KING EDWARD VI
HANDSWORTH GRAMMAR
SCHOOL FOR BOYS

KING EDWARD VI
ACADEMY TRUST
BIRMINGHAM

Year 7

2023 Mathematics 2024

Unit 1 Tasks – Part 1

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Unit 1 Tasks – Part 2

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1 Factors, Multiples and Primes

square numbers

1) write down the square numbers.

a) what digits can a square number end with?

b) which square numbers end with a 6?

c) which end with an 8?

2) split these sets of numbers into four groups so that each group adds up to a different square number:

a) 1, 2, 2, 2, 3, 3, 3, 3, 3, 4, 4, 4, 5

b) 1, 1, 3, 4, 4, 4, 4, 5, 5, 6, 6, 11, 12, 13, 20

3) what happens when you divide a square number by 4? what remainders are possible? why is this?

4) make any size square and take away 4
what factor pair make what is left?
try this for several starting square numbers and look for patterns

what happens if you take away 9 rather than taking away 4?

5) find two consecutive square numbers (like 5^2 and 6^2) which when added together make
a) 545 b) 841.

6) find two consecutive square numbers (like 4^2 and 3^2) which when subtracted make 47.

7) find the squares of numbers ending in a 5 (like 25^2 or 95^2 or 45^2)
can you find any patterns in these numbers?

8) write down any two digits.

- add the digits and square this
- subtract the digits and square this
- subtract these squares and divide by 4

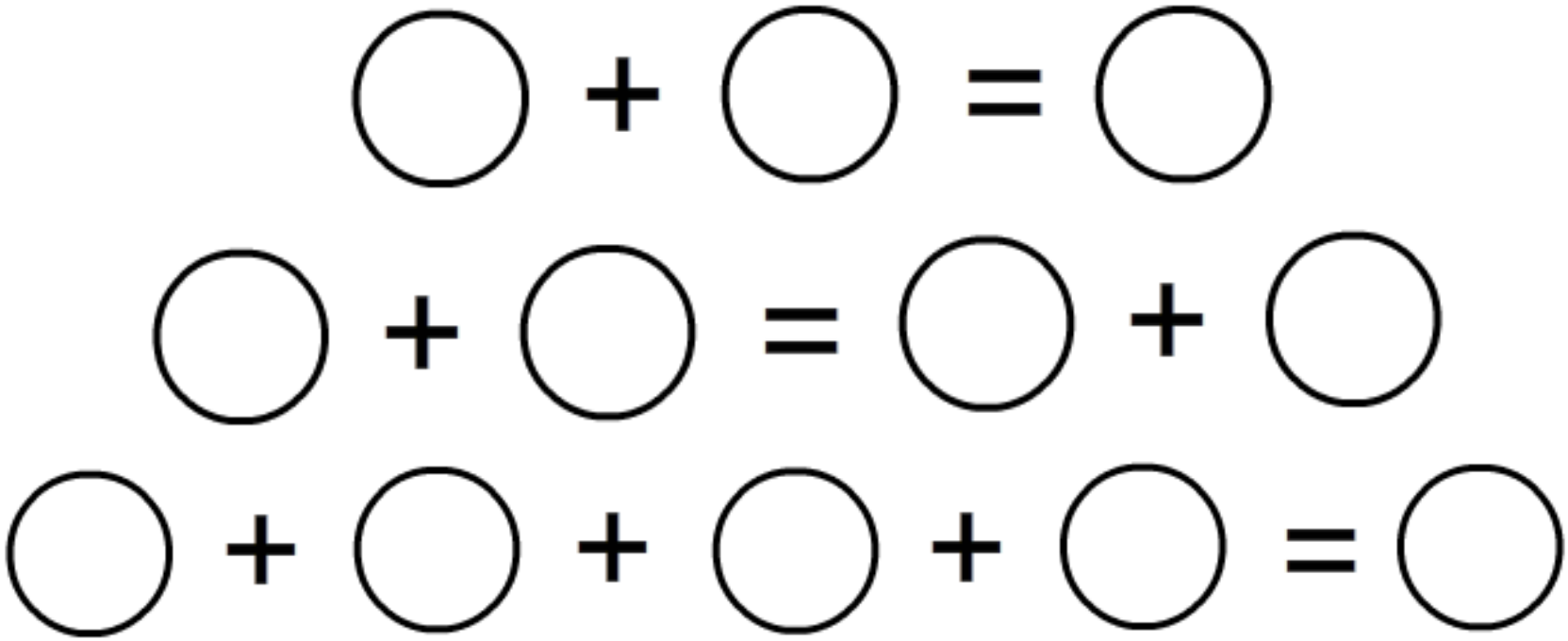
explore for several starting pairs of digits
what do you notice?

9) find the squares of two consecutive numbers (like 7^2 and 8^2) add them and then subtract 1
can you find any patterns?

10) square an odd number (like 7^2 or 11^2) then subtract 1
can you find any patterns?

Square & cube numbers puzzle

Using only square and cube numbers less than or equal to 100, can you fill in the circles to make these sums true? You can only use each number once and you must use all the numbers.



triangular numbers

(1) what pattern do you get when you add a triangular number to the one after it?
(e.g. 45 + 55 = 100)

(2) what do you need to add to the
a) 3rd plus the 4th triangular number to get the 7th ?
b) 1st plus the 6th triangular number to get the 7th ?
c) 2nd plus the 5th triangular number to get the 7th ?
suggest a general rule
test it out for another triangular number

(3) which number triangular numbers are these?
(e.g. 66 is the 11th triangular number)
a) 990
b) 1540
c) 3160
d) 4753
e) 7750

(4) what pattern do you get in the remainders when you divide each of the triangular numbers by 3?
can you explain why?

(5) what happens when you multiply a triangular number by 3 and add the one before it?

(6) what have these series to do with the triangular numbers?
1
1 + 5
1 + 5 + 9
1 + 5 + 9 + 13
can you see why?

(7) what happens when you square a triangular number and subtract the square of the previous triangular number?

(8) what happens when you multiply a triangular number by 8 and add 1?

(9) what have these series to do with the triangular numbers?
3
3 + 7
3 + 7 + 11
3 + 7 + 11 + 15
can you see why?

n	T_n
1	1
2	3
3	6
4	10
5	15
6	21
7	28
8	36
9	45
10	55
11	66
12	78
13	91
14	105
15	120
16	136
17	153
18	171
19	190
20	210
21	231
22	253
23	276
24	300
25	325
26	351
27	378
28	406
29	435

Fluency Practice

Question 1: Write down the first six multiples of these numbers

(a) 5 (b) 3 (c) 4 (d) 10 (e) 7 (f) 9

(g) 11 (h) 20 (i) 100 (j) 50 (k) 12 (l) 35

Question 2: Below is a list of numbers.

12 15 17 20 22 25 27 30 32 35 39 40

From the list write down any numbers that are multiples of:

(a) 2 (b) 5 (c) 10 (d) 3 (e) 4 (f) 8

Question 3: List all the numbers between 40 and 60 (inclusive) that are multiples of:

(a) 5 (b) 3 (c) 6 (d) 8 (e) 9 (f) 14

Question 4: Below is a list of numbers.

100 101 102 103 104 105 106 107 108 109

From the list write down any numbers that are multiples of:

(a) 2 (b) 3 (c) 5 (d) 10 (e) 4 (f) 15

Question 1: A light flashes every 8 seconds. How many times will it flash in 3 minutes?

Question 2: Find the smallest number over 200 that is a multiple of 6.

Question 5: A crate can hold 12 cans of lemonade.
Thomas has 200 cans of lemonade.
How many crates can be filled?

consecutive numbers

three consecutive numbers

(1) are multiples of 2 , 3 and 4 (in this order)
what could they be? in general?

(2) are multiples of 3 , 4 and 5 (in this order)
what could they be? in general?

(3) are multiples of 4 , 5 and 6 (in this order)
what could they be? in general?

four consecutive numbers

(4) are multiples of 2 , 3 , 4 and 5 (in this order)
what could they be? in general?

five consecutive numbers

(5) are multiples of 2 , 3 , 4 , 5 and 6 (in this order)
what could they be? in general?

Fluency Practice

Question 5: (a) List the first ten multiples of 3.
(b) List the first ten multiples of 4.
(c) Write down any numbers listed that are multiples of both 3 and 4.

Question 6: (a) List the first ten multiples of 5.
(b) List the first ten multiples of 6.
(c) Write down any numbers listed that are multiples of both 5 and 6.

Question 7: (a) List the first ten multiples of 6.
(b) List the first ten multiples of 9.
(c) Write down any numbers listed that are multiples of both 6 and 9.

Question 8: Write down three common multiples of 8 and 12.

Question 9: Write down three common multiples of 4 and 6.

Question 10: Write down three common multiples of 15 and 20.

Question 1: (a) Write down the first ten multiples of 2.
(b) Write down the first ten multiples of 3.
(c) List the first three common multiples of 2 and 3.

Question 2: (a) Write down the first ten multiples of 4.
(b) Write down the first ten multiples of 5.
(c) List the first three common multiples of 4 and 5.

Question 3: Write down three common multiples of each of these pairs of numbers.

(a) 2 and 5 (b) 3 and 4 (c) 4 and 6 (d) 10 and 15

(e) 20 and 30 (f) 3 and 5 (g) 6 and 9 (h) 6 and 12

Question 4: Find the first even number that is a multiple of 5 and 7.

Question 6: Find a number that is a multiple of 2, 3, 4, 5 and 6.

Problem Solving

product puzzles (i)

example

3	5	15
4	2	8
12	10	

(1)

		3
		10
6	5	

(2)

		6
		7
3	14	

(3)

		10
		21
14	15	

(4)

		9
		12
6	18	

2 solutions ?

(5)

		16
		18
12	24	

2 solutions ?

(6)

		30
		12
18	20	

2 solutions ?

(7)

		24
		14
6	56	

2 solutions ?

(8)

		27
		10
15	18	

(9)

		21
		22
77	6	

(10)

		35
		24
15	56	

(11)

		49
		15
35	21	

product puzzles (ii)

(12)

		42
		18
21	36	

(13)

		28
		45
35	36	

(14)

		63
		64
72	56	

(15)

		48
		49
42	56	

(16)

		60
		84
72	70	

2 solutions ?

(17)

		42
		27
63	18	

2 solutions ?

(18)

		36
		28
84	12	

3 solutions ?

(19)

		30
		80
40	60	

3 solutions ?

(20)

		36
		54
72	27	

3 solutions ?

(21)

		24
		36
18	48	

4 solutions ?

(22)

		72
		72
54	96	

4 solutions ?

(23)

		48
		72
72	48	

how many solutions ?

Problem Solving

use 1 to 9, once only in the cells so that you obtain row and column products as shown:

(1)

			15
			108
			224
144	8	315	

(2)

			21
			64
			270
36	30	336	

(3)

			80
			63
			72
72	48	105	

(4)

			12
			189
			160
15	144	168	

use 1 to 9, once only in the cells so that you obtain row and column products as shown:

(5)

			48
			105
			72
96	45	84	

(6)

			54
			56
			120
16	210	108	

(7)

			96
			45
			84
32	70	162	

(8) two solutions

			42
			54
			160
35	144	72	

Fluency Practice

Question 4: (a) Write down the first ten multiples of 5.
(b) Write down the first ten multiples of 8.
(c) Find the lowest common multiple (LCM) of 5 and 8.

Question 5: (a) Write down the first ten multiples of 6.
(b) Write down the first ten multiples of 8.
(c) Find the lowest common multiple (LCM) of 6 and 8.

Question 6: Find the lowest common multiple (LCM) of each of these pairs of numbers.

(a) 5 and 6	(b) 2 and 7	(c) 3 and 8	(d) 4 and 10
(e) 9 and 4	(f) 6 and 7	(g) 6 and 8	(h) 9 and 12
(i) 15 and 40	(j) 12 and 20	(k) 13 and 4	(l) 18 and 6
(m) 25 and 35	(n) 22 and 33	(o) 16 and 24	(p) 20 and 28

Question 7: Find the lowest common multiple (LCM) of each of these sets of numbers.

(a) 2, 3 and 5	(b) 3, 4 and 5	(c) 2, 5 and 7	(d) 5, 6 and 9
(e) 10, 12 and 15	(f) 2, 3, 4 and 5	(g) 1, 2, 3, 4, 5 and 6.	

Question 6: Explain why Charlie is wrong

To find the LCM of two numbers, just multiply them together

Question 8: Jennifer says that the lowest common multiple of two consecutive numbers is equal to the product of the two numbers.
By trying four different pairs of consecutive numbers, explore her theory.

Intelligent Practice

Find the LCM of:

1) 5 and 10
2) 10 and 5
3) 20 and 5
4) 20 and 10
5) 20 and 30
6) 4 and 30
7) 5 and 30
8) 7 and 30
9) 14 and 30
10) 28 and 30
11) 30 and 30
12) 30 and 48
13) 36 and 48
14) 24, 36 and 48
15) 240, 360 and 480

Can you spot any patterns between questions and answers? Can you explain why they occur?

Fill in the Gaps

Find the LCM of...	Multiples of First Number	Multiples of Second Number	Answer
3 *and* 5	3, 6, 9, 12, (15), 18, ..	5, 10, (15), 20, 25, 30, ..	15
2 *and* 5	2, 4, 6, 8, (10), 12, ..	5, (10), 15, 20, 25, 30, ..	
3 *and* 4	3, 6, 9, 12, 15, 18, ..	4, 8, 12, 16, 20, 24, ..	
3 *and* 6	3, 6, 9, 12, 15, 18, ..		
4 *and* 6	4, 8, 12, 16, 20, 24, ..		
5 *and* 8			
6 *and* 8			
5 *and* 6			
6 *and* 10			
6 *and* 12			
8 *and* 12			
8 *and* 10			
10 *and* 25			
25 *and* 40			
☐ *and* 5		5, 10, 15, (20), 25, 30, ..	20
6 *and* ☐	6, 12, (18), 24, 30, . ..		18

Problem Solving

what is the remainder when 4321 is divided by:
2? 3? 4? 5? 6? (not 7) 8? 9? 10?
why is this?

what is the smallest number that has this property?

Fluency Practice

A) State whether the numbers are divisible by 2.

1) 7,462 _____ 2) 353 _____

3) 97 _____ 4) 4,018 _____

B) 1) Which of the following numbers is not divisible by 2?

a) 149 b) 22 c) 6,486 d) 3,170

2) Which of the following numbers is divisible by 2?

a) 5,993 b) 84 c) 721 d) 295

C) Choose the correct digits that will make each statement true.

1) 42__ is divisible by 2.

a) 2 b) 7 c) 0 d) 6

2) 1,06__ is not divisible by 2.

a) 0 b) 1 c) 4 d) 5

D) Nathan has 158 books. Can he make sets of 2 books each without any book remaining?

Fluency Practice

A) State whether the numbers are divisible by 5.

1) 20,455 _____

2) 6,852 _____

3) 90,008 _____

4) 890 _____

B) 1) Which of the following numbers is divisible by 5?

a) 53,760 b) 9,251 c) 654 d) 78,213

2) Which of the following numbers is not divisible by 5?

a) 5,685 b) 36,690 c) 287 d) 1,000

C) 1) A stationery store sells watercolor tubes in packs of 5. Will there be any individual tubes remaining after packing 310 tubes?

_____

2) An order for 1,865 lights has been placed. Can the lights be equally grouped into 5 large cardboard boxes?

Fluency Practice

A) State whether the numbers are divisible by 10.

1) 530 _____ 2) 1,296 _____

3) 81,707 _____ 4) 3,650 _____

B) 1) Which of the following numbers is divisible by 10?

a) 9,800 b) 65,146 c) 4,432 d) 843

2) Which of the following numbers is not divisible by 10?

a) 37,670 b) 79,561 c) 210 d) 2,390

C) 1) Mr. Burns, the art teacher, wants to distribute 10 paintbrushes each among his students. If there are a total of 456 brushes, will he be able to equally distribute them all?

_____

2) A carton contains 10 matchboxes. Can 56,320 matchboxes be packed into such cartons without any left out?

Fluency Practice

A) State whether the numbers are divisible by 4.

1) 312 _____ 2) 44,827 _____

3) 78,285 _____ 4) 1,016 _____

B) 1) Which of the following numbers is divisible by 4?

a) 204 b) 8,215 c) 983 d) 35,994

2) Which of the following numbers is not divisible by 4?

a) 4,544 b) 54,765 c) 132 d) 65,480

C) Choose the correct digits that will make each statement true.

1) 6,24__ is divisible by 4.

a) 0 b) 3 c) 4 d) 8

2) 80,3__4 is not divisible by 4.

a) 4 b) 1 c) 8 d) 3

D) Bethany has 208 scented candles, which she must decorate a number of tables with. If she uses 4 candles to decorate each table, will there be any candles left?

Fluency Practice

A) State whether the numbers are divisible by 8.

1) 38,562 _____ 2) 71,096 _____

3) 9,384 _____ 4) 2,541 _____

B) 1) Which of the following numbers is divisible by 8?

a) 6,473 b) 13,480 c) 82,695 d) 5,918

2) Which of the following numbers is not divisible by 8?

a) 46,976 b) 7,072 c) 3,549 d) 27,584

C) Choose the correct digits that will make each statement true.

1) 8,56__ is divisible by 8.

a) 8 b) 7 c) 0 d) 6

2) 58,2__8 is not divisible by 8.

a) 4 b) 2 c) 1 d) 3

D) A candy-making factory has 26,936 candies, which they need to dispatch in packs of 8. Will there be any candies left after the packaging process is complete?

Fluency Practice

A) State whether the numbers are divisible by 3.

1) 54 _____ 2) 5,053 _____

3) 8,639 _____ 4) 774 _____

B) 1) Which of the following numbers is not divisible by 3?

a) 3,102 b) 236 c) 27 d) 4,518

2) Which of the following numbers is divisible by 3?

a) 539 b) 85 c) 9,285 d) 640

C) Choose the correct digits that will make each statement true.

1) 15__ is divisible by 3.

a) 6 b) 3 c) 7 d) 9

2) 2,8__ 6 is not divisible by 3.

a) 2 b) 5 c) 0 d) 4

D) There were 126 grilled pork chops prepared at a large barbecue party. If the guests ate 3 chops each, was there any left?

Fluency Practice

A) State whether the numbers are divisible by 9.

1) 198 _____ 2) 8,000 _____

3) 4,082 _____ 4) 53,523 _____

B) 1) Which of the following numbers is divisible by 9?

a) 895 b) 23,509 c) 9,892 d) 32,130

2) Which of the following numbers is not divisible by 9?

a) 99,378 b) 264 c) 1,323 d) 3,015

C) Write the missing digit in each number so that the number formed is divisible by 9.

1) __ 95 2) 15,__49

3) 2,0__0 4) 3__2

D) Delilah packed 9 pretzels in one basket. There were a total of 218 pretzels, and Delilah wanted to pack all of them into such baskets. Did any pretzel remain?

Fluency Practice

A) State whether the numbers are divisible by 7.

1) 10,871 _____ 2) 4,923 _____

3) 356 _____ 4) 72,184 _____

B) 1) Which of the following numbers is not divisible by 7?

a) 8,762 b) 63,546 c) 294 d) 3,885

2) Which of the following numbers is divisible by 7?

a) 904 b) 798 c) 1,236 d) 56,314

C) Fill in the missing digits.

1) Write the smallest digit to make the number divisible by 7.

a) 45,92__ b) 6,__60

2) Write the largest digit to make the number divisible by 7.

a) 1__2 b) 5__,640

D) A gardener wants to plant 875 roses in the garden. Can he plant them in rows having 7 plants each without any plants left?

Fluency Practice

State whether the number is divisible by 11.

