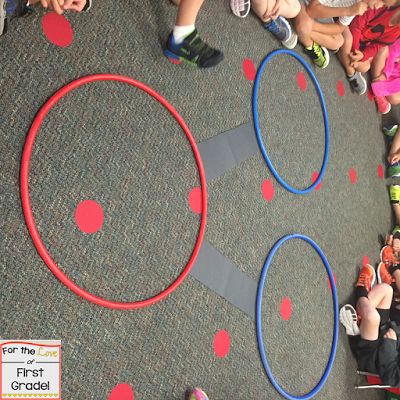
Models and Images

Bar model

Representation of a maths problem. It is NOT a method of working the questions out but a way of representing and understanding the question.

Part, part whole

Objects to use- hoops, three part plates.

Don’t forget to turn them around too!

Bar model- addition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Stage 1 | Stage 2 | Stage 3 | Stage 4 | Stage 5 | Stage 6 | Comparison |
| ?  See the source image See the source image See the source image  CONCRETE  **Use physical things (could be anything).**  I.e “I’ve got 2 red cars and 3 yellow cars. How many have I got altogether?”  **Use red and yellow cars for each part.**  It is best to use actual objects but you could use photographs of the objects if you have to. | ?  See the source image https://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpghttps://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpghttps://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpg  PICTORAL  **Picture of the objects or draw the objects in the bar.**  I.e “I’ve got 2 red cars and 3 yellow cars. How many have I got altogether?”  **Use pictures of the objects in the questions or draw them**. | ?  See the source image  REPRESENTATIONAL  **Use counters to represent the objects.**    I.e “I’ve got 2 red cars and 3 yellow cars. How many have I got altogether?”  **Use red and yellow counters** | ?    DISCRETE  **Creating the bar to show the two numbers you are using.**  I.e “I’ve got 2 red cars and 3 yellow cars. How many have I got altogether?”  **ONLY use this method for two numbers that equal less than 10.** | ?  2  AUGMENTATION  **Moving on from the discrete method.**  I.e “I’ve got 2 red cars and 3 yellow cars. How many have I got altogether?”  **Have the first number in a part and draw the number of boxes that you are adding on.** | ?  2 3  CONTINUOUS  **Use the numbers in the number sentence.**  I.e “I’ve got 2 red cars and 3 yellow cars. How many have I got altogether?” | 2  R 1  ?  Y  NUMBERS OUTSIDE AND MISSING  **Use the number in number sentence to find the missing number.**  I.e “I’ve got 2 red cars. I’ve got 1 more yellow car than red cars. How many yellow cars have I got?  Challenge  How many cars have I got altogether? |

Bar model- Subtraction

Reduction -Cross out the number (3) because you are taking them away.

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| --- | --- | --- | --- |
| Stage 1 | Stage 2 | Stage 3 | Stage 4 |
| 5  ? See the source image See the source image See the source image  CONCRETE  **Use physical things (could be anything).**  I.e “I’ve got 5 cars and I give three of them to my friend. How many have I got left?”  Start with 5 cars. Place three in one part and cross them out/ put something over them (to show they have been taken away). Place the remaining in the other part.  **Use actual cars**  It is best to use actual objects but you could use Photographs of the objects if you have to. | 5  https://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpghttps://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpghttps://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpg  PICTORAL  **Picture of the objects or draw the objects in the bar.**  I.e “I’ve got 5 cars and I give three of them to my friend. How many have I got left?”  Start with 5 cars. Place three in one part and cross them out/ put something over them (to show they have been taken away). Place the remaining in the other part.  **Use pictures** | 5    REPRESENTATIONAL  **Use counters to represent the objects.**  I.e “I’ve got 5 cars and I give three of them to my friend. How many have I got left?”  Start with 5 counters. Place three in one part and cross them out/ put something over them (to show they have been taken away). Place the remaining in the other part.  **Use red and yellow counters** | 5  3  CONTINUOUS  **Use the numbers in the number sentence.**  I.e “I’ve got 5 cars and I give three of them to my friend. How many have I got left?”  Write the number 3 in one part but cross it out to show it has been taken away.  **Use the numbers in the question** |

