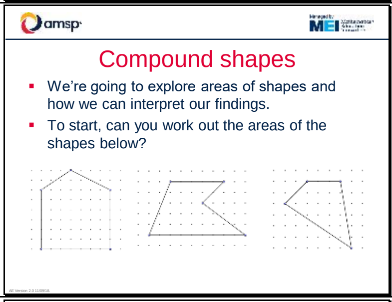
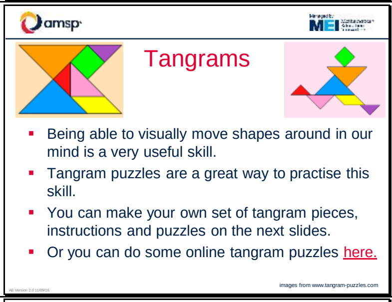
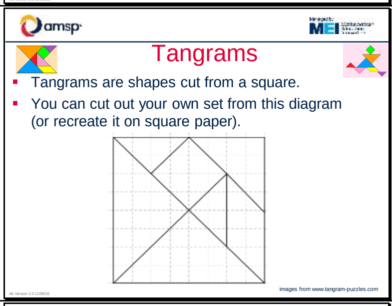
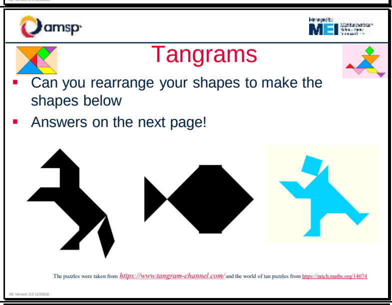
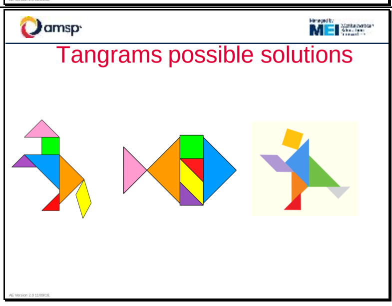
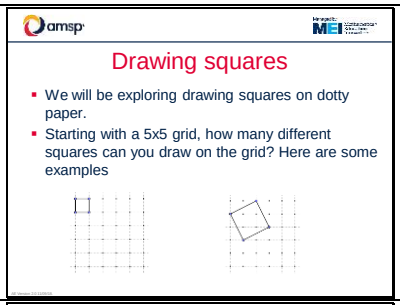
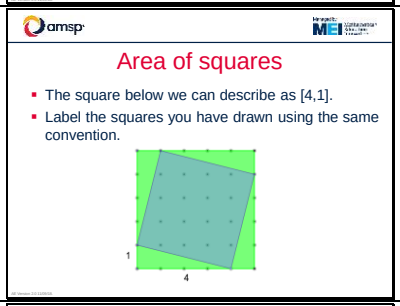
Slide 1		
Slide 2		It is easiest to work out the area of the final shape by taking the large square and subtracting the 3 triangles from it. This is a good method as it is one we will be using through this activity.
Slide 3		It is not essential to cover tangrams to access this activity, however using spatial awareness and geometrical reasoning is a skill that will be used later.
Slide 4		It is not essential to cover tangrams to access this activity, however using spatial awareness and geometrical reasoning is a skill that will be used later.
Slide 5		It is not essential to cover tangrams to access this activity, however using spatial awareness and geometrical reasoning is a skill that will be used later. Additional work on tangrams can be found: https://www.tangram-channel.com/tangram-worksheets/ https://www.tangram-channel.com/tangram-cards/essential-cards/
Slide 6		

Slide 7



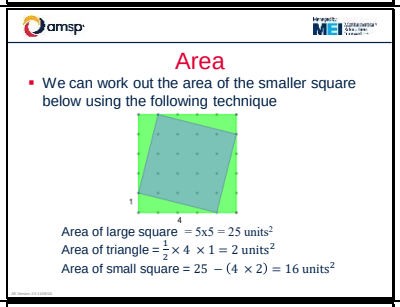
Encourage students to have a systematic approach – they could visualise moving vertices or rotating squares.
Encourage students to discuss how they could describe the square they are drawing.
There are 13 squares they can draw.