1) 1,144 _____

2) 450 _____

3) 54,780 _____

4) 712,712 _____

5) 977 _____

6) 2,761 _____

7) 86,856 _____

8) 601,178 _____

9) 177,210 _____

10) 5,476 _____

11) 64,614 _____

12) 238,095 _____

13) 3,309 _____

14) 286 _____

15) 35,651 _____

16) 421,411 _____

17) 456,753 _____

18) 45,782 _____

19) 28,324 _____

20) 548,746 _____

Fluency Practice

A) State whether the numbers are divisible by 6.

1) 2,376 _____

2) 6,431 _____

3) 91,403 _____

4) 582 _____

B) 1) Which of the following numbers is divisible by 6?

a) 769 b) 8,527 c) 450 d) 13,814

2) Which of the following numbers is not divisible by 6?

a) 30,006 b) 52,628 c) 9,672 d) 282

D) Victor, a food stand owner, prepared and steamed 354 fresh dumplings. He sold them in plates, and each plate contained 6 dumplings. Did any dumplings remain?

Fluency Practice

State whether the number is divisible by 12.

1) 761,004 _____

2) 12,405 _____

3) 10,188 _____

4) 3,576 _____

5) 1,222 _____

6) 36,943 _____

7) 78,420 _____

8) 732 _____

9) 599 _____

10) 323,170 _____

11) 816 _____

12) 571,752 _____

13) 278,940 _____

14) 47,316 _____

15) 65,172 _____

16) 56,546 _____

17) 900,101 _____

18) 965,388 _____

19) 4,510 _____

20) 7,392 _____

Fluency Practice

Use divisibility rule to circle the factors of each number.

1) 3,642

is divisible by

3 4 5 6 12

2) 516

is divisible by

2 3 4 9 10

3) 569,820

is divisible by

2 3 4 5 10

4) 55

is divisible by

2 4 5 7 11

5) 48,704

is divisible by

2 3 4 8 9

6) 9,541

is divisible by

3 7 8 9 12

7) 21,208

is divisible by

2 4 8 10 11

8) 114,786

is divisible by

2 3 5 7 9

9) 248

is divisible by

2 3 4 5 8

10) 758,428

is divisible by

2 3 4 9 10

11) 6,040

is divisible by

2 4 5 8 9

12) 835,752

is divisible by

2 3 4 6 8

13) 16,596

is divisible by

2 3 4 7 12

14) 684,342

is divisible by

2 4 6 8 9

15) 96,415

is divisible by

4 5 10 11 12

Fluency Practice

Is the number to the left of each row divisible by the number at the top of each column? Check the boxes.

	2	3	4	5	6	7	8	9	10	11	12
497,652											
8,118											
28,755											
640											
874,629											
981,274											
19,746											
6,804											
246,972											
30,630											
176											
78,900											

Problem Solving

What is the **largest** multiple you can make using the digits below?
You don't have to use each digit and can use each one at most once

2 3 4 5

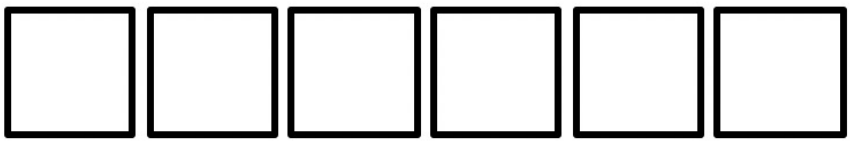
Multiple of 2 **Multiple of 3** **Multiple of 6**

What are the smallest and largest multiples of 4 you can make using **all** the digits below?

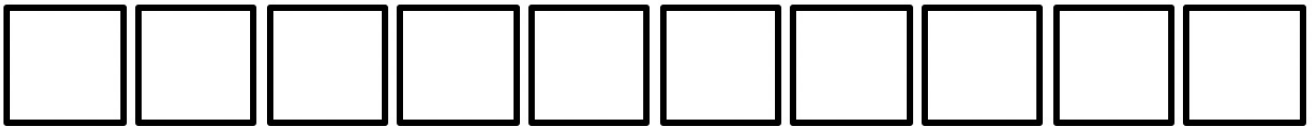
4 5 6 7 8

Smallest _____ **Largest** _____

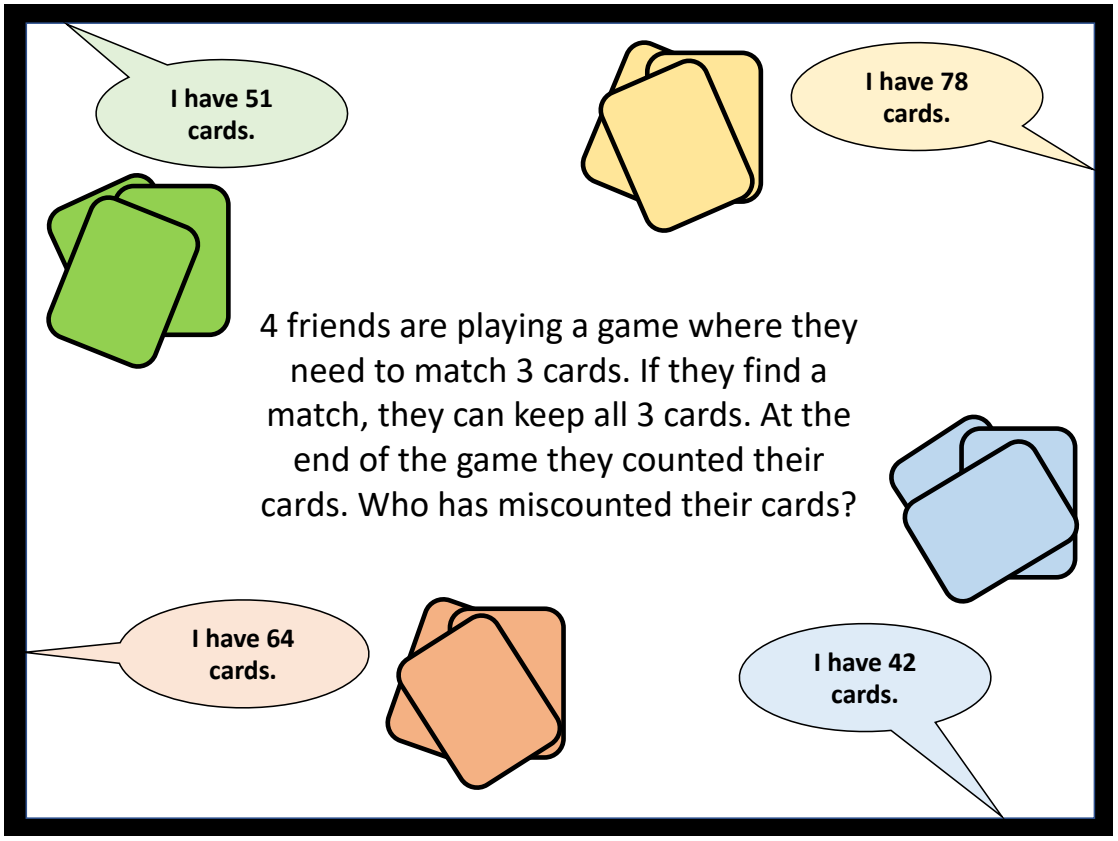
Using the digits 1 to 6, create a 6 digit number so that the first two digits are divisible by two, the first three digits are divisible by three, etc
How many answers are there?



Do the same using the digits 0 to 9 (one answer!)



Problem Solving



478, 512 is divisible by 3

When I type 478, 512 ÷ 3 into a calculator.
I accidently mistype the third digit.

The result is still an INTEGER

What number could I have typed?

Problem Solving

8	7	1	4

Can you rearrange the 4 cards above to Make a number that is divisible by 3?

Is it possible to find a number divisible by 3 with just 3 of the cards above?

3 digits are written onto cards
The cards are arranged to create a 3 digit number: 752

7	5	2

Can you rearrange the 3 cards above to a number that is divisible by 3?

How many numbers between **25310** and **25319** are divisible by 6?

How many numbers between **25320** and **25329** are divisible by 6?

Each of the three 3-digit numbers in the calculation below are divisible by 3

$$\begin{array}{r} 3\ 1\ \square \\ +\ 6\ 4\ \square \\ \hline 9\ 5\ \square \end{array}$$

The last digit in each number is hidden.
Explain why the last digit cannot be an 8 in any of the 3 numbers

4 digits are written onto cards
The cards are arranged to create a 4 digit number: 3178

3	1	7	8

How many ways can you arrange the 4 cards so they make a 4 digit number that is divisible by 6?

Problem Solving

[1] in the number
235, A11B
replace A and B by digits so that the number divides exactly by 3 and by 5

try to establish all the possible answers

[2] in the number
56, A2B
replace A and B by digits so that the number is a multiple of 15

show that there are 7 solutions

[3] replace A and B in the number
22,A2B so that the number is a multiple of 45

show that there are 2 solutions

[4] replace A and B in the number
2A7,69B so that the number is divisible by 3 , 5 and 11

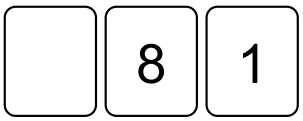
show that there are 2 solutions

[5] replace A and B in the number
6A,9B0 so that 44 is a factor of the number

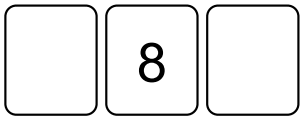
show that there are 5 solutions

Problem Solving

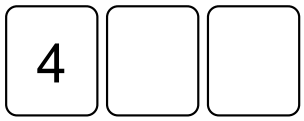
Place a digit in each box so that each number matches the description given.
Numbers cannot start with a 0.

a) 

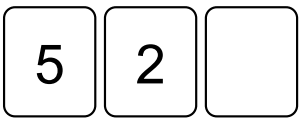
is a multiple of 3

b) 

is the smallest multiple of 3 possible.

c) 

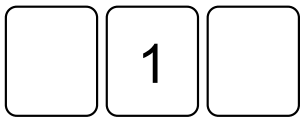
is the largest multiple of 3 possible

d) 

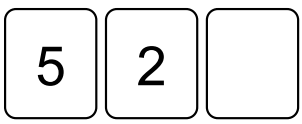
is a multiple of 4

e) 

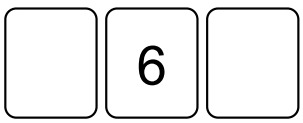
is the smallest multiple of 4 possible.

f) 

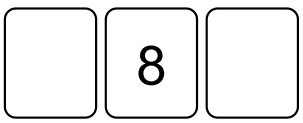
is the largest multiple of 4 possible.

g) 

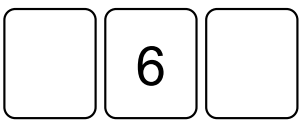
is a multiple of 5

h) 

is a multiple of 3,4 and 5

i) 

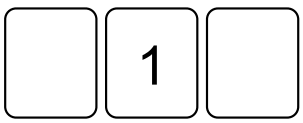
is the largest multiple of 15 possible

j) 

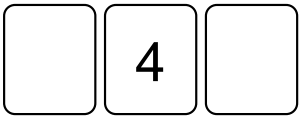
is a multiple of 3 less than 200

k) 

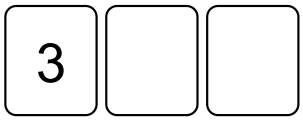
is the largest possible multiple of 6

l) 

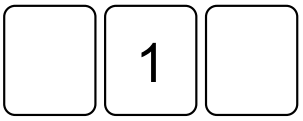
is the smallest multiple of 6 possible

m) 

is the largest possible multiple of 15

n) 

the largest number that is not a multiple of 2, 3 or 5

o) 

the smallest number that is not a multiple of 3,4 or 5

Fluency Practice

Question 1: List all the factors of these numbers

(a) 8 (b) 10 (c) 7 (d) 12 (e) 20 (f) 22 (g) 18

(h) 50 (i) 15 (j) 19 (k) 30 (l) 100 (m) 32 (n) 24

(o) 42 (p) 28 (q) 66 (r) 70 (s) 45 (t) 60 (u) 25

Question 2: Is 3 a factor of.... ?

(a) 14 (b) 21 (c) 27 (d) 32 (e) 57 (f) 301 (g) 100

Question 3: Is 5 a factor of.... ?

(a) 20 (b) 34 (c) 40 (d) 38 (e) 45 (f) 102 (g) 135

Question 4: List all the factors of these numbers (you may use a calculator)

(a) 84 (b) 140 (c) 200 (d) 240 (e) 145 (f) 192 (g) 244

Question 5: Is 9 a factor of.... ?

(a) 38 (b) 90 (c) 72 (d) 108 (e) 909 (f) 9001 (g) 293

Question 1: 21 25 30 45
Which number is the odd one out? why?

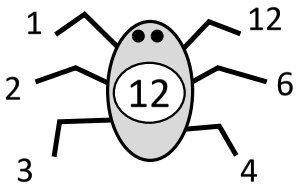
Question 2: 15 24 28 33
Which number is the odd one out? why?

Question 3: Mary has 26 sweets and is able to share them evenly between her friends.
Mary has more than 1 friend.
Write down how many friends Mary might have.

Question 4: James says that all numbers have an even number of factors.
Is he correct?

Factor Bugs

This is an **example** of a complete **Factor Bug**.

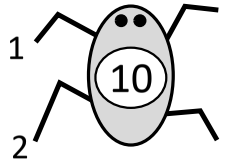


Each leg (or tail) is a **factor** of the **bug's number (12)**.

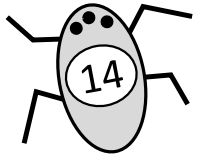
Some of these bugs have a **tail**.

Complete each **factor bug**!

A)



B)



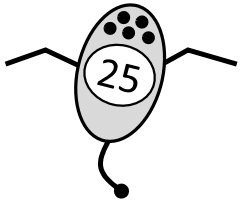
C)

D)

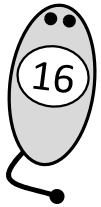
E)

F)

G)

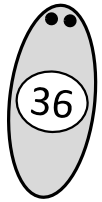


H)



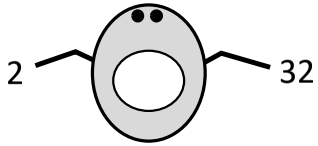
I)

J)

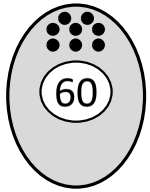


K)

L) These factors are a pair.



M)



What can you say about factor bugs with tails?

Make your own factor bugs with 2, 3, 5, 6 and 7 factors!

Problem Solving

	Odd	Even
Factor of 20		
Factor of 12		
Factor of 6		

Use only the numbers;

1, 2, 3, 4, 5, 6

Fill in the gaps

	Factor of 28	Factor of 48	Factor of 45
Factor of 42			
Factor of 54			
Factor of 40			

Use only the numbers;

1, 2, 3, 4, 5,

6, 7, 8, 9

Fill in the gaps

	Factor of …	Factor of …	Factor of …
Factor of …	2	4	5
Factor of …	7	8	1
Factor of …	3	6	9

Use only the numbers;

18

20

42

45

48

56

Fill in the gaps

Intelligent Practice

Find all the factors of:

1) 8
2) 10
3) 7
4) 12
5) 20
6) 22
7) 18
8) 50
9) 15
10) 19
11) 30
12) 100
13) 32
14) 24
15) 42
16) 28
17) 66
18) 70
19) 45
20) 60
21) 25

Count the number of factors for each question.

- Which numbers have two factors?
- Which numbers have an odd number of factors? Why?

- Take the factors of 28 (not including 28) add them together. What do you notice?

LCM and HCF

Find the LCM of each pair of numbers.

(a) 4 and 5 (b) 3 and 8

(c) 4 and 8 (d) 4 and 6

(e) 10 and 15 (f) 15 and 25

Find the HCF of each pair of numbers.

(a) 8 and 18 (b) 16 and 36

(c) 16 and 24 (d) 12 and 19

(e) 12 and 36 (f) 20 and 45

Find the HCF and LCM of each of these pairs of numbers.

(a) 80 and 112 (b) 60 and 72

(c) 210 and 350 (d) 135 and 450

Cheese slices are sold in packs of 8. Bread buns are sold in packs of 6. What is the least number of each pack that needs to be bought to have the same number of cheese slices and bread rolls?

Fred runs around a racing track in 4 minutes. Debbie runs around the track in 3 minutes. If they both start together on the start line, when will they both be together on the start line again? How many laps will each of them have done?

Prestwich contains three churches. At St. Peter's church the bells ring every 15 minutes. At St. Paul's church the bells ring every 20 minutes. At St. Mary's church the bells ring every 8 minutes. If the bells ring at all three churches at 1pm, when is the next time this will happen?

Factors and Multiples

	Factor of 18	Factor of 48	Multiple of 7	Factor of 75
Multiple of 3				
Multiple of 2				
Factor of 42				
Has exactly 3 factors				

factors and multiples

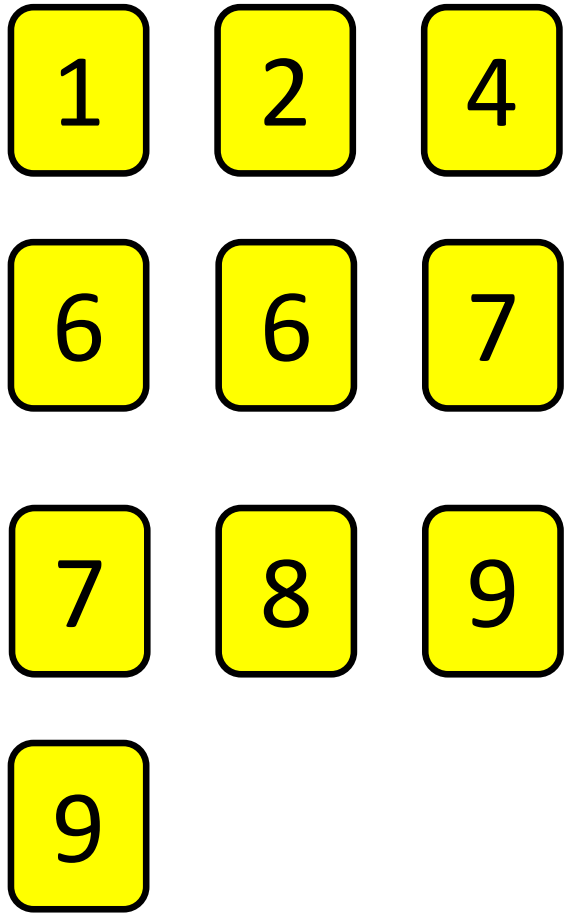
2 7 9 3 28 25

1 49 16 1 3

6 24 15 4 21

Types of Numbers

Prime			
Square			
Factors of 72			
Multiple of 3			
Cube			
Make the biggest possible total			



Types of Numbers

•Some students (fewer than 100) are trying to get into groups.

•When they are 3s, two people are left over.

•When they are 4s, three people are left over.

•When they are 5s, four people are left over.

•When they are 6s, five people are left over.

•How many students are there in total?

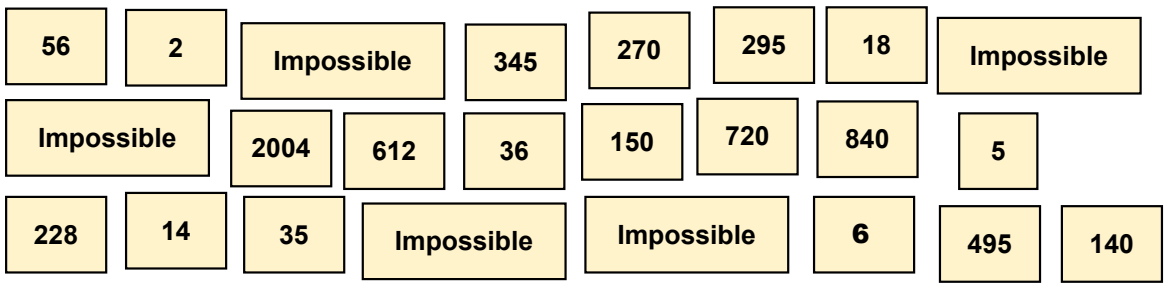
Fill in the table with the numbers 1 – 9			
	Square Number	**Prime**	**Factors of 120**
Multiples of 3			
Factors of 120			
Factor of 140			

Divisibility Rules

is it divisible by...?

