

Learning Reminders

Revise column addition of whole numbers.

Adding **45,782 + 52,476** is just the same but with an extra digit!

First add the 1s.
 $2 + 6 = 8$.
The 8 goes in the 1s place in the answer line.

Next add the 10s.
 $8 + 7 = 15$.
The 5 goes in the 10s place in the answer line.
Put the 1 in the 100s place above the line.

Next add the 100s.
 $7 + 4 + 1 = 12$.
The 2 goes in the 100s place in the answer line.
Put the 1 in the 1000s place above the line.

$$\begin{array}{r} 45782 \\ + 52476 \\ \hline 11 \\ 98258 \end{array}$$

Next add the 1000s.
 $5 + 2 + 1 = 8$.
The 8 goes in the 1000s place in the answer line.

Finally add the 10,000s.
 $4 + 5 = 9$.
The 9 goes in the 10,000s place in the answer line.

Learning Reminders

Revise column addition of whole numbers.

Adding **52,378 + 3641**.

One number has 5 digits one number has 4 digits.

$$\begin{array}{r} 52378 \\ + 3641 \\ \hline \end{array}$$

Reading the numbers out aloud can help check that they are lined up correctly.
Three thousand should be directly under two thousand, six hundred under three hundred and so on.

Now find the answer!

Answer
56,019

Choose either Mild or hot depended on your confidence you could always do both

Practice Sheet Mild
Adding 3-digit and 4-digit numbers

Answer each question using compact column addition.
But, look out for one which would be quicker to calculate mentally.

1. $3575 + 2718$

5. $4578 + 234$

2. $5671 + 1482$

6. $8482 + 573$

3. $4289 + 245$

7. $7458 + 634$

4. $6582 + 1998$

8. $5678 + 3781$

Challenge

Write two additions with answers between 5000 and 10,000 where there are no 2s or 3s in any of the numbers.

Practice Sheet Hot
Adding 4-digit and 5-digit numbers

Answer each question using compact column addition.
But, look out for one which would be quicker to calculate mentally.

1. $63,789 + 24,845$

6. $45,782 + 2845$

2. $27,045 + 16,839$

7. $28,341 + 5294$

3. $34,578 + 26,284$

8. $34,784 + 3997$

4. $74,286 + 52,153$

9. $72,458 + 8725$

5. $58,482 + 34,619$

10. $56,794 + 7537$

Challenge

Write two additions with answers between 20,000 and 30,000 where there are no zeros or fives in any of the numbers!



A Bit Stuck?
Addition mission

$$482 + 286 =$$

$$654 + 268 =$$

$$\begin{array}{r} 400 \ 80 \ 2 \\ + 200 \ 80 \ 6 \\ \hline \end{array}$$

$$\begin{array}{r} 600 \ 50 \ 4 \\ + 200 \ 60 \ 8 \\ \hline \end{array}$$

$$287 + 642 =$$

$$749 + 244 =$$

+

+

$$385 + 247 =$$

$$387 + 327 =$$

+






+

Working out



Investigation Football Crowds



	Arsenal	59,999
	Bournemouth	9,532
	Chelsea	40,437
	Crystal Palace	25,455
	Everton	38,780
	Huddersfield	22,202

	Liverpool	52,983
	Manchester Utd.	74,498
	Newcastle	51,121
	Tottenham	54,216
	Watford	20,003
	Wolves	31,137

The table shows average attendance at some Premier League football grounds last season. Use the information in the table to solve these **addition** problems.

For each problem try to answer **first** by rounding and estimating, then **check** by adding.

- Find two teams whose total attendance is less than 30,000.
- Find two teams whose total attendance is very close to 90,000.
- Find two teams whose total attendance is very close to 60,000.
- Emma said that the combined total attendance for Everton and Wolves is greater than 70,000. Is she correct?
- Peter said that the combined total attendance for Tottenham and Chelsea is less than 90,000. Is he correct?
- What is the total of Manchester United and Liverpool's attendance?
- Can you find two more teams whose total attendance is also greater than 100,000?
- Beth said that she can use a mental strategy to add Watford's attendance to any other team's attendance. What strategy did she use? Give some other examples adding to Watford to show how this works.
- Tariq said that he can use a mental strategy to add Arsenal's attendance to any other team's attendance. What strategy did he use? Give some other examples adding to Arsenal to show how this works.

Learning Reminders

Add three, four and five numbers including those with different numbers of digits.

Adding $4567 + 24 + 236$

$$\begin{array}{r}
 4\ 5\ 6\ 7 \\
 2\ 4 \\
 +\ 2\ 3\ 6 \\
 \hline
 1\ 1 \\
 9\ 3\ 2\ 7
 \end{array}$$

There's something
wrong here!

$4567 + 24 + 236$ can't be more than 9000 as we are only adding 100s and 10s on to 4567. Closer to 5000 is a better estimate.

Try setting out $4567 + 24 + 236$ and solving it before checking on the next page.

Learning Reminders

Add three, four and five numbers including those with different numbers of digits.

Adding $4567 + 24 + 236$

$$\begin{array}{r}
 4\ 5\ 6\ 7 \\
 2\ 4 \\
 +\ 2\ 3\ 6 \\
 \hline
 1\ 1 \\
 5\ 8\ 2\ 7
 \end{array}$$

That's better!

The 1s and 10s digits of each number are all lined up correctly.

Add the 1s, then 10s, then 100s, then 1000s. Remember to use the 'waiting line' for any digits moved between columns.