**Bar model- subtraction**

**Partitioning subtraction**- Same as above but DO NOT cross out the part (they are not going anywhere).

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| --- | --- | --- | --- | --- | --- |
| Stage 1 | Stage 2 | Stage 3 | Stage 4 | Comparison  More than | Comparison  Less than |
| 5  ? See the source image See the source image See the source image  CONCRETE  **Use physical things (could be anything).**  I.e “I’ve got 5 cars. Three of them are yellow. How many are red?  **Use red and yellow cars for each part.**  It is best to use actual objects but you could use photographs of the objects if you have to. | 5  ? https://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpghttps://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpghttps://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpg  PICTORAL  **Picture of the objects or draw the objects in the bar.**  I.e “I’ve got 5 cars. Three of them are yellow. How many are red?”  **Use pictures of the objects** | 5  ?  REPRESENTATIONAL  **Use counters to represent the objects.**    I.e “I’ve got 5 cars. Three of them are yellow. How many are red?”  **Use red and yellow counters** | 5  ? 3  CONTINUOUS  **Use the numbers in the number sentence.**  I.e “I have got 5 cars. Three of them are yellow, How many are red?”  **Use the numbers in the question** | 5  P  ?  3    J  COMPARISON  I.e. “Peter has 5 cars. Jane has 3 cars. How many more cars does peter have?”  5-3=2  **Don’t draw a bar (for the more than) as this number of cars does not exist.** | 5  P 5  ?    J 3  COMPARISON  I.e. “Peter has 5 cars. Jane has 3 cars less than Peter. How many cars does Jane have?”  5-2=3  **Don’t draw a bar (for less than) as this number of cars does not exist.** |

Do not use (stages 1-4) with large numbers.

For larger numbers you MUST link division to multiplication (stage 5).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Stage 1  **Bar model- division by sharing** | Stage 2 | Stage 3 | Stage 4 | Stage 5 |
| 4  ? ?  CONCRETE    James has 4 cakes. He puts them into 2 boxes. How many will he have in each box?  Share 4 cakes between the boxes.  4÷2=2  It should look like this…  4  Two cakes stock photo. Image of brown, close, decorating - 28916274  Two cakes stock photo. Image of brown, close, decorating - 28916274  **Use actual cakes**  It is best to use actual objects but you could use Photographs of the objects if you have to. | 4  ? ?  PICTORAL  James has 4 cakes. He puts them into 2 boxes. How many will he have in each box?  Share 4 cakes between the boxes.  4÷2=2  It should look like this…  4  C:\Users\JSmith\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\F0332C75.tmp  C:\Users\JSmith\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\F0332C75.tmp  **Use pictures of cakes** | 4  ? ?  REPRESENTATIONAL  James has 4 cakes. He puts them into 2 boxes. How many will he have in each box?  Share 4 cakes between the boxes.  4÷2=2  It should look like this…  4    **Use counters** | 4  ? ?  James has 4 cakes. He puts them into 2 boxes. How many will he have in each box?  Share 4 cakes between the boxes by drawing dots  4÷2=2  It should look like this…  4  . . . .  **Use the numbers in the question** | 4  ? ?  James has 4 cakes. He puts them into 2 boxes. How many in each box?  Use you times tables knowledge to help you.  4÷2=2  It should look like this…  4  2 2  **Use the numbers in the question** |

|  |  |  |  |
| --- | --- | --- | --- |
| Stage 1  **Bar model- division by grouping** | Stage 2 | Stage 3 | Stage 4 |
| 4  Two cakes stock photo. Image of brown, close, decorating - 28916274  CONCRETE  James has 4 cakes. He wants 2 in each box. How many boxes will he need?  Start with one 2, then add more 2’s and count in 2’s as you do it.  It should look like this…  4  Two cakes stock photo. Image of brown, close, decorating - 28916274  Two cakes stock photo. Image of brown, close, decorating - 28916274  6÷2=3  **Use actual cakes**  It is best to use actual objects but you could use Photographs of the objects if you have to | 4  C:\Users\JSmith\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\F0332C75.tmp  PICTORAL  James has 4 cakes. He wants 2 in each box. How many boxes will he need?  Start with one 2, then add more 2’s and count in 2’s as you do it.  It should look like this…  4  C:\Users\JSmith\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\F0332C75.tmp  C:\Users\JSmith\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\F0332C75.tmp  4÷2=2  **Use pictures of cakes** | 4    REPRESENTATIONAL  James has 4 cakes. He wants 2 in each box. How many boxes will he need?  Start with one 2, then add more 2’s and count in 2’s as you do it.  It should look like this…  4    4÷2=2  **Use counters** | 4  2 5  James has 4 cakes. He wants 2 in each box. How many boxes will he need?  Start with one 2, then add more 2’s and count in 2’s as you do it.  It should look like this…  4  2 2  4÷2=2  **Use the numbers in the question** |

Do not draw the dots for grouping.

**Bar model- multiplication**

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| --- | --- | --- |
| Method 1 | Method 2 | Method 3- comparative |
| ?  5 5  Cakes come in boxes of 5. I buy 6 boxes. How many do I buy?  **Start with one 5, then add more 5’s and count in 5’s as your do it until you have drawn 6 boxes.**  It will end up looking like this…  30  5 5  5 5  5 5  5 5  5 5  5 5  5 | ?  5 5  5 5  5 5  5 5  5 5  5 5  5  Cakes come in boxes of 5. I buy 6 boxes. How many do I buy?  **Split the bar into 6. Write 5 in each. Then count in 5’s to work out the answer.**  6x5=30  It will end up looking like this…  30  5 5  5 5  5 5  5 5  5 5  5 5  5 | B  =24  Y  The blue bucket contains 3 times as much water as the yellow bucket. There are 24 litres in total. How much is in the blue bucket?  24÷4=6  Your bar should then look like this…  6  6  6  B  =24  6  Y  6x3= 18  So there is 18 litres in the blue bucket. |

Methods 1 and 2 are very similar. Choose which way works best for you and the children.

If you want to do this practically, you could use different resources to represent the number.

* Numicon
* Place value counters
* Base ten rods

Make sure it is one thing to use that represents that number, i.e. don’t use 5 individual counters in each box.

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| --- | --- | --- | --- |
| Pre-algebra | Three way problem | Complex problem | Goal Free |
| 110  38  Cone and cube needs to be different sizes.  The mass of 1 cube and 4 cones in 110g. The mass of 1 cube and 2 cones is 72g. What is the mass of 1 cube?  110-72=38  38 ÷ 2 = 19 (mass of 1 cone)  19x4=76  110-76=34  1 cone =34g | 2,346  O  =5000  ?  E  =2654  ?  A  1118  There are 5000 trees in a forest. There are 2,346 oak trees. There are 1,118 more Elm than Ash trees. How many Elm trees are there?  5000-2345 = 2654  2654-1118=1536  1536÷2- 768  768+1118=1886  There are 1886 Elm trees. | D  84  F  ?  S  Dave has ½ as many beanbags as Fred. Fred has 1/3 as many beanbags as Sarah. Sarah has 84 more beanbags than Fred. How many beanbags are there in total?  2/3 = 84  84÷2= 42 (1/3)  F-42  D 42÷2=21  21+42+42+84=189 | D  84  F  ?  S  Take the question away so you can represent the situation.  Dave has ½ as many beanbags as Fred. Fred has 1/3 as many beanbags as Sarah. Sarah has 84 beanbags than Fred.  Then ask them lots of questions…  Who’s bar is the longest? How do you know? How have you represented that Dave has half as many as Fred? |