Complete the table using the numbers at the bottom.

	Multiple of 2	Multiple of 4	Multiple of 5	Multiple of 10
Odd Number				
Multiple of 3				
Multiple of 6				
Multiple of 7				
Multiple of 9				
Prime Number				



true or false?

A) 6435 is divisible by 6

B) 2009 is divisible by 4

C) 542 is divisible by 3

D) 3212 is divisible by 4

E) 2307 is divisible by 9

F) 4300 is divisible by 5

G) 1334 is divisible by 2

H) 1044 is divisible by 9

number puzzles

My number is a square number.
My number is less than 50.
My number is even.
My number is a multiple of 12.
My number is ……..

My number is a factor of 64.
My number is a cube number.
My number is less than 20.
My number is ……..

My number is a multiple of 4.
My number has 8 factors, including 2 and 3.
My number is less than 30.
My number is ……..

7 is a factor of my number.
My number is a multiple of 8.
My number is less than 100
My number is ……..

My number is odd.
My number has exactly 3 factors.
My number is less than 50.
My number has 7 as a factor.
My number is ……..

My number is a prime number.
My number is a factor of 46.
My number is an odd number.
My number is ……..

My number is a multiple of 6 and a multiple of 5.
My number has 12 as a factor.
My number is less than 100
My number is ……..

My number is a cube number.
My number is a multiple of 9.
My number is odd.
My number is less than 100.
My number is ……..

My number is a triangular number.
My number is a multiple of 3.
My number is a factor of 30.
My number is more than 10.
My number is ……..

My number is a prime number.
My number is a factor of 51.
My number is one more than a square number.
My number is ……...

My number is greater than 20.
My number ends with a 0.
My number is a multiple of 12.
My number is less than 100.
My number is ……...

Extension
Make up your own number puzzle for a friend.

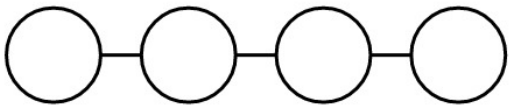
My number is a square number.
My number is a factor of 50.
My number is ……...

Consecutive Chains

consecutive chains

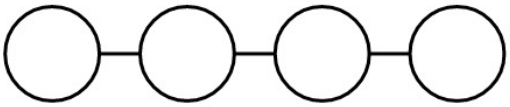
Use the clues to find sets of increasing consecutive numbers. All numbers used are less than 100.

A



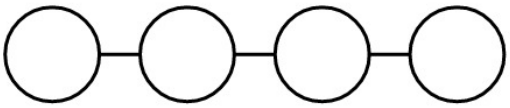
prime — *cube number* — *square number* — *factor of 60*

B



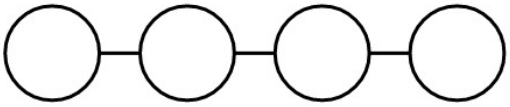
prime — *prime* — *square number* — *prime*

C



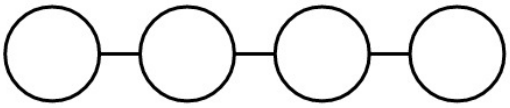
factor of 36 — *prime* — *multiple of 10* — *multiple of 3*

D



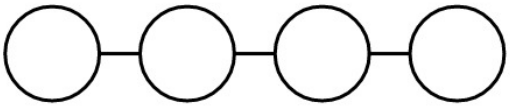
multiple of 1 — *multiple of 4 & 6* — *square number* — *factor of 100*

E



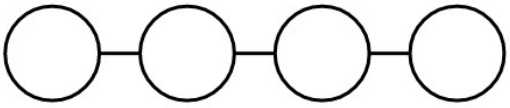
prime — *even* — *multiple of 3 & 5* — *square number*

F



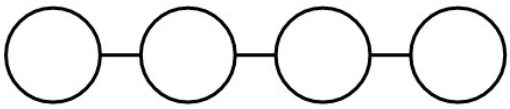
prime — *factor of 48 & 60* — *prime* — *even*

G



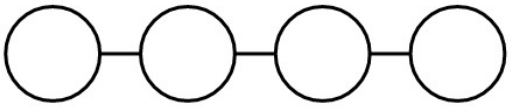
greater than 15 — *divisible by 3* — *even* — *less than 25*

H



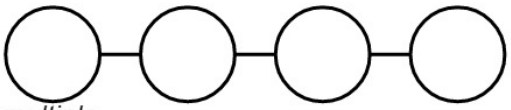
square number — *not prime* — *cube number* — *not prime*

I



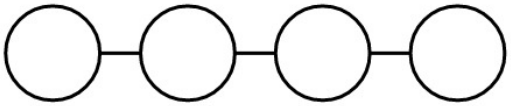
not prime — *not prime* — *not prime* — *square number*

J



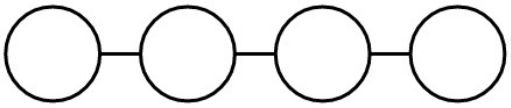
multiple of 2 & 11 — *prime* — *multiple of 5* — *not prime*

K



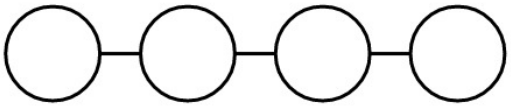
multiple of 6 — *multiple of 5* — *multiple of 4* — *multiple of 3*

L



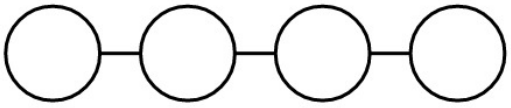
multiple of 7 — *no clue* — *no clue* — *multiple of 9*

M



prime — *no clue* — *no clue* — *prime*

N



multiple of 2 & 7 — *no clue* — *multiple of 3 & 8* — *no clue*

True or False

Square numbers have an odd number of factors 1	If a number has 12 as a factor, it will also have 6 as a factor 2	If a number has both 2 and 3 as factors, 6 will also be a factor 3	All multiples of 6 are also multiples of 3 4
All numbers in the 5 times table are also in the 10 times table 5	Multiples of 6 are always divisible by 12 6	Multiples of 12 are always divisible by 6 7	If a number is divisible by 3 and divisible by 4, it is also divisible by 12 8
Square numbers always have 3 factors 9	"6 x a" is always divisible by 6 (if a is a positive integer) 10	"a x 2 x b x 3" is always divisible by 6, if a and b are any positive integers. 11	"6 x a" is always divisible by 3 when a is a positive integer 12
Multiples of 6 are never prime numbers 13	All multiples of 5 are odd numbers 14	All multiples of 6 are even numbers 15	There is 1 odd number that has 2 as a factor 16

Factors and Multiples Puzzle

Pair up all the numbers and clues.

Each clue should be paired with one number.

You may find it useful to list options before you start pairing up.

Factor of 15	
Multiple of 7	
Factor of 49	
Multiple of 21	
Multiple of 9	
A number with an odd number of factors	
A common factor of 45 and 20	
A common multiple of 6 and 10	

30

27

1

42

36

49

14

3

Factors and Multiples Puzzle

Create a final clue so that this has a solution?

Can you make the clue so that it is unique solution?

A number with exactly 3 factors	
A number with exactly 2 factors	
Multiple of 4	
Multiple of 19	
Common Factor of 16 and 24	
Multiple of 5	
Common factor of 42 and 63	
?????	

25

8

9

19

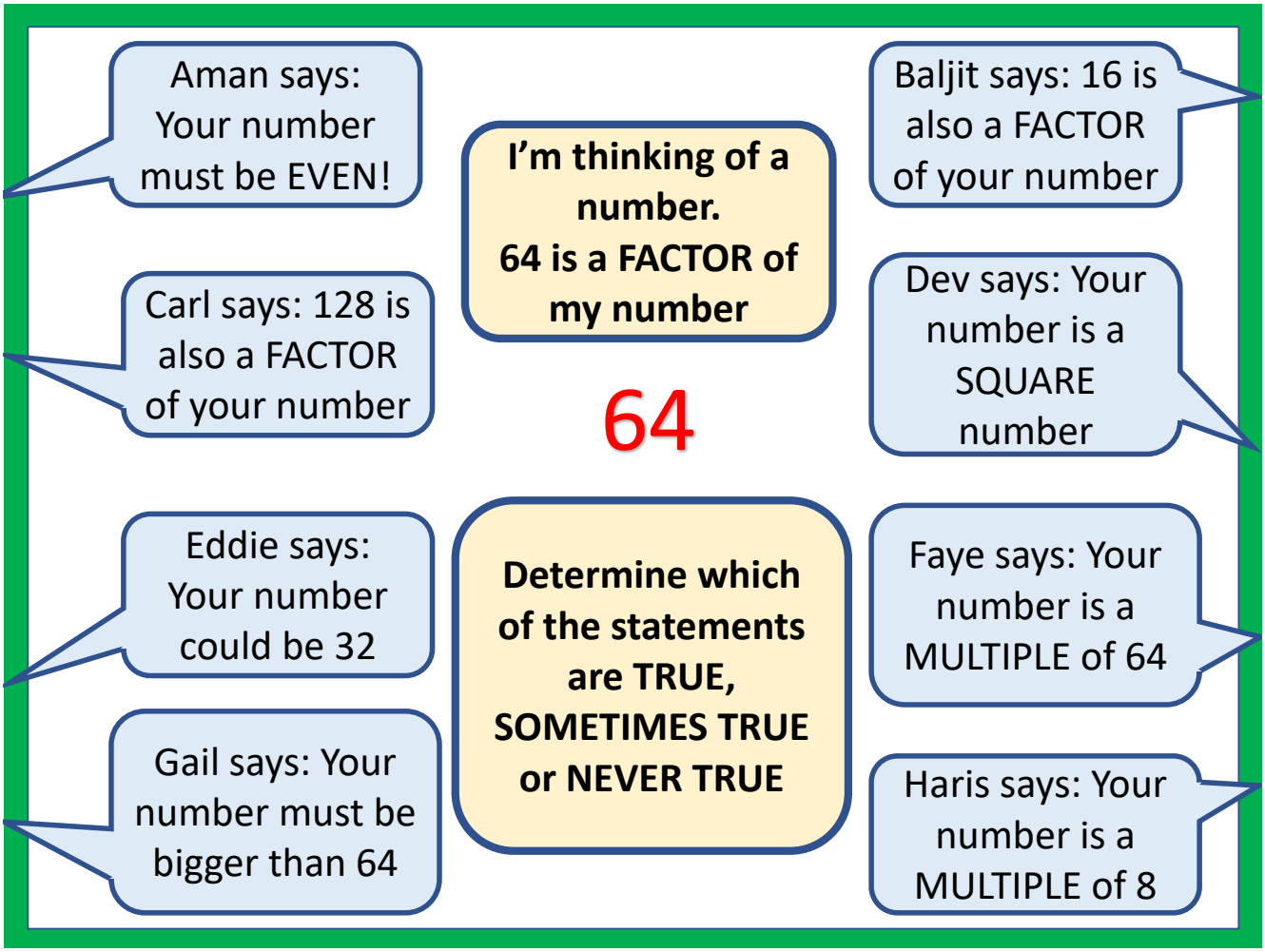
56

7

40

38

64 is a Factor of my Number



More-Same-Less – HCF and LCM

Instructions: Complete the remaining boxes by making the minimum change possible to the centre box. If there are boxes that cannot be filled in, say why.

Highest common factor of the 2 numbers

	Less	Same	More
More			
Same		24, 30	
Less			

Lowest common multiple of the two numbers

HCF and LCM

A. This grid shows the highest common factor of each pair of numbers.
Can you complete it?

	28	45	120
90			
56			
36			

B. Find the lowest common multiple of 63 and 105.

C. Car A takes 40 seconds to complete one lap of a track. Car B does the same lap in 18 seconds. They begin doing laps together from the starting line.

After how many **minutes** are they both at the starting line together again?

D. What is the greatest number that will divide 64 and 24 without a remainder?

F. Emma and Jenny are counting.

Emma starts at 32 and counts up in 8's.

Jenny starts at 54 and counts up in 6's.

What is the first number that both girls will say?

E. Anna is packing treats into bags for a raffle. She has 120 chocolates, 84 lollipops and 96 stickers.

She wants to make as many prize bags as possible. Each bag **must** contain the same number of chocolates, the same number of lollipops and the same number of stickers.

How many lollipops will be in each bag?

G. The lowest common multiple of two numbers is 120. Their highest common factor is 4. One of the numbers is 40. What is the other number?

H. The highest common factor of two numbers, *a* and *b,* is 18.

a is a multiple of 10.

The sum of *a* and *b* is 12^2

What are the numbers *a* and *b* ?

Total is PRIME	**Total is PRIME**	**Total is PRIME**	**Total is PRIME**	**Total is PRIME**
Total is PRIME				**Total is PRIME**
Total is PRIME				**Total is PRIME**
Total is PRIME				**Total is PRIME**
Total is PRIME	**Total is PRIME**	**Total is PRIME**	**Total is PRIME**	**Total is PRIME**

Arrange the prime numbers

3
5
7
11
13
17
19
23
29

Into the 9 gaps so the totals in each row, column and diagonal is a prime number

Problem Solving

make exactly 6 one or two digit prime numbers using the digits 1 to 9 exactly once

how many different ways can this be done?

For example: 2, 3, 5, 41, 67, 89

Fluency Practice

Question 1: (a) List all the factors of 10
(b) List all the factors of 15
(c) Write down all the common factors of 10 and 15.

Question 2: (a) List all the factors of 12
(b) List all the factors of 18
(c) Write down all the common factors of 12 and 18.

Question 3: Write down all the common factors of each of these pairs of numbers.

(a) 6 and 8 (b) 15 and 20 (c) 9 and 15 (d) 7 and 14

(e) 30 and 40 (f) 21 and 27 (g) 18 and 30 (h) 16 and 24

Question 1: Martin says that 6 is a common factor of 42, 36 and 50.
Is he correct?

Fluency Practice

Question 4: (a) List all the factors of 14
(b) List all the factors of 21
(c) Find the highest common factor (HCF) of 14 and 21.

Question 5: (a) List all the factors of 24
(b) List all the factors of 36
(c) Find the highest common factor (HCF) of 24 and 36.

Question 6: Find the highest common factor (HCF) of each of these pairs of numbers.

(a) 4 and 14	(b) 6 and 9	(c) 9 and 21	(d) 8 and 12
(e) 6 and 15	(f) 10 and 17	(g) 30 and 45	(h) 40 and 60
(i) 28 and 63	(j) 24 and 36	(k) 16 and 28	(l) 18 and 45
(m) 150 and 200	(n) 12 and 54	(o) 90 and 270	(p) 39 and 65

Question 7: Find the highest common factor (HCF) of each of these sets of numbers.

(a) 12, 6 and 15	(b) 27, 33 and 12	(c) 30, 15 and 25	(d) 8, 20 and 12
(e) 10, 25 and 13	(f) 12, 24 and 30	(g) 9, 36 and 45	(h) 100, 125 and 200

Question 3: Sam has completed his maths homework.
Can you spot any mistakes?

Find the highest common factor of 18 and 36

Factors of 18: 2, 3, 6, 9
Factors of 36: 2, 3, 4, 6, 9, 12, 18

HCF = 9

Intelligent Practice

Find the HCF of:

1) 5 and 10
2) 10 and 5
3) 20 and 5
4) 20 and 10
5) 20 and 30
6) 4 and 30
7) 5 and 30
8) 7 and 30
9) 14 and 30
10) 28 and 30
11) 30 and 30
12) 30 and 48
13) 36 and 48
14) 24, 36 and 48
15) 240, 360 and 480

Can you spot any patterns between questions and answers? Can you explain why they occur?

Fill in the Gaps

Find the HCF of...	Factors of First Number				Factors of Second Number				Answer
6 *and* 10	1	2	3	6	1	2	5	10	2
10 *and* 15	1	2	5	10	1	3	5	15	
6 *and* 15									
8 *and* 10	1	2	4	8					
8 *and* 15									
8 *and* 16					1	2	4	8	16
14 *and* 16									
15 *and* 18					1	2	3	6	9	18
8 *and* 18									
10 *and* 20									
8 *and* 28									
15 *and* 20									
12 *and* 18									
20 *and* 32									
16 *and* 24									
16 *and* 40									

Fluency Practice

LCM or HCF? ①

For each question, do you need to calculate
the **Lowest Common Multiple** or the **Highest Common Factor**?

a) Kyle goes to the gym every 2 days. Tracy goes to the gym every 6 days. They met at the gym on Saturday.
On which day of the week will they meet next?

b) Tammy has a 16 cm length of liquorice & a 24 cm strip of liquorice. Using the two pieces, she wants to cut equal-length strips & waste nothing. What is the maximum length of the equal-sized pieces?

c) Rashid is buying plates & cups for a party. Plates come in packs of 6 & cups come in packs of 8. How many packs of each does he need to buy to have an equal amount of plates & cups?

d) Ms Yates is making classroom packs for other teachers.
She has 25 board pens & 30 protractors that she wants to split equally.
How many packs can she make with no pens or protractors left behind?

e) A company stacks two types of boxes next to each other.
One type of box is 10 cm tall, the other is 8 cm tall.
What is the lowest height where both stacks are equal in height?

f) For PE, Mr Jones wants to make mixed groups with an equal amount of girls in each, & an equal amount of boys in each.
There are 40 boys & 32 girls. How many groups can he make?

g) Workbooks come in packs of 15. Revision guides come in packs of 12.
Mr Smyth wants to have an equal number of both.
What is the minimum quantity of each pack he must buy?

h) Jess has a tea-break every 30 minutes. Liam has a tea break every 50 minutes. They were both on a break at 9:00 am. What time will they be on break at the same time next?

Fluency Practice

LCM or HCF? ②

For each question, do you need to calculate
the **Lowest Common Multiple** or the **Highest Common Factor**?

a) Rashid is buying plates & cups for a party. Plates come in packs of 8 & cups come in packs of 10. How many packs of each does he need to buy to have an equal amount of plates & cups?

b) Kyle goes to the gym every 3 days. Tracy goes to the gym every 5 days. They met at the gym on Saturday.
On which day of the week will they meet next?

c) Tammy has a 45 cm length of liquorice & a 36 cm strip of liquorice. Using the two pieces, she wants to cut equal-length strips & waste nothing. What is the maximum length of the equal-sized pieces?

d) A company stacks two types of boxes next to each other.
One type of box is 15 cm tall, the other is 8 cm tall.
What is the lowest height where both stacks are equal in height?

e) Ms Yates is making classroom packs for other teachers.
She has 60 board pens & 48 protractors that she wants to split equally.
How many packs can she make with no pens or protractors left behind?
How many pens are in each pack?

f) For PE Mr Jones wants to split boys & girls equally into as many different groups as possible. There are 56 boys & 70 girls.
How many groups can be made? How many boys & girls are in each group?

h) Workbooks come in packs of 25. Revision guides come in packs of 30.
Mr Smyth wants to have an equal number of both.
How many packs of workbooks does he need to buy?
How many packs of revision guides does he need to buy?

g) Jess has a tea-break every 50 minutes. Liam has a tea break every 45 minutes. They were both on a break at 9:30 am. What time will they be on break at the same time next?