Practice Sheet Mild
Adding 'towers' of numbers

1. $54 + 37 + 28 + 46$

2. $548 + 24 + 36$

3. $274 + 145 + 78$

4. $346 + 214 + 257$

5. $537 + 138 + 67 + 83$

6. $4521 + 35 + 82$

7. $548 + 278 + 325 + 426$

8. $3471 + 1824 + 2347$

Practice Sheet Hot
Adding 'towers' of numbers

1. $537 + 138 + 67 + 83$

2. $4521 + 35 + 82$

3. $548 + 278 + 325 + 426$

4. $3471 + 1824 + 2347$

5. $4721 + 5321 + 378 + 753$

6. $8461 + 374 + 68 + 94$

7. $78 + 93 + 45 + 62 + 48$

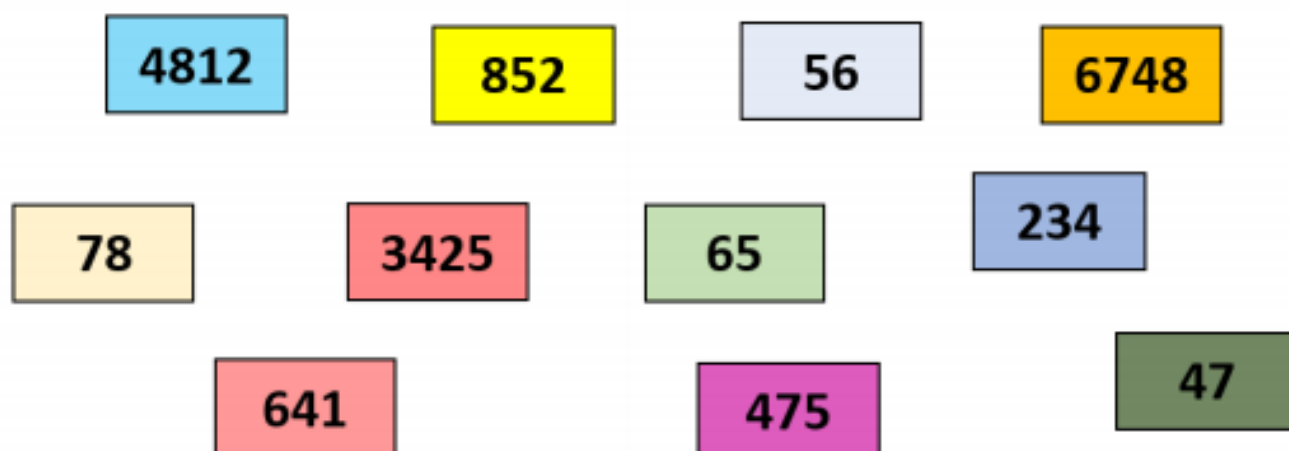
8. $745 + 428 + 328 + 38 + 75$

9. $4782 + 871 + 372 + 58 + 82$

10. $5479 + 2781 + 3781 + 651 + 238$

Investigation

Adding Towers



Challenge 1

Find three or four numbers with totals in the following ranges:

<200

500 to 1000

1000 to 2000

4000 to 5000

8000 to 9000

Look carefully at the numbers and estimate your answers before setting out carefully in columns to add.

Challenge 2

Find four or five numbers, aiming to find a total with an answer in each of the following ranges:

10,000 to 12,000

>12,000

Champion Adders Challenge!

Find the total of all 10 numbers.

Hint!

Rather than one big tower of 10 numbers you can add the numbers in groups of 3 or 4 numbers, then find the 'total of the totals'...

Use column addition to add decimals and measures including money.

This is an addition of two lengths in metres.

$$45.83\text{m} + 23.45\text{m}$$

This is very like adding amounts of money in pounds and pence.

$$\begin{array}{r} 45.83\text{ m} \\ + 23.45\text{ m} \\ \hline \end{array}$$

Carefully add the two lengths.

Today there will be a whole mix of calculations to work out using column addition, but - as always - watch out for any that might be more efficiently solved mentally!

Answer
69.28m

Practice Sheet Mild

Adding decimals, measures and money

Solve using column addition. Look out for a question which would be quicker to answer mentally.

1. $£24.47 + £18.28$

5. $£45.67 + £19.99$

2. $£35.83 + £26.72$

6. $34.26\text{m} + 25.38\text{m}$

3. $482.4 + 271.3$

7. $78.85\text{m} + 46.47\text{m}$

4. $345.7 + 228.6$

8. $£56.38 + £5.74$

Practice Sheet Hot**Adding decimals, measures and money**

Solve using column addition. Look out for a question which would be quicker to answer mentally.

1. $345.7 + 228.6$

5. $£56.75 + £29.98$

2. $£78.85 + £46.47$

6. $76.78\text{m} + 47.59\text{m}$

3. $457.8 + 364.5$

7. $634.5 + 78.6$

4. $23.46 + 34.28$

8. $45.38\text{m} + 8.64\text{m}$

Challenge

Two amounts are added together, totalling £100.50 exactly.
The total of the 10ps is greater than £1.
What could the two amounts be?

$$\begin{array}{r} £ \quad \square \square . \square \square \\ + £ \quad \square \square . \square \square \end{array}$$

Working out

Check your understanding

Questions

Arrange the digits 4, 5 and 6 to create an addition of two 3-digit numbers which add to 1000.

You may use each digit as often as you like.

Explain why it would be sensible to choose different methods to solve (a) and (b) below. Then solve both.

(a) $67,493 + 21,561$

(b) $50,005 + 9,998$

Complete the addition by finding \square , \clubsuit and \triangle :

$$\begin{array}{r} 12\square62 \\ + 938\clubsuit \\ \hline 2\triangle251 \\ \hline \end{array}$$

Use digits 2 to 8 once each to create two amounts of money in the form $\pounds\square\square.\square\square + \pounds\square.\square\square$. Add these.

Now re-arrange the digits so as to give the largest total possible.

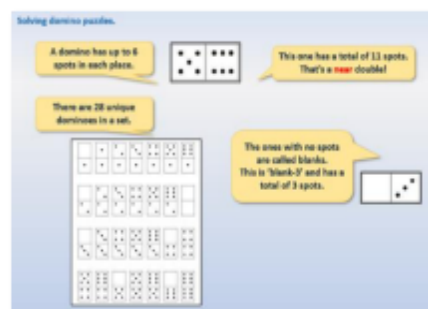
Now re-arrange the digits so as to give the smallest total possible.

Week 15, Day 4

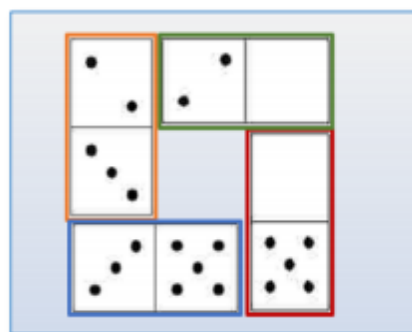
Solving mathematical puzzles: domino problems

Each day covers one maths topic. It should take you about 1 hour or just a little more.

1. Start by reading through the **Learning Reminders**.



2. Think you've got it? Have a go at the **Investigative Practical Activity**.



3. Have I mastered the topic? A few questions to **Check your understanding**.

Identify the value of the '4' in the following numbers:

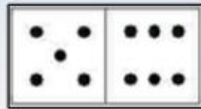
(a) 3.407
(b) 4.821
(c) 0.043
(d) 5.104
(e) 48,739

How many times must Dan multiply 0.048 by 10 to get 48,000?

What number is one hundred times smaller than 0.4?

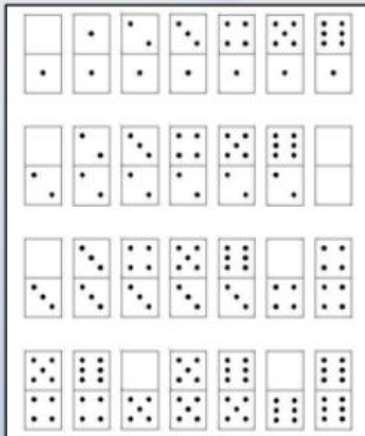
Solving domino puzzles.

A domino has up to 6 spots in each place.



This one has a total of 11 spots.
That's a **near** double!

There are 28 unique dominoes in a set.

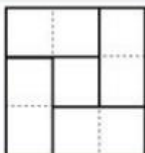


The ones with no spots are called blanks.
This is 'blank-3' and has a total of 3 spots.



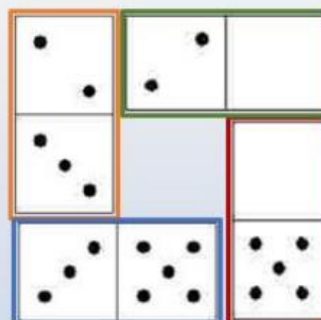
Solving domino puzzles.

In this puzzle 4 dominoes are used to make a square.



The ends of the dominoes must match.