**Bar model- comparative models for advanced questions**

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| --- | --- | --- | --- |
| Unit fraction-  Stage 1  (Numerated is always 1) | Unit fraction- Stage 2  (Numerated is always 1) | Non-unit Fractions- Stage 3 | Fractions- Stage 4  Comparison bar model |
| 25  ? 5  ? 5  ? 5  ? 5  ?5  5  Find 1/5 of a 25.  Split the bar into 5 to show you are finding 1/5.  Link to division!  25÷5=5 | ?  5 5  5 5  5 5  5 5  5 5  5  1/5 of a number is 5.  What is the number?  Split the bar into 5 and write 5 in each part.  Link to multiplication  5x5=25 | 25  ? 5  ? 5  ? 5  ? 5  ? 5  5  Peter has 25 sweets. He eats 3/5.  How many does he eat?  Split the bar into 5 parts.  Find 1/5 of 25 = 5  (25÷5=5)  5x3=15  Peter eats 15 sweets. | 24  12 12  8 8 8  John is thinking of a number.  Half of John’s number is 12. What is 1/3 of his number?  1/2 = 12 so the whole must be 24.  1/3 of 24=8  24÷3=8 |

**Bar model- fractions**

**Part, part whole**

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| --- | --- | --- | --- | --- | --- |
| Stage 1 | Stage 2 | Stage 3 | Stage 4 | Stage 5 | Stage 6 |
| See the source imageSee the source imageSee the source image  **CONCRETE**  There are two yellow cars in the garage. One more red car comes into the garage. How many cars are in the garage altogether?  Use physical objects  Use photographs of the objects if you need to. | https://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpghttps://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpgSee the source imageSee the source image  **PICTORAL**  There are two yellow cars in the garage. One more red car comes into the garage. How many cars are in the garage altogether?  Use pictures of the objects or draw them in the parts. | See the source imageSee the source image  **REPRESENTATIONAL**  There are two yellow cars in the garage. One more red car comes into the garage. How many cars are in the garage altogether?  Use counters to represent the objects. (Use the different colours for the different objects) | See the source image  2  1  **NUMBERS**  There are two yellow cars in the garage. One more red car comes into the garage. How many cars are in the garage altogether?  Use the numbers in the question | See the source image  3  1  **MISSING NUMBERS**  There are three cars in the garage. There is one red car and the rest are yellow. How many yellow cars are in the garage?  Use the numbers in the question | See the source image  3  **DIFFERENT WAYS OF MAKING THE NUMBER**  There are three cars in the garage. Some are red and some are yellow. Write down all the possible combinations there could be.  Use the numbers in the question |

Tens frame- getting children to use number bonds to help them.

|  |  |  |  |
| --- | --- | --- | --- |
| Stage 1 | Stage 2 | Stage 3 | Stage 4 |
| CONCRETE  See the source image  See the source imageSee the source imageSee the source imageSee the source image8+4=  First, make the two numbers on two separate 10 frames.  See the source image    See the source imageSee the source image  See the source imageSee the source image  Then partition the second number, to complete one ten frame 8+2+2=12 | PICTORAL  See the source imageSee the source imageSee the source imageSee the source imageSee the source imageSee the source image  See the source imageSee the source imageSee the source image  https://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpghttps://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpghttps://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpghttps://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpg  8+4=  First, make the two numbers on two separate 10 frames.  See the source imageSee the source imageSee the source imageSee the source imageSee the source image  See the source image  https://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpgSee the source imageSee the source imageSee the source imagehttps://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpg  https://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpghttps://c2.staticflickr.com/4/3455/5715563854_d2a4f70396_b.jpg  Then partition the second number, to complete one ten frame 8+2+2=12 | See the source imageSee the source imageSee the source imageSee the source imageSee the source imageSee the source imageSee the source imageSee the source imageSee the source imageSee the source imageSee the source imageSee the source imageSee the source imageSee the source imageSee the source imageSee the source imageSee the source imageSee the source imageREPRESENTATIONAL  8+4=  First, make the two numbers on two separate 10 frames.  Then partition the second number, to complete one ten  frame 8+2+2=12 | MENTALLY  Children should be using their knowledge of number bonds to help them work out questions mentally.  8+4=  First, partition the 4 in your head into 2 and 2.  8+2=10  10+2=12 |