Slide 8



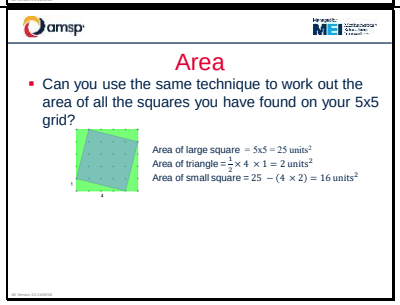
Here students might find they have drawn congruent squares – you can discuss whether [4,1] is the same as [1,4] for example. Does order matter?

Slide 9



Some students may find the area using another method.
Encourage students to use this method as they will need to use this approach in the next steps.

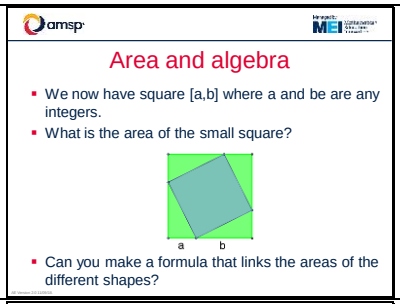
Slide 10



Square	Size
[1,0]	1
[1,1]	2
[2,0]	4
[2,1]	5
[2,2]	8
[3,0]	9
[3,1]	10
[3,2]	13
[4,0]	16
[4,1]	17
[3,3]	18
[4,2]	20
[5,0]	25

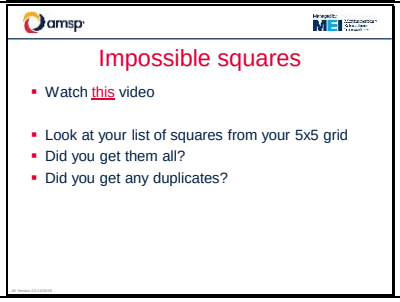
Students may also realise that there is a [4,3] square with area 25.

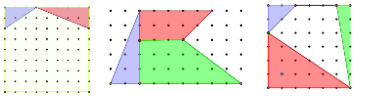
Slide 11



This is a lovely way to prove Pythagoras. It is explained in the numberphile video, but some students may already see the connection.

