Maths - Year 6

Calculating 6: Exploring calculations: multi-step non-routine problems and order of operations

Key Vocabulary

Inverse	The opposite or reverse.
Overheads	A cost or expense.
Income	Financial earnings.
Profits	Financial gains.
Cubing	Multiplying a number by it-self, then itself again e.g. $4^3 = 4 \times 4 \times 4$
Squaring	Multiplying a number by it-self e.g. $4^2 = 4 \times 4$.

Mathematical Skills

- Make reasoned decisions about strategy and work systematically to solve multi-step problems.
- Identify the calculations needed to solve multi-step problems.
- Calculate efficiency using appropriate mental or written strategies.
- Use estimating to check that the results of calculations are reasonable.
- Use the inverse calculation to check that an answer is correct.
- Use knowledge of the conventional order of operations to carry out calculations involving more than one operation, also square and cube numbers.
- Know that brackets can be used to indicate that part of a calculation should be carried out first.

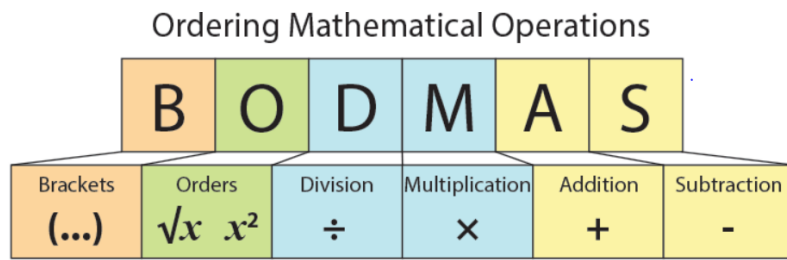### Mathematical Methods

- Solving multi-step problems.

E.g. Plan a theme park. A company is planning to build and run a new theme park. Encourage children to talk about what the park should include, agreeing that a theme park usually has a variety of rides and attractions, along with amenities such as cafes and toilets. Tell them that the theme park company has provided a basic 'project specification':

- The budget for construction is £500,000
- The different areas should be connected by paved paths; the estimated construction cost for a path is £300 per square metre.
- There should be plenty of green space to help attract visitors; the estimated construction cost is £50 per square metre for park or woodland and £200 per square metre for gardens.
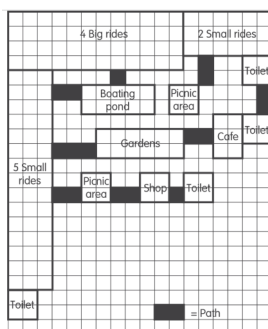
Attraction or amenity	Number	Running costs (per day)	Spend (average per visitor)
Big ride		£120 each	£7
Small ride		£100 each	£5
Boating pond		£200 each	£2
Cafe		£1000 each	£5
Toilets		£50 each	£0
Shop		£750 each	£6
Picnic area		£50 in total	£0
Gardens	n/a	£200	£0
Paths	n/a	£50 in total	£0
Park	n/a	£75 in total	£0
Woodland	n/a	£50 in total	£0

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- Using the BODMAS convention order of operations to solve problems.

Ordering Mathematical Operations

B	O	D	M	A	S
Brackets	Orders	Division	Multiplication	Addition	Subtraction
(...)	$\sqrt{x}$ x^2	$\div$	$\times$	$+$	-

E.g. (40 + 15) x 60 = 3300   and 40 + 15 x 60 = 940.

- Exploring the order of operations e.g.

$6 + 3^2 = 15$

$(6 + 3)^2 = 81$

$4 \times 5^2 = 100$

$(4 \times 5)^2 = 400$

$6 + 4^3 \div 8 = 14$

$(6 + 4)^3 \div 8 = 125$

Can you..?

- Check Dougal's calculations and make any corrections that are necessary.

$78 - 16 \times 3 = 186$

$49 \times 6 \div 2 = 147$

$36 \div 6 \times 4 - 2 = 12$

- Use the order of operations to solve this calculation. How many different solutions can you find by adding brackets to the calculation.

$$6 + 3 \times 7 - 3$$