This square uses the **3** and **2**,
2 and **blank**, **blank** and **5** and
5 and **3** dominoes.



Check that the total of all of the spots is 20.

I wonder whether this is the only solution for a total of **20 spots**...?

Investigative Practical Activity

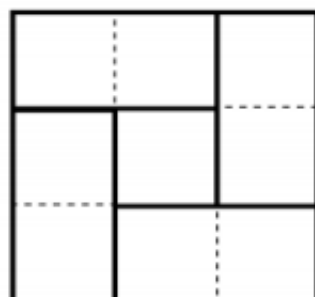
Domino squares

Things you will need:

a set of 0-0 to 6-6 dominoes (check that you have all 28), or cut out the set we provide



- Four dominoes are arranged in a square so that ends match, and the total of all the spots is 20. Find at least 4 different solutions.
- Use the page of blank square grids to record your solutions.



- Repeat, this time finding domino squares with a total of 30.
- What strategies did you apply from last time?
- What did you change?
- What was the same?
- Can a square of dominoes be made with an odd total?
- How can you explain this?
- What is the smallest total you can make? And the largest?

Challenge

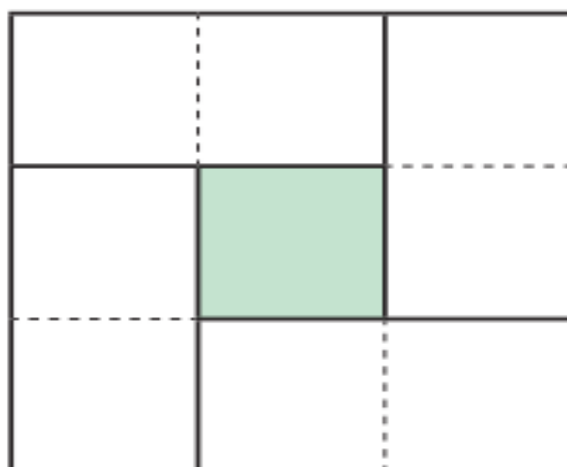
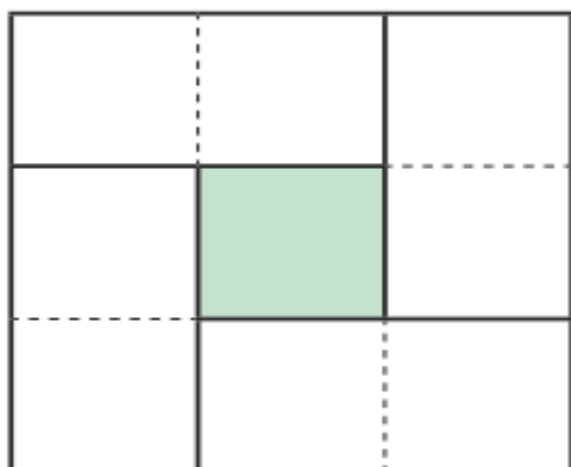
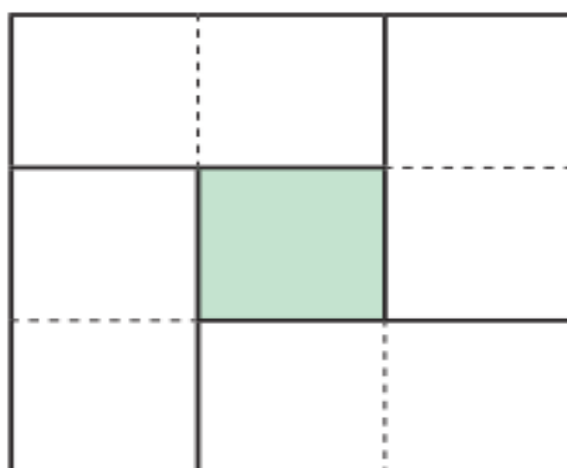
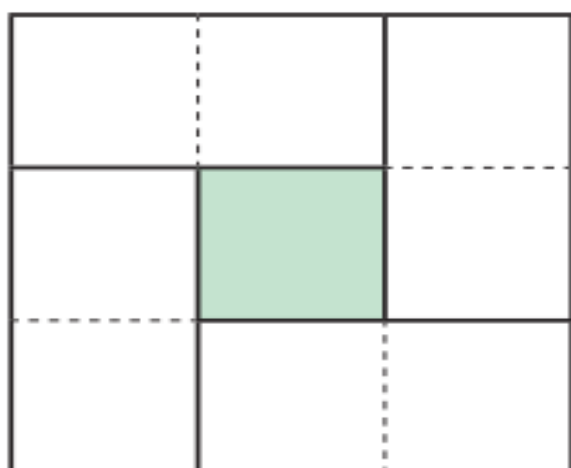
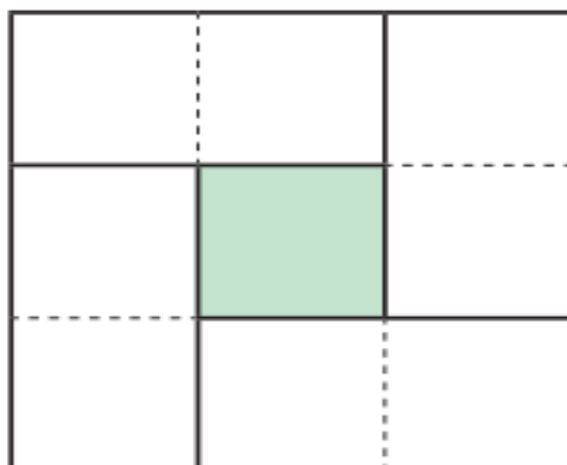
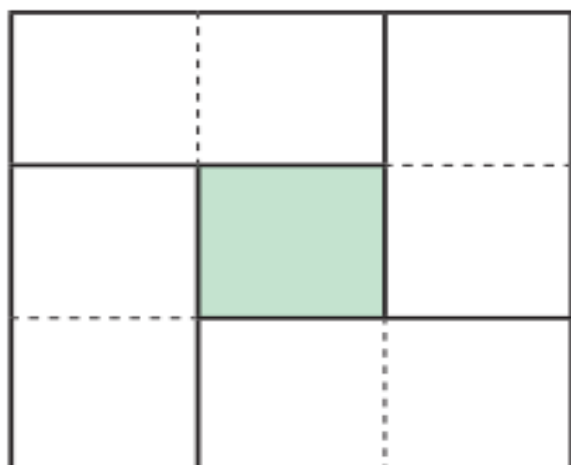
Use eight dominoes to make a square (2 on each side).

Again, the ends of each domino should match.

Make at least one square so that the total of all of the spots is 50.

