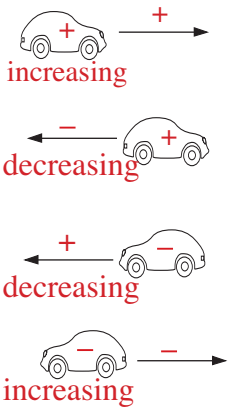
p) $(-4)-(-6) = +2$

q) $(-4)-(+3) = -7$

r) $(-4)-0 = -4$

s) $0-(-2) = +2$

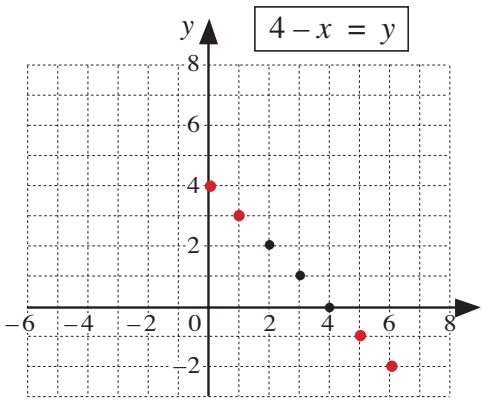
t) $0-(+3) = -3$



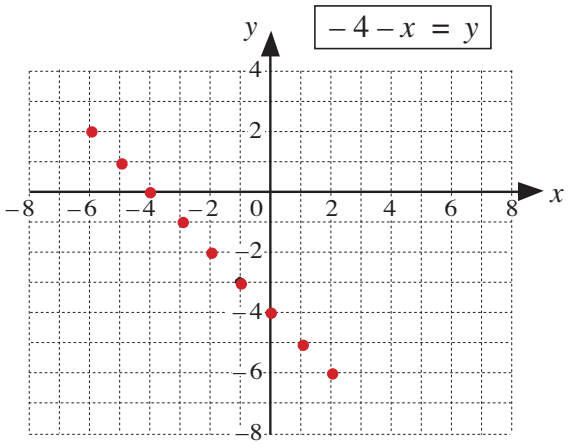
1

Fill in the missing differences. Continue drawing the graphs.

a)
$(+4) - (+6) = \boxed{-2}$
$(+4) - (+5) = \boxed{-1}$
$(+4) - (+4) = 0$
$(+4) - (+3) = +1$
$(+4) - (+2) = +2$
$(+4) - (+1) = +3$
$(+4) - 0 = +4$
$(+4) - (-1) = \boxed{+5}$
$(+4) - (-2) = \boxed{+6}$



b)
$(-4) - (+2) = \boxed{-6}$
$(-4) - (+1) = \boxed{-5}$
$(-4) - 0) = -4$
$(-4) - (-1) = -3$
$(-4) - (-2) = -2$
$(-4) - (-3) = \boxed{-1}$
$(-4) - (-4) = 0$
$(-4) - (-5) = \boxed{+1}$
$(-4) - (-6) = \boxed{+2}$



2

Calculate the sums and differences.

a)

$(+3) + (-5) = -2$	$(+3) - (+5) = -2$
$(+3) + (-4) = -1$	$(+3) - (+4) = -1$
$(+3) + (-3) = 0$	$(+3) - (+3) = 0$
$(+3) + (-2) = +1$	$(+3) - (+2) = +1$
$(+3) + (-1) = +2$	$(+3) - (+1) = +2$
$(+3) + 0 = +3$	$(+3) - 0 = +3$
$(+3) + (+1) = +4$	$(+3) - (-1) = +4$
$(+3) + (+2) = +5$	$(+3) - (-2) = +5$

b)

$(-3) + (-2) = -5$	$(-3) - (+2) = -5$
$(-3) + (-1) = -4$	$(-3) - (+1) = -4$
$(-3) + 0 = -3$	$(-3) - 0 = -3$
$(-3) + (+1) = -2$	$(-3) - (-1) = -2$
$(-3) + (+2) = -1$	$(-3) - (-2) = -1$
$(-3) + (+3) = 0$	$(-3) - (-3) = 0$
$(-3) + (+4) = +1$	$(-3) - (-4) = +1$
$(-3) + (+5) = +2$	$(+3) - (-5) = +2$

3

Tick the solution to the equation if it is correct. Correct the mistake if it is wrong.

a) $x - (-12) = 20$
$20 + (-12) = 8$
$x = 8$ ✓

b) $-12 - y = -15$
$-12 - (-15) = 3$
$y = 3$ ✓

c) $z - (+3) = -2$
$-2 - (+3) = -5$
$z = -5$
$-2 + (+3) = +1$
$z = +1$

1

Fill in the missing numbers.

a) $+6+(-3) = \boxed{+3}$ b) $0-(-10) = \boxed{+10}$ c) $-8+(-2) = \boxed{-10}$

d) $-6+(-6) = \boxed{-12}$ e) $-15+(-8) = \boxed{-23}$ f) $-15-(-8) = \boxed{-7}$

2

Complete the statements.

a) $(-2)+(-2)+(-2)+(-2) = \boxed{+4} \times \boxed{-2} = \boxed{-8}$

b) $(-3)+(-3)+(-3)+(-3)\ldots. = \boxed{-3} \times \boxed{-15}$

c) $\boxed{-3}+\boxed{-3}+\boxed{-3}+\boxed{-3}+\boxed{-3}+\boxed{-3}+\boxed{-3} = 7 \times \boxed{-3} = -21$

3

Calculate as simply as possible.

a) $12 \times 12 = 144$ b) $20 \times 20 = 400$ c) $13 \times 13 = 169$ d) $12 \times 21 = 252$

e) $19 \times 20 = 380$ f) $49 \times 8 = 392$ g) $30 \times 31 = 930$ h) $29 \times 12 = 348$

4

Practise long multiplication.

a)

	2	7	4
×	2	3	
	8	2	2
+ 5	4	8	0
6	3	0	2

b)

		4	7
×		2	6
	2	8	2
+	9	4	0
1	2	2	2

c)

		6	1	2
×		1	0	7
	4	2	8	4
+ 6	1	2	0	0
6	5	4	8	4

d)

		4	6	7
×		2	0	5
	2	3	3	5
+ 9	3	4	0	0
9	5	7	3	5

5

Practise mental division.

a) $45 \div 9 = 5$ b) $24 \div 8 = 3$ c) $63 \div 7 = 9$ d) $40 \div 10 = 4$

e) $15 \div 3 = 5$ f) $28 \div 7 = 4$ g) $81 \div 9 = 9$ h) $42 \div 7 = 6$

i) $48 \div 6 = 8$ j) $26 \div 3 = 8\frac{2}{3}$ (or 8, r 2) k) $52 \div 6 = 8\frac{2}{3}$ (or 8, r 4) l) $60 \div 8 = 7\frac{1}{2}$ (or 7, r 4)

6

Practise division.

a) $217 \div 3 = 72\frac{1}{3}$ (or 72, r 1) $2170 \div 30 = 72\frac{1}{3}$ (or 72, r 10) $2170 \div 3 = 723\frac{1}{3}$ (or 723, r 1)

b) $495 \div 5 = 99$ $4950 \div 50 = 99$ $4950 \div 5 = 990$

c) $156 \div 4 = 39$ $1560 \div 40 = 39$ $1560 \div 4 = 390$

7

Practise division.

a)

		8	1	r 3
6	4	8	9	

b)

		4	7	3	r 6
9	4	2	6	3	

c)

			2	9	2	r 18
2	1	6	1	5	0	

d)

			2	7	r 6
1	8	4	9	2	

1

Write two possible plans for solving each question. Calculate one of the plans and write the answer in a sentence.

a) Adrian had no money, neither cash nor debt, so we can say that he had £0. Then he ran up debts of £3 each day for a week. What is his balance now?

Plan 1: $(-3) + (-3) + (-3) + (-3) + (-3) + (-3) + (-3) = -£21$

Plan 2: $7 \times (-3) = -£21$

Answer: Adrian's balance is now −£21.

b) Five boys were £20 in debt. If they shared the debt equally, how much was each boy in debt?

Plan 1: $(-£4) + (-£4) + (-£4) + (-£4) + (-£4) = -£20$ or $£20 \div 5 = £4$

Plan 2: $5 \times (£4) = -£20$

Answer: Each boy was £4 in debt.

2

a) Continue the calculations.

i) $(-2) \times 5 = (-2) + (-2) +$ (−2) + (−2) + (−2) = −10

ii) $4 \times (-3) = (-3) + (-3) +$ (−3) + (−3) = −12

iii) $(-10) \times 6 = (-10) + (-10) +$ (−10) + (−10) + (−10) + (−10) = −60

b) Write the additions as multiplications.

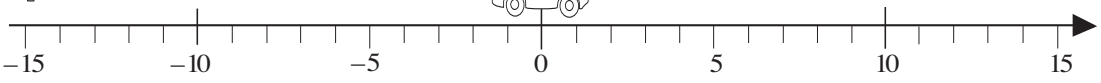
i) $(-5 + (-5) + (-5) + (-5) + (-5) + (-5) + (-5)$ (= 5) × 7 = −35

ii) $(-6) + (-6) + (-6) + (-6) + (-6) + (-6) =$ (−6) × 6 = −36

iii) $(-100) + (-100) + (-100) + (-100) =$ (−100) × 4 = −400

3

The car starts at 0 each time and faces the house.
Write its moves as a multiplication or a division.



a) It moves 4 units per second for 3 seconds towards the house.

