

# Reasoning and Problem Solving

## Step 2: Mental Calculations

### National Curriculum Objectives:

Mathematics Year 6: (6C6) [Perform mental calculations, including with mixed operations and large numbers](#)

### Differentiation:

Questions 1, 4 and 7 (Problem Solving)

**Developing** Give examples of different strategies to mentally calculate numbers to 1,000.

**Expected** Give examples of different strategies to mentally calculate numbers to 10,000.

**Greater Depth** Give examples of different strategies to mentally calculate numbers to 100,000, including decimal numbers.

Questions 2, 5 and 8 (Reasoning)

**Developing** Identify the correct mental calculation method used when solving a problem including whole numbers up to 1,000.

**Expected** Identify the correct mental calculation method used when solving a multi-step problem including whole numbers up to 10,000.

**Greater Depth** Identify the correct mental calculation method used when solving a multi-step problem including whole numbers up to 100,000, including decimal numbers.

Questions 3, 6 and 9 (Reasoning)

**Developing** Determine which example of rounding and estimating is most appropriate (involves rounding money up to £20).

**Expected** Determine which example of rounding and estimating is most appropriate (involves rounding money up to £100).

**Greater Depth** Determine which example of rounding and estimating is most appropriate (involves rounding money up to £1,000).

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# Reasoning and Problem Solving – Mental Calculations

1a. Give 2 different ways of mentally calculating the following:

$$125 \times 5$$



6 PS

1b. Give 2 different ways of mentally calculating the following:

$$320 \times 3$$



6 PS

2a. Sinead and Gabriel are solving the calculation  $50 \times 20$ .

I did  $5 \times 2 = 10$ , then x my answer by 100. My answer is 1,000.



Sinead



Gabriel

I did  $50 \times 2$  then  $50 \times 10$ , then I added my answers together. My answer is 600.



6 R

2b. Ben and Isabel are solving the calculation  $25 \times 30$ .

I did  $25 \times 3 = 75$ , then x 10. My answer is 750.



Ben



Isabel

I did  $25 \times 3$  then  $25 \times 0$  and added them together. My answer is 75.



6 R

Who is correct? Explain how you know.

Who is correct? Explain how you know.

3a. Josh is estimating the cost of 3 items.

Magazine = £4.99, Football = £10.99, Sweets = £3.99

Which calculation would give him the best estimation? Explain why.

a  $4 + 5 + 11$

b  $4 + 10 + 3$



6 R

3b. Kelly is estimating the cost of 3 items.

Book = £7.99, Notepad = £5.99, Pencil case = £4.99

Which calculation would give her the best estimation? Explain why.

a  $8 + 6 + 5$

b  $10 + 5 + 5$



6 R

# Reasoning and Problem Solving – Mental Calculations

4a. Give 3 different ways of mentally calculating the following:

$$225 \times 9$$



6 PS

4b. Give 3 different ways of mentally calculating the following:

$$420 \times 11$$



6 PS

5a. Steph and Sheldon are solving the calculation  $125 \times 4 \times 12$ .

I did  $125 \times 4 = 500$ , then  $500 \times 10$ , then added 1,000. My answer is 6,000.



Sheldon



Steph

I did  $125 \times 4 = 500$ , then I  $\times$  by 10, then by 2. My answer is 10,000.

Who is correct? Explain how you know.



6 R

5b. Hannah and Lucas are solving the calculation  $108 \times 5 \times 15$ .

I did  $108 \times 10$ , then  $\div 2 = 540$ . Then  $540 \times 10$ , then  $\times 5$ . My answer is 27,000.



Hannah



Lucas

$108 \times 10$ , then  $\div 2 = 540$ . Then  $540 \times 10$  and  $540 \times 5$  and added both to get 8,100.

Who is correct? Explain how you know.



6 R

6a. Hafsa is estimating the cost of 3 items.

Game = £19.99, Headset = £37.99,  
Controller = £34.99

Which calculation would give her the best estimation? Explain why.

a  $20 + 40 + 30$

b  $20 + 38 + 35$



6 R

6b. Chuan is estimating the cost of 3 items.

Jeans = £36.99, Shoes = £29.99,  
Shirt = £24.99

Which calculation would give him the best estimation? Explain why.

a  $40 + 30 + 20$

b  $37 + 30 + 25$



6 R

# Reasoning and Problem Solving – Mental Calculations

7a. Give 3 different ways of mentally calculating the following:

$$1,025 \times 5 \times 12$$



6 PS

7b. Give 3 different ways of mentally calculating the following:

$$1,200 \times 10 \times 11$$



6 PS

8a. Sean and Alice are solving the calculation  $225 \times 4 \times 12$ .