Investigative Practical Activity

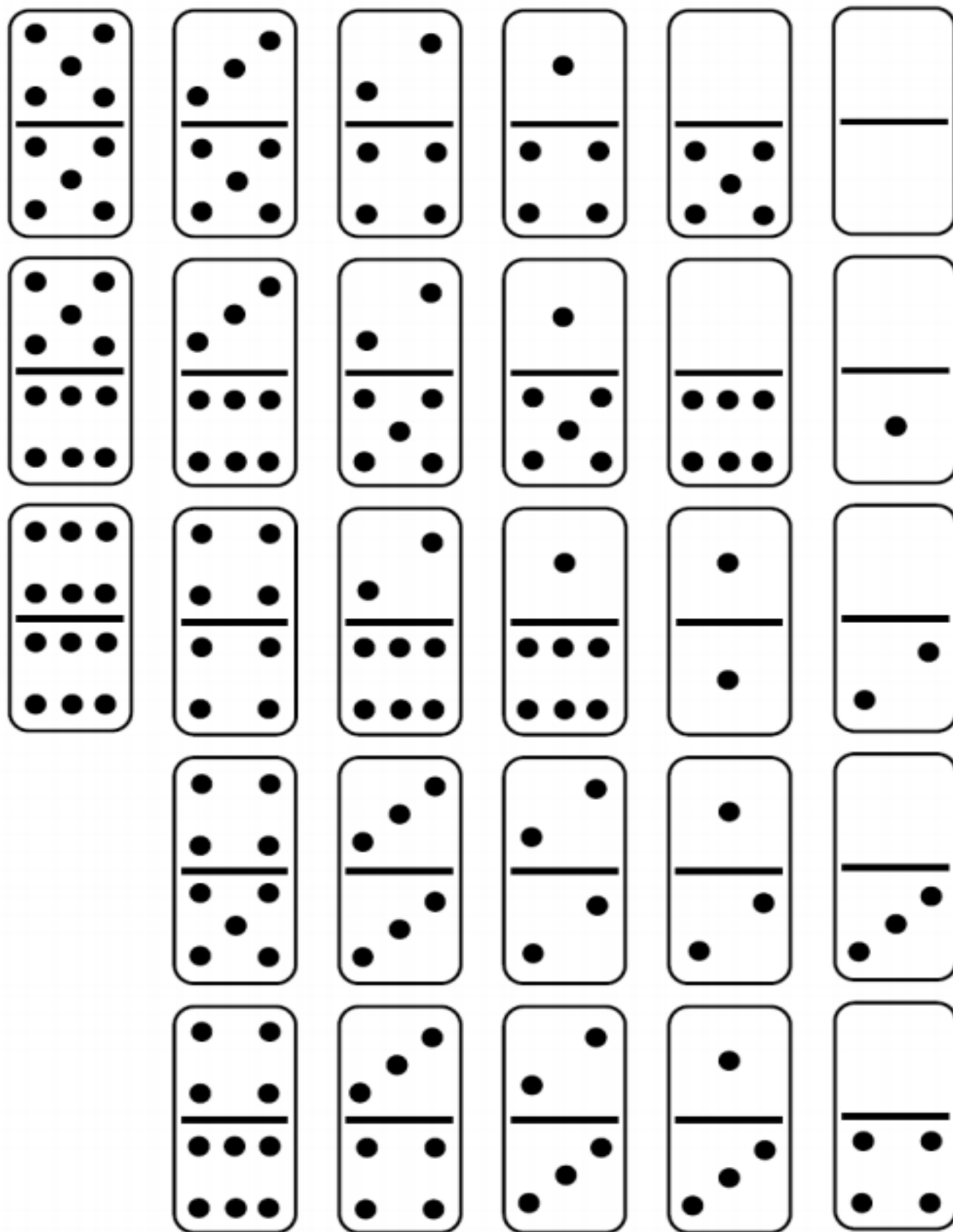
Domino squares



Investigative Practical Activity

Domino squares

Carefully cut out this set of dominoes to use if you do not have any at home



Blank

Check your understanding

Questions

Make squares of four dominoes with the following totals.
Don't forget that the ends must match!

	12	

	16	

	26	

Fold here to hide answers

Check your understanding

Answers

Here are just some of the possibilities:

1	1	1
1	12	0
4	4	0

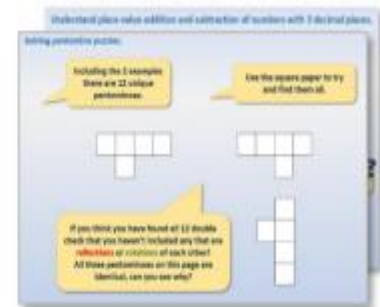
2	1	1
2	16	1
4	4	1

3	3	3
3	26	5
2	2	5

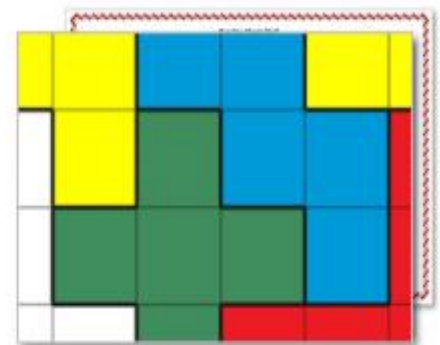
Transformations: reflection and rotation; pentomino puzzles

Each day covers one maths topic. It should take you about 1 hour or just a little more.

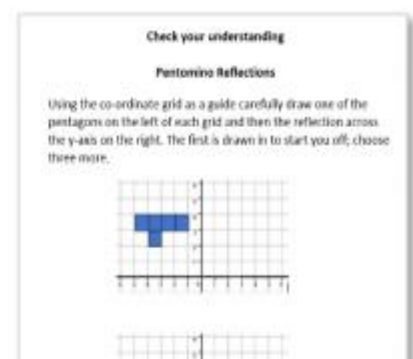
1. Start by reading through the **Learning Reminders**.



2. Think you've got it? Have a go at the **Investigative Practical Activity**.



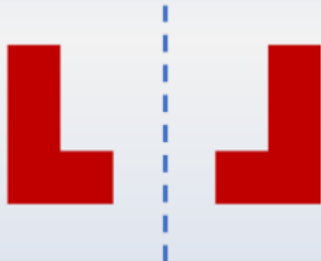
3. Have I mastered the topic? A few questions to **Check your understanding**.



Friday

Transformations: reflection and rotation.

To solve today's puzzles we will need to
reflect and **rotate** shapes.



Here, the **L** shape has been **reflected** across the dotted line.

The shape on the right is the **mirror image** of the shape on the left.

Here, the **L** shape has been
rotated (turned around)
in anticlockwise steps
of $\frac{1}{4}$ turn or 90° .



Transformations: reflection and rotation: pentomino puzzles.

So, what is a '**pentomino**'?

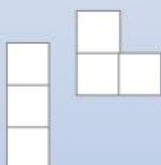
Well, we know that this is a **domino**:

Which makes this a **triomino**:

and this!



So, is this a different **triomino**?



And these?

NO. Each of these arrangements of 3 squares is either a **reflection** or **rotation** of an arrangement we have already found.

There are only two unique **triominoes**.

Transformations: reflection and rotation: pentomino puzzles.

So, what is a 'pentomino'?

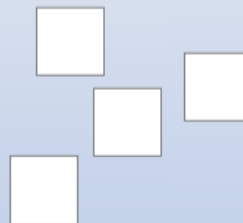
Four side-by-side squares make a tetromino:



How many other arrangements can you find?