Slide 12



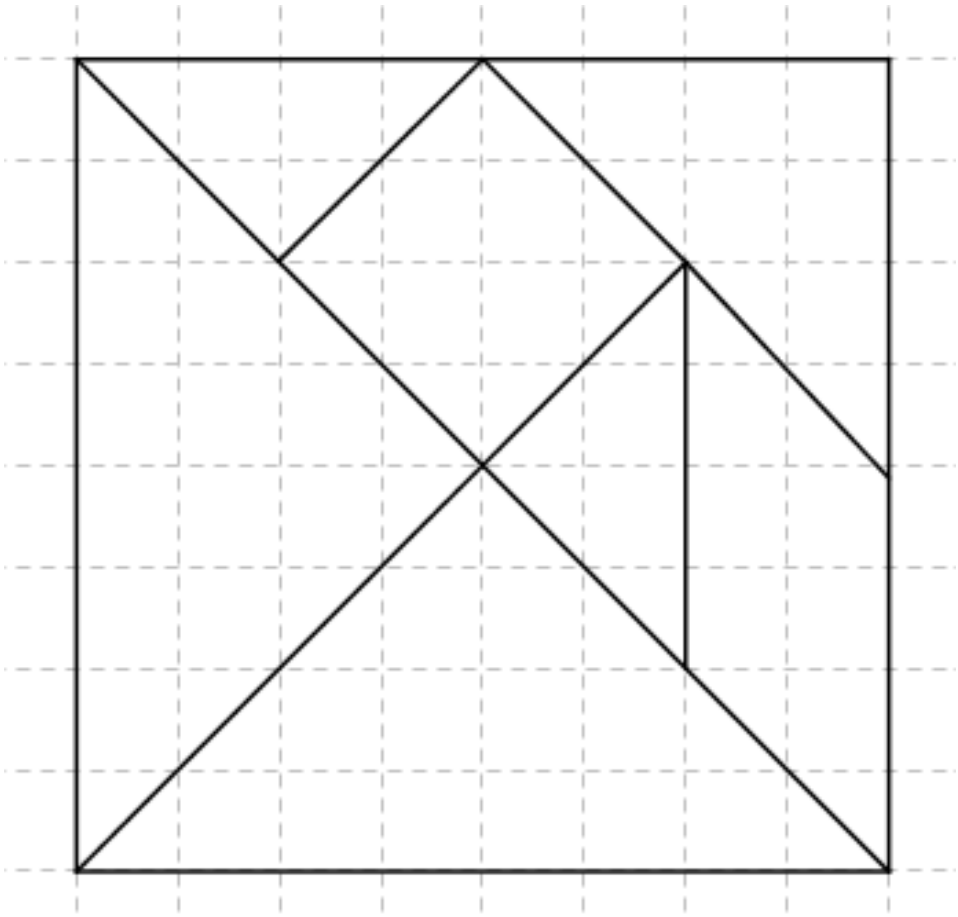
<table>
<tr><td>Slide 13</td><td>Impossible squares
▪ What squares with area less than 25 units^2 can you not draw with vertices on the dots?</td><td>3,6,7,11,12,14,15,19,21,22,23,24</td></tr>
<tr><td>Slide 14</td><td>Impossible squares
▪ When working with squares with small (<50) area, we can calculate manually using the formula given in the video which factors will result in
$a^2 + b^2 \neq c^2$
▪ Using the formula (4k+3)$^{\text{odd power}}$, what factors result in an impossible square? You can use the table below to help
<table><tr><th></th><th>K=0</th><th>K=1</th><th>K=2</th><th>K=3</th></tr><tr><td>Power = 1</td><td>3</td><td>7</td><td></td><td></td></tr><tr><td>Power = 3</td><td></td><td></td><td></td><td></td></tr></table></td><td>Encourage students to realise that the odd power is important, so neither 9 or 18 are impossible squares as they have 3^2 which is an even power.
<table><tr><th></th><th>K=0</th><th>K=1</th><th>K=2</th><th>K=3</th></tr><tr><td>Power = 1</td><td>3</td><td>7</td><td>11</td><td>15</td></tr><tr><td>Power = 3</td><td>27</td><td>343</td><td>1331</td><td>3375</td></tr></table></td></tr>
<tr><td>Slide 15</td><td>Impossible squares
▪ Can you prove why all your impossible squares on your 5x5 grid are impossible? Which are the factors that make them impossible?
▪ In the video Ben Sparks details which numbers can't be made up to 25. Can you work out all the impossible squares between 30 and 40?</td><td>30,31,33,35,38,39</td></tr>
<tr><td>Slide 16</td><td>Further reading
▪ To explore summing cubes watch this followed by this
▪ To explore different number theory ideas, this time looking at prime numbers watch this
▪ To explore more squares watch this</td><td></td></tr>
<tr><td>Slide 17</td><td>Compound shapes answers
 
Large square
- two triangles
= 64 – 3 – 5
= 56 units^2
Triangle + two trapeziums
= 5 + 8 + 15
= 28 units^2
Large square
- three triangles
= 36 – 2 – 12 – 3
= 19 units^2</td><td></td></tr>
<tr><td>Slide 18</td><td>Contact the AMSP
01225 716 492
admin@amsp.org.uk
amsp.org.uk
Advanced_Maths</td><td>Stay informed about the AMSP and receive updates:
https://amsp.org.uk/subscribe</td></tr>
</table>

Tangrams

Making a tangram set

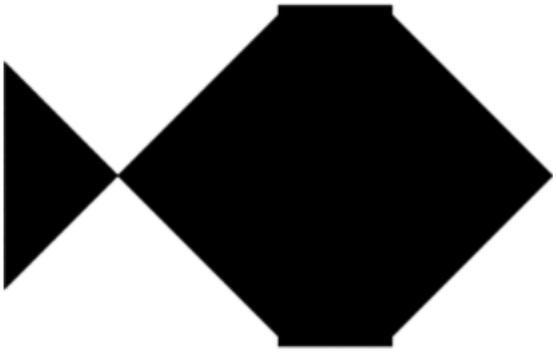
Tangrams are shapes cut from an 8x8 square.
You can cut out your own set from this diagram (or recreate it on square paper)

You may wish to stick it on to card and colour in the shapes to make them distinct.



Can you cut out your set and make the following shapes?

The puzzles were taken from https://www.tangram-channel.com/ and the world of tan puzzles from www.nrich.maths.org



Solutions below: