

MATHS SESSION 5: BETWEEN-COUNTRY GAPS

Age range: 11–16 years

<p>Outline Learners will explore some development indicators in more detail and then ask and answer questions about a set of tabulated data for the UK and the four Young Lives countries: Ethiopia, India, Peru and Viet Nam. Learners will consider different ways in which data can be represented and then convert between percentages and fractions to present development indicators. They will finish by discussing reasons for describing data in different ways and generating their own statements about the development data.</p>		
<p>Learning objectives</p> <ul style="list-style-type: none"> To interpret development data. To be able to convert between percentages and fractions. To describe data in different ways. To generate statements about a set of data. 	<p>Learning outcomes</p> <ul style="list-style-type: none"> Learners will interpret tabulated development data for the UK and the four Young Lives countries. Learners will ask and answer questions about this set of data. Learners will convert between percentages and fractions. Learners will generate statements about development data. 	
<p>Key questions</p> <ul style="list-style-type: none"> What does this development data tell us? What questions could we ask about this data? What would the answers be? What would this percentage be as a fraction? What calculation was used to generate this statement? Why might people want to describe data in different ways? 	<p>Resources</p> <ul style="list-style-type: none"> <i>Maths slideshow B</i> (slides 13–20) Resource sheets: <ul style="list-style-type: none"> <i>Measuring development</i> (Tables 1, 2 and 3) <i>Measuring development indicators</i> <i>Fractions and percentages</i> (Completed table) <i>Describe it in a different way</i> (Completed statements) Activity sheets: <ul style="list-style-type: none"> <i>Fractions and percentages</i>– (Tables 1 and 2) <i>Describe it in a different way</i> 	
<p>Curriculum links</p>		
<p>England KS3 Mathematics <i>Pupils should be taught to:</i> Number</p> <ul style="list-style-type: none"> Interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages. Use a calculator and other technologies to calculate results accurately and then interpret them appropriately. <p>Ratio, proportion and rates of change</p> <ul style="list-style-type: none"> Express one quantity as a fraction of another. Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction. 	<p>Wales KS3 Mathematics Developing numerical reasoning</p> <ul style="list-style-type: none"> Interpret mathematical information; draw inferences from graphs, diagrams and data, including discussion on limitations of data. <p>Using number skills</p> <ul style="list-style-type: none"> Use equivalence of fractions, decimals, percentages and ratio to compare proportions. Calculate a percentage, fraction, decimal of any quantity with a calculator where appropriate. 	<p>Scotland Mathematics and Numeracy</p> <ul style="list-style-type: none"> I can choose the most appropriate form of fractions, decimal fractions and percentages to use when making calculations mentally, in written form or using technology, then use my solutions to make comparisons, decisions and choices. MNU 3 and 4-07a I can solve problems involving fractions and mixed numbers in context, using addition, subtraction or multiplication. MTH 4-07b

Note: These are suggested activities and resources to support your teaching rather than guide it. Additional teaching input may be required to develop learners' knowledge, skills and understanding of some of these concepts.

Activity 5.1 (20 min)

Questioning data

Note: The first part of this activity is the same as Geography activity 2.4.

- Ask learners to recap some of the different ways in which 'development' is measured. Some examples are provided on slides 14 and 15.
- Organise learners into pairs and give each pair copies of *Measuring development – Table 1, 2 or 3* according to ability. A copy of *Measuring development – Table 1* is provided on slide 16 and a description of each indicator is provided in *Measuring development indicators*. Explain that this table shows the total population and data for selected development indicators for each of the four Young Lives countries (Ethiopia, India, Peru and Viet Nam) and the UK. Say that this data is calculated by the World Bank, an organisation which lends money to different countries to support economic growth and development, for example major infrastructure projects or education programmes.
- Ask learners to look at the *Measuring development* table. Ask questions about the data such as:
 - *What is the life expectancy in Peru?*
 - *What percentage of the population has access to electricity in Ethiopia?*
 - *What is the difference between the number of Internet users per 100 people in the UK and the number in India?*
 - *Which country has the lowest infant mortality rate?*
- Ask learners to work in pairs to generate their own questions about the data. Allow time for learners to share their questions and try to answer the questions of others.
- Remind learners that the Young Lives researchers also collected data about some of these development indicators in selected communities in Ethiopia, India, Peru and Viet Nam. Show slides 17 to 20 with quotes from four young people about their access to education, water, sanitation facilities and electricity. Discuss learners' responses to this information. Draw out the point that these development indicators are averages and don't reflect any in-country inequalities. Emphasise that these quotes are from just four young people. Although many young people in each of these countries will face similar challenges, others will have similar access to education, drinking water, safe sanitation and electricity as young people in the UK.