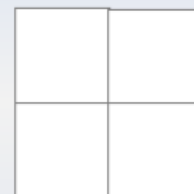
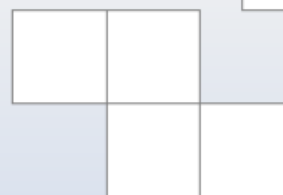
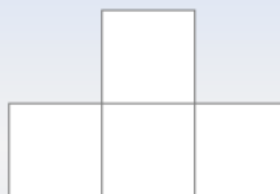
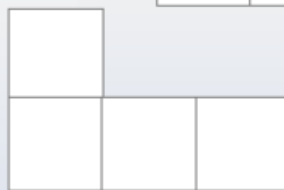
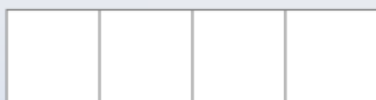
REMEMBER – A unique tetromino will not be a reflection or rotation of an arrangement you have already found.

Investigate this for yourself before checking on the next slide...



Transformations: reflection and rotation: pentomino puzzles.

Here are the 5 tetrominoes.
None of them is a reflection or rotation of any other.



So, can you use 5 side-by-side squares to make every possible unique pentomino?!

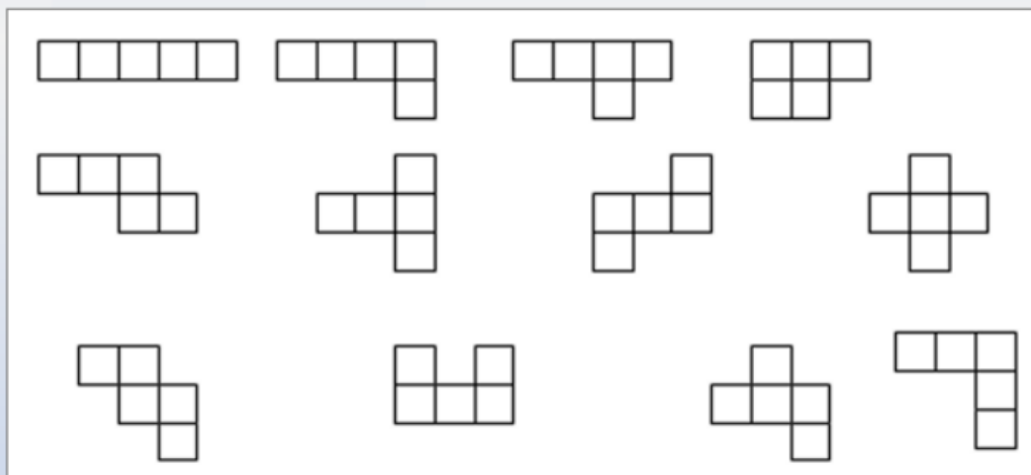
Use the squared paper to sketch and investigate...

**HINT**

There are more than 10, so persevere before checking out the whole set on the next slide...!

Transformations: reflection and rotation: pentomino puzzles.

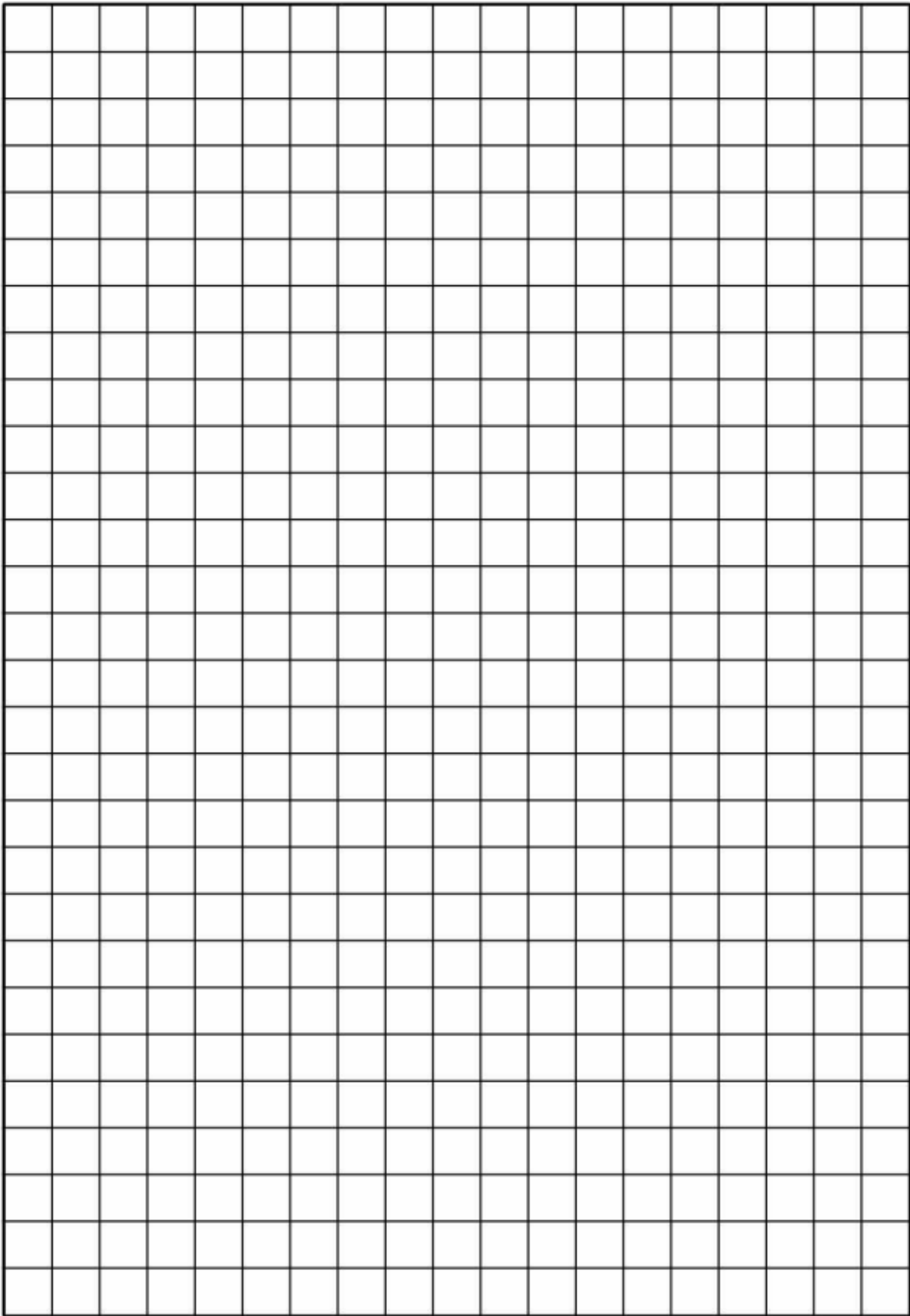
Here they are...
The 12 unique pentominoes.

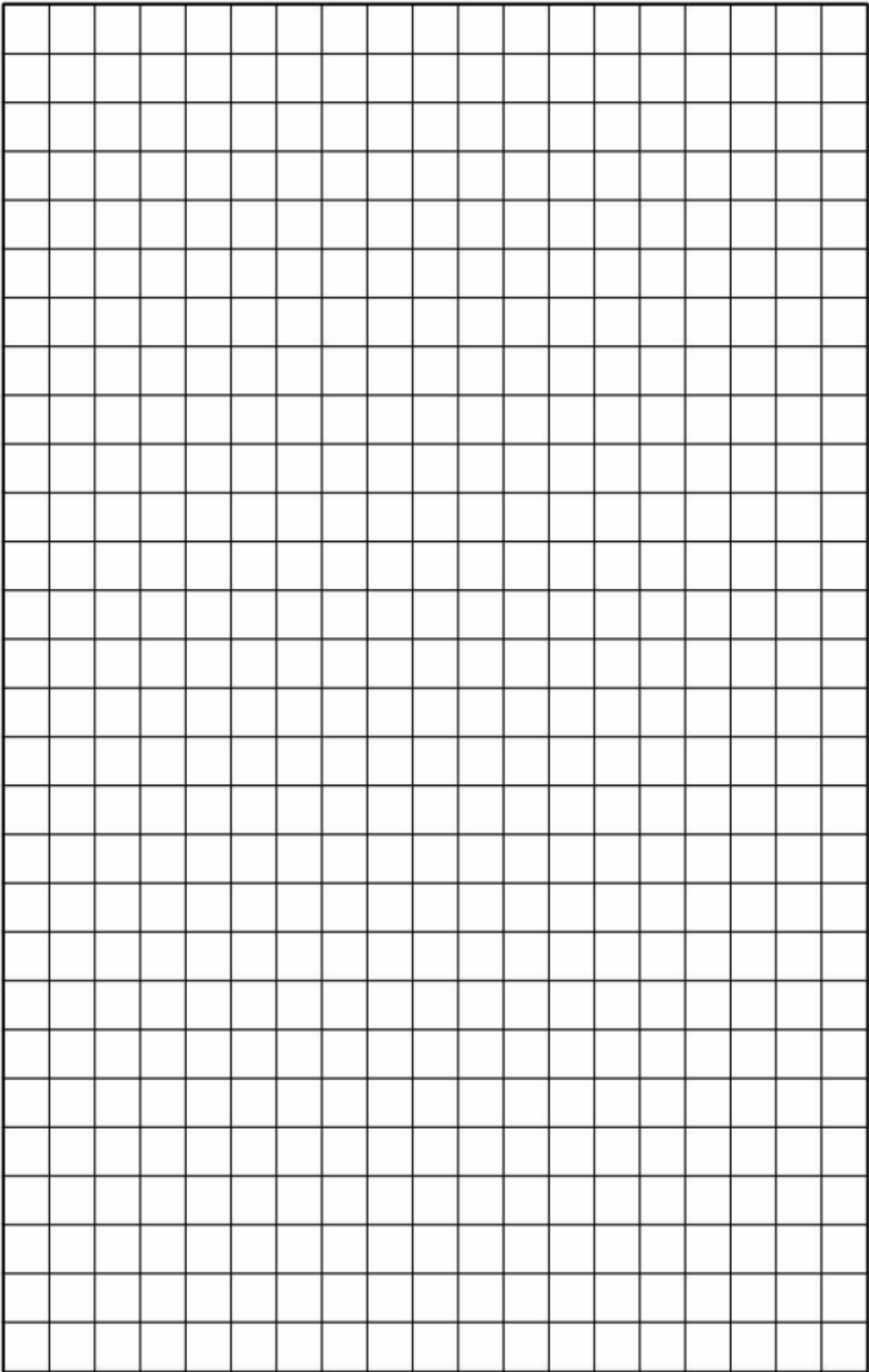


Did you find them all?!

Remember, you may have a **reflection** or **rotation** of one of these, so it looks a bit different but is actually the same shape...

If in doubt, cut out your shape, then rotate or reflect it to try to sit it on top of one of these 12...





Investigative Practical Activity

Investigating Pentominoes

Things you will need:

a set of 12 pentominoes (see next page)

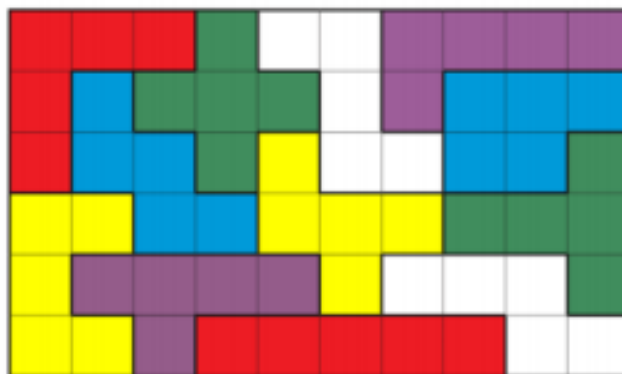


So, did you enjoy trying to find all 12 unique pentominoes?!

Carefully cut out the set of pentominoes to use for these activities.

Challenge 1

All 12 pentominoes can be arranged to make a 10 by 6 rectangle. Here is one solution:



- Look at the solution for 30 seconds. Now turn over the page and see if you can make the rectangle with all 12 of your pentominoes.
- Remember you will probably need to **reflect** or **rotate** your pentominoes. If you get stuck, have another peek at the solution...

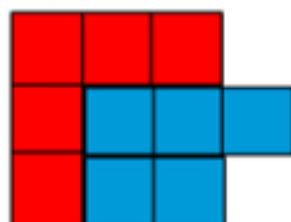
Challenge 2

Now try to make *other* rectangles with the pentominoes:

- Use three pentominoes to make a 3 by 5 rectangle.
- Use four pentominoes to make a 4 by 5 rectangle.
- Use five pentominoes to make a 5 by 5 rectangle (i.e. a square).
- Use six pentominoes to make a 6 by 5 rectangle.
- Use all 12 pentominoes to make 3 by 20, 4 by 15 and 5 by 12 rectangles!

Challenge 3

Here is the same shape, each made by joining 2 pentominoes:

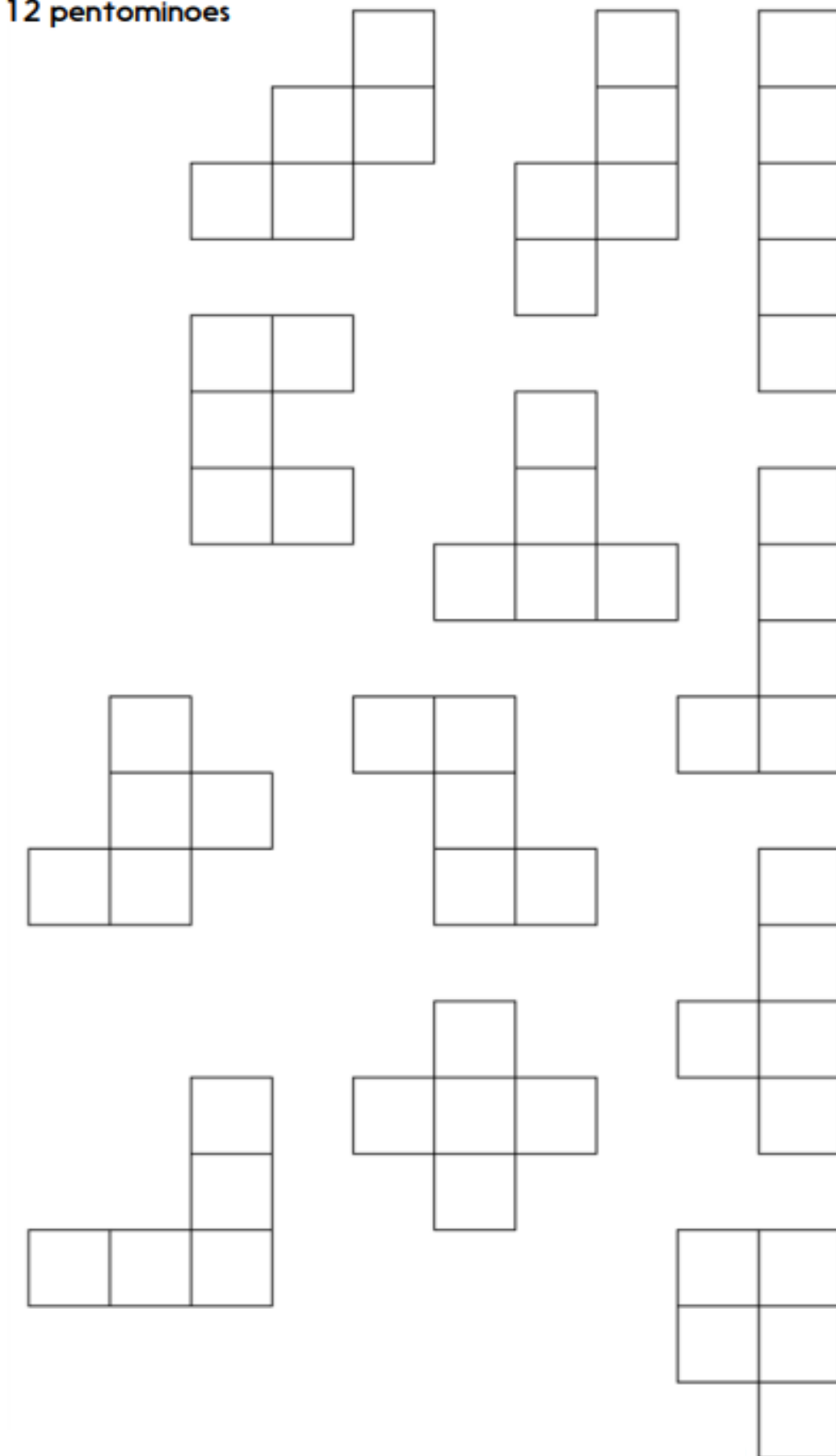


- Find 4 more pairs like this.

Investigative Practical Activity

Investigating Pentominoes

A set of all 12 pentominoes

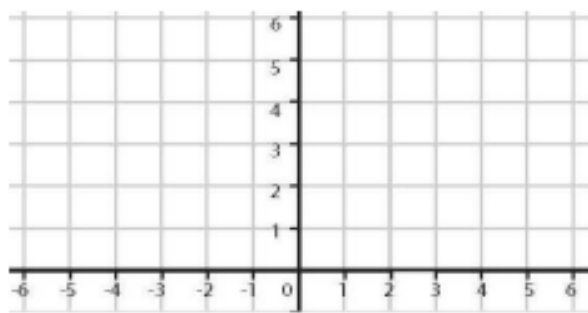
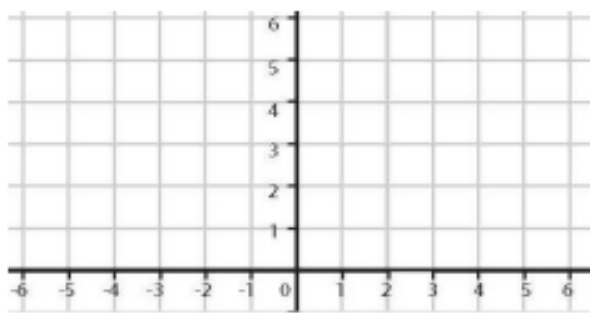
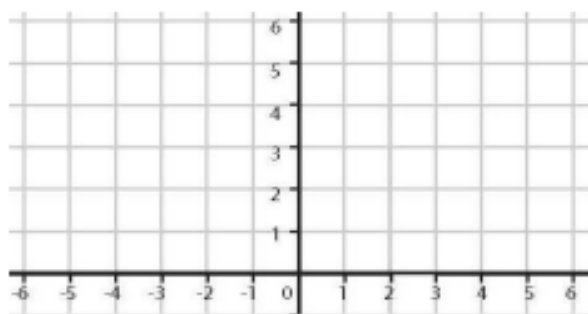
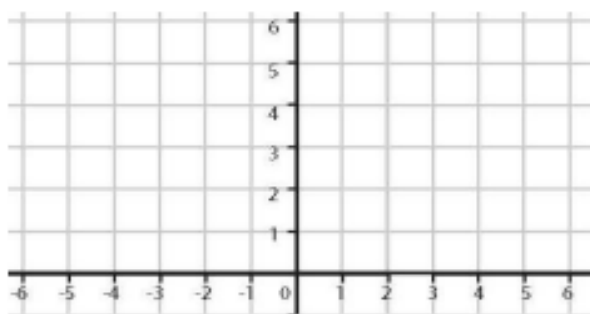
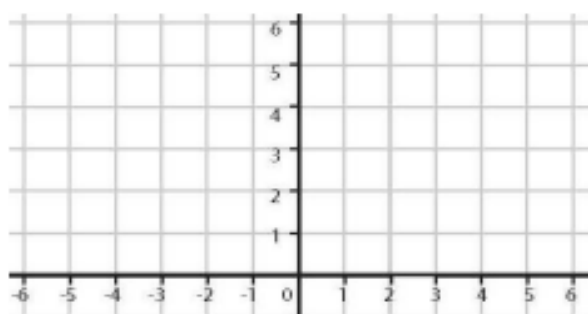
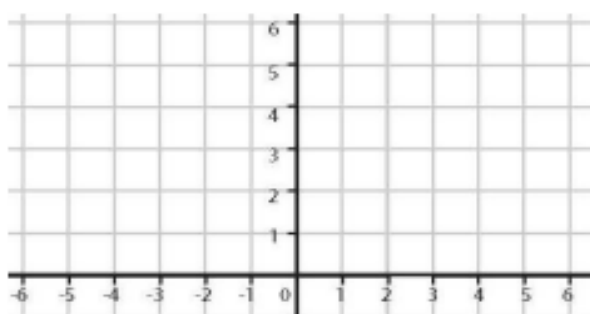
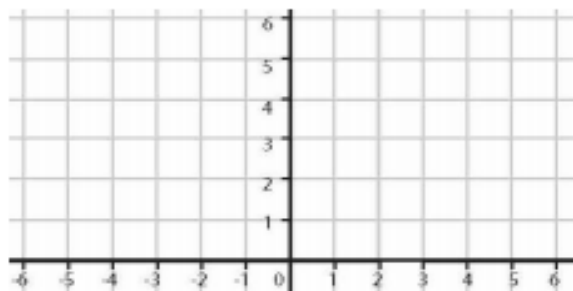
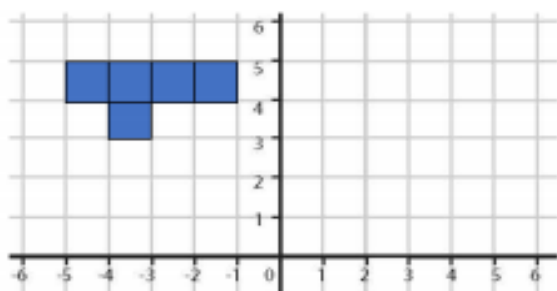


Check your understanding

Questions

Pentomino reflections

Using the co-ordinate grid as a guide, carefully draw one of your pentominoes on the left of each grid, then the reflection across the y-axis on the right. The first is drawn in to start you off; choose 7 more.