Factor, Multiple, Both or Neither

For the **Relationship**, choose either: *is a factor of*, *is a multiple of, is neither a factor nor a multiple of*, or *is both a factor and a multiple of*

1st number	Relationship	2nd number
3		9
9		3
9		27
9		49
9		6
6		9
9		9
1		9
9		1
9		2
9		4.5
4.5		9
0		9
9		0

Extension

1. Complete these statements with the most simple examples you can think of

2. Then complete the statements with the most interesting examples you can think of

   _____ is a factor of ____

   _____ is a multiple of _____

   _____ is both a factor and a multiple of ____

   _____ is neither a factor nor a multiple of _____

Factors, Multiples and Primes			
(a)	**(b)**	**(c)**	**(d)**
Write down the first five multiples of 9.	Write down all the factors of 20.	Write down the first five multiples of 13.	Write down all the factors of 36.
(e)	**(f)**	**(g)**	**(h)**
6 is a multiple of 18. True or false?	12 is a factor of 48. True or false?	Find a number which is a prime number and a factor of 10.	Find a number which is a square number and a factor of 32.
(i)	**(j)**	**(k)**	**(l)**
Find a number that is a factor of both 18 and 24.	Find a number that is a multiple of 5 and a square number.	Find two prime numbers that add to make another prime number.	Write down all the prime numbers between 20 and 50.
(m)	**(n)**	**(o)**	**(p)**
Find a prime number and a multiple of 4 that when added together give another prime number.	Find a multiple of 10 and a prime number whose difference is a square number.	Find two prime numbers that multiply together to make a factor of 40.	Find two different prime numbers and a factor of 60 that when added together make a multiple of 30.

Lowest Common Multiple

1. a) Write down the first five multiples of 6.
   b) Write down the first five multiples of 9.
   c) What is the lowest common multiple (LCM) of 6 and 9.
   d) State one other common multiple of 6 and 9.

2. a) Select all the common multiples of 10 and 15:

   60 45 50 75 90 1500

   b) What is the lowest common multiple of 10 and 15?

3. Find the lowest common multiple of:

   a) 6 and 8 b) 3 and 4 c) 9 and 12

   d) 5 and 8 e) 7 and 14 f) 6 and 15

   g) 10 and 25 h) 12 and 8 i) 20 and 25

4. Deborah says:

   "To find the LCM of two numbers, you can just multiply them together."

   a) Give an example of a pair of numbers for which this **works**.

   b) Give an example of a pair of numbers for which this **does not work**.

5. Complete each statement with a number from the box:

   a) 12 is the LCM of 6 and ___

   b) 18 is the LCM of 6 and ___

   c) 30 is the LCM of 6 and ___

   d) 42 is the LCM of 6 and ___

8	4
10	14
16	18

6. Find the lowest common multiple of:

   a) 2, 3 and 5 b) 3, 6 and 8

   c) 3, 6 and 7 d) 4, 9 and 10

1. Write the first 6 multiples of each number

a. 5 b. 9 c. 7 d. 12 e. 20 f. 11 g. 50 h. 35

2. Decide whether the following statements are true or false

a. 20 is a multiple of both 5 and 10

b. The next multiple of 5 after 20 is 30

c. The multiples of 20 include 40 and 80

d. 7 is a multiple of 14

e. 16 is a multiple of only two other numbers

f. 30 is a multiple of 2, 5, 6 and 30

3. Write down three common multiples of each set of numbers

a. 8 and 10 b. 4 and 6 c. 3 and 5 d. 6 and 12 e. 10 and 25 f. 12 and 15

4. Find the lowest common multiple for each set of numbers

a. 4 and 10 b. 6 and 9 c. 12 and 20 d. 15 and 25 e. 30 and 60 f. 12 and 16

g. 2, 3 and 5 h. 3, 4 and 5 i. 10, 15 and 20

5.

Burgers come in packs of 6. Buns come in packs of 16.
Nadine wants to buy equal amounts of hot dogs and buns.
How many packs of each should she buy?

6.

A bus leaves Durham bus station every 12 minutes.
A train leaves Durham train station every 18 minutes.
At 10am a bus and a train leave the stations at the same time.
Between 10am and 1pm, how many times do they leave together?

Factors and Primes

1. Write down all the factors of:

   a) 8 b) 12 c) 14 d) 29

   e) 15 f) 16 g) 17 h) 18

2. Which of the following are prime numbers?

   13 6 19 7 9 11 4 21 3 17

3. Joseph is thinking of a number.
   It is less than 10 and has exactly 3 factors.
   Find the two possible numbers Joseph could be thinking of.

4. What is the smallest prime number?

5. What is the smallest composite number?

6. Emily says that the bigger a number is, the more factors it will have.
   Give an example to show that Emily is wrong.

7. Which of the following have exactly 3 factors?

   25 20 13 3 49 9

8. Write down all the factors of:

   a) 24 b) 40 c) 46 d) 28

9. a) Which number, less than 20, has the most factors?
   b) List the factors of this number.

10. a) Which number, less than 40, has the most factors?
    b) List the factors of this number.

12. Write down all the prime numbers between 10 and 30.

13. Jack says that all prime numbers are odd.
    Give an example to show that Jack is wrong.

14. Is each statement true or false?

a) 8 is a factor of 12	b) 26 is a factor of 13
c) 31 is a prime number	d) 15 is a composite number
e) 2 is a factor of 3960	f) 10 has four factors
g) All positive integers have 1 as a factor	h) All prime numbers have exactly 1 factor

Goldbach's Conjecture

"Every **even number** greater than two can be written as the **sum of two prime numbers**."

4 = 2 + 2 6 = 3 + 3 8 = 3 + 5 ... *Can you keep going?*

Highest Common Factor

1. a) Write down all the factors of 18.

   b) Write down all the factors of 24.

   c) Write down all the common factors of 18 and 24.

   d) What is the highest common factor (HCF) of 18 and 24?

2. The table shows all the factors of some numbers.
   Find the highest common factor of:

   a) 70 and 72

   b) 72 and 75

   c) 72 and 84

   d) 72 and 88

   e) 75 and 88

Number	Factors
70	1, 2, 5, 7, 10, 14, 35, 70
72	1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72
75	1, 3, 5, 15, 25, 75
84	1, 2, 4, 21, 42, 84
88	1, 2, 4, 8, 11, 22, 44, 88

3. Find the highest common factor of:

   a) 8 and 12 b) 15 and 21 c) 6 and 11

   d) 24 and 32 e) 12 and 20 f) 14 and 28

   g) 30 and 45 h) 12 and 24 i) 17 and 19

4. Two numbers are chosen from the five times table.
   Harry says: "The highest common factor of the numbers must be 5."

   Give an example to show that Harry is wrong.

5. Complete each statement with a number from the box:

   a) 4 is the HCF of 12 and ___

   b) 6 is the HCF of 12 and ___

   c) 2 is the HCF of 12 and ___

   d) 1 is the HCF of 12 and ___

21	30
27	16
14	25

1. Write all the factors of each number

a. 12 b. 18 c. 45 d. 50 e. 54 f. 70 g. 128 h. 135

2.

a. Which number is a factor of all other numbers?

b. Which two numbers are factors of all even numbers?

c. Which numbers must be factors of all number with a last digit is 5?

d. Which numbers must be factors of all numbers with a last digit of 0?

e. What type of number has an odd number of factors?

3. Given the factors of a number are written in order, find the missing values

a. 1, ☐, 3, 5, ☐, ☐, 15, ☐

b. 1, 2, ☐, ☐, 22, ☐

c. 1, ☐, 4, 5, ☐, 10, ☐, ☐

d. ☐, ☐, 7, ☐, 21, ☐

e. 1, 2, 3, ☐, ☐, 6, ☐, ☐, ☐, ☐, ☐, 24, ☐, ☐, ☐, ☐

4. Write down all the common factors of the numbers

a. 15 and 25 b. 8 and 20 c. 16 and 36 d. 24 and 42 e. 16 and 48 f. 66 and 90

5. Find the highest common factor for each set of numbers

a. 10 and 35 b. 16 and 28 c. 21 and 56 d. 18 and 90 e. 12 and 54 f. 150 and 200

g. 8, 12 and 16 h. 18, 27 and 42 i. 30, 60 and 150

HCF and LCM

1. Find the HCF of:

   a) 24 and 30 b) 27 and 15 c) 32 and 21

2. Find the LCM of:

   a) 12 and 8 b) 10 and 14 c) 12 and 15

3. a) Find the HCF of 45 and 60
   b) Find the LCM of 45 and 60
   c) Multiply your answers to parts **a** and **b** together.
   d) Multiply 45 and 60.

4. a) Find the HCF of 24 and 16
   b) Find the LCM of 24 and 16
   c) Multiply your answers to parts **a** and **b** together.
   d) Multiply 24 and 16.

5. Buses following route A depart from the station every 15 minutes.
   Buses following route B depart from the station every 9 minutes.

   At 9:00am, two buses depart from the station at the same time, following the routes A and B.

   What will be the next time at which two buses following the two routes depart from the station together?

6. Simon checks his car's tyres every 6 weeks.
   Simon checks his car's oil level every 8 weeks.

   If Simon is due to check both his tyres and oil level today, how long will it be until he next needs to check both of these on the same day?

7. It is Megan's turn to do the washing up at her house every three days.
   It is Monday and it is Megan's turn to do the washing up.
   After how many days will it again be Monday and Megan's turn?

HCF and LCM

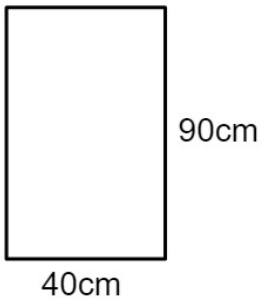
8. Stuart has two lengths of ribbon, which are 150cm and 120cm long.
He wants to cut both ribbons into smaller strips which are all the same length.

   What is the largest strip length that Stuart could cut the ribbons into?

9. Gabrielle is covering a rectangular patch of wall with square tiles. The rectangle measures 40cm by 90cm.

   Work out the largest possible length of square tile that Gabrielle could use without having to cut any tiles.

   Assume that no gaps are necessary between tiles.



10. John bought a number of apples in packs of 6.
Paul bought a number of apples in packs of 8.

    John and Paul realised that they had bought exactly the same number of apples. What is the smallest possible number of apples that each man could have bought?

11. A class of children can be arranged into either 4 equal groups, or into 7 equal groups, with no children left over.

    What is the smallest possible number of children in the class?

12. Jason is playing a drumming pattern.
He hits a bass drum every 4 beats and a cymbal every 12 beats.

    On the first beat of the pattern, Jason hits the bass drum and the cymbal together. After how many more beats will Jason play hit the bass drum and the cymbal together?

13. On a disco lighting rig, a yellow light flashes every 6 seconds and a green light flashes every 9 seconds. The lights initially flash at the same time.

    How many times in a minute will the yellow and green lights flash together?

14. Jane has 24 lollies, 60 chews and 96 chocolates. She wants to arrange the sweets into identical packets, without having any sweets left over.

    a) What is the maximum number of identical packets Jane can make?

    b) How many of each type of sweet should Jane put in each packet.

2 Sets and Venn Diagrams

Fluency Practice

A1 List {vowels}	**A2** List {the first six consonants}	**A3** List {vowels in the word 'NUMBER'}	**A4** List {consonants in the word 'MATHS'}
B1 List {vowels in the word 'ALGEBRA'}	**B2** List {consonants in the word 'SETS'}	**B3** List {letters in the word 'ISOSCELES'}	**B4** List {vowels in 'SQUARE ROOT'}
C1 List {days of the week}	**C2** List {seasons in the year}	**C3** List {colours in the rainbow}	**C4** List {countries in the United Kingdom}
D1 List {first three months of the year}	**D2** List {months of the year with four letters}	**D3** List {months of the year beginning with 'A'}	**D4** List {days of the week which contain an 'E'}
E1 Describe the following set: {spring, summer}	**E2** Describe the following set: {square, rhombus}	**E3** Describe the following set: {north, east, south, west}	**E4** Describe the following set: {orange, yellow, indigo, violet}

Set Notation

Describe these sets in words.

(a) {4, 8, 12, 16, 20, 24, 28}

(b) {1, 4, 9, 16, 25}

(c) {Europe, Asia, Africa,…}

(d) {1, 2, 3, 4, 6, 12}

List the elements of the sets:

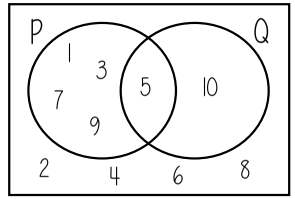
(a) Multiples of 7 less than 30

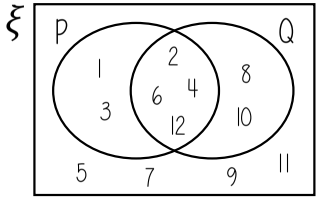
(b) Months of the year

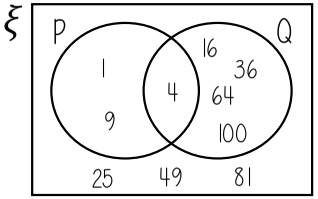
(c) Factors of 25

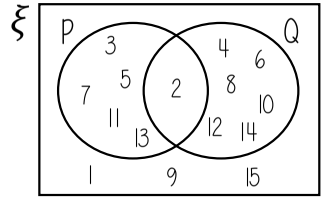
A1 List {the first six multiples of 3}	**A2** List {prime numbers less than 10}	**A3** List {all the factors of 12}	**A4** List {even numbers between 3 and 11}
B1 Describe the set: {1, 2, 3, 4, 5}	**B2** Describe the set: {1, 3, 5, 7, 9}	**B3** Describe the set: {1, 2, 3, 6, 9, 18}	**B4** Describe the set: {11, 13, 17, 19}
C1 A = {positive integers less than 5} List set A	**C2** B = {negative integers more than 6} List set B	**C3** C = {integers between 4 and 9} List set C	**C4** D = {integers between –3 and 4} List set D
D1 M = {the first five multiples of 6} List set M	**D2** F = {all the factors of 20} List set F	**D3** P = {the first six prime numbers} List set P	**D4** S = {square numbers less than 20} List set S
E1 A = {factors of 20} B = {1, 2, 5, 10, 20} Are the sets A and B the same?	**E2** C = {first five multiples of 7} D = {7, 14, 21, 27, 35} Are the sets C and D the same?	**E3** E = {prime numbers less than 20} F = {the first nine prime numbers} Are the sets E and F the same?	**E4** G = {numbers on a dice} H = {positive integers less than 7} Are the sets G and H the same?

1. For each Venn diagram, describe the sets: ξ, P and Q

a. 

b. 

c. 

d. 

2. Given the sets, can you place the members into a Venn diagram

a.
ξ = {10, 11, 12, 13, 14, 15, 16}
P = {12, 14, 16}
Q = {10, 11, 12, 16}

b.
ξ = {integers from 15 to 21, inclusive}
X = {15, 18, 21}
Y = {16, 18, 20}

c.
ξ = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
E = {even numbers}
F = {factors of 10}

d.
ξ = {a, b, c, d, e, f, g, h, i, j}
A = {a, e, i}
B = {a, c, e, g, i}

e.
ξ = {integers from 1 to 12, inclusive}
M = {multiples of 2}
N = {numbers less than or equal to 5}

Fluency Practice

Constructing Three Set Venns

Illustrate with a Venn diagram.

$$\xi = \{1\ to\ 10\ inclusive\}$$

$$A = \{1\ to\ 5\ inclusive\}$$

$$B = \{even\ numbers\}$$

$$C = \{3\ to\ 7\ inclusive\}$$

Illustrate with a Venn diagram.

$$\xi = \{1\ to\ 12\ inclusive\}$$

$$A = \{prime\ numbers\}$$

$$B = \{multiples\ of\ 6\}$$

$$C = \{multiples\ of\ 3\}$$

Illustrate with a Venn diagram.

$$\xi = \{a\ to\ j\ inclusive\}$$

$$A = \{h, i, j\}$$

$$B = \{a, c, e, g, i\}$$

$$C = \{e, f, g, h, i\}$$

Illustrate with a Venn diagram.

$$\xi = \{10\ to\ 20\ inclusive\}$$

$$A = \{multiples\ of\ 2\}$$

$$B = \{multiples\ of\ 3\}$$

$$C = \{multiples\ of\ 5\}$$

Illustrate with a Venn diagram.

$$\xi = \{1\ to\ 15\ inclusive\}$$

$$A = \{x: 3 \leq x \leq 9\}$$

$$B = \{odd\ numbers\}$$

$$C = \{7, 8, 9, 10, 11\}$$

1. On your 100 grid, highlight all the prime numbers.

2. Are the following statements *true* or *false*? Explain your answer.

a. 2 the only even prime number

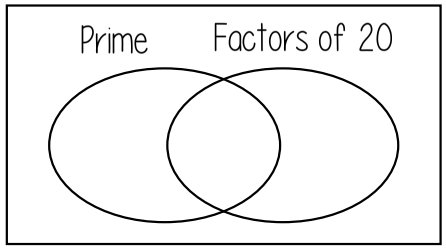
b. 1 is a prime number

b. A number can be both square and prime

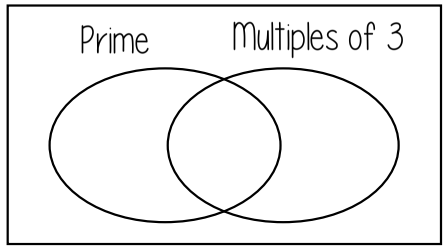
d. The sum of two prime numbers is always even

3. Copy each diagram, then place the numbers 1 to 20 into each Venn diagram.

a.



b.