Differentiation

- *Make it easier: Give learners copies of Measuring development – Table 1 (data rounded to the nearest whole number).*
- *Make it harder: Give learners copies of Measuring development – Table 2 or 3 (data rounded to 1 or 2 decimal places).*

Activity 5.2 (25 min)

Fractions and percentages

- Organise learners into pairs and give each pair a copy of *Measuring development – Table 1*. A copy of this table is provided on slide 16. Learners will have been introduced to this table in *Activity 5.1*. A description of each indicator is provided in *Measuring development indicators*.
- Ask learners to identify all the development indicators which are described as percentages of the total population:
 - Access to improved water source
 - Access to improved sanitation facilities
 - Access to electricity
 - Living in a rural area (rural population)
 - Living in an urban area (urban population)
 - Living in extreme poverty.
- Ask learners how else these percentages could be described. *What would this percentage be as a fraction?*
- Provide each learner with a copy of *Fractions and percentages – Table 1* or *2* (see below for differentiation). Explain that this table contains some of the data from the *Measuring development* table. Ask learners to complete the table with the missing values. Explain that they will need to convert between percentages and fractions.
- A completed version of the table is provided in *Fractions and percentages – Completed table*.

Differentiation

- *Make it easier:* Use *Fractions and percentages – Table 1* and convert each percentage into a fraction.
- *Make it harder:* Use *Fractions and percentages – Table 2* and complete the missing values for the percentages and fractions.

Activity 5.3 (30 min)

Calculating percentages

Note: Learners will need to use a calculator for this activity.

- Distribute copies of *Measuring development – Table 1*. This table is also provided in slide 16.
- Agree which of these development indicators are described as percentages of the total population. Learners should remember this from *Activity 5.2*.
- Ask learners: *What percentage of the total population in Peru is living in extreme poverty?* Agree that the answer is 5%. Now ask learners: *Using this data, how many people in Peru are living in extreme poverty?*
- Select learners to share their calculations. Agree that 5% of 30 million (the total population of Peru) is 1.5 million.

- Ask learners to use the table and a calculator to come up with similar questions and calculate the answers. Possible questions include:
 - *How many people in Ethiopia have no access to electricity?*
 - *How many people in India have no access to improved sanitation facilities?*
 - *How many people in Peru have no access to an improved drinking water source?*
 - *How many people in Viet Nam live in rural areas?*
 - *How many people in the UK live in urban areas?*

Differentiation

- *Make it harder: Ask learners to calculate the answers to their questions using the data in Measuring Development – Tables 1, 2 and 3. Ask learners to then calculate the differences in the three totals to show the significance of rounding the data.*

Activity 5.4 (45 min)

Describe it in a different way

- Point out that the data in *Measuring development – Table 1* could be described in different ways.
- Organise learners into pairs and give each pair a copy of *Measuring development – Table 1* and *Describe it in a different way*. Explain that the ten statements in *Describe it in a different way* were all calculated using the data in *Measuring development – Table 1*. Ask learners to use this data to complete the missing part of each statement. The correct answers are provided in *Describe it in a different way – Completed statements*.
- Allow time for learners to share and discuss their answers, using the following questions as prompts:
 - *Did any of the statements surprise you? If so, which statements and why?*
 - *Do you think it makes a difference to how people react to data if it is described in a different way? Explain your answer.*
 - *Why might people want to describe data in different ways?*
 - *What other statements could you calculate using the data in Measuring development – Table 1?*
- Ask learners to use the data in *Measuring development – Table 1* to generate their own set of statements.
- Allow time at the end of the activity for learners to discuss any similarities and differences they noticed between the countries in terms of the different development indicators. You could ask the following questions:
 - *What similarities and differences are there in the development data for these countries?*
 - *Which development indicators vary the most between these countries?*
 - *What do you think are the reasons for these inequalities?*