3 × 4 = 12 or 3 × (+4) = (+12)

b) It moves 4 units per second for 4 seconds towards the tree.

4 × (−4) = −16 It moves (−16) units, or 16 units to the left.

c) It moves 15 units towards the tree in 3 seconds. How many units does it move each second on average?

−15 ÷ 3 = −5 Each second it moves (−5) units, or 5 units to the left.

4

Write the 7th, 10th and 20th terms of each of these sequences in your exercise book.

a) *Rule:* +(−9) or −(+9) $-9, -18, -27, \ldots$ $-63, -90, -180$

b) *Rule:* (−12) $-12, -24, -36, \ldots$ $-84, -120, -240$

c) *Rule:* (−40) $-40, -80, -120, \ldots$ $-280, -400, -800$

1

Fill in the products and notice how they change.

$5 \times 3 =$ 15

$5 \times 2 =$ 10

$5 \times 1 =$ 5

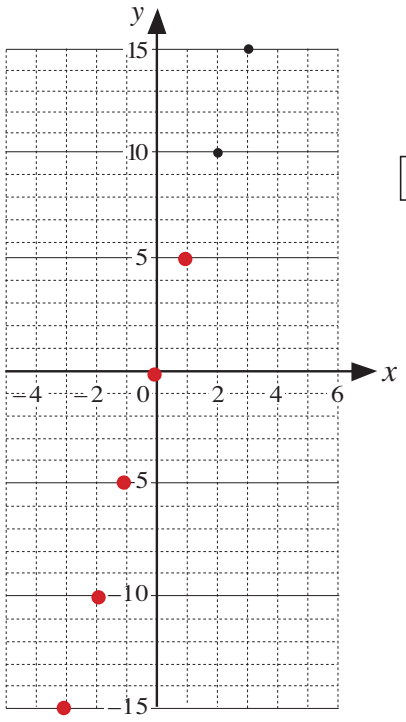
$5 \times 0 =$ 0

$5 \times (-1) =$ -5

$5 \times (-2) =$ -10

$5 \times (-3) =$ -15

Complete the graph.



$5 \times x = y$

2

Fill in the quotients and notice how they change. Complete the graph.

$9 \div 3 =$ 3

$6 \div 3 =$ 2

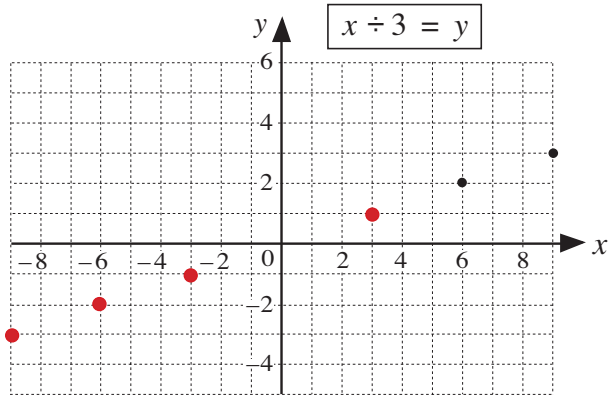
$3 \div 3 =$ 1

$0 \div 3 =$ 0

$-3 \div 3 =$ -1

$-6 \div 3 =$ -2

$-9 \div 3 =$ -3



$x \div 3 = y$

3

a) In your exercise book or on a grid, draw a house according to these coordinates.

Wall: $(-3, 1)$, $(-2, 1)$, $(-2, -2)$, $(2, -2)$, $(2, 1)$, $(3, 1)$

Roof: $(-3, 1)$, $(0, 4)$, $(3, 1)$ *Window:* $(-1, 0)$, $(1, 0)$, $(1, 1)$, $(-1, 1)$, $(-1, 0)$

b) Form new coordinates from those in part a) and draw the new images.

i) Multiply the first number of each pair (the x coordinate) by 2 and leave the 2nd number of each pair (the y coordinate) unchanged.

ii) Multiply the y coordinates of the original pairs by 3 and leave the x coordinates unchanged.

iii) Multiply both the original x and y coordinates by 2.

iv) Divide both the x and y coordinates in part iii) by 4.

See Lesson Plan (web address at top of this page) for answers to Question 3.

4

Write each multiplication as an addition in your exercise book.

a) $(-5) \times 4$ b) $3 \times (-8)$ c) $(-15) \times 5$ d) $(-150) \times 6$

a) $(-5) + (-5) + (-5) + (-5) = -20$ b) $(-8) + (-8) + (-8) = -24$ c) $(-15) + (-15) + (-15) + (-15) + (-15) = -75$

d) $(-150) + (-150) + (-150) + (-150) + (-150) + (-150) = -900$

1

Write an operation for each question and underline the result.

a) Tina has £2 and Joe has £17. How much should Joe give to Tina so that they both have the same amount? $(£17 - £2) \div 2 = £15 \div 2 = \underline{£7.50}$

Joe should give £7.50 to Tina.

b) Colin has £23. If we add his money to Kate's money, the total amount is £11. How much does Kate have? $£23 + K = £11$, so $K = £11 - £23 = \underline{£12}$

Kate has debts of £12 (or has a balance of – £12).

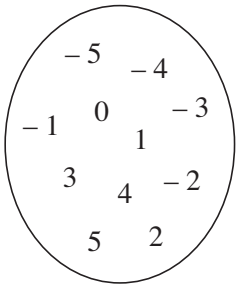
c) Arnie has a bank balance of – £43. If he adds it to Christine's bank account, the balance is £17 altogether. How much does Christine have in her bank account?

$£17 - (-£43) = £17 + £43 = \underline{£60}$ or $-£43 + C = £17$, so $C = £17 - (-£43) = \underline{£60}$

Christine has £60 in her bank account.

2

Do the numbers in the set make the statements true or false? Complete the table.



Statement	Numbers which make it true	Numbers which make it false
$5 - \square = 8$	– 3	– 5, – 4, – 2, – 1, 0 1, 2, 3, 4, 5
$6 + \square = 1$	– 5	– 4, – 3, – 2, – 1, 0 1, 2, 3, 4, 5
$\square < 3$	– 5, – 4, – 3, – 2, – 1, 0, 1, 2	3, 4, 5
$5 - \square > 6$	– 5, – 4, – 3, – 2	– 1, 0, 1, 2, 3, 4, 5
$4 + \square \leq 8$	– 5, – 4, – 3, – 2 – 1, 0, 1, 2, 3, 4	5

3

List the integers represented by the shapes. Show the solutions on a number line.

a) $-4 - \square = -18$
$\square$: 14

b) $-\bigcirc < 1$
$\bigcirc$: 0, 1, 2, 3, .

c) $13 + \triangle = -10$
$\triangle$ = – 23

d) $-3 - \square \leq -15$
$\square$: 12, 13, 14

e) $10 - \bigcirc = 15$
$\bigcirc$ = – 5

f) $\triangle - (-2) > 5$
$\triangle$: 4, 5, 6, ...

g) $\square + (-3) = -5$
$\square$ = – 2

h) $-8 - \frown > -1$
$\frown$: – 8, – 9, – 10, ...

i) $-10 + (-x) = -11$
x = 1

4

List the integers represented by the shapes. Show the solutions on a number line.

a) $\square \times 6 \geq -18$
$\square$: – 3, – 2, – 1, ...

b) $+8 \times \bigcirc \leq 0$
$\bigcirc$: 0, – 1, – 2, ...

c) $\triangle \times 4 = \triangle + (-12)$
$\triangle$ = – 4

d) $-24 \div \square = -6$
$\square$ = 4

e) $\bigcirc \div 5 = -3$
$\bigcirc$ = – 15

f) $(-5) + \triangle < +6$
$\triangle$: 10, 9, 8, ...

1

Find a rule and complete the table.

a)

x	4	– 1	0	17	– 29	– 165	40	– 1024	+ 12	– 309	– 4
y	– 4	1	0	– 17	29	165	– 40	1024	– 12	+ 309	4

y = opposite of x, or $y = -x$ x = opposite of y, or $x = -y$

b)

a	5	– 4	+ 11	0	+ 105	– 48	– 382	382	+ 2183	– 536
b	5	4	+ 11	0	105	48	+ 382	+ 382	2138	536

b = absolute value of a, or $b = |a|$ or $a = \pm b$

2

Which is more? How many more? Fill in the missing signs and write the differences.

a) $-3+2$ [=] $-3+(+2)$

b) $+4-3$ [=] $+4+(-3)$

c) $-4-3$ [<] 8 $+4+(-3)$

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

e) $3+(-4)$ [=] $+3-4$

f) $5-2$ [>] 10 $-5+(-2)$

3

Calculate the sums and differences.

a) $-7+(+12) = 5$

b) $+8+(-9) = -1$

c) $-13+(-7) = -20$

d) $+9+(+1) = 20$

e) $-8-(-12) = 4$

f) $+10-(+12) = -2$

g) $+8-(-1) = 19$

h) $-10-(+12) = -22$

i) $-13-(-13) = 0$

4

Fill in the missing numbers.

a) [6] $-(-2) = 8$

b) $-12+$ [-8] $= -20$

c) [15] $+(-15) = 0$

d) $-6-(-8) = -6+$ [8]

e) $12-(+10) = +12+$ [-10]

f) $-4+$ [-6] $= -4-(+6)$

g) $24+(-9)-$ [-9] $= 24$

5

Which integers can be written instead of the shapes?

a) $13-\square > 10$
$\square$: 2, 1, 0, . . .

b) $-10+(-\bigcirc) < -11$
$\bigcirc$: 2, 3, 4, . . .

c) $\triangle \div 5 = -7$
$\triangle = -35$

d) $(-4)\times\square > -24$
$\square$: 5, 4, 3, . . .

e) $-12+2\times\bigcirc = -16$
$\bigcirc = -2$

f) $\triangle \div (+3) = -6$
$\triangle = -18$

6

Find a rule. Complete the table.