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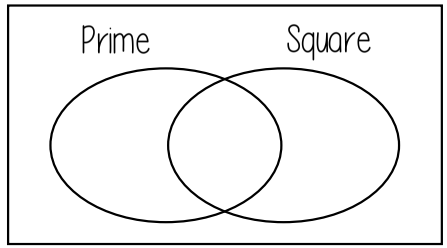


4. Find two prime numbers which have a...

a. ...sum of 8

b. ...sum of 84

c. ...difference of 6

d. ...difference of 12

e. ...sum that is a square number

f. ...product of 77

5. Use divisibility rules to decide if the following numbers are prime

a. 111 b. 157 c. 182 d. 163 e. 141 f. 129

Maths Venns

Triangle Number
Square Number
Cube Number
If you think a region is impossible to fill, convince me why!
Think of a number that could belong in each of the regions
A
B
C
D
E
F
G
H

Maths Venns

Triangle Number
Prime Number
Cube Number
If you think a region is impossible to fill, convince me why!
Think of a number that could belong in each of the regions
A
B
C
D
E
F
G
H

Maths Venns

Factor of 30
If you think a region is impossible to fill, convince me why!
More than 10
Even Number
Think of a number that could belong in each of the regions
A
B
C
D
E
F
G
H

Maths Venns

Multiple of 3
If you think a region is impossible to fill, convince me why!
Factor of 36
Square Number
Think of a number that could belong in each of the regions
A
B
C
D
E
F
G
H

Maths Venns

Factor of 40
Multiple of 5
Multiple of 4
If you think a region is impossible to fill, convince me why!
Think of a number that could belong in each of the regions
A
B
C
D
E
F
G
H

3 Negative Numbers

Fluency Practice

Question 1: Work out the answers to each of the following

(a) $2 - 3$	(b) $3 - 5$	(c) $4 - 9$	(d) $1 - 5$
(e) $5 - 7$	(f) $6 - 7$	(g) $8 - 11$	(h) $2 - 10$
(i) $-2 + 4$	(j) $-3 + 9$	(k) $-7 + 10$	(l) $-6 + 1$
(m) $-5 + 8$	(n) $-9 + 7$	(o) $-20 + 11$	(p) $-12 + 18$
(q) $-3 - 2$	(r) $-4 - 1$	(s) $-6 - 3$	(t) $-1 - 5$
(u) $-7 - 3$	(v) $-8 - 5$	(w) $-9 - 12$	(x) $-15 - 13$

Question 2: Work out the answers to each of the following

(a) $3 + 5 - 4$	(b) $2 + 1 - 6$	(c) $5 - 8 - 1$	(d) $7 - 10 + 1$
(e) $8 + 3 - 15$	(f) $5 - 6 - 4$	(g) $1 - 7 - 4$	(h) $-3 + 6 + 1$
(i) $-8 + 2 + 3$	(j) $-10 + 4 - 6$	(k) $-9 - 3 - 1$	(l) $-2 - 7 + 4$
(m) $-20 + 11 - 6$	(n) $-5 + 14 - 8$	(o) $-13 - 4 + 6$	(p) $-30 - 80 + 40$

Fluency Practice

Question 3: Work out the answers to each of the following

(a) $4 + -1$ (b) $6 + -2$ (c) $8 + -7$ (d) $3 + -5$

(e) $1 + -7$ (f) $3 + -10$ (g) $-2 + -1$ (h) $-1 + -6$

(i) $-5 + -5$ (j) $-4 + -5$ (k) $-10 + -11$ (l) $-8 + -4$

Question 4: Work out the answers to each of the following

(a) $6 - +1$ (b) $3 - +2$ (c) $8 - +4$ (d) $2 - +5$

(e) $1 - +9$ (f) $-2 - +5$ (g) $-10 - +3$ (h) $-1 - +1$

(i) $5 - +11$ (j) $-2 - +6$ (k) $-20 - +13$ (l) $15 - +25$

Question 5: Work out each of the following

(a) $1 - -2$ (b) $3 - -1$ (c) $3 - -5$ (d) $6 - -4$

(e) $9 - -2$ (f) $-1 - -4$ (g) $-2 - -1$ (h) $-8 - -3$

(i) $-5 - -9$ (j) $- 6 - -7$ (k) $-15 - -8$ (l) $-12 - -30$

Question 6: Work out each of the following

(a) $11 - 15$ (b) $-9 + 5$ (c) $-4 - 8$ (d) $-4 + -3$

(e) $-9 - +4$ (f) $10 - -3$ (g) $7 - 20$ (h) $-2 - -5$

(i) $12 + -7$ (j) $-4 - -1$ (k) $-9 + -8$ (l) $8 - 13$

(m) $6 - -11$ (n) $-7 - +7$ (o) $-6 - 5$ (p) $-20 + -3$

(q) $-9 - -15$ (r) $-8 + 25$ (s) $31 - 50$ (t) $-30 - -16$

(u) $-41 - 14$ (v) $- 5 - +23$ (w) $-16 + -15$ (x) $40 - -40$

(y) $-18 - -27$ (z) $-52 + 90$

Intelligent Practice

Calculate:

1) $5 + 3 =$

2) $3 + 5 =$

3) $(-3) + 5 =$

4) $5 + (-3) =$

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

6) $(-5) + 3 =$

7) $(-5) - 3 =$

8) $(-3) - 5 =$

9) $3 - 5 =$

10) $3 - (-5) =$

11) $-3 - (-5) =$

12) $(-5) - (-3) =$

13) $(-5.2) - (-3) =$

14) $(-5.2) + (-3) =$

15) $(-1.2) + (-3) =$

16) $(-1.2) + 3 =$

17) $(-1.2) - (-3) =$

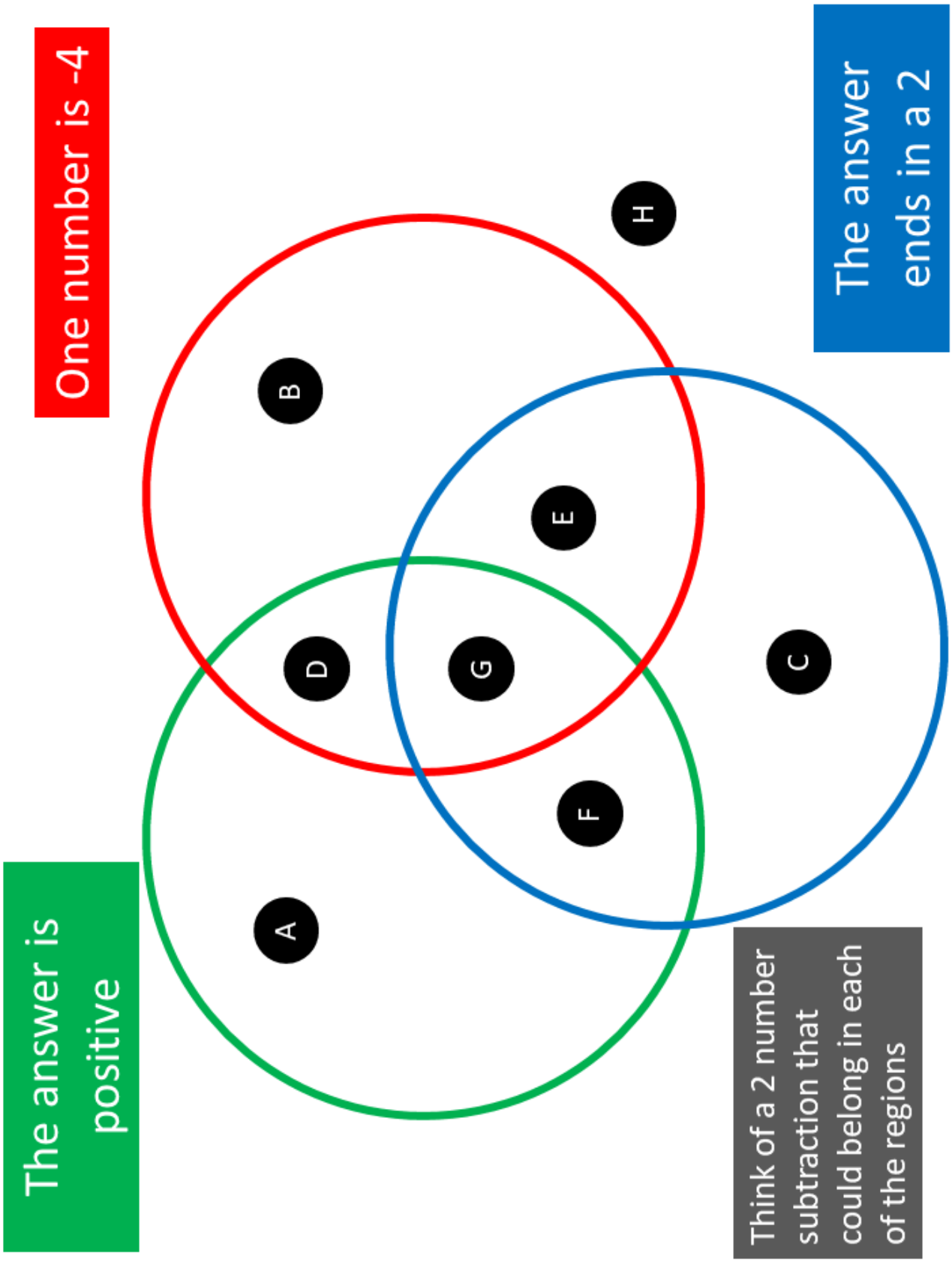
18) $(-1.2) - (-5) =$

19) $1.2 - 5 =$

Maths Venns

One number is -2
The answer ends in a 5
The answer is negative
Think of a 2 number addition sum that could belong in each of the regions
A
B
C
D
E
F
G
H

Maths Venns


One number is -4
The answer ends in a 2
The answer is positive
Think of a 2 number subtraction that could belong in each of the regions
A
B
C
D
E
F
G
H

Fluency Practice

Question 1: Answer each of the following multiplications

(a) 2×-3 (b) -4×3 (c) -5×5 (d) -7×-2

(e) -6×-3 (f) 8×-4 (g) -9×3 (h) -5×-8

(i) -9×7 (j) 10×-8 (k) 7×-4 (l) 6×8

(m) -11×3 (n) 4×-15 (o) -12×-12 (p) -5×7

(q) 9×-8 (r) -7×-8 (s) 12×-6 (t) 4×-13

(u) -11×10 (v) -20×-6 (w) 14×7 (x) -18×-13
(y) 25×-7 (z) -16×21

Question 2: Answer each of the following multiplications

(a) $2 \times 3 \times -2$ (b) $-3 \times 2 \times 5$ (c) $-5 \times -6 \times 2$ (d) $10 \times -3 \times -4$

(e) $-9 \times 2 \times -2$ (f) $-4 \times -3 \times -5$ (g) $-8 \times -8 \times -2$ (h) $5 \times -4 \times -7$

Maths Venns

One number is -1
The answer ends in a 4
The answer is negative
Think of a 2 number multiplication that could belong in each of the regions
A
B
C
D
E
F
G
H

Fluency Practice

Question 5: Answer each of the following divisions

(a) $-10 \div 2$ (b) $-12 \div 3$ (c) $-24 \div 4$ (d) $-42 \div 6$

(e) $9 \div -3$ (f) $21 \div -7$ (g) $-44 \div 11$ (h) $-72 \div 9$

(i) $-10 \div -5$ (j) $-28 \div -4$ (k) $-30 \div -3$ (l) $-48 \div -8$

(m) $-6 \div 6$ (n) $24 \div -3$ (o) $-12 \div -12$ (p) $-132 \div 11$

(q) $72 \div -8$ (r) $-108 \div -9$ (s) $36 \div -9$ (t) $100 \div -4$

(u) $-95 \div 5$ (v) $-49 \div -7$ (w) $144 \div 12$ (x) $-215 \div -5$

(y) $90 \div -15$ (z) $-342 \div 9$

Question 6: Answer each of the following divisions

(a) -9×-5 (b) $-32 \div 8$ (c) $66 \div -6$ (d) 2×-12

(e) $-24 \div -3$ (f) -12×7 (g) $-54 \div 6$ (h) -16×-2

(i) 8×-6 (j) -7×-6 (k) $40 \div -8$ (l) $56 \div -7$

(m) $-81 \div -9$ (n) -14×-5 (o) 10×-11 (p) $-65 \div 5$

(q) -90×-3 (r) $-170 \div -10$ (s) $1 \div -1$ (t) -1.5×-3

(u) $-17 \div 2$ (v) 2.2×-10 (w) $-93 \div -10$ (x) -6.2×-3

(y) -9×10.5 (z) $52 \div -5$

Intelligent Practice

Calculate:

1) $2 \times 10 =$

2) $10 \times 2 =$

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

4) $10 \times (-2) =$

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

6) $(-10) \div (-2) =$

7) $10 \div (-2) =$

8) $(-10) \div 2 =$

9) $2 \div (-10) =$

10) $2 \div 10 =$

11) $10 \times 2 \times 2 =$

12) $10 \times 2 \times (-2) =$

13) $10 \times (-2) \times (-2) =$

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

15) $(-10) \div (-2) \times (-2) =$

16) $10 \div (-2) \times (-2) =$

Maths Venns

One number is -4
The answer is a whole number
The answer is negative
Think of a 2 number division that could belong in each of the regions
A
B
C
D
E
F
G
H

Fluency Practice

1) The temperature in Nottingham on Wednesday is $-6\ ^{\circ}C$.
   On Thursday, the temperature decreases by $1\ ^{\circ}C$.
   Find the temperature in Nottingham on Thursday.

2) The temperature in Salford on Friday is $-1\ ^{\circ}C$.
   On Saturday, the temperature decreases by $2\ ^{\circ}C$.
   Find the temperature in Salford on Saturday.

3) The temperature in Sheffield on Wednesday is $-1\ ^{\circ}C$.
   On Thursday, the temperature decreases by $15\ ^{\circ}C$.
   Find the temperature in Sheffield on Thursday.

4) The temperature in Portsmouth on Tuesday is $-3\ ^{\circ}C$.
   On Wednesday, the temperature decreases by $12\ ^{\circ}C$.
   Find the temperature in Portsmouth on Wednesday.

5) The temperature in Bath on Tuesday is $-4\ ^{\circ}C$.
   On Wednesday, the temperature increases by $1\ ^{\circ}C$.
   Find the temperature in Bath on Wednesday.

Fluency Practice

1) The temperature in Norwich is $-10^{\circ}C$.
   The temperature in Leicester is $2^{\circ}C$.
   What is the difference between the temperature in Norwich and the temperature in Leicester?

2) The temperature in Brighton and Hove is $15^{\circ}C$.
   The temperature in Birmingham is $18^{\circ}C$.
   What is the difference between the temperature in Brighton and Hove and the temperature in Birmingham?

3) The temperature in Peterborough is $13^{\circ}C$.
   The temperature in Manchester is $2^{\circ}C$.
   What is the difference between the temperature in Peterborough and the temperature in Manchester?

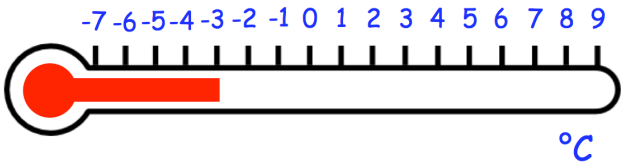
4) The temperature in Sunderland is $0^{\circ}C$.
   The temperature in Southampton is $8^{\circ}C$.
   What is the difference between the temperature in Sunderland and the temperature in Southampton?

5) The temperature in Lichfield is $3^{\circ}C$.
   The temperature in Wolverhampton is $-4^{\circ}C$.
   What is the difference between the temperature in Lichfield and the temperature in Wolverhampton?

Fluency Practice

Question 1: The thermometer below shows the temperature at 6am in a town.

(a) What temperature is shown?



The temperature increases by 5°C by 10am.

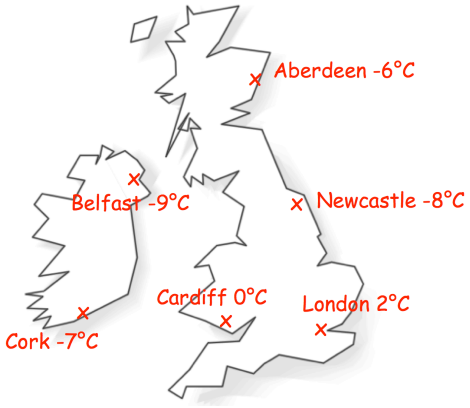
(b) What is the temperature at 10am.

Question 2: The map shows the temperatures in six cities.

(a) Which city is the warmest?

(b) Which city is the coldest?

(c) What is the difference in temperature between London and Cork?



The temperature in Berlin is 4°C colder than Belfast

(d) What is the temperature in Berlin?

Question 3: Shown is a list of locations and their elevations

Location	Elevation
Coachella	-22 metres
Bern	542 metres
Jericho	-258 metres
Baku	-28 metres
Lake Eyre	-16 metres
Tokyo	17 metres

(a) List the locations that are below sea level, 0 metres.

(b) Which location has the lowest elevation?

(c) Which location has the highest elevation?

(d) Work out the difference in Baku's and Tokyo's elevations

Question 4: At 3am the temperature is −8°C.
By 1pm the temperature went up by 13°C.
From 1pm to 10pm the temperature went down by 6°C

Work out the temperature at 10pm.

Fluency Practice

Question 5: The table below shows some information about the minimum and maximum temperature for a day in January.

City	Minimum °C	Maximum °C
Glasgow	-6°C	9°C
Bristol	4°C	14°C
Norwich	-7°C	7°C
Hull	-1°C	10°C
Derby	5°C	11°C
Lisburn		-2°C

The minimum temperature in Lisburn is 1°C colder than its maximum temperature.

(a) What was Lisburn's minimum temperature?

(b) Which city had the lowest minimum temperature?

(c) Which city had the greatest maximum temperature?

(d) Which city had the greatest difference between their minimum and maximum temperatures?

Question 6: Dominic's bank account balance is £23.
He withdraws £50 from his bank account.
What is his new bank account balance?

Question 7: Daisy's bank account balance is −£100.
Daisy deposits £35 into the bank account.
What is her new bank account balance?

Question 8: The table shows the melting points of some elements

Element	Melting Point
Bromine	-7°C
Caesium	29°C
Mercury	-39°C
Nitrogen	-210°C
Phosphorus	44°C
Silicon	1414°C

(a) Which element has the lowest melting point?

(b) Work out the difference in melting points of bromine and mercury

(c) Work out the difference in melting points of nitrogen and silicon

The temperature is −10°C

(d) Which of the elements are solid?

Question 9: Ballymena Rovers started a football season on −14 points
Each win is worth 3 points.
Each draw is worth 1 point
Each loss is worth 0 points.
Over the season, Ballymena Rovers won 15 matches, drew 3 matches and lost 2.

How many points did they finish with at the end of the season?

Question 10: Tristan is taking part in a maths competition.
Each correct answer is worth 5 points and each incorrect answer is worth −3
If Tristan chooses not to answer a question, it is worth 0 points.
There are 10 questions in total.

(a) What would Tristan's final score be if he answered 5 correctly, 4 incorrectly and left 1 blank?

(b) Can Tristan finish with −10 points? Explain your answer.

Practical Negative Numbers

The average January temperatures in ℃ of some cities across the world are shown below.

Seoul	-2
Tokyo	+5
New York	+1
Edinburgh	+4
Toronto	-4
Moscow	-16

(a) Which city has the lowest average January temperature?

(b) Which city's temperature is closest to -8℃?

(c) What is the difference between the temperature in Moscow and the temperature in Tokyo?

(d) What temperature is halfway between the temperature in Seoul and the temperature in Edinburgh?

(e) Order the cities by their temperature, lowest to highest.

The scores of some golfers who played in the British Open golf tournament in 2021 are shown below.

Tommy Fleetwood	-2
Jordan Speith	-13
Sergio Garcia	-4
Ryan Fox	+6
Collin Morikawa	-15
Justin Rose	+3

(f) Which player scored the lowest (best) score?

(g) Which player's score was closest to zero?

(h) What is the difference between the scores of Sergio Garcia and Justin Rose?

(i) What score would be halfway between Tommy Fleetwod and Justin Rose's scores?

(j) Order the players by their scores, lowest (best) to highest (worst).