Differentiation

- *Make it harder: Ask learners to use Measuring development – Table 2 or 3 (data rounded to 1 or 2 decimal places) to generate their own set of statements.*

Further ideas

- Ask learners to investigate the use and manipulation of data in the media or advertising. They could collect headlines, articles or advertisements which refer to some data. They could then investigate the source of the data mentioned in the article and whether or not the article is presenting the data in an unbiased way. This could be used to prompt discussion about why data might be presented in a particular way, such as for sensationalism or to promote a particular product or campaign.
- Ask learners to explore different ways of representing the information visually using dried pulses, sticky notes or beads.
- Ask learners to explore the use of infographics to represent percentages and development data. See Oxfam's *Everyone Counts, Unit 3 Session 1*:
www.oxfam.org.uk/education/resources/everyone-counts
- Ask learners to use the Internet to research other well-being and development indicators. Useful websites include:
 - World Bank Open Data: data.worldbank.org
 - UN Data: data.un.org
- Ask learners to investigate other ways of presenting this data, for example using pie charts or bar charts.

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Measuring development

Table 1

Indicator	Ethiopia	India	Peru	Viet Nam	UK
Population (millions)	97	1,295	31	91	65
Life expectancy at birth (years)	64	66	75	76	81
GDP per capita (current US\$)	565	1,596	6,551	2,052	45,603
Infant mortality rate (per 1,000 live births)	41	38	13	17	4
Access to improved water source (% of total population)	57	94	87	98	100
Access to improved sanitation facilities (% of total population)	28	40	76	78	99
Access to electricity (% of total population)	27	79	91	99	100
Mobile phone subscriptions (per 100 people)	32	74	103	147	124
Internet users (per 100 people)	3	18	40	48	92
Rural population (% of total population)	81	68	22	67	18
Urban population (% of total population)	19	32	78	33	82
Primary school enrolment (% of relevant age group)	65	93	92	98	100
Living in extreme poverty (% of total population)	34	21	4	3	No data

Data rounded to the nearest whole number.

Data source: World Bank Open Data: data.worldbank.org

Data collected from 2006 to 2015.

Measuring development

Table 2

Indicator	Ethiopia	India	Peru	Viet Nam	UK
Population (millions)	97.0	1,295.3	31.0	90.7	64.5
Life expectancy at birth (years)	63.6	66.5	74.8	75.8	81.0
GDP per capita (current US\$)	565.2	1,595.7	6,550.9	2,052.3	45,603.3
Infant mortality rate (per 1,000 live births)	41.4	37.9	13.1	17.3	3.5
Access to improved water source (% of total population)	57.3	94.1	86.7	97.6	100.0
Access to improved sanitation facilities (% of total population)	28.0	39.6	76.2	78.0	99.2
Access to electricity (% of total population)	26.6	78.7	91.2	99.0	100.0
Mobile phone subscriptions (per 100 people)	31.6	74.5	102.9	147.1	123.6
Internet users (per 100 people)	2.9	18.0	40.2	48.3	91.6
Rural population (% of total population)	81.0	67.6	21.7	67.0	17.7
Urban population (% of total population)	19.0	32.4	78.3	33.0	82.3
Primary school enrolment (% of relevant age group)	65.3	93.1	91.8	98.0	99.9
Living in extreme poverty (% of total population)	33.5	21.3	3.7	3.2	No data

Data rounded to one decimal place.

Data source: World Bank Open Data: data.worldbank.org

Data collected from 2006 to 2013.