Draw a graph to show the data.

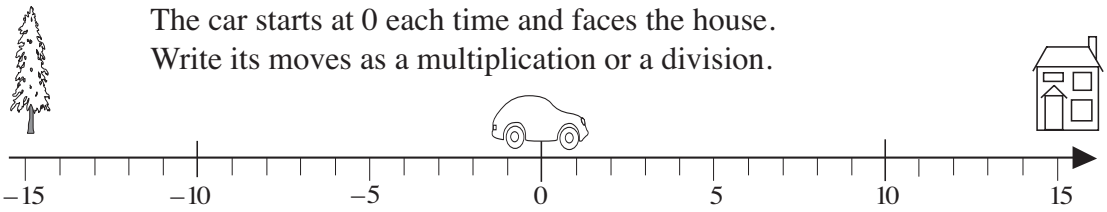
e.g.

x	+ 3	+ 5	– 1	0	+ 8	– 5	– 6	7
y	+ 1	– 1	5	4	– 4	+ 9	10	– 3

Rule: $x + y = 4$, $x = 4 - y$, $y = 4 - x$

See Lesson Plan for graph.

1



The car starts at 0 each time and faces the house.
Write its moves as a multiplication or a division.

a) It moves 3.5 units per second for 4 seconds towards the house.

3.5 units × 4 = 14 units

b) It moves 4 units per second for 2.5 seconds towards the tree.

2.5 × 4 units = 10 units

c) It moves 10 units towards the tree in 3 seconds. How many units does it move each second?

10 units ÷ 3 = $3\frac{1}{3}$ units

d) It moves 25 units towards the tree at a steady speed of 5 units per second. How many seconds does it take?

25 units ÷ 5 units = 5 (seconds)

2

Write these additions as multiplications and calculate the answers.

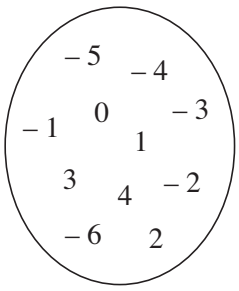
a) (– 7) + (– 7) + (– 7) + (– 7) + (– 7) = 35

b) (– 11) + (– 1) + (– 1) + (– 1) + (– 1) + (– 1) = – 66

c) (– 30) + (– 30) + (– 30) + (– 30) = – 120

3

Do the numbers in the set make the statements true or false? Complete the table.



Statement	Numbers which make it true	Numbers which make it false
6 – ☐ = 9	– 3	– 6, – 5, – 4, – 2, – 1, 0, 1, 2, 3, 4
6 + ☐ = 0	– 6	– 5, – 4, – 3, – 2, – 1, 0, 1, 2, 3, 4
☐ < 2	– 6, – 5, – 4, – 3, – 2, – 1, 0, 1	2, 3, 4
3 – ☐ > 4	– 6, – 5, – 4, – 3, – 2	– 1, 0, 1, 2, 3, 4
4 + ☐ ≤ 2	– 6, – 5, – 4, – 3, – 2	– 1, 0, 1, 2, 3, 4

4

Find a rule and complete the table. Draw a graph to show the data in your exercise book.

x	– 3	+ 4	+ 1	– 5	– 2	0	– 1	+ 2	3	– 4	+ 5
y	+ 2	– 5	– 2	4	+ 1	– 1	0	– 3	– 4	3	– 6

Rule: $x + y = -1$, or $x = -1 - y$, or $y = -1 - x$

See Lesson Plan for graph.

1

Practise mental calculation.

a) $6 + 8 = 14$ b) $24 + 5 = 29$ c) $32 + 19 = 51$ d) $250 + 190 = 440$

e) $13 - 8 = 5$ f) $26 - 12 = 14$ g) $54 - 18 = 36$ h) $350 - 140 = 210$

i) $6 \times 7 = 42$ j) $14 \times 5 = 70$ k) $6 \times 90 = 540$ l) $18 \times 100 = 1800$

m) $30 \div 5 = 6$ n) $42 \div 7 = 6$ o) $150 \div 10 = 15$ p) $250 \div 10 = 25$

2

Do these calculations in your exercise book.

a) $4335 + 20\,597 = 24\,932$ b) $4613 - 2518 = 2095$ c) $63 \times 18 = 1134$

d) $784 \div 8 = 98$ e) $7015 \times 109 = 764\,635$ f) $52\,623 \div 71 \approx 741.16901$

3

Solve these problems in your exercise book.

a) How much money has Philip saved if he still needs £217 before he has enough money to buy the £1520 boat that he wants? £1520 – £217 = £1303
Philip has saved £1303.

b) Andrew has saved £385, which is £127 less than the amount that Ben has saved. Ben's sister, Kate, has saved £82. How much money have the two boys saved?
A: £385, B: £385 + £127 A + B: £385 + £385 + £127 The two boys have saved £897.

c) Charlie has gathered 258 kg of pears. How much money will he make if he sells the pears for 91 p per kg? 258 × 91 p = £234.78
Charlie will make £234.78.

4

Write an operation for each problem and calculate the result in your exercise book.

a) How much is Linda's balance if she owes £24 and has only £11 in her account?
– 24 + 11 = – 13 Linda's balance is – £13.

b) How much is Kate's balance if she is £100 in debt and has £170 in her account?
– 100 + 170 = 70 Kate's balance is £70.

c) How much more or less is £110 in cash than £80 in debt?
110 – (– 80) = 110 + 80 = 190 Having £110 is £190 more than being £80 in debt.

d) How much higher or lower is – 170 m than – 4900 m?
– 170 – (– 4900) = – 170 + 4900 = 4730
– 170 m is 4730 m higher than – 4900 m *or* – 170 m is 4730 m higher than – 4900 m.

e) How much more or less is £800 outgoings than £700 income?
– 800 – (+ 700) = – 1500 *or* 700 – (– 800) = 700 + 800 = 1500
£800 outgoings is £1500 less than £700 income *or* £700 income is £1500 mores than £800 outgoings.

5

a) Write the operations in a shorter form.

i) $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{1}{8} \times 5 = \frac{5}{8}$

ii) $\frac{2}{9} + \frac{2}{9} + \frac{2}{9} = \frac{2}{9} \times 3 = \frac{6}{9} \left(= \frac{2}{3}\right)$

iii) £4.50 + £4.50 + £4.50 + £4.50 = £4.50 × 4 = £18

b) Calculate: i) $\frac{7}{10} - \frac{3}{10} = \frac{4}{10} \left(= \frac{2}{5}\right)$ ii) $1 - \frac{4}{5} = \frac{1}{5}$ iii) $3 - 1\frac{1}{6} = 2 - \frac{1}{6} = 1\frac{5}{6}$

6

Find a rule.

Complete the table.

x	7	8	9	5	9	6	7	10	6	0
y	3	2	5	8	9	10	7	8	11	30
z	22	17	46	41	82	61	50	81	67	1

Rule:

$z = x \times y + 1$

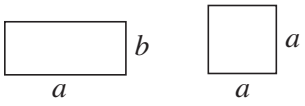
$y = (z - 1) \div x$

$x = (z - 1) \div y$

1

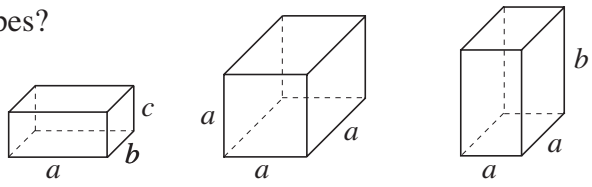
Which single name describes these shapes?

a)



rectangles

b)



cuboids

2

Measure the lengths of a, b and c in the shapes in Q.1. Calculate these measures in your exercise book and write the results here.

a) *Rectangle* (different sides): Perimeter = 46 mm Area = 112 mm^2

b) *Square*: Perimeter = 36 mm Area = 81 mm^2

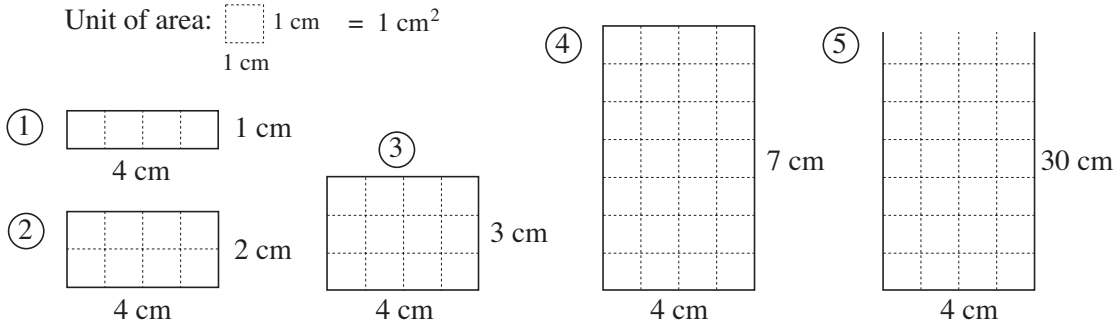
c) *Cuboid* (different edges) Surface area = 346 mm^2 Volume = 390 mm^3

d) *Cube* Surface area = 726 mm^2 Volume = 1331 mm^3

e) *Cuboid* (square based) Surface area = 576 mm^2 Volume = 896 mm^3

3

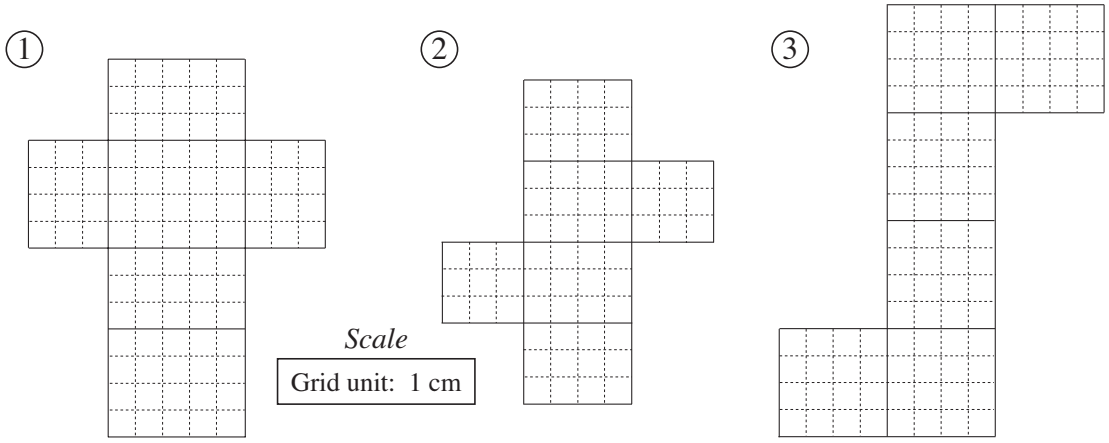
What is the area of each of these rectangles? (Only part of rectangle 5 is shown.)



A_1 = 4 cm^2 A_2 = 8 cm^2 A_3 = 12 cm^2 A_4 = 28 cm^2 A_5 = 120 cm^2

4

Imagine the cuboid shown by each net. Calculate its surface area and volume in your exercise book and write the results here.



① A = 94 cm^2 V = 60 cm^3

② A = 66 cm^2 V = 36 cm^3

③ A = 96 cm^2 V = 64 cm^3

1

The volume of a cuboid is 36 unit cubes and its edges are a whole number of units.

Fill in the table to show how long its edges could be.

a	1	1	1	1	1	2	2	3	
b	1	2	3	4	6	2	3	3	
c	36	18	12	9	6	9	6	4	

(Only 8 possibilities so 9th column not needed.)

2

Write a plan and and calculate the result. Write the answer as a sentence.

The cost of hiring a 45-seater coach for a tour is £3780.

a) How much would it cost per person if 42 people go on the tour?

Plan: £3780 ÷ 42 *C:*

Answer: The cost would be £90 per person.

b) How much would it cost each person if 45 people go on the tour?

Plan: £3780 ÷ 45 *C:*

Answer: It would cost each person £84.

3

Last year Uncle Alex planted cabbages in a field which was 15 m wide and 40 m long.
This year he wants to plant cabbages in a new field but has not decided whether to use the 5 m wide field, the 24 m wide field or the 30 m wide field.
If he plants the same amount of cabbages as last year, what lengths will each of these fields have to be? e.g. Last year, area of cabbages: 15 m × 40 m = 600 m^2

This year, area of cabbages: 600 m^2 (the same as last year)

5 m wide field: *Plan*: 600 m^2 ÷ 5 m = 120 m

24 m wide field: *Plan*: 600 m^2 ÷ 24 m = 25 m

30 m wide field: *Plan*: 600 m^2 ÷ 30 m = 60 m^2 ÷ 3 m = 20 m

Answer: The 5 m wide field would have be to 120 m long, the 24 m field 25 m long and the 30 m field 20 m long.

4

Solve this problem in your exercise book. Write the answer here.

We have 48 cards and want to put them into envelopes so that there is the same number of cards in each envelope and none are left over. How many envelopes could we use?

Answer: We could use 1, 2, 3, 4, 6, 8, 12, 16, 24 or 48 envelopes.
(The number of envelopes used must be the factors of 48.)

5

A strange clock whistles every 8 minutes, clicks every 3 minutes and chings every 12 minutes.
When it is turned on, after how many minutes will it whistle, click and ching at the same time? 24 minutes
(After every 24 (= 8 × 3) minutes)

1

Write plans and do the calculation in your exercise book. Write the answer here.

a) How many 60 cm lengths can be cut from a ribbon which is 8 m 90 cm long?

8 m 90 cm ÷ 60 cm = 890 cm ÷ 60 cm = 14 (times), r 50 cm

Answer: . . . 14 lengths can be cut. (There will be 50 cm left over.) . . . . . .

b) 12 litres 50 cl of milk is poured into glasses which can hold 30 cl when full.
How many glasses are needed?

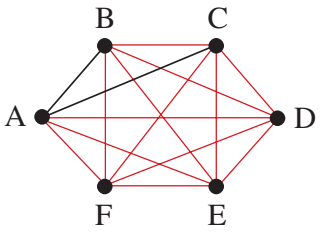
12 litres 50 cl ÷ 30 cl = 1250 cl ÷ 30 cl = 41 (times), r 20 cl

Answer: . . . 42 glasses are needed; 41 full and one holding only 20 cl. . . . . .

2

At a birthday party, 6 friends shook hands with one another.
How many handshakes were there?

Complete the diagram and list all the possibilities.



AB BC CD DE EF

AC BD CE DF

AD BE CF

AE BF

AF

15 handshakes

3

From the entrance to a park, there are 3 different paths to the fountain.
From the fountain there are 4 different paths to the play area.
From the play area there are 5 different paths to the bandstand.

How many different ways are there to get to the bandstand from the entrance?

Draw a diagram to show it.

3 × 4 × 5 = 12 × 5 = 60

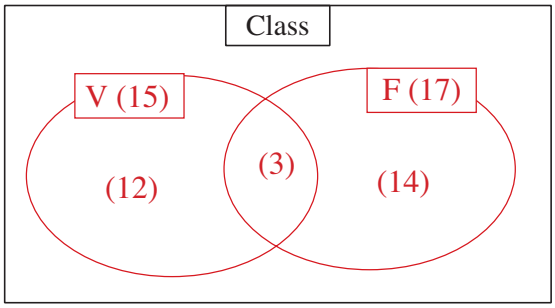
60 ways

4

In a class of 29 pupils, 15 pupils play volleyball and 17 pupils play football.

Each pupil plays at least one of the two games.

How is it possible?
Draw a set diagram to show it.



5

In a bag there are 3 *red*, 4 *white* and 5 *green* marbles. What is the least number of marbles that we must take out of the bag (with our eyes closed) so that we are **certain** of getting:

a) at least one of each colour 10 (First 9 could be white or green; 10th must then be red.)

b) at least one *white* marble 9 (First 8 could be red or green; 9th must then be white.)

c) 2 marbles of the same colour? 4 (First 3 could be one of each colour; 4th must be one of these colours.)

1

Find a rule.

Complete the table.

										e.g.
x	4	5	2	4	5	10	6	5	9	3
y	2	3	9	7	5	1	6	4	0	7
z	7	14	17	27	24	9	35	19	– 1	20

Rule:

$z = x \times y - 1$

$x = (z + 1) \div y$

$y = (z + 1) \div x$

2

Write a plan and calculate the result. Write the answer as a sentence.

The cost of hiring an 18-seater minibus for a holiday is £1152.

a) How much would it cost per person if 16 people go on this holiday?

Plan: £1152 ÷ 16 = £576 ÷ 8 = £72 *C:*

Answer: . It would cost £72 per person for 16 people. . . . . .

b) If the cost per person was £64, how many people went on the holiday?

Plan: £1152 ÷ £64 = £576 ÷ £32 *C:*
= £72 ÷ £4 = 18 (times)

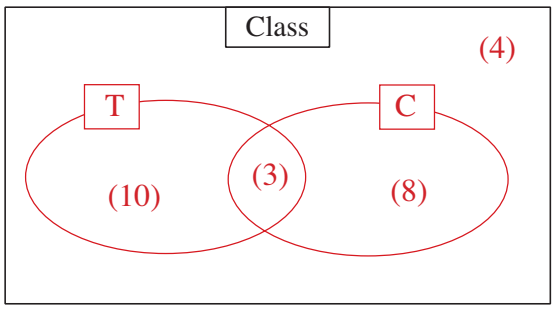
Answer: . 18 people went on holiday at a cost of £64 each. . . . . .

3

The teacher of a class of 25 pupils asked them if they liked tea and coffee.

13 pupils liked tea, 11 pupils liked coffee, 3 pupils liked both tea and coffee, and 4 pupils liked neither tea nor coffee.

How is it possible?
Draw a Venn diagram to show the data.



4

a) A farmer sold 300 chickens for £2.75 each. With the money he received from the sale, he bought 50 geese. What was the price of each goose?

£2.75 × 300 ÷ 50 = £2.75 × 6 = £16.50

Each goose cost £16.50.

b) A typist can type at a rate of 50 words per minute. How long will it take her to type 12 pages which contain 300 words per page?

