Numbers in the Media

Solution

Possible solution using standard form

Double checking figures in tables:

UK

£1.88 trillion: $(1.88 \times 10^{12}) \div 0.82 = \$2.292682927 \times 10^{12}$ ($2,292,682,927,000) ≈ $\$2.29 \times 10^{12}$ or $2.29 trillion

India

₹153 trillion: $(1.53 \times 10^{14}) \div 66.58 = \$2.297987384 \times 10^{12}$ ($2,297,987,384,000) ≈ $\$2.30 \times 10^{12}$ or $2.30 trillion

Therefore, approximations in US dollars from the figures in the table appear to be correct.

Using correct exchange rates:

UK

Using $1 = £0.8151

£1.88 trillion: $(1.88 \times 10^{12}) \div 0.8151 = \$2.306465464 \times 10^{12}$ ($2,306,465,464,000) ≈ $\$2.31 \times 10^{12}$ or $2.31 trillion

This corrected approximation is bigger than the $2.29 trillion approximation reported for the UK, and it is bigger than India's reported $2.30 trillion.

In more detail, this is almost $14 billion ($13,782,537,000) bigger than the more accurate $2,292,682,927,000 calculated for the UK using the incorrect exchange rate in the table.

- $\$2.306465464 \times 10^{12} - \$2.292682927 \times 10^{12} = \$1.3782537 \times 10^{10} = \$13,782,537,000$

India

Using $1 = 66.85

₹153 trillion: $(1.53 \times 10^{14}) \div 66.85 = \$2.288706058 \times 10^{12}$ ($2,288,706,058,000) ≈ $\$2.29 \times 10^{12}$ or $2.29 trillion

This corrected approximation is smaller than the incorrect approximation of $2.30 trillion for India reported in the table, and also smaller than the corrected approximation of $2.31 trillion for the UK. It is also the same as the incorrect approximation for the UK reported in the table.

In more detail, this corrected value is almost $9 billion ($9,281,326,000) smaller than the more accurate $2,297,987,384,000 calculated for India using the incorrect exchange rate in the table and almost $18 billion ($17,759,406,000) smaller than the corrected $2,306,465,464,000 for the UK.

- $\$2.297987384 \times 10^{12} - \$2.288706058 \times 10^{12} = \$9.281326 \times 10^{9} = \$9,281,326,000$
- $\$2.306465464 \times 10^{12} - \$2.288706058 \times 10^{12} = \$1.7759406 \times 10^{10} = \$17,759,406,000$

Numbers in the Media (Continued)

Country	Incorrect conversion to US dollars	Corrected conversion to US dollars	Corrected difference
UK	$\$2.292682927 \times 10^{12}$	$\$2.306465464 \times 10^{12}$	$+\$1.3782537 \times 10^{10}$
India	$\$2.297987384 \times 10^{12}$	$\$2.288706058 \times 10^{12}$	$-\$9.281326 \times 10^{9}$

Country	Incorrect conversion to US dollars	Corrected conversion to US dollars	Corrected difference
UK	$2,292,682,927,000	$2,306,465,464,000	+$13,782,537,000
India	$2,297,987,384,000	$2,288,706,058,000	-$9,281,326,000

The headline is not correct. The reasons for this are as follows:

- The corrected conversion of UK GDP in US dollars is bigger than what was reported for both the UK and India.
- The corrected conversion of India GDP in US dollars is smaller than what was reported for both the UK and India.
- The corrected conversion of UK GDP in US dollars is bigger than the corrected conversion of India GDP in US dollars.

Pupils can discuss with each other (or as part of a teacher-led discussion) why the degrees of accuracy have had such an effect on the reported figures.

For example, for the UK the report rounded the exchange rate to two decimal places instead of using the rate with four decimal places. This had a big impact on the result from the conversion when compared to the more accurate exchange rate value (almost $14 billion difference): this is down to the fact that there are very large numbers involved.

The report also rounded the value in trillions to two decimal places: when rounding to two decimal places when working with trillions, you are either:

- adding billions that aren't there (when rounding up); or
- removing billions that are there (when rounding down).

Numbers in the Media (Continued)

Possible solution using decimals to represent trillions

Double checking figures in tables:

UK

£1.88 trillion: 1.88 ÷ 0.82 = $2.292682927 trillion or approximately £2.29 trillion

India

₹153 trillion: 153 ÷ 66.58 = $2.297987384 trillion or approximately £2.30 trillion
So approximations in dollars from the figures in the table appear correct.
Using correct exchange rates:

UK

Using $1 = £0.8151
£1.88 trillion: 1.88 ÷ 0.8151 = $2.306465464 trillion or approximately $2.31 trillion

This corrected approximation is bigger than the $2.29 trillion approximation reported for the UK, and it is bigger than India's reported $2.30 trillion.

India

Using $1 = ₹66.85

₹153 trillion: 153 ÷ 66.85 = $2.288706058 trillion or approximately $2.29 trillion

This corrected approximation is smaller than the incorrect approximation of $2.30 million for India from the table, and also smaller than the corrected approximation of $2.31 trillion for the UK. It is also the same as the incorrect approximation for the UK from the table.

Country	GDP	Corrected conversion to US dollars	Corrected conversion to US dollars
UK	£1.88 trillion	$2.29 trillion	£2.31 trillion
India	₹153 trillion	$2.30 trillion	£2.29 trillion

The headline is not correct. The reasons for this are as follows:

- The corrected approximation of UK GDP in US dollars is bigger than what was reported for both the UK and India.
- The corrected approximation of India GDP in US dollars is smaller than what was reported for India and the same as what was reported for the UK.
- The corrected approximation of UK GDP in US dollars is bigger than the corrected conversion of India GDP in US dollars.

Pupils can discuss with each other (or as part of a teacher-led discussion) why rounding to a number of degrees of accuracy is important when making approximations, and how this can have an effect on the reported figures, as is demonstrated above.