Fluency Practice

Work out:

(a) $1 - 3$ (b) $4 - 9$

(c) $-5 + 6$ (d) $-6 + 8$

(e) $-2 - 3$ (f) $2.5 - 6$

Work out:

(a) $10 + -3$ (b) $7 - +6$

(c) $-4 + -2$ (d) $-6 - +3$

(e) $3 + +7$ (f) $-4.6 + -4$

Work out:

(a) $6 - -4$ (b) $+8 - -1$

(c) $-1 - -5$ (d) $-3 - -9$

(e) $3.5 - -2$ (f) $-0.5 - -4.5$

Work out:

(a) 2×-4 (b) -7×3

(c) $-5 \times +6$ (d) $+2 \times -9$

(e) -6×-3 (f) 7×-7

(g) -4×-5 (h) $+2 \times -0.5$

(i) -3×-3 (j) $(-3)^2$

Work out:

(a) $8 \div -2$ (b) $-9 \div 3$

(c) $-25 \div +5$ (d) $+12 \div -4$

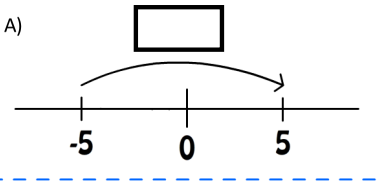
(e) $-30 \div -3$ (f) $+10 \div +2$

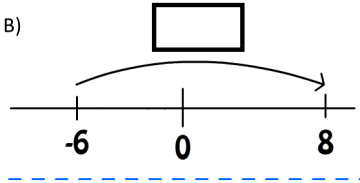
(g) $-7 \div -1$ (h) $-20 \div -2.5$

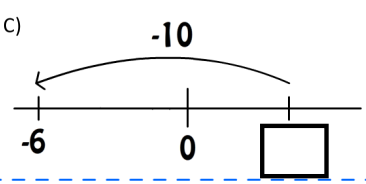
Number Line Journeys

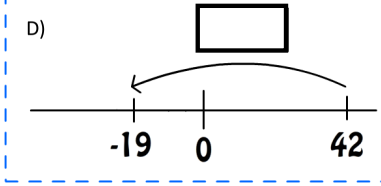
Number Line Journeys

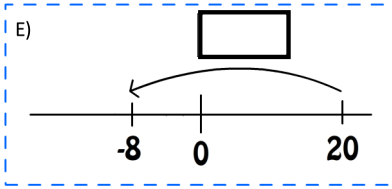
Determine the missing numbers to complete these number line journeys:

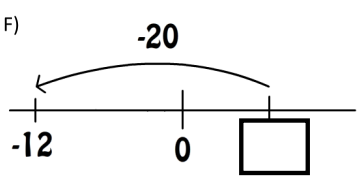
A) 

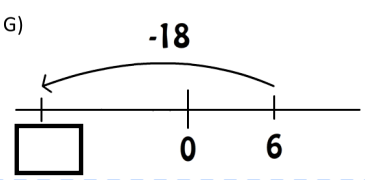
B) 

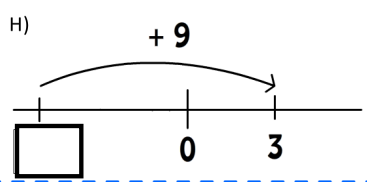
C) 

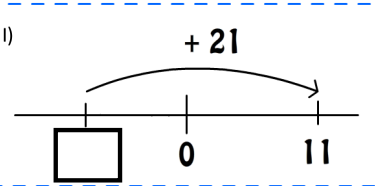
D) 

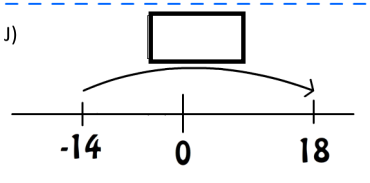
E) 

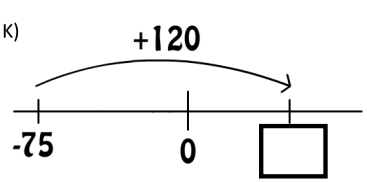
F) 

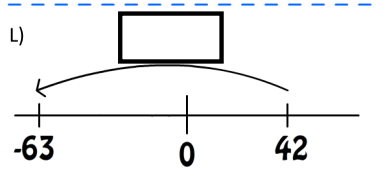
G) 

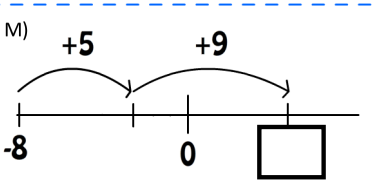
H) 

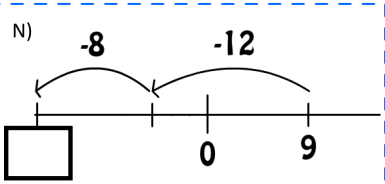
I) 

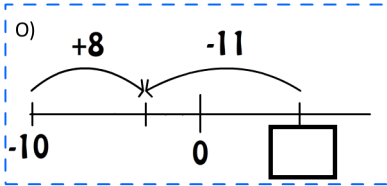
J) 

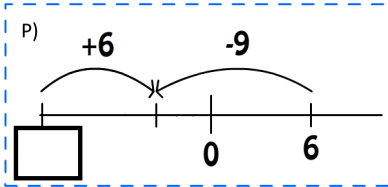
K) 

L) 

M) 

N) 

O) 

P) 

Q) 7 - 15 = ☐

S) 8 - 20 = ☐

U) -10 + 3 = ☐

W) 22 - 26 = ☐

R) -3 + 10 = ☐

T) -6 - 4 = ☐

V) -6 + 15 = ☐

X) -52 + 18 = ☐

Negative Numbers Code Breaker!

Calculate the answer to these sums.
The answer will then give you a letter in the code box.
Write it in the yellow box. The letters spell a secret message – can you crack it?

a. 5 - 10 gives ..... -5 | K

b. -5 + 20 gives ……..

c. -5 - -20 gives ……..

d. -6 + 9 gives ……..

e. -4 + -2 gives ……..

f. -10 + 20 gives ……..

g. 3 - - 3 gives ……..

h. -4 - - 12 gives ……..

i. 5 - - 5 gives ……..

j. -1 + -1 gives ……..

k. -2 + 2 gives ……..

l. -5 - - 5 gives ……..

m. 15 + -2 gives ……..

n. 5 -6 gives ……..

o. -7 + 5 gives ……..

p. -10 + 5 gives ……..

q. -5 + -6 gives ……..

r. 5 - - 10 gives ……..

Code Box

-12 = K	-5 = K	2 = J	9 = B
-11 = T	-4 = S	3 = P	10 = A
-10 = L	-3 = !	4 = F	11 = ?
-9 = U	-2 = N	5 = Q	12 = U
-8 = I	-1 = I	6 = L	13 = R
-7 = O	0 = D	7 = Z	14 = W
-6 = C	1 = Y	8 = M	15 = E

s. -2 + 12 gives ……..

t. 2 + -5 gives ……..

Negative Numbers Code Breaker

Addition and Subtraction Puzzles

1. ***Warm up***

a) 2 + -3 = ☐ b) -3 + -1 = ☐ c) -4 + 3 = ☐

d) -1 - -4 = ☐ e) -1 - 4 = ☐ f) 3 - -7 = ☐

g) -4 + -2 = ☐ h) 1 + -1 = ☐ i) -6 - 3 = ☐

2. ***Number pyramids*** *Each pair of side-by-side numbers add to give the number above.*

a)

3	-2	-4

b)

	-7	
	-4	5

c)

	0	
	-3	
		2

3. ***Two-way puzzles*** *Write numbers in the boxes to make the calculations work both across and down.*

a)

-5	+	2	=
+		+	
-3	+	-1	=
=		=	

b)

5	-	-3	=
+		-	
-6	+	-2	=
=		=	

c)

-4	+	-3	=
-		+	
-4	-	-3	=
=		=	

4. ***Missing signs*** *Write an addition (+) or subtraction (-) symbol in the boxes to make the calculations correct.*

a) 3 ☐ -5 = -2 b) -3 ☐ 3 = -6 c) 4 ☐ -4 = 0

d) -4 ☐ 1 = -3 e) -1 ☐ -8 = 7 f) -2 ☐ -2 = -4

g) 2 ☐ -3 = 5 h) -7 ☐ 6 = -1 i) 0 ☐ -5 = -5

5. ***Magic Squares*** *Complete the grid so that every row, column and the two diagonals add up to the same magic number.*

a)

1	-4	-3
		2
-1		

Magic number: .....

b)

-2		-4
	-1	
2		

Magic number: .....

c)

-5		
2		-6
-3		

Magic number: .....

Addition and Subtraction Puzzles

6. ***Missing numbers***

a) 2 + ☐ = -3 b) 3 - ☐ = 7 c) -3 + ☐ = 4

d) -1 - ☐ = 0 e) -4 + ☐ = -5 f) 0 + ☐ = -4

g) 6 - ☐ = 9 h) -1 - ☐ = 1 i) 4 - ☐ = -2

7. ***Chains***

a) 6 → -10 → ☐ → + -3 → ☐ → - -6 → ☐

b) ☐ → -5 → **-3** → +2 → ☐ → + -4 → ☐

c) ☐ → + -4 → ☐ → - -1 → **-5** → +9 → ☐

8. ***Two-way puzzles*** *Write numbers in the boxes to make the calculations work both across and down.*

a)

-2	+	☐	= -7
+		+	
☐	+	-3	= ☐
=		=	
-1		☐	

b)

-2	-	-6	= ☐
+		+	
☐	-	☐	= ☐
=		=	
-4		-3	

c)

☐	-	-8	= 4
-		+	
☐	-	☐	= 10
=		=	
☐		-2	

9. ***Arrange the numbers***

a)

☐ + ☐ = -2

☐ - ☐ = 10

☐ + ☐ = 2

-6 -4 -4 4 6 6

b)

☐ - ☐ = 0

☐ + ☐ = -5

☐ - ☐ = -3

-4 -3 -3 -1 2 5

c)

☐ - ☐ = -3

☐ - ☐ = -2

☐ - ☐ = -1

-3 -2 -1 -1 1 2

d)

☐ + ☐ = -9

☐ - ☐ = 3

☐ + ☐ = -5

-1 -2 -3 -4 -5 -6

Always, Sometimes, Never True?

Adding a negative number is the same as subtracting	A calculation involving adding always gives you a positive answer
Two negatives make a positive	Two positives make a positive
Subtraction always leaves you with a negative number	A positive and a negative is a negative
Subtracting a negative number is the same as adding	A negative and a positive is a negative

Adding and Subtracting with Negative Numbers

A

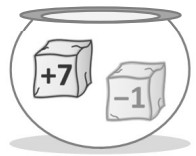
total = +4

now add +2

=

B

total =

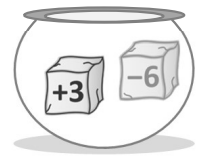


now add −2

=

C

total =

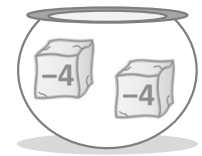


now add +2

=

D

total =

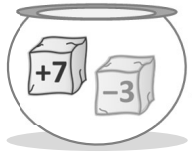


now add −2

=

E

=

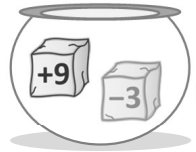


now subtract +7

=

F

=

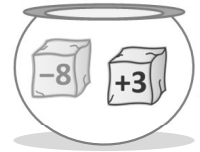


now subtract −3

=

G

=

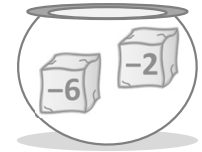


now subtract +3

=

H

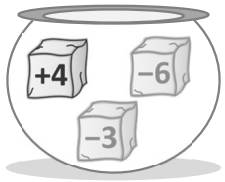
=



now subtract −6

=

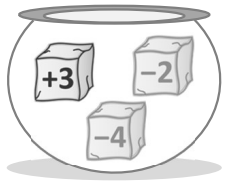
I



now add −1

=

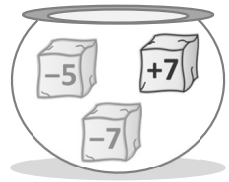
J



now subtract −4

=

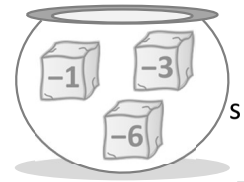
K



now add +8

=

L



now subtract −6

=

M

(+6) − (+2) =

N

(+2) − (+4) =

O

(−2) + (+5) =

P

(−2) + (−3) =

Q

6 + (−9) =

R

5 − (−3) =

S

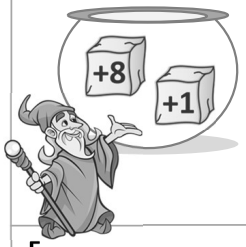
(−2) − (+7) =

T

(−8) − (−2) =

Adding and Subtracting with Negative Numbers

A

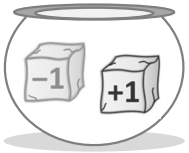


total = +9

now add −2

= ____

B

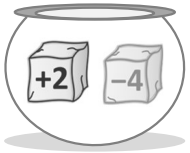


total = ____

now add −2

= ____

C

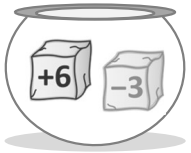


total = ____

now add +5

= ____

D



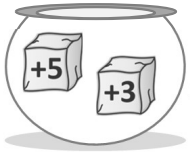
total = ____

now add −4

= ____

E

= ____

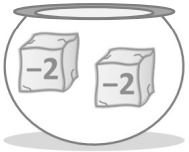


now subtract +3

= ____

F

= ____

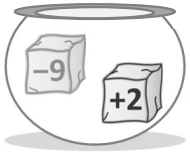


now subtract −2

= ____

G

= ____

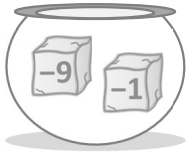


now subtract +2

= ____

H

= ____

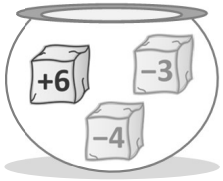


now subtract −1

= ____

I

____

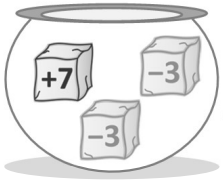


now add −2

= ____

J

____

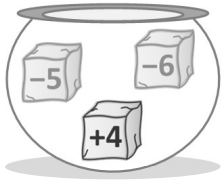


now subtract −3

= ____

K

____

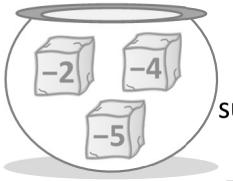


now add +9

= ____

L

____



now subtract −4

= ____

M (+4) − (+6) =

N (+8) − (+2) =

O (−6) + (+8) =

P (−4) + (−7) =

Q 5 + (−5) =

R 3 − (−7) =

S (−3) − (+3) =

T (−5) − (−8) =

Adding and Subtracting with Negative Numbers

A

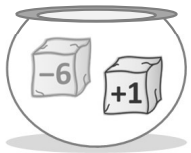
total = +4

now add −3

=

B

total =

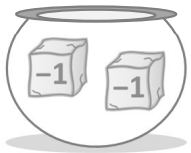


now add −3

=

C

total =

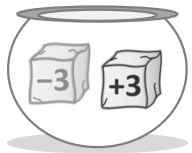


now add +8

=

D

total =

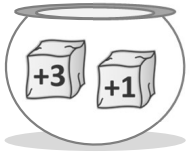


now add −9

=

E

=

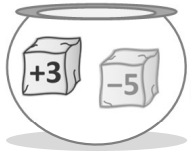


now subtract +1

=

F

=

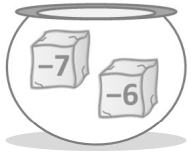


now subtract −5

=

G

=

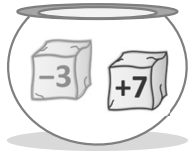


now subtract −6

=

H

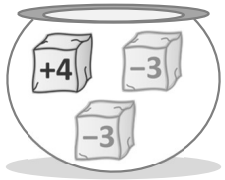
=



now subtract +7

=

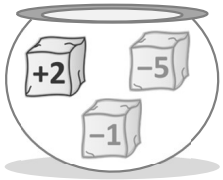
I



now add +7

=

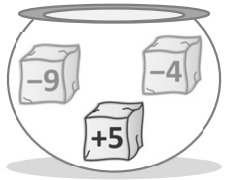
J



now subtract −5

=

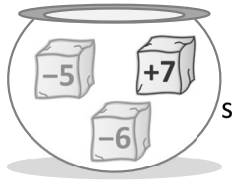
K



now add +3

=

L



now subtract −5

=

M

(+8) − (+2) =

N

(+4) − (+9) =

O

(−8) + (+3) =

P

(−2) + (−2) =

Q

3 + (−9) =

R

2 − (−5) =

S

(−6) − (+7) =

T

(−2) − (−9) =

negative numbers magic squares

Complete each of these magic squares so that each row, column and diagonal adds up to the same total.

-4		0
3	-1	
-2		2

-1		-3
	0	2
3		1

		-1
2	0	
1	-4	

-3		
	-2	0
1		-1

-6		
-7	-5	-3
		-4

		-7
		-2
-1		-3

0	5	-2
4		

-4		
	-1	
	-3	2

		-4
	-1	1
2		

		2
5	1	
0		

-7		
-3	-8	-1

0	-7	
-5		
-4		

think! can you work out the missing numbers?

a + 6 + 3 = 7	2 + b + 4 = 1	3 + 6 + c = 4	1 + d + 5 = 2	e + 9 + 1 = 0	f + 4 + -3 = 2
8 + g + 2 = 5	-3 + 5 + 2 = h	i + 3 = -1	j + 2 + 6 = -4	2 + k = -1	4 + -1 = L
m + -3 = -5	n + -1 = 4	o + 2 + -3 = 1	3 - p = -2	7 - q = 9	2 - r = 4

Magic Squares

MAGIC Squares

In each square, the rows, columns and diagonals all total the same MAGIC number! Can you complete the squares?

A

1	0	5
		−2

MAGIC No. = 6

B

−3		
	1	−2
		5

MAGIC No. =

C

−6	−1	4
3		

MAGIC No. =

D

−7		
−4	3	

MAGIC No. = −9

E

−6		
	−5	
	−1	

MAGIC No. = −15

F

		−3
		−5
1		

MAGIC No. = −3

1

G

			4
−4		1	−1
0			
−5	5	6	−8

MAGIC No. =

H

−18	−3		18
	−9	3	−24
	−12		−21

MAGIC No. = −18

Magic Squares

11		
	4	16
		– 3

		8
	1	
– 6	2	

– 1		
30	6	
		13

complete the magic squares so they have the same row, column and diagonal totals

	9	
	1	
– 1	– 7	

	20	– 9
	1	
11		

		– 3
	1	
5		8

explore the relationship for the sum of the four corner numbers with a 1 in the centre

– 6		
	– 1	
	– 2	4

– 6		
	– 2	
8		2

– 7		
	– 3	
	– 8	1

		2
– 10	6	– 8

– 2		
	– 5	
– 1		– 8

		– 3
– 17	6	– 19

Number Pyramids

Number Pyramids

1

Each brick is the two bricks below it added together.