300 × 12 ÷ 50 = 3600 ÷ 50 = 360 ÷ 5 = 72 (min.)

or 300 ÷ 50 = 6 (min); 6 min × 12 = 72 min

It will take her 72 minutes (or 1 h 12 min) to type 12 pages.

5

The charges for a taxi fare in a city are:

£2.20 for the first 1.5 km and £0.14 for each additional 100 m.

a) How much will it cost for a journey of 4 km?

4 km – 1.5 km = 2.5 km = 2500 m = 25 × 100 m

Cost for 1.5 km: £2.20

Cost for 2.5 km: 14 p × 25 = 250 p + 100 p = £3.50

Total cost: £2.20 + £3,50 = £5.70

b) If the cost of a journey was £7.66, what distance was travelled?

£7.66 – £2.20 = £5.46 = 546 p

14 p → 100 m

546 p → 100 m × (546 ÷ 14)
= 100 m × (273 ÷ 7)
= 3.9 km

Total distance: 3.9 km + 1.5 km = 5.4 km

1

Join up points A and B and measure the distance between them.

Distance from A to B: 32 mm

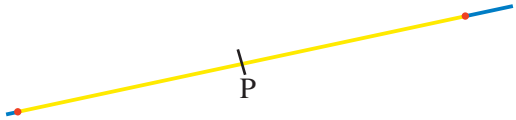
2

Colour the points on the straight line in:

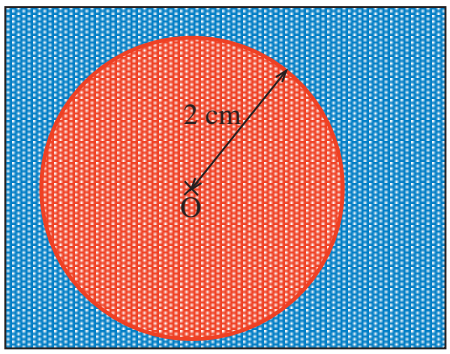
a) *red* if they are 3 cm from P

b) *blue* if they are more than 3 cm from P

c) *yellow* if they are less than 3 cm from P



3



a) Draw the set of points in the frame which are 2 cm from point O.

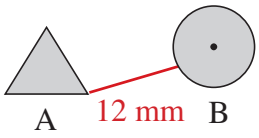
b) Colour *red* the points which are less than 2 cm from point O.

c) Colour *blue* the points which are more than 2 cm from point O.

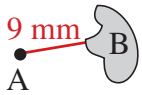
4

What is the shortest distance between the two shapes? Draw a measuring line, measure it and write its length beside it.

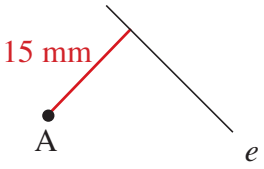
a)



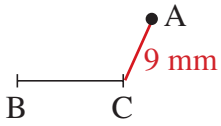
b)



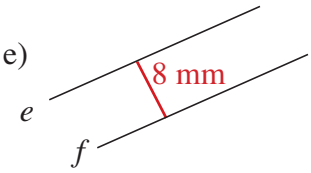
c)



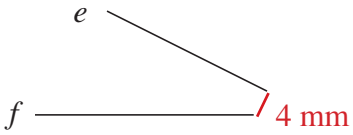
d)



e)



f)

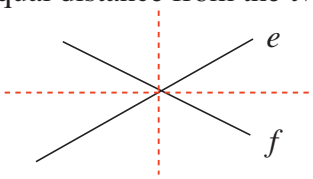


5

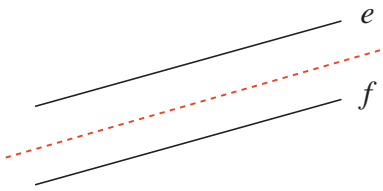
Draw all the points on the plane which are:

a) an equal distance from the two lines:

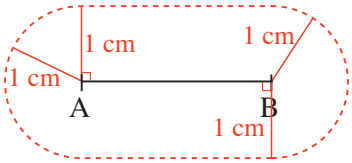
i)



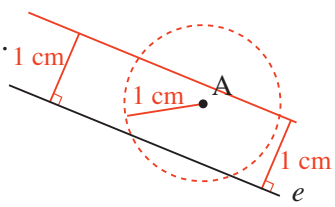
ii)



b) 1 cm from line segment AB



c) 1 cm from line *e* and from point A.



1

Complete the sentences..

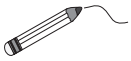
a) The **circumference** of a circle is the set of points in a plane which are an equal distance from the centre point of the circle.

b) The radius of a circle is a straight line which connects the centre of the circle with a point on the circumference.

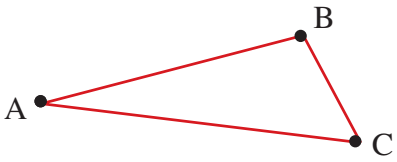
c) A **sphere** is the set of points which are not more than a given distance from a point in space, as long as the given distance is not zero.

2

Points A, B and C are in the same plane but do not form a straight line.



Join up the points and measure the connecting line segments.



Length of AB: 35 mm

BC: 15 mm

AC: 41 mm

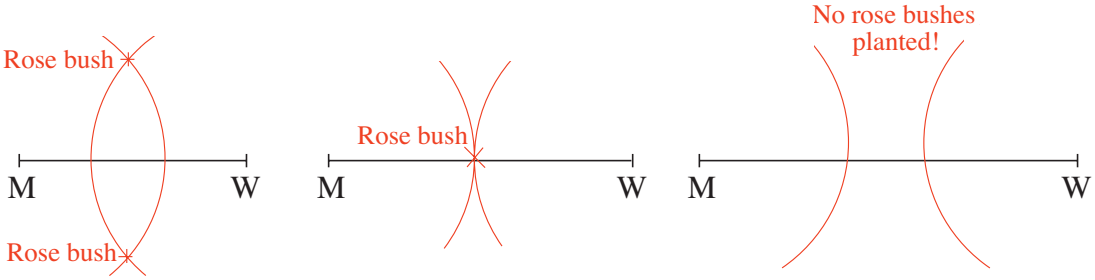
3

In a park garden there is a monument and a well. The park gardeners were asked to plant some rose bushes that were both:

- 2 m from the monument, and also
- 2 m from the well.

Show on the diagrams where the rose bushes should be planted if the distance between the well and the monument is:

a) 3 metres b) 4 metres c) 5 metres

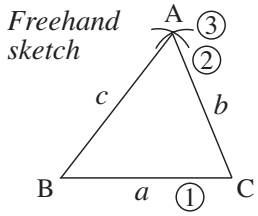


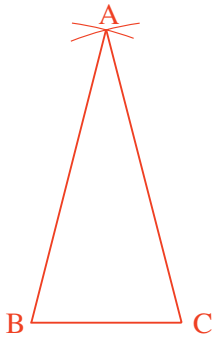
4

Draw accurately the triangle which has these sides:

$a = 2$ cm, $b = 4$ cm, $c = 4$ cm

Follow the order of construction in the diagram.

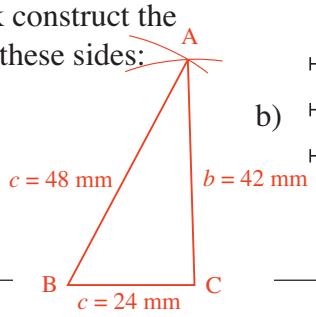




1

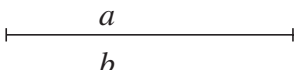
In your exercise book construct the triangles which have these sides:

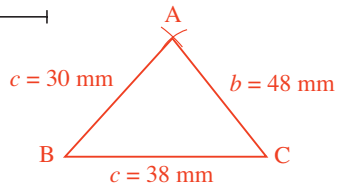
a) a = 24 mm, b = 42 mm, c = 48 mm



b)

Diagrams reduced to scale





2

In your exercise book, construct the triangle which has:

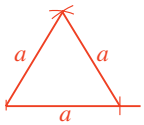
a) a perimeter of 12 cm and sides of equal length;

$a = b = c$, so $P = 3 \times a = 12$ $\quad 3 \times a = 12$ cm $\quad a = 4$ cm

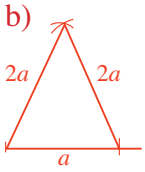
b) a perimeter of 15 cm, two sides of equal length and its third side half as long as he others.

$b = c = 2a$, so $P = a + 2a + 2a = 15$ cm $\quad 5a = 15$ cm $\quad a = 3$ cm

a)



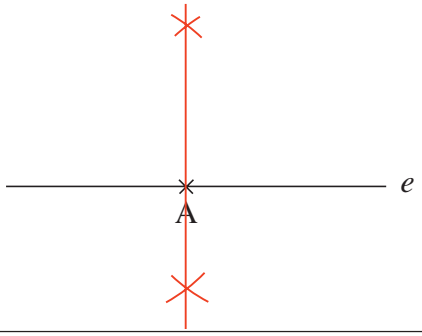
b)



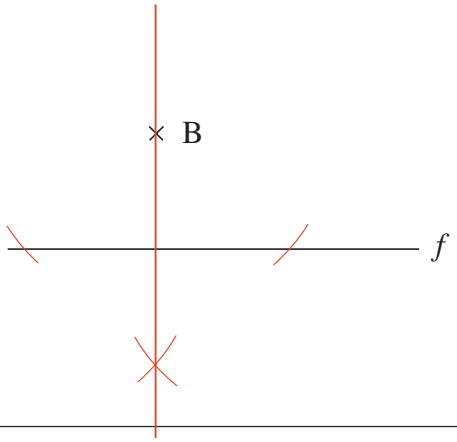
3

Draw a line which is **perpendicular** to the given line and passes through the given point.

a)



b)

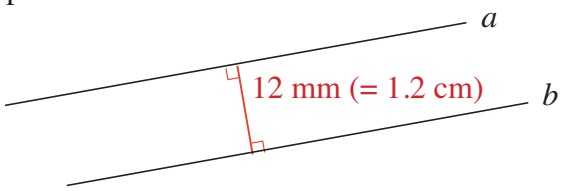


4

In a field there are two paths, a and b, as shown in the diagram.

