Addition, Subtraction, Multiplication and Division: The Vault

Aim:	Success Criteria:	Resources:
Solve problems involving addition, subtraction, multiplication and division. I can find missing numbers using the inverse.	I know what 'inverse' means. I can write the inverse of a number sentence. I can use my knowledge of known number facts to solve missing number problems. I can use the inverse to solve missing number problems.	**Lesson Pack** Calculators
	Key/New Words: Opposite, inverse, reverse, calculation, operation.	**Preparation:** Differentiated **Missing Number Vault Activity Sheet** – one per child **Blank Pyramid Activity Sheet** – one per pair **Extra Challenge Activity Sheet** – as required

Prior Learning:	It will be helpful if children have a secure understanding of place value, number bonds, multiplication facts and corresponding number facts.

Learning Sequence

	**Box It Up:** Children draw a two-by-two grid. Children populate each space with a digit from one to nine. This will make 4 two-digit numbers; 2 two-digit numbers reading across and 2 two-digit numbers reading down. The children will add, subtract, multiply or divide the numbers in any order to gain an answer. How many different answers can they children make?	
	**Mission Training:** Using the **Lesson Presentation**, demonstrate to the children how to find missing numbers using the inverse operation.	
	**Pyramid Puzzles:** Using the populated pyramids shown on the **Lesson Presentation**, the children fill in the **Blank Pyramid Activity Sheet** by adding the adjacent numbers together and writing their sum in the block above them. The children continue the activity until they have completed the pyramid. In some cases, the children will have to use the inverse to find the missing numbers. This activity is repeated where children multiply and divide numbers to find the missing numbers. Did the children use the inverse operation to finding the missing numbers? Can children explain why they used the inverse operation to find the missing numbers?	
	**The Vault:** Explain to the children that they will be completing a range of questions that will require them to find the missing number or digit using the inverse operation, as demonstrated earlier in the lesson. Each missing number or digit will be used to answer a question. Once all of the missing numbers or digits have been found and the related questions are answered, the code will be produced to unlock the vault. Children may wish to use a calculator to complete the calculations.  Individually, the children use the inverse operation to obtain missing numbers in whole number sentences to complete the differentiated **Missing Number Vault Activity Sheet** and find the code to unlock the vault.  Individually, the children use the inverse operation to obtain missing numbers in number sentences involving decimals to complete the differentiated **Missing Number Vault Activity Sheet** and find the code to unlock the vault.  Individually, the children use the inverse operation to obtain missing digits in number sentences to complete the differentiated **Missing Number Vault Activity Sheet** and find the code to unlock the vault. An **Extra Challenge Activity Sheet** is provided as an extension activity if required.	

Diving into Mastery: Schools using a mastery approach may prefer to use the following as an alternative activity. These sheets might not necessarily be used in a linear way. Some children might begin at the 'Deeper' section and in fact, others may 'dive straight in' to the 'Deepest' section if they have already mastered the skill and are applying this to show their depth of understanding.

Children use known facts from one calculation to give answers to a related calculation using understanding of commutativity and inverse operations.

Children answer reasoning questions using known facts from one calculation to give answers to a related calculation using understanding of commutativity and inverse operations.

Children solve a problem using known facts from one calculation to give answers to a related calculation using understanding of commutativity and inverse operations.

Vault Calculations: Invite children to create their own calculations that have a missing number for their partner to solve. Then ask the children to explain their method of calculation. Can the children use the inverse operation to find the missing numbers? Can the children use the correct terminology?

Exploreit

Gameit: Children use these marvellous **Year 6 Multiplication and Division Challenge Cards** to practise their inverse problem solving.

Findit: Children complete this fabulous set of **Year 5 to 6 Inverse Multiplication and Division Activity Sheets**.