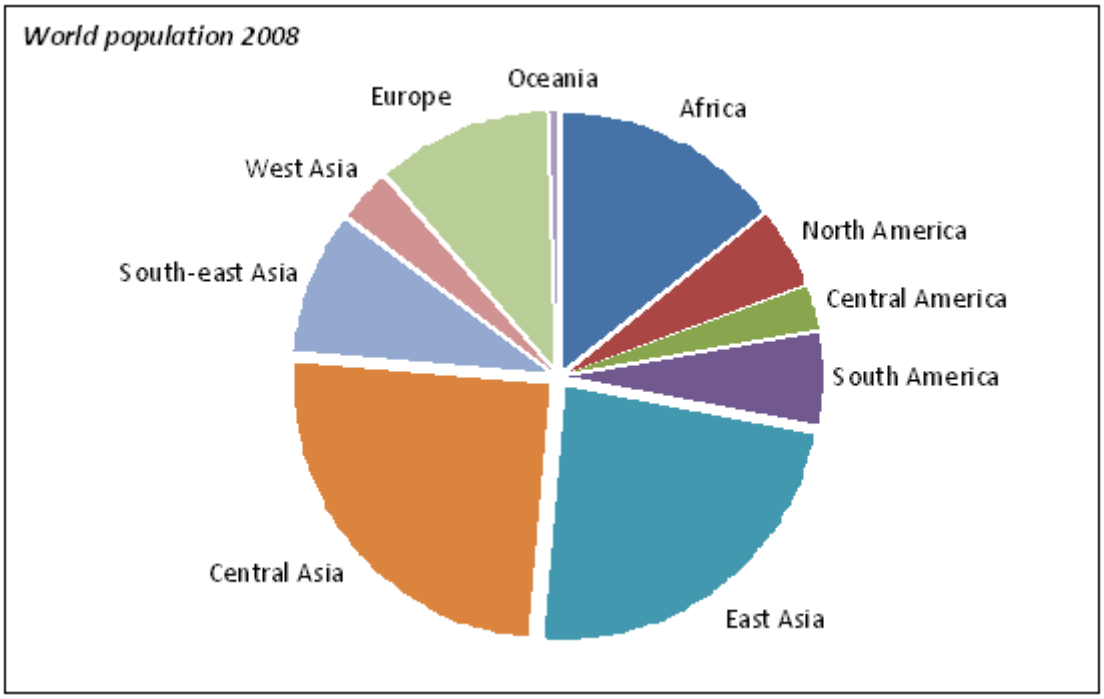
Numerical Reasoning

Practice Test 8

Solution Booklet



Q1 In which continent or subcontinent did approximately 23% of the world's population live in 2008?

Africa America Central Asia **East Asia**

This is to be done by estimation. 23% is just under ¼ and is represented by the sector with an angle at the centre of the pie graph of about 83º. The nearest to this is East Asia. Central Asia is just over ¼ of the pie graph, so not the correct answer.

Q2 In 2008, approximately what fraction of the world's population lived in the Americas?

1/4 1/5 **1/7** 1/9

The three Americas (North, Central and South) together make an angle of about 50º at the centre of the pie graph. As a fraction, this is 50/360 = 5/36, or approximately 1/7. Or, out of the possible options, the combined slice looks to be about 1/7 by inspection.

Q3 The total world population in 2008 was estimated to be 6,707 million. Approximately how many people lived in Europe?

560 million **745 million** 932 million 1,179 million

Again, this is an estimation question. The angle representing Europe is about 40º at the centre of the pie graph. The population, therefore, was about 40/360× 6,707 million = 745 million. Hopefully if you didn't get 745, your answer was closest to this than any of the other options.

Q4 The current population growth rate for Africa is estimated to be 2.4% per annum and the population of Africa in 2008 was estimated to be 967 million. If the current growth rate is maintained, in which year will the population of Africa exceed 1.1 billion?

2012 2013 **2014** 2015

An increase of 2.4% per annum means that the population for each successive year is found by multiplying the previous year's population by 1.024.