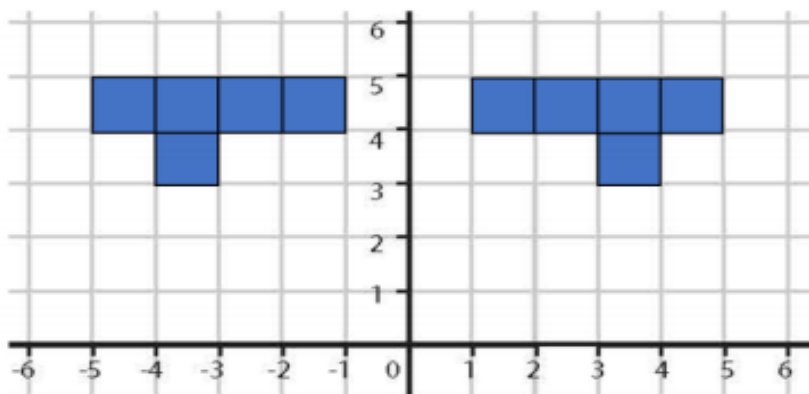
Answers on next page

Weekly answers

Friday

Answers**Pentomino reflections**

Look for accurately drawn reflections across the y-axis, e.g.



Thursday

Adding decimals, measures and money (mild)

1. $£24.47 + £18.28 = £42.75$
2. $£35.83 + £26.72 = £62.55$
3. $482.4 + 271.3 = 753.7$
4. $345.7 + 228.6 = 574.3$
5. $£45.67 + £19.99 = £65.66$ quicker to work out mentally
6. $34.26\text{m} + 25.38\text{m} = 59.64\text{m}$
7. $78.85\text{m} + 46.47\text{m} = 125.32\text{m}$
8. $£56.38 + £5.74 = £62.12$

Adding decimals, measures and money (hot)

1. $345.7 + 228.6 = 574.3$
2. $£78.85 + £46.47 = £125.32$
3. $457.8 + 364.5 = 822.3$
4. $23.46 + 34.28 = 57.74$
5. $£56.75 + £29.98 = £86.73$ quicker to work out mentally
6. $76.78\text{m} + 47.59\text{m} = 124.37\text{m}$
7. $634.5 + 78.6 = 713.1$
8. $45.38\text{m} + 8.64\text{m} = 54.02\text{m}$

Challenge

Two amounts are added together, totalling £100.50 exactly.
 The total of the 10ps is greater than £1.
 What could the two amounts be?

e.g. Any pair of amounts, totalling £100.50 where the 10ps total is >£1.

$£46.63$
 $+ £53.87$

Check your understanding**Answers**

Arrange the digits 4, 5 and 6 to create an addition of two 3-digit numbers which add to 1000. You may use each digit as often as you like.

Possible answers:

444 + 556, 445 + 555, 446 + 554, 454 + 546, 455 + 545, 456 + 544.

Explain why it would be sensible to choose different methods to solve (a) and (b) below. Then solve both.

(a) $67,493 + 21,561$ 89,054 best solved by column addition as there are lots of different digits in each number and several instances where 'carrying' will be needed.

(b) $50,005 + 9,998$ 60,003 can be solved mentally with supporting jottings, by adding 10,000 and then subtracting 2.

Complete the addition by finding \square , \clubsuit and \triangle :

$$\begin{array}{r} 12\ 8\ 6\ 2 \\ +\ 9\ 3\ 8\ 9 \\ \hline 1\ 1\ 1\ 1 \\ \hline 2\ 2\ 2\ 5\ 1 \\ \hline \end{array}$$

Use digits 2 to 8 once each to create two amounts of money in the form $\pounds\square\square.\square\square + \pounds\square.\square\square$. Add these. Various answers.

Now re-arrange the digits so as to give the largest total possible.

Possible largest: $\pounds 86.42 + \pounds 7.53 = \pounds 93.95$ (digits for the £1s, 10ps or 1ps can be swapped over, e.g. $\pounds 87.53 + \pounds 6.42$).

Now re-arrange the digits so as to give the smallest total possible.

Possible smallest: $\pounds 24.68 + \pounds 3.57 = \pounds 28.25$ (again, digits for the £1s, 10ps or 1ps can be swapped over).

Practice Sheets Answers

Adding 'towers' of numbers (mild)

1. $54 + 37 + 28 + 46 = 165$
2. $548 + 24 + 36 = 608$
3. $274 + 145 + 78 = 497$
4. $346 + 214 + 257 = 817$
5. $537 + 138 + 67 + 83 = 825$
6. $4521 + 35 + 82 = 4638$
7. $548 + 278 + 325 + 426 = 1577$
8. $3471 + 1824 + 2347 = 7642$

Adding 'towers' of numbers (hot)

1. $537 + 138 + 67 + 83 = 825$
2. $4521 + 35 + 82 = 4638$
3. $548 + 278 + 325 + 426 = 1577$
4. $3471 + 1824 + 2347 = 7642$
5. $4721 + 5321 + 378 + 753 = 11,173$
6. $8461 + 374 + 68 + 94 = 8997$
7. $78 + 93 + 45 + 62 + 48 = 326$
8. $745 + 428 + 328 + 38 + 75 = 1614$
9. $4782 + 871 + 372 + 58 + 82 = 6165$
10. $5479 + 2781 + 3781 + 651 + 238 = 12,930$

Practice Sheets Answers

Adding 3-digit and 4-digit numbers (mild)

1. $3575 + 2718 = 6293$
2. $5671 + 1482 = 7153$
3. $4289 + 245 = 4534$
4. $6582 + 1998 = 8580$ quicker to work out mentally
5. $4578 + 234 = 4812$
6. $8482 + 573 = 9055$
7. $7458 + 634 = 8092$
8. $5678 + 3781 = 9459$

Challenge

Write two additions with answers between 5000 and 10,000 where there are no 2s or 3s in any of the numbers.

e.g. $4061 + 4694 = 8755$

Adding 4-digit and 5-digit numbers (hot)

1. $63,789 + 24,845 = 88,634$
2. $27,045 + 16,839 = 43,884$
3. $34,578 + 26,284 = 60,862$
4. $74,286 + 52,153 = 126,439$
5. $58,482 + 34,619 = 93,101$
6. $45,782 + 2845 = 48,627$
7. $28,341 + 5294 = 33,635$
8. $34,784 + 3997 = 38,781$ quicker to work out mentally
9. $72,458 + 8725 = 81,183$
10. $56,794 + 7537 = 64,331$

Challenge

Write two additions with answers between 20,000 and 30,000 where there are no zeros or fives in any of the numbers!

e.g. $11,226 + 8393 = 19,619$