A)

	4	
−5	6	−2

B)

−4	−2	4

C)

	−9	
−3		8

D)

	2	−5
	−3	

E)

		−4	
	−12		
		7	
−5		9	

F)

		4	
			−6
−6			−12

G)

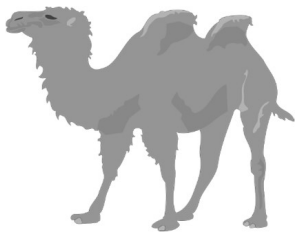
		−9	
		−1	
−6	3	−8	

H)

		2		
		7		
			1	
				−5
−3				−3

I)

	−3		2	
		−2		
	5			−6

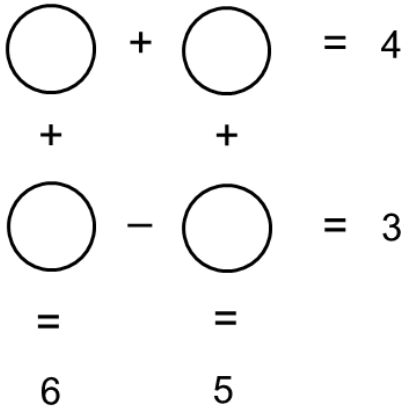


Puzzle Square

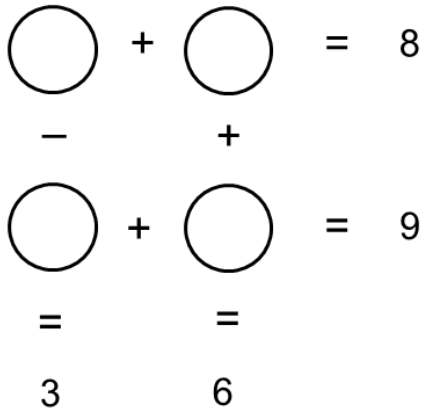
find numbers to fit the puzzles (a) (one minus)

read subtractions as (left – right) or (top – bottom)

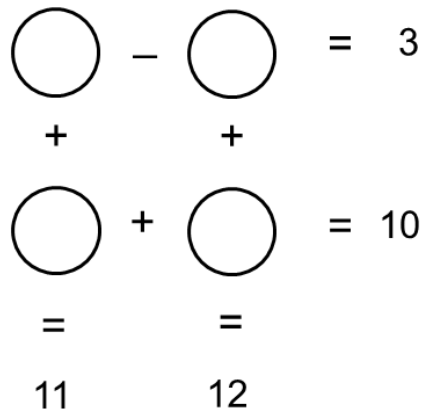
(1)



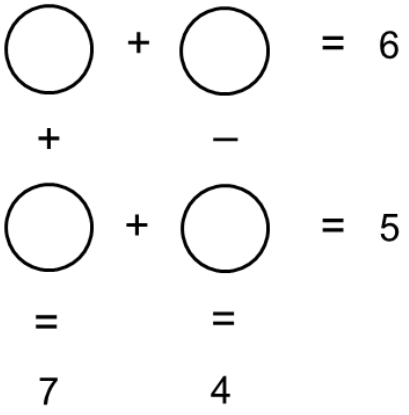
(2)



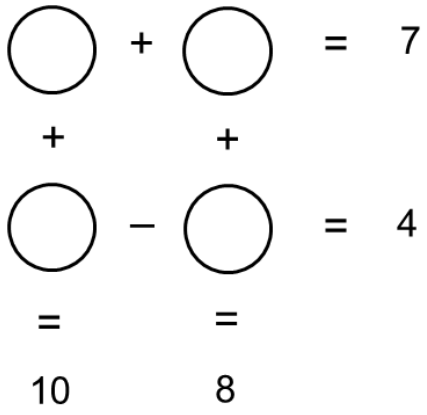
(3)



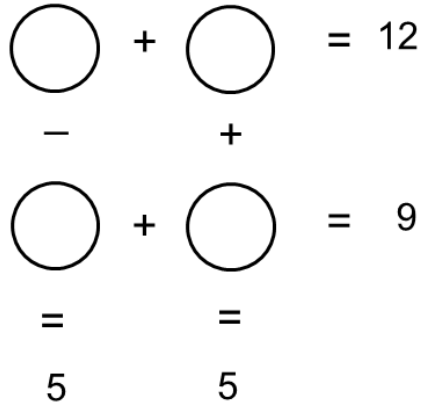
(4)



(5)



(6)



find numbers to fit the puzzles (b)

read subtractions as (left – right) or (top – bottom)

(1)

◯	+	◯	= 4
+		+	
◯	–	◯	= 3
=		=	
14		3	

(2)

◯	+	◯	= 4
–		+	
◯	+	◯	= 9
=		=	
2		1	

(3)

◯	–	◯	= 2
+		+	
◯	+	◯	= – 8
=		=	
3		– 3	

(4)

◯	+	◯	= 3
+		–	
◯	+	◯	= 2
=		=	
1		10	

(5)

◯	+	◯	= 4
+		+	
◯	–	◯	= 12
=		=	
5		3	

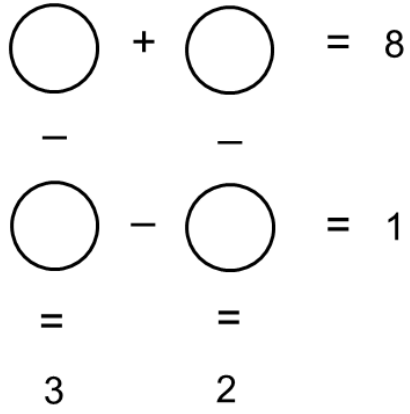
(6)

◯	+	◯	= 4
–		+	
◯	+	◯	= 1
=		=	
13		3	

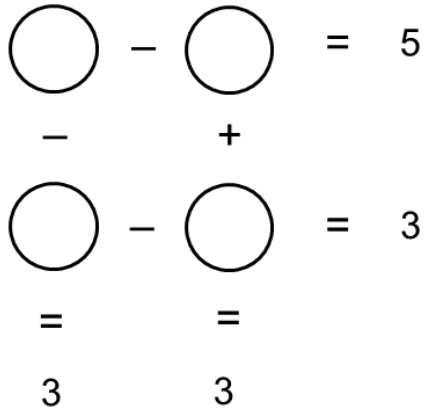
find numbers to fit the puzzles (c) (three minuses)

read subtractions as (left – right) or (top – bottom)

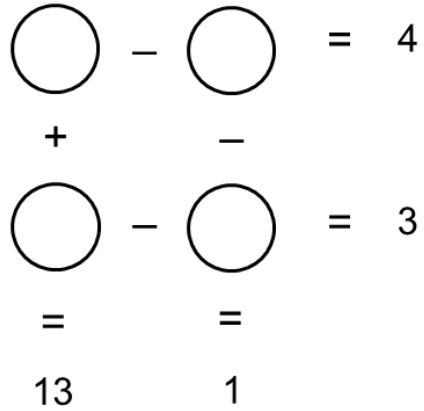
(1)



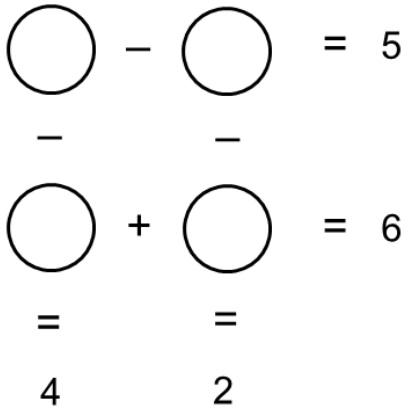
(2)



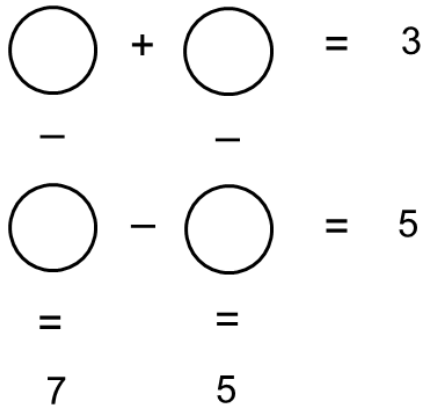
(3)



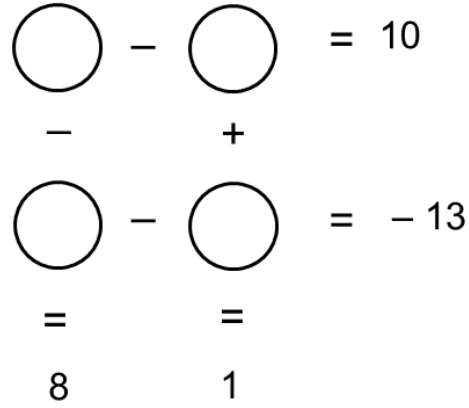
(4)



(5)



(6)



Multiplication and Division Puzzles

1. ***Warm up***

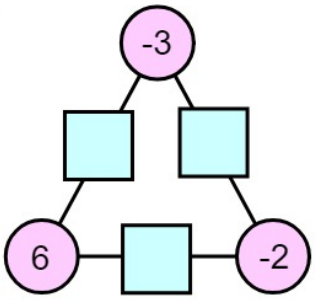
a) $4 \times -7 =$ ☐ b) $-3 \times -1 =$ ☐ c) $-20 \div 4 =$ ☐

d) $15 \div -5 =$ ☐ e) $-9 \times -9 =$ ☐ f) $42 \div -6 =$ ☐

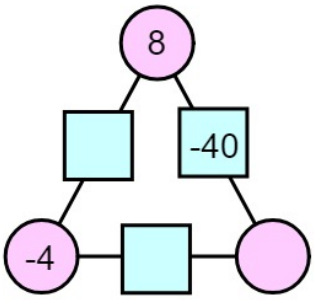
g) $-12 \times 4 =$ ☐ h) $-4 \times 0 =$ ☐ i) $-8 \div -4 =$ ☐

2. ***Multiplication Arithmagons 1*** *The numbers in the circles multiply to make the numbers in the squares between them.*

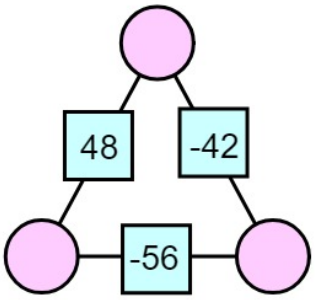
a)



b)



c)



3. ***Two-way puzzles*** *Write numbers in the boxes to make the calculations work both across and down.*

a)

-6	×	4	=
×		×	
-5	×	-8	=
=		=	

b)

-7	×	-9	=
×		÷	
6	÷	-3	=
=		=	

c)

12	÷	-4	=
×		×	
-8	÷	-1	=
=		=	

d)

-4	×		= 16
×		÷	
	×	-2	=
=		=	
12			

e)

-6	÷	2	=
×		×	
	÷		=
=		=	
-48		-8	

f)

	÷	-3	= 8
÷		×	
	÷		= -12
=		=	
		6	

4. ***Function machine chains***

a) **-12** → × 8 → ÷ -2 → ☐

b) **9** → × -6 → ÷ -3 → ☐

c) **-9** → × 8 → ÷ -3 → ☐

d) **72** → ÷ -3 → ÷ 4 → ☐

Multiplication and Division Puzzles

5. ***Missing numbers***

a) $4 \times \square = -36$ b) $-6 \div \square = 6$ c) $-5 \times \square = -20$

d) $-8 \div \square = -2$ e) $-7 \times \square = 63$ f) $4 \div \square = -0.4$

g) $-9 \times \square = 81$ h) $-1 \div \square = -1$ i) $-6 \times \square = -12$

6. ***Arrange the numbers 1***

a)

$2 \times \square = -4 \times \square$

$-4 \times \square = 12 \times \square$

$12 \times \square = -3 \times \square$

-6	12	-3	-6	24	9

b)

$4 \times \square = 40 \div \square$

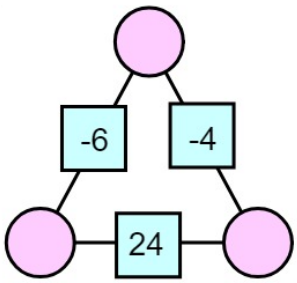
$-3 \times \square = 60 \div \square$

$-5 \times \square = 80 \div \square$

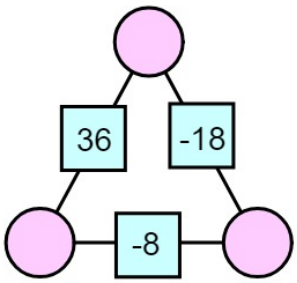
-8	-5	-4	-2	2	5

7. ***Multiplication Arithmagons 2*** *The numbers in the circles multiply to make the numbers in the squares between them.*

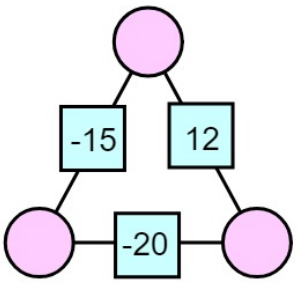
a)



b)



c)



8. ***Arrange the numbers 2***

a)

$\square \times \square = 12$

$\square \times \square = -12$

$\square \times \square = 5$

-1	-2	-3	-4	-5	6

b)

$\square \div \square = -2$

$\square \times \square = 18$

$\square \times \square = -24$

-12	-8	-6	-3	2	4

c)

$\square \div \square = 4$

$\square \div \square = -3$

$\square \div \square = 2$

-24	-18	-12	-9	-3	8

d)

$\square \div \square = -2$

$\square \times \square = -24$

$\square \div \square = 2$

-6	-6	-4	-3	4	8

Product Tables

(1)

×	4	2
3		
2		

(2)

×	5	1
1		
4		

(3)

×	0	6
2		
3		

(4)

×	2	4
7		
– 2		

(5)

×	8	– 2
5		
0		

(6)

×	10	– 4
2		
3		

(7)

×	3	3
– 2		
7		

(8)

×	8	– 2
10		
– 5		

(9)

×	10	– 4
10		
– 5		

(10)

×	9	– 3
8		
– 3		

(11)

×	11	– 5
11		
– 6		

(12)

×	15	– 9
12		
– 7		

Multiplication Gridz

Multiplication GRIDZ

A

×	1	−2	3	−4
2			6	−8
−3	−3			12
−5				

B

×	4			−5	−6
−2		6		10	
7	28	−21	14		
				25	30
	16		8		

C

×	−8	−1			−12	7	−4
6				54	−72		−24
	32						
						49	
−9	72			−81	108		
	40		−15	−45			20

Reverse Multiplication Grids

×		
	24	−18
	8	−6

Use: $-6, -4, -2, 3$

×		
	−27	12
	−45	20

Use: $-9, 3, 4, 5$

×		
	48	−56
	−72	84

Use: $-12, -7, 6, 8$

×			
	15	−24	−27
	30	−48	−54
	−40	64	72

Use: $-9, -8, -8, 3, 5, 6$

×			
	−36	8	48
	−63	14	84
	27	−6	−36

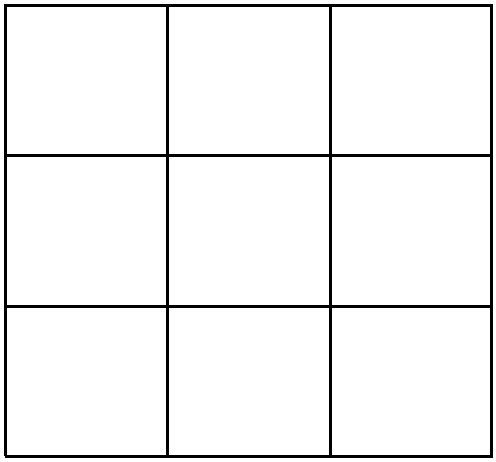
Use: $-12, -7, -4, -2, 3, 9$

×						
	36	−15	6	27	−12	−21
	−96	40	−16	−72	32	56
	96	−40	16	72	−32	−56
	−72	30	−12	−54	24	42
	84	−35	14	63	−28	−49

Use:
$-12, -9, -8, -7,$
$-3, -2, 4, 5,$
$6, 7, 8$

Directed Numbers Puzzle

Use these clues to work out the numbers in the grid.

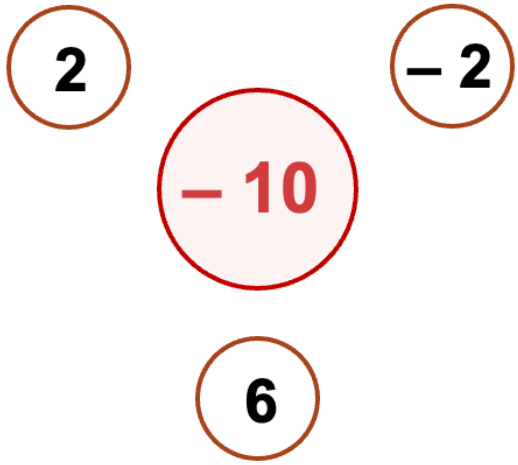


Clues

1. The number in the centre equals - 5 - 3
2. The number that goes in the top right box is 5 less than -5
3. The number in the bottom left is −3 × −3
4. The number in the top left is the number in the centre add −3 × −1
5. The number in the middle of the bottom row is 6 less than the number above it.
6. There is a number 6 in one of the middle row boxes.
7. There is a number equal to −4 × −5 next to the box containing −5
8. When you add up the right hand column you get −27
9. The number below −5 is -6 - 10

Directed Target

using the three given numbers try to make the target of **– 10**



use any of the operations:

can you make the target given?
you must use *all* three numbers and any of: – , + , ×

target: – 5 using 1 , 3 , – 2

target: – 5 using 1 , 2 , – 3

target: – 13 using 2 , 3 , – 5

target: – 17 using 3 , 5, – 4

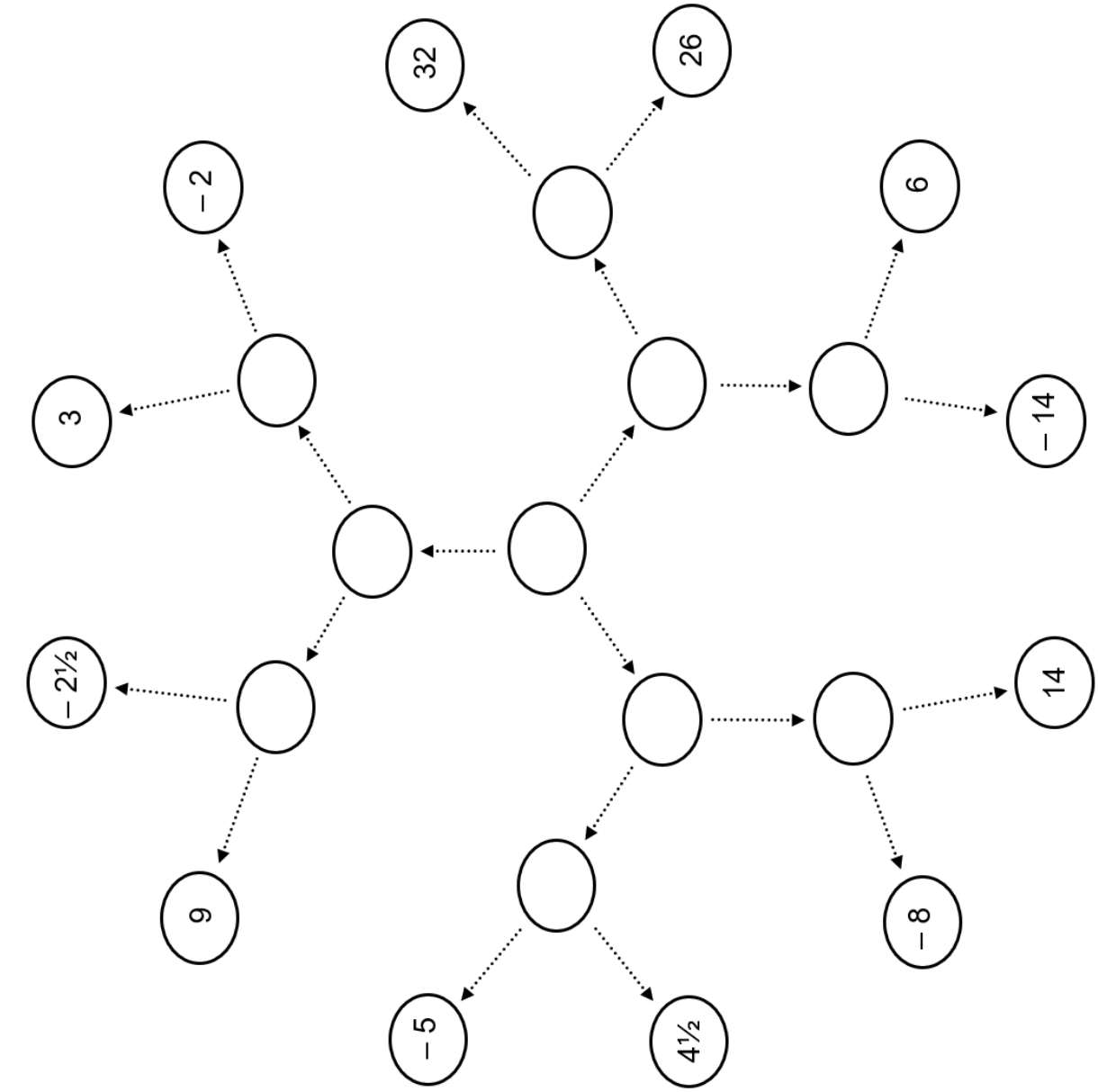
target: – 37 using 5 , 7 , – 6

try to find two (or more) solutions to each of these

what other *negative* integer targets can be reached?