What is the shortest route from path a to path b?
Draw and then measure it.

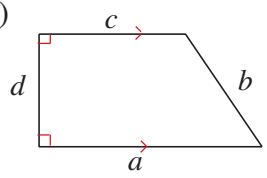
Use a ruler and a set square to construct the line.



5

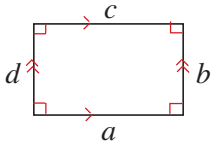
Mark on the diagrams, or list by their letters, the **perpendicular** and **parallel** lines.

a)



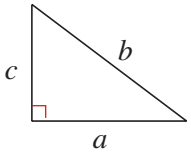
or $a \parallel c$, $d \perp a$, $d \perp c$

b)



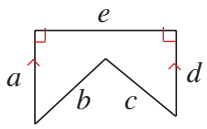
or $a \parallel c$, $b \parallel d$, $a \perp b$, $a \perp d$, $c \perp b$, $c \perp d$

c)



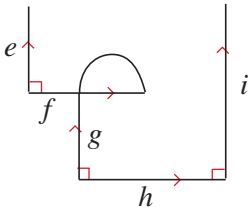
or $a \perp c$

d)



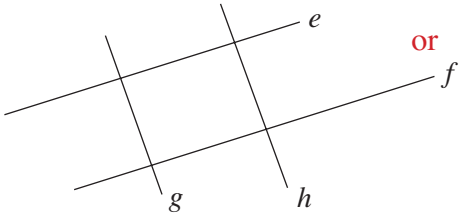
or $a \parallel d$, $a \perp e$, $d \perp e$

e)



or $e \parallel g \parallel i$, $f \parallel h$, $e \perp f$, $e \perp h$, $f \perp g$, $f \perp i$, $g \perp h$, $h \perp i$

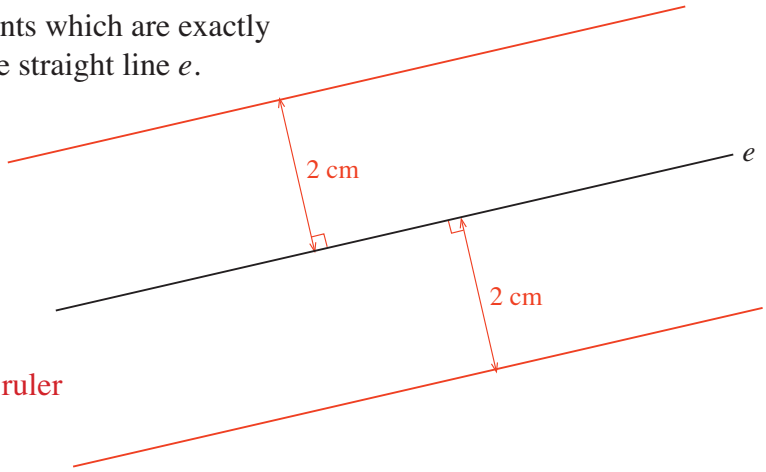
f)



or $e \parallel f$, $g \parallel h$, $e \perp f$, $e \perp h$, $f \perp g$, $f \perp h$

1

Draw the set of points which are exactly 2 cm away from the straight line e.



Use set square and ruler or compasses

2

a) Draw a set of x and y axes in your exercise book.

b) Draw the set of points which are 2 units from the x axis.

c) Draw the set of points which are 3 units from the y axis.

d) Give the coordinates of the points which satisfy both conditions.

(– 3, 2), (– 3, – 2), (3, – 2), (3, 2)

3

Draw three lines which are parallel to line e.

Any 3 lines parallel to line e.
See Lesson Plan for construction.

4

Do the calculation in your exercise book and write the answer here.

Imagine a block of flats which has 6 storeys, all equal in height.

Where are the points which are an equal distance from the floor level of the 2nd storey and the floor level of the 6th storey?

e.g. 6th – 2nd = 4 (storeys), 4 storeys ÷ 2 = 2 storeys
6th – 2 storeys = 4th storey or 2nd + 2 storeys = 4th storey

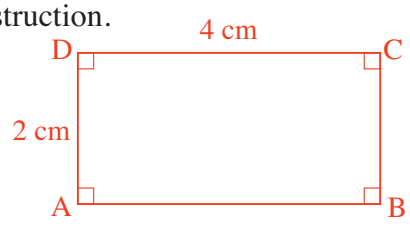
Answer: The points are on the floor of the 4th storey.

5

Construct the rectangle which has these adjacent sides: $a = 4$ cm, $b = 2$ cm

Make a freehand sketch first to show the order of construction.

See Lesson Plan for construction.



1

a) In your exercise book, construct the triangle which has:

i) two sides of length 5 cm each and a perimeter of 18 cm
sides of lengths 5 cm, 5 cm and (18 cm – (5 + 5) = 18 cm – 10 cm) = 8 cm

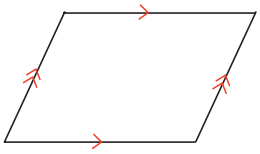
ii) sides of lengths 3 cm, 4 cm and 5 cm
sides of lengths 3 cm, 4 cm and 5 cm

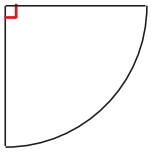
iii) a perimeter of 20 cm, two sides of equal length and its 3rd side 8 cm long.
sides of lengths 8 cm, 6 cm and 6 cm

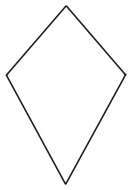
b) Colour the triangle which has a pair of perpendicular sides.
Triangle ii) should be coloured.

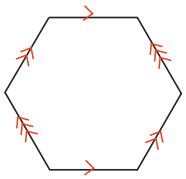
2

Mark on the diagrams the perpendicular and parallel lines.

a) 

b) 

c) 

d) 

3

a) Draw a set of x and y axes in your exercise book.

b) Draw the set of points which are 4 units from the x axis.

c) Draw the set of points which are 2 units from the y-axis.

d) Write the coordinates of the points which satisfy both conditions.
(– 2, – 4), (2, – 4), (2, 4), (– 2, 4)

See Lesson Plan for answers.

4

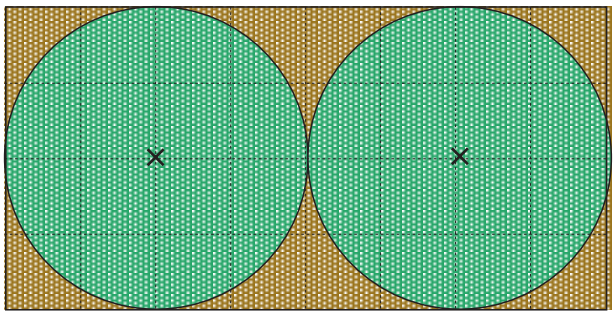
The diagrams show the scale drawing of a garden. *Scale*: 1 cm → 1 m

Garden sprinklers can water an area of soil up to 2 m in any direction. They are always positioned so that they reach as much of the garden as possible.

a) Show on the diagram where 2 sprinklers should be placed.

i) Colour *green* the points reached by the sprinklers.

ii) Colour *brown* the points **not** reached by the sprinklers.

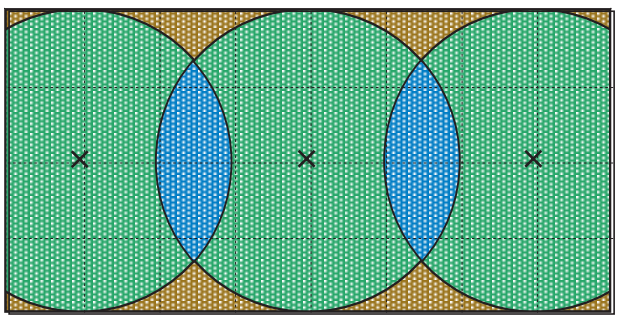


b) Show on the diagram where 3 sprinklers should be placed.

i) Colour *blue* the poi
which are reached
more than one spri

ii) Colour *green* the p
which are reached
just one sprinkler.

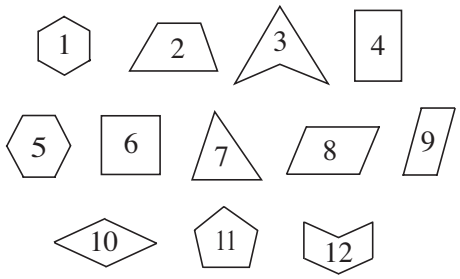
iii) Colour *brown* the p
which are not reach
by any sprinkler.