Measuring development

Table 3

Indicator	Ethiopia	India	Peru	Viet Nam	UK
Population (millions)	96.96	1,295.29	30.97	90.73	64.51
Life expectancy at birth (years)	63.62	66.46	74.81	75.76	80.96
GDP per capita (current US\$)	565.16	1,595.70	6,550.92	2,052.29	45,603.29
Infant mortality rate (per 1,000 live births)	41.40	37.90	13.10	17.30	3.50
Access to improved water source (% of total population)	57.30	94.10	86.70	97.60	100.00
Access to improved sanitation facilities (% of total population)	28.00	39.60	76.20	78.00	99.20
Access to electricity (% of total population)	26.56	78.70	91.20	99.00	100.00
Mobile phone subscriptions (per 100 people)	31.59	74.48	102.92	147.11	123.58
Internet users (per 100 people)	2.90	18.00	40.20	48.31	91.61
Rural population (% of total population)	80.97	67.63	21.72	67.05	17.66
Urban population (% of total population)	19.03	32.37	78.29	32.95	82.35
Primary school enrolment (% of relevant age group)	65.32	93.09	91.84	97.97	99.91
Living in extreme poverty (% of total population)	33.54	21.25	3.70	3.23	No data

Data rounded to two decimal places.

Data source: World Bank Open Data: data.worldbank.org

Data collected from 2006 to 2013.

Measuring development indicators

- **Life expectancy**

This is the average number of years a new born baby in a country would be expected to live if mortality patterns at the time of its birth remain the same in the future.

- **Average income per person (GDP per capita)**

This is the average annual income of each person in a country. It is often measured in US\$.

- **Infant mortality rate**

This is the number of newborn infants per 1,000 live births in a country who die before they reach their first birthday.

- **Access to improved water source**

This is the percentage of a country's population with access to an improved water source. Improved water sources are those that are protected in some way from outside contamination, such as water piped to houses, public taps and boreholes.

- **Access to improved sanitation facilities**

This is the percentage of a country's population with access to improved sanitation facilities. Improved sanitation facilities include flush toilets, pit latrines and composting toilets.

- **Access to electricity**

This is the percentage of a country's population with access to electricity.

- **Mobile phone subscriptions**

This is the number of mobile phone subscriptions per 100 people. Some people will have more than one mobile phone subscription, such as people who subscribe to a phone for business use or parents who have mobile phone subscriptions for their children.

- **Internet users**

This is the number of Internet users per 100 people. This indicator only measures Internet use among individuals of a certain age range, frequently those aged 16 to 74.

- **Rural population**

This is the percentage of a country's population who live in rural areas. Rural is generally used to describe areas that are less densely populated. There are different types of rural area, depending on how accessible they are from urban areas. Some rural areas are close to the edge of an urban area, others are in remote countryside.

- **Urban population**

This indicator is the percentage of a country's population who live in urban areas. Urban is generally used to describe areas which are more densely populated, such as towns and cities.

- **Primary school enrolment**

This is the percentage of children of the official primary school age in a country who are enrolled in primary school.

- **Living in extreme poverty**

This is the percentage of a country's population who are living in extreme poverty. Extreme poverty is usually defined as living on less than US\$1.90 per day for all your needs.

Fractions and percentages

Table 1

Indicator	Ethiopia		India		Peru		Viet Nam		UK	
	Percentage	Fraction	Percentage	Fraction	Percentage	Fraction	Percentage	Fraction	Percentage	Fraction
Proportion of population with access to improved water source	57		94		87		98		100	
Proportion of population with access to improved sanitation facilities	28		40		76		78		99	
Proportion of population with access to electricity	27		79		91		99		100	
Proportion of population living in rural areas	81		68		22		67		18	
Proportion of population living in urban areas	19		32		78		33		82	
Proportion of population living in extreme poverty	34		21		4		3		No data	No data

Data source: World Bank Open Data: <http://data.worldbank.org/> Data collected from 2006 to 2013.