I did  $225 \times 2 \times 2$ . Then I multiplied by 10, then by 2. My answer is 18,000.



Sean



Alice

$225 \times 4 = 900$  then  $900 \times 10$  added to  $900 \times 2$ . My answer is 10,800.

Who is correct? Explain how you know.



6 R

8b. Josh and Chuan are solving the calculation  $450 \times 8 \times 25$ .

I did  $8 \times 25 = 200$ , then  $450 \times 2 \times 100$ . My answer is 90,000.



Josh



Chuan

I doubled 450 three times, then  $3,600 \times 20 = 72,000$ , then  $\times 5$ . My answer is 360,000.

Who is correct? Explain how you know.



6 R

9a. Ben is estimating the cost of 3 items.

Games Console = £259.99,  
Game = £29.99, Controller = £54.99

Which calculation would give him the best estimation? Explain why.

a  $260 + 30 + 55$

b  $260 + 30 + 50$



6 R

9b. Isabel is estimating the cost of 3 items.

DVD Player = £56.99, TV = £429.99, HDMI Cable = £14.99

Which calculation would give him the best estimation? Explain why.

a  $60 + 430 + 10$

b  $57 + 430 + 15$



6 R

# Reasoning and Problem Solving – Mental Calculations

- 1a. Various answers, for example:  $125 \times 10 \div 2$ ;  $125 + 125 + 125 + 125 + 125$ ;  $(100 \times 5) + (20 \times 5) + (5 \times 5)$ .
- 1b. Various answers, for example:  $320 \times 2 + 320$ ;  $320 + 320 + 320$ ;  $(300 \times 3) + (20 \times 3)$
- 2a. Sinead is correct. Gabriel multiplied by 12 because he did 10 lots of 50 and then 2 lots of 50. He should have multiplied 50 by 2 then multiplied by 10.
- 2b. Ben is correct. Isabel partitioned her multiplier but she multiplied by 0 instead of 10.
- 3a. A because the numbers are rounded to the nearest £1. B is rounded down and taken 99p off each price.
- 3b. A because the numbers are rounded to the nearest £1. B is rounded to the nearest £5.

## Expected

- 4a. Various answers, for example:  $225 \times 10 - 225$ ;  $(200 \times 9) + (20 \times 9) + (5 \times 9)$ ;  $(2 \times 225) + (2 \times 225) + (2 \times 225) + (2 \times 225) + 225$
- 4b. Various answers, for example:  $420 \times 10 + 420$ ;  $(400 \times 11) + (20 \times 11)$ ;  $(420 \times 5 \times 2) + 420$
- 5a. Sheldon is correct. Steph didn't multiply by 12, she multiplied by 20. She should have multiplied the answer by 10 then the original answer by 2 and added them together.
- 5b. Lucas is correct. Hannah didn't multiply by 15, she multiplied by 50. She should have multiplied the answer by 10 then the original answer by 5 and added together.
- 6a. B because the numbers are rounded to the nearest £1. A is rounded to the nearest £10.
- 6b. B because the numbers are rounded to the nearest £1. A is rounded to the nearest £10.

## Greater Depth

- 7a. Various answers, for example:  $1,025 \times 10 \times 6$ ;  $1,025 \times 5 = 5,125$ ,  $(5,125 \times 10) + (5,125 \times 2)$ ;  $(1,000 \times 5 \times 12) + (20 \times 5 \times 12) + (5 \times 5 \times 12)$
- 7b. Various answers, for example:  $1,200 \times 10 \times 10 + 12,000$ ;  $(10 \times 11) \times 1,200$ ;  $12 \times 11 \times 10 \times 100$
- 8a. Alice is correct. Sean multiplied his answer by 20 not 12 as he  $\times 10$  then  $\times 2$ .
- 8b. Josh is correct. Chuan multiplied by 100 as he did  $\times 20$  then  $\times 5$  instead of multiplying his original answer by 5 then adding them together.
- 9a. A because the numbers are rounded to the nearest £1. B is rounded to the nearest £10.
- 9b. B because the numbers are rounded to the nearest £1. A is rounded to the nearest £10.