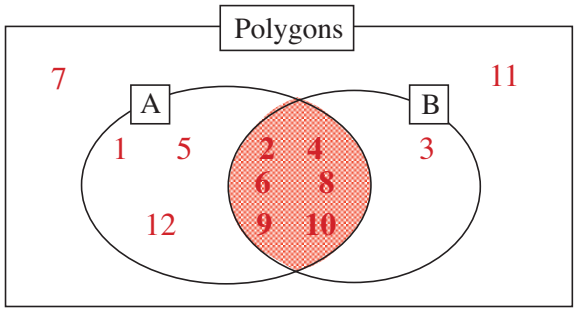


1

a) Write the number of the polygons in the correct place in the set diagram if:

A = {It has at least 1 pair of parallel sides}, B = {It is a quadrilateral}



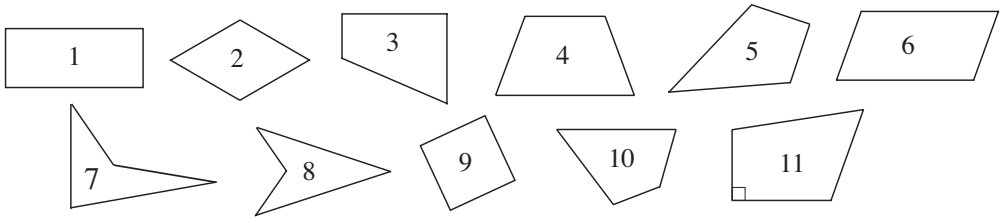


b) Write ∅ in the area where there are no numbers. There is no empty set!

c) Colour *red* the area where the polygons have parallel sides **and** are quadrilaterals.

2

List the numbers of the quadrilaterals which belong in each set.



A = {It has a pair of parallel sides} . . . 1, 2, 3, 4, 6, 9 . . . .

B = {Its opposite sides are equal in length} . . . 1, 2, 6, 9 . . . .

C = {Its opposite sides are parallel} . . . 1, 2, 6, 9 . . . .

D = {All its sides are equal in length} . . . 2, 9 . . . .

E = {It has a pair of perpendicular sides} . . . 1, 3, 9, 11 . . . .

F = {It has a pair of parallel sides and its opposite sides are equal} . . . 1, 2, 6, 9 . . . .

G = {It has a pair of parallel sides but not all its sides are equal} . . . 1, 3, 4, 6 . . . .

H = {All its sides are equal but it has no pair of parallel sides} . . . empty set . . . .

I = {Its opposite sides are equal and parallel} . . . 1, 2, 6, 9 . . . .

J = {Its opposite sides are equal but are not parallel} . . . empty set . . . .

K = {It has a pair of parallel and a pair of perpendicular sides} . . . 1, 3, 9 . . . .

3

Decide whether the statements are true or false. Write a ✓ or a ✗.

a) Every rectangle is a trapezium. ✓

b) Every trapezium is a rectangle. ✗

c) Every rhombus is a parallelogram. ✓

d) Every parallelogram is a rhombus. ✗

e) A parallelogram can be a trapezium. ✓

f) All parallelograms are trapeziums. ✓

g) Not all parallelograms are trapeziums. ✗

h) A trapezium can be concave. ✗

i) A trapezium need not be a quadrilateral. ✗

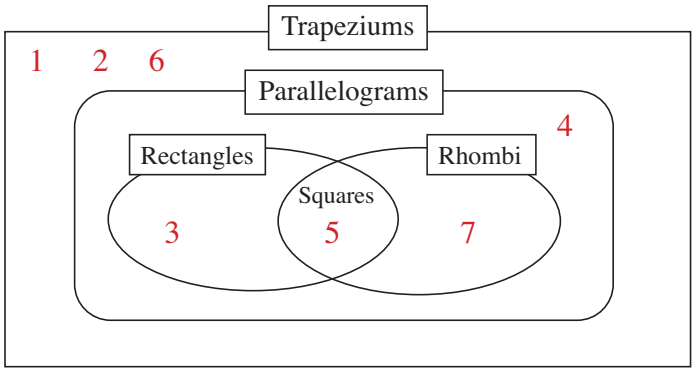
j) There is no rhombus which is concave. ✓

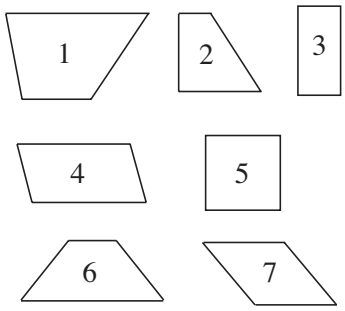
k) All rhombi are convex. ✓

l) Not every parallelogram is a rhombus. ✓

1

Write the numbers of the trapeziums in the correct set.





List in your exercise book the common properties of these trapeziums:

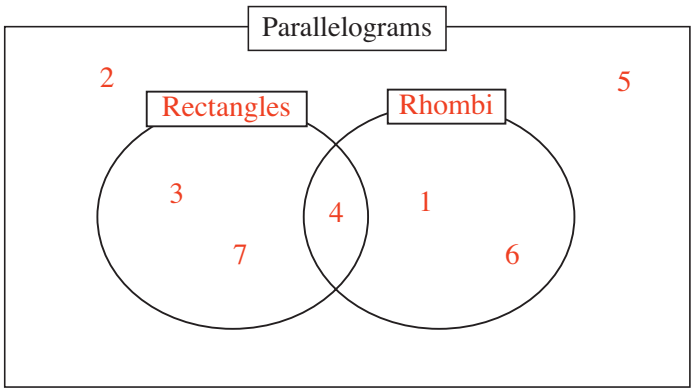
a) 2, 3 and 5
They have at least 2 right angles.

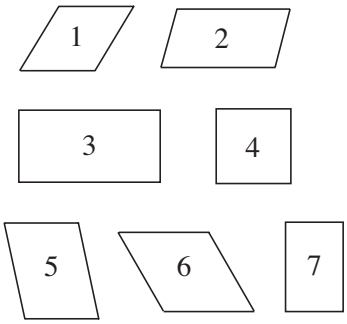
b) 3, 4, 5 and 7
They have 2 pairs of parallel sides (parallelograms).

c) 3, 5, 6 and 7.
They are symmetrical.

2

Make a set diagram for these parallelograms. Write the numbers of the parallelograms in the correct set.





List in your exercise book the common properties of these parallelograms.

a) 1, 4 and 6
They have equal sides.

b) 3, 4 and 7
They have 4 right angles; adjacent sides are perpendicular to one another.

c) 1, 3, 4, 6 and 7.
They are parallelograms which have equal sides or which have equal angles.

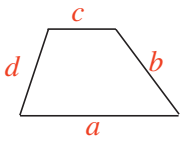
3

a) Label the sides with letters, using the same letter for equal sides.

b) Below each shape, write a plan for its perimeter.

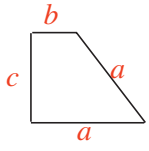
c) Measure the sides, then calculate the perimeters in your exercise book.

i)



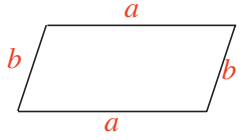
$P = a + b + c + d$
$= 56$ (mm)

ii)



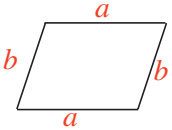
$P = a + a + c + d$
$= 48$ (mm)

iii)



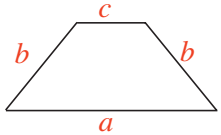
$P = 2 \times (a + b)$
$= 74$ (mm)

iv)



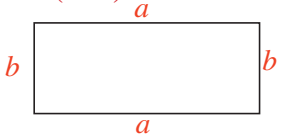
$P = 2 \times (a + b)$
$= 56$ (mm)

v)



$P = a + 2 \times b + c$
$= 67$ (mm)

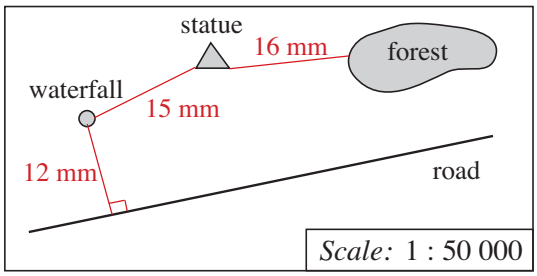
vi)



$P = 2 \times (a + b)$
$= 84$ (mm)

1

The diagram shows part of a map.



How far away is:

a) the waterfall from the statue:

i) on the map 15 mm

ii) in real life? 750 m

b) the waterfall from the road: i) on the map 12 mm

ii) in real life? 600 m

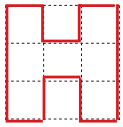
c) the statue from the forest: i) on the map 16 mm

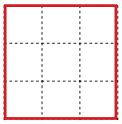
ii) in real life? 800 m

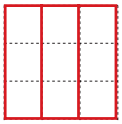
2

Each solid was cut from a cube with edges 3 units long. Draw how you would see it from the front, from the side and from above. Calculate its volume.

a)

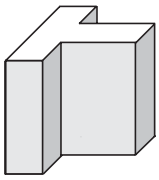


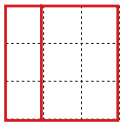


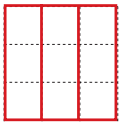


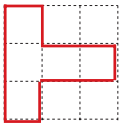
Volume = 21 unit cubes

b)







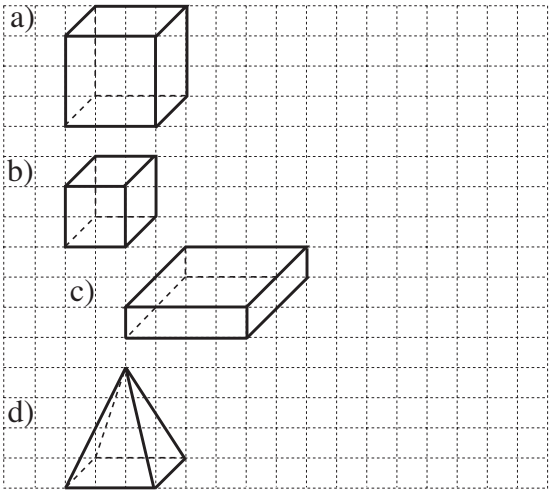


RHS

Volume = 15 unit cubes

3

Draw a copy of each solid on the grid. Name the solid and count how many vertices, edges and faces it has.