Smaller Radiating Directed Numbers

(1)



steps allowed:

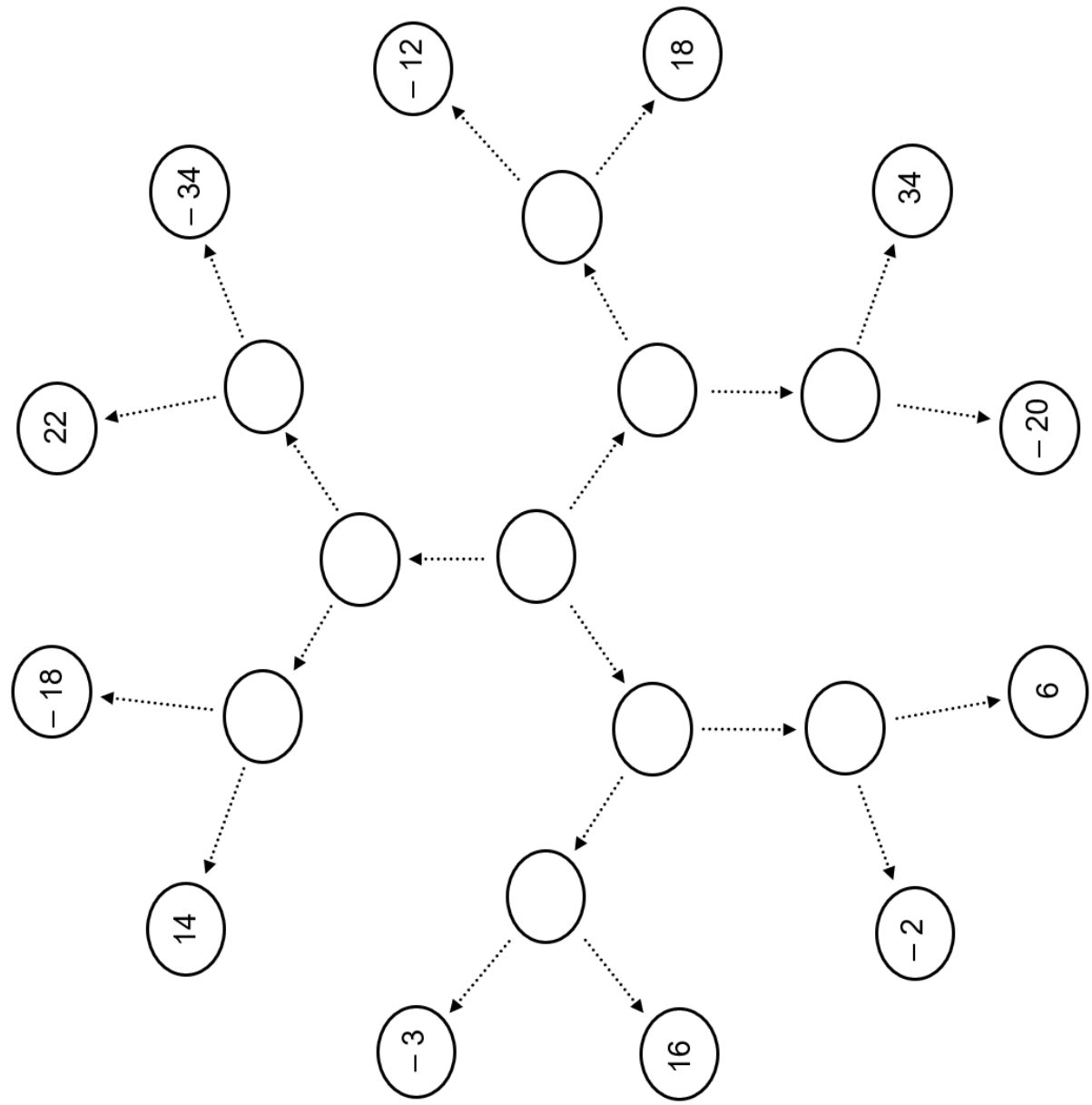
+ 4

– 2

÷ – 2

Smaller Radiating Directed Numbers

(2)



steps allowed:

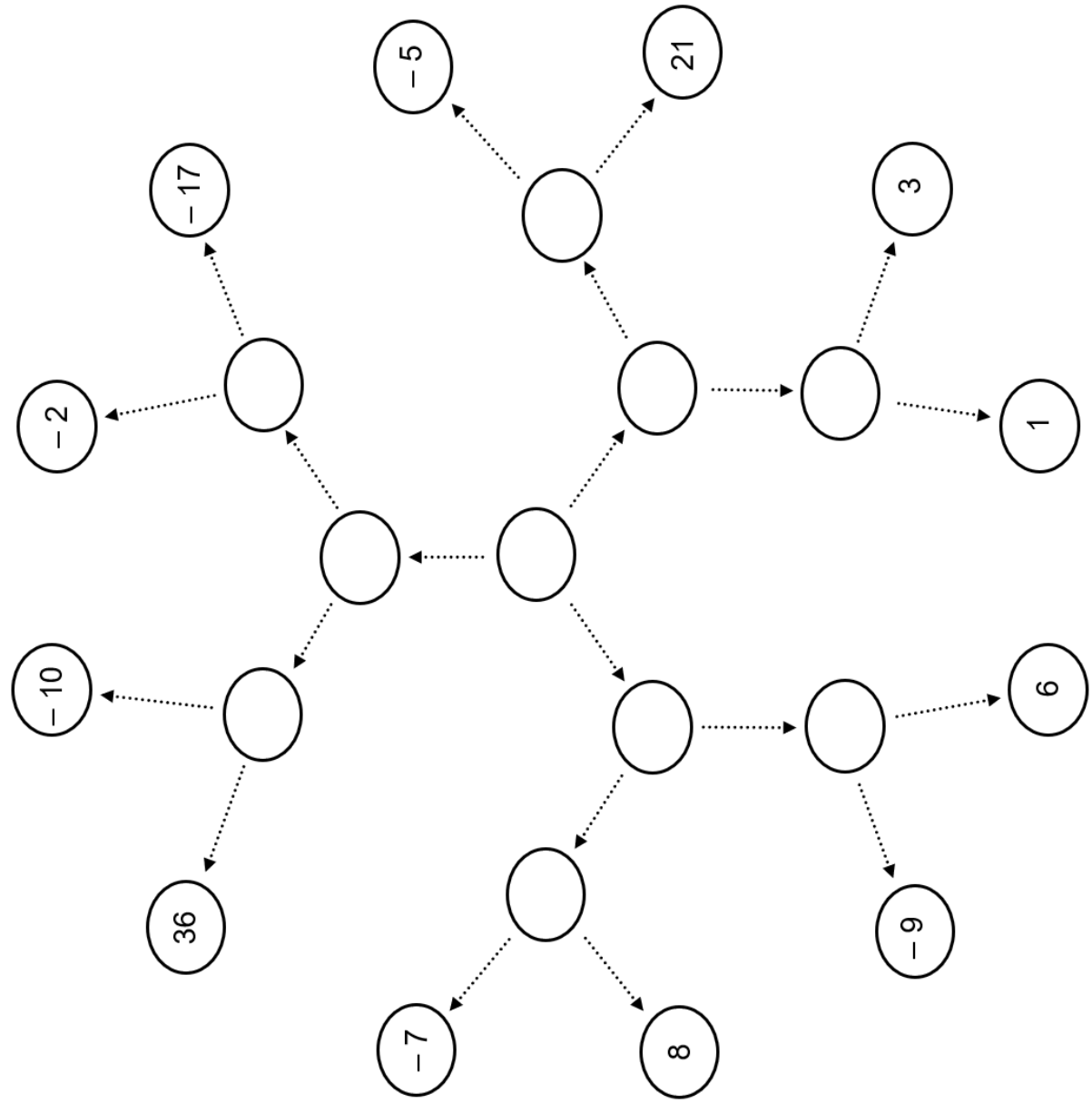
+ 5

– 3

× – 2

Smaller Radiating Directed Numbers

(3)



steps allowed:

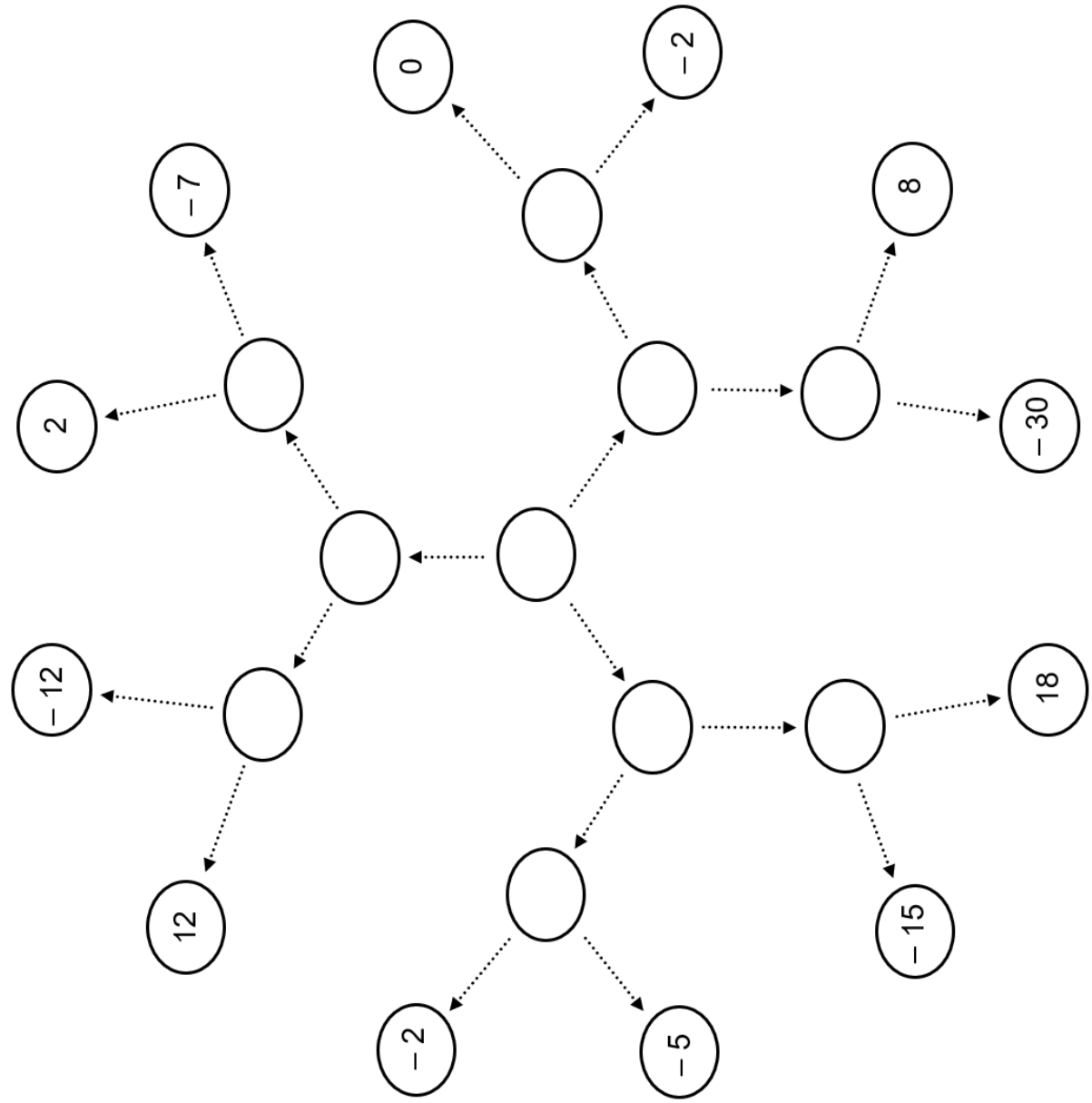
+ 6

– 9

÷ – 3

Smaller Radiating Directed Numbers

(4)



steps allowed:

– 6

× – 2

÷ – 3

Radiating Directed Numbers

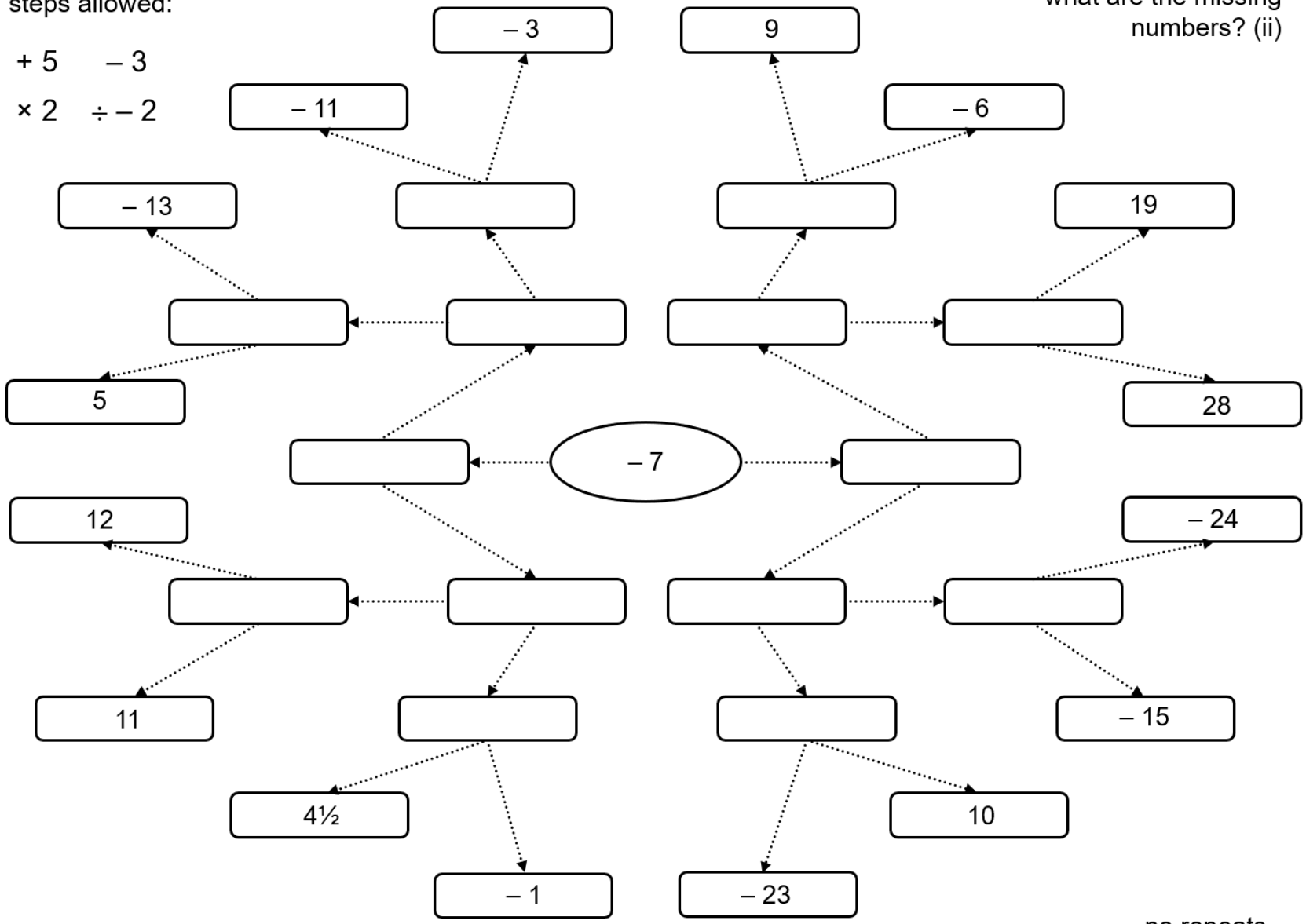
Radiating Directed Numbers

what are the missing numbers? (ii)

steps allowed:

+ 5 – 3

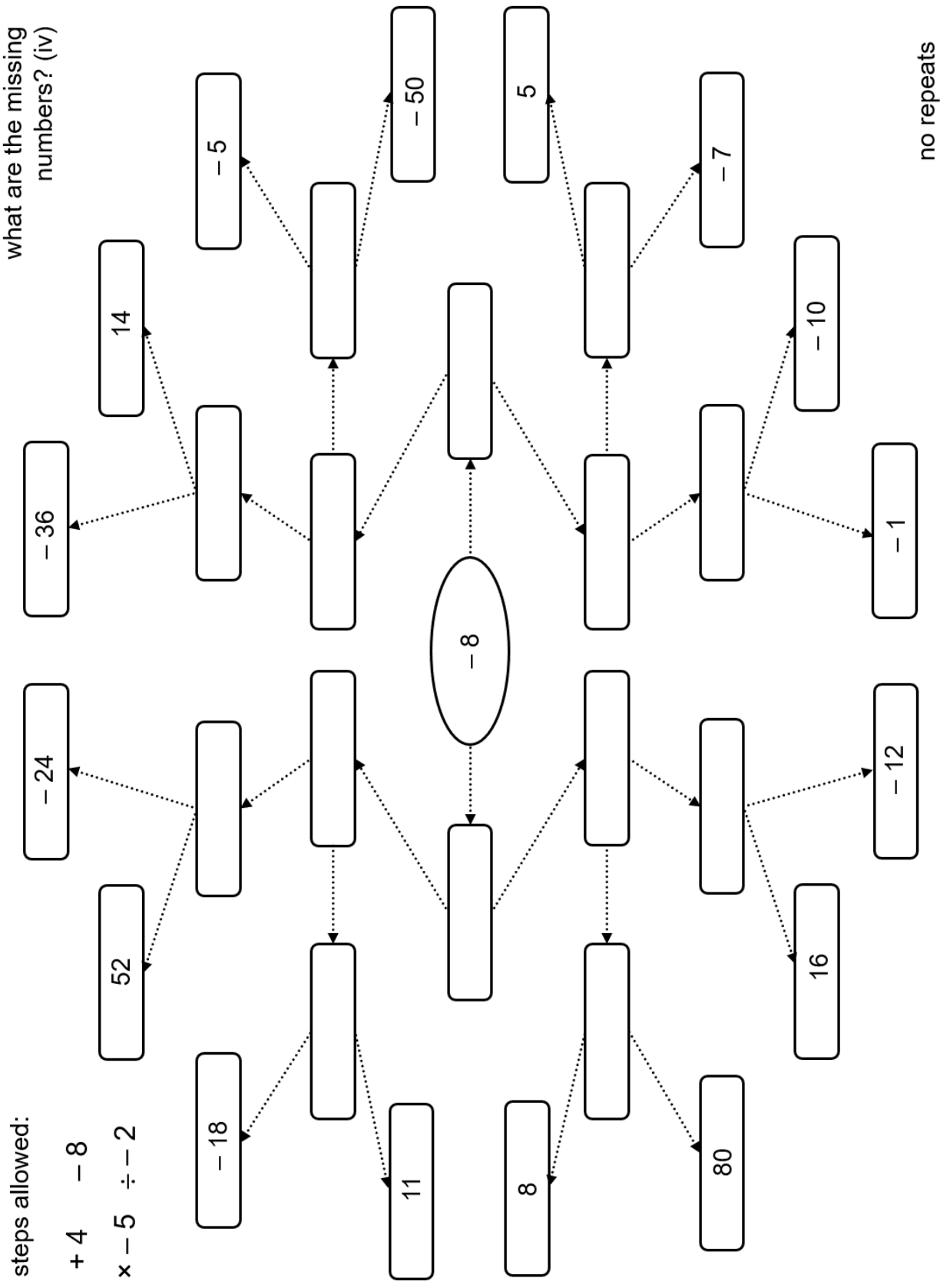
× 2 ÷ – 2



no repeats

Radiating Directed Numbers

Radiating Directed Numbers



Totalling Up

Totalling Up

Dae opens a new pizza shop.
In March he sells £1500 of pizza… but he has **costs**!

He spent £400 on **Ingredients**, £200 on **Electricity**, £100 on **Pizza Boxes** and £600 on **Shop Rent**.

March Sales
£1500

Ingredients
−£400

Electricity
−£200

Pizza Boxes
−£100

Shop Rent
−£600

How much money does Dae keep after these costs?

How many different ways can we write this calculation?

Because it is a new business, the owner of the shop decides **take away the rent** for March. How much money does Dae keep now?

Can we write this calculation as a subtraction?

What happens when we subtract a negative from a total?