Fractions and percentages

Table 2

Indicator	Ethiopia		India		Peru		Viet Nam		UK	
	Percentage	Fraction	Percentage	Fraction	Percentage	Fraction	Percentage	Fraction	Percentage	Fraction
Proportion of population with access to improved water source	57			$\frac{47}{50}$		$\frac{87}{100}$		$\frac{49}{50}$		1
Proportion of population with access to improved sanitation facilities		$\frac{7}{25}$	40		76			$\frac{39}{50}$	99	
Proportion of population with access to electricity	27		79		91		99		100	
Proportion of population living in rural areas		$\frac{81}{100}$		$\frac{17}{25}$		$\frac{11}{50}$	67		18	
Proportion of population living in urban areas	19			$\frac{8}{25}$		$\frac{39}{50}$	33			$\frac{41}{50}$
Proportion of population living in extreme poverty		$\frac{17}{50}$	21		4			$\frac{3}{100}$	No data	No data

Data source: World Bank Open Data: <http://data.worldbank.org/> Data collected from 2006 to 2013.

Fractions and percentages

Completed table

Indicator	Ethiopia		India		Peru		Viet Nam		UK	
	Percentage	Fraction	Percentage	Fraction	Percentage	Fraction	Percentage	Fraction	Percentage	Fraction
Proportion of population with access to improved water source	57	$\frac{57}{100}$	94	$\frac{47}{50}$	87	$\frac{87}{100}$	98	$\frac{49}{50}$	100	1
Proportion of population with access to improved sanitation facilities	28	$\frac{7}{25}$	40	$\frac{2}{5}$	76	$\frac{19}{25}$	78	$\frac{39}{50}$	99	$\frac{99}{100}$
Proportion of population with access to electricity	27	$\frac{27}{100}$	79	$\frac{79}{100}$	91	$\frac{91}{100}$	99	$\frac{99}{100}$	100	1
Proportion of population living in rural areas	81	$\frac{81}{100}$	68	$\frac{17}{25}$	22	$\frac{11}{50}$	67	$\frac{67}{100}$	18	$\frac{9}{50}$
Proportion of population living in urban areas	19	$\frac{19}{100}$	32	$\frac{8}{25}$	78	$\frac{39}{50}$	33	$\frac{33}{100}$	82	$\frac{41}{50}$
Proportion of population living in extreme poverty	34	$\frac{17}{50}$	21	$\frac{21}{100}$	4	$\frac{1}{25}$	3	$\frac{3}{100}$	No data	No data

Data source: World Bank Open Data: <http://data.worldbank.org/> Data collected from 2006 to 2013.

Describe it in a different way

Complete the missing part of each statement using the data in *Measuring development – Table 1*.

- 1) The population of India is approximately _____ times the population of the UK.

- 2) A child born in Peru today is currently expected to live _____ years longer than a child born in Ethiopia today.

- 3) _____ fifths of the population of India have access to improved sanitation facilities.

- 4) _____% of children in Ethiopia (to the nearest whole number) die before their first birthday.

- 5) _____% of the population of Ethiopia don't have access to electricity.

- 6) To the nearest million, _____ million people in Ethiopia don't have access to an improved water source.

- 7) GDP per capita in the UK is roughly _____ times GDP per capita in Viet Nam.

- 8) There are _____ times as many Internet users per 100 people in Viet Nam as there are per 100 people in Ethiopia.

- 9) Roughly _____ out of every five people in the UK lives in a rural area.

- 10) Approximately _____ million people in India are living in extreme poverty.

Describe it in a different way

Completed statements

Complete the missing part of each statement using the data in *Measuring development – Table 1*.

- 1) The population of India is approximately 20 times the population of the UK.

- 2) A child born in Peru today is currently expected to live 11 years longer than a child born in Ethiopia today.

- 3) Two fifths of the population of India have access to improved sanitation facilities.

- 4) 4 % of children in Ethiopia (to the nearest whole number) die before their first birthday.

- 5) 73 % of the population of Ethiopia don't have access to electricity.

- 6) To the nearest million, 42 million people in Ethiopia don't have access to an improved water source.

- 7) GDP per capita in the UK is roughly 22 times GDP per capita in Viet Nam.

- 8) There are 16 times as many Internet users per 100 people in Viet Nam as there are per 100 people in Ethiopia.

- 9) Roughly one out of every five people in the UK lives in a rural area.

- 10) Approximately 272 million people in India are living in extreme poverty.