Name: cuboid

v = 8 e = 12 f = 6

Name: cube

v = 8 e = 12 f = 6

Name: cuboid

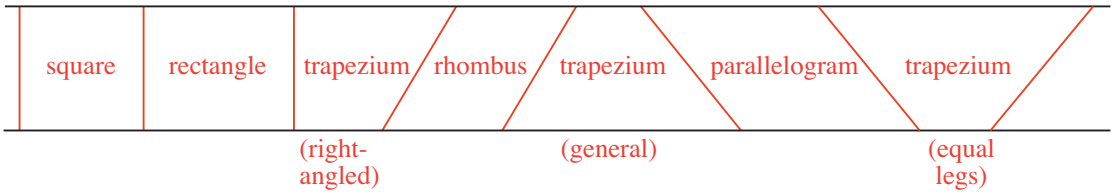
v = 8 e = 12 f = 6

Name: pyramid

v = 5 e = 8 f = 5

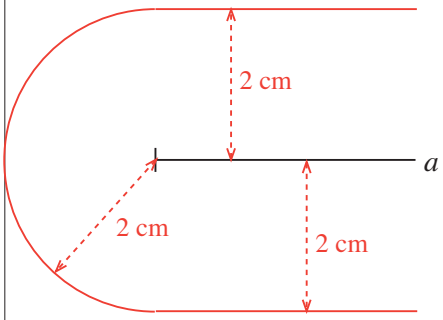
1 Draw lines through the two parallel lines to make different trapeziums.
Make one of the shapes a special trapezium.

e.g.

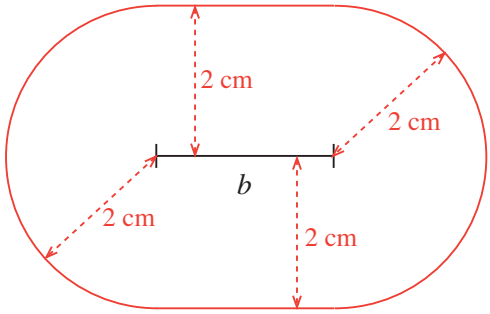


2 Draw the set of points on the same plane which are 2 cm from:

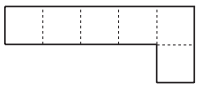
a) this ray



b) this line segment



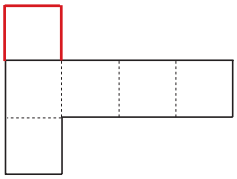
3 a) Can this net be folded to make a cube?



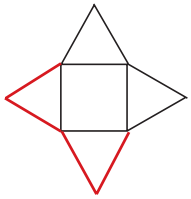
No

b) Complete each net so that it can be folded to make a solid.

e.g. i)

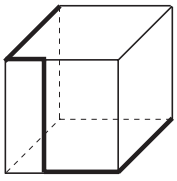


ii)

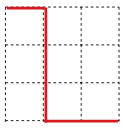


4 a) A thick black line has been drawn on the surface of a transparent glass cube.
Draw the 3 views of the line.

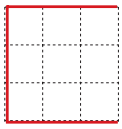
e.g.



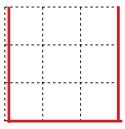
Front view



Side view

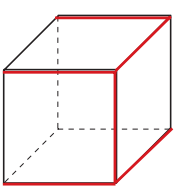


Top view

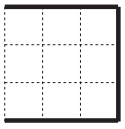


b) Draw a line on the surface of the glass cube to match the 3 views shown below.

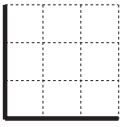
e.g.



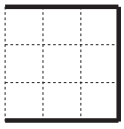
Front view



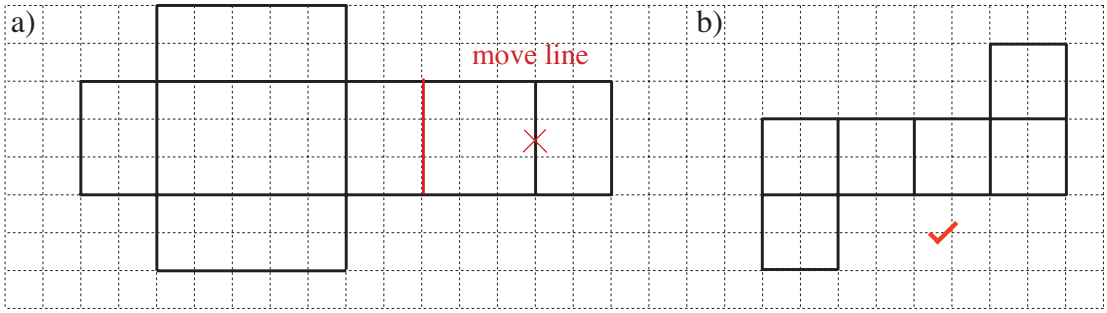
Side view

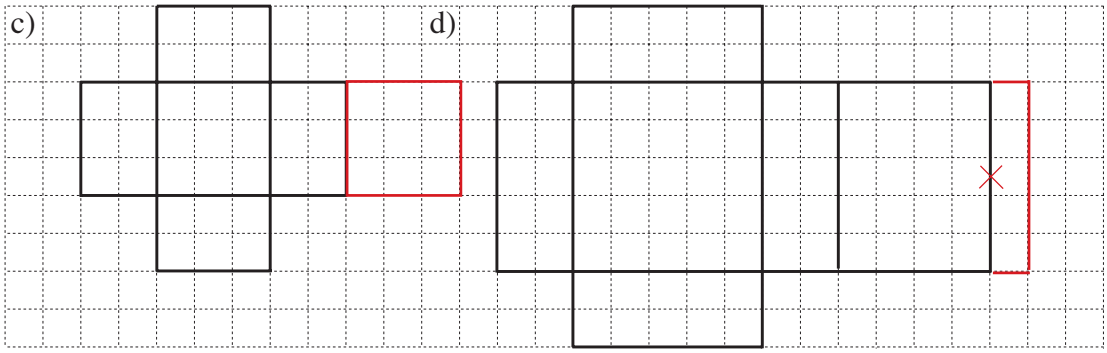


Top view

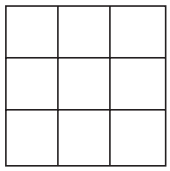


1 These nets should form a solid. Tick them if they do and correct them if they do not.





2 a) How many squares can you see in this diagram?



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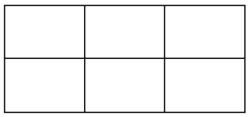
b) How many rectangles can you see in this diagram?



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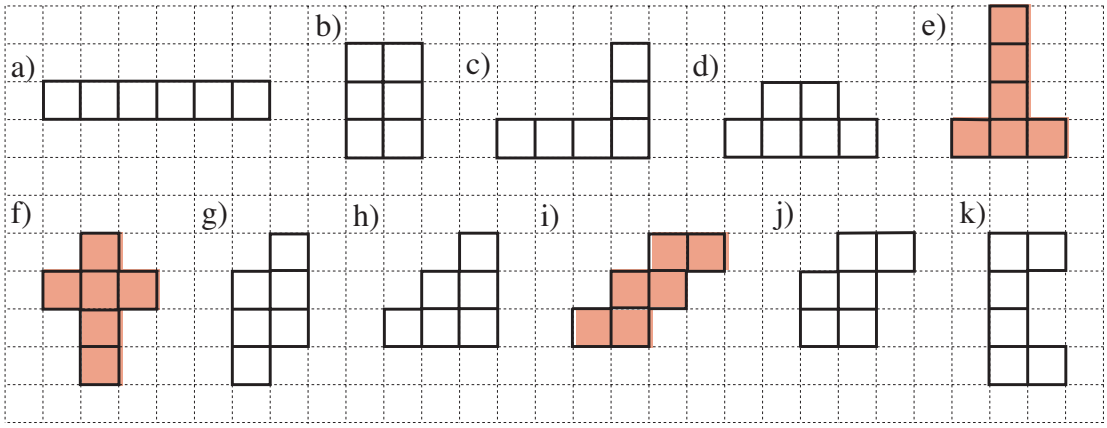
3 **Hexominoes** are formed by connecting 6 squares along at least one side.
Here are 11 examples of different hexominoes.



i) In your exercise book, draw as many other different hexominoes as you can. How many hexominoes have you found altogether?

35

ii) Colour the hexominoes in the diagram and in your exercise book which could be used as the net for a cube. How many did you colour?

3 in this diagram plus 8 others