To the nearest 1 million:

Population of Africa in 2009 = 967 × 1.024 = 990

Population of Africa in 2010 = 990 × 1.024 =1,014

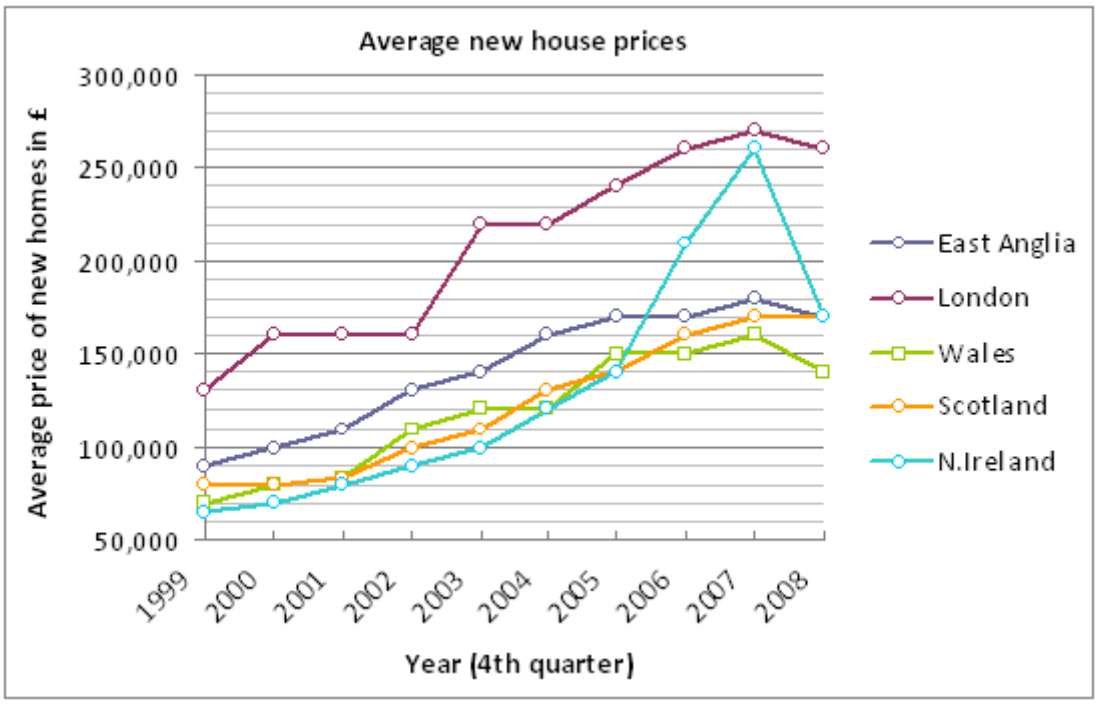
Population of Africa in 2011= 1.014 × 1.024 = 1,038

Population of Africa in 2012= 1,038 × 1.024 = 1,063

Population of Africa in 2013= 1,063 × 1.024 = 1,089

Population of Africa in 2014 = 1,089 × 1.024 = 1,115

∴ The population, will exceed 1 billion in 2014



Q5 Which region has shown the greatest range in its average new house prices over the ten year period?

London Wales Scotland **N. Ireland**

The prices in Northern Ireland range from about £65,000 in 1999 to nearly £270,000 in 2007. This can be seen by inspection of the graph.

Q6 Which region has shown the least percentage increase in its average new house prices over the ten year period?

East Anglia London Wales Scotland

Reading from the graph to the nearest £5,000, the calculations for each region are as follows:

Region	East Anglia	London	Wales	Scotland	N. Ireland
1999 price	£90,000	£130,000	£70,000	£80,000	£65,000
2008 price	£170,000	£260,000	£140,000	£170,000	£170,000
	170 ÷ 90	260 ÷ 130	140 ÷ 70	170 ÷ 80	170 ÷ 65
% increase	88.9%	100%	100%	113%	162%

The prices in East Anglia show the least percentage increase.

Q7 If the average London house price continues to fall by the same percentage as it did between the last quarter of 2007 and the last quarter of 2008, in what year would the average house price in London revert to their 2003-2004 levels?

2009 2010 **2013** 2015

Rate of decline between Q4 2007 and Q4 2008 = 260,000 ÷ 270,000 = 0.96296 which is a 3.704% decline (rounded). Keep the 0.962963 value in your calculator, or write it down, in order to multiply the consecutive year's house price by this value. For London the price in 2008 was £260,000 and the prices in 2003-2004 were £220,000. Using these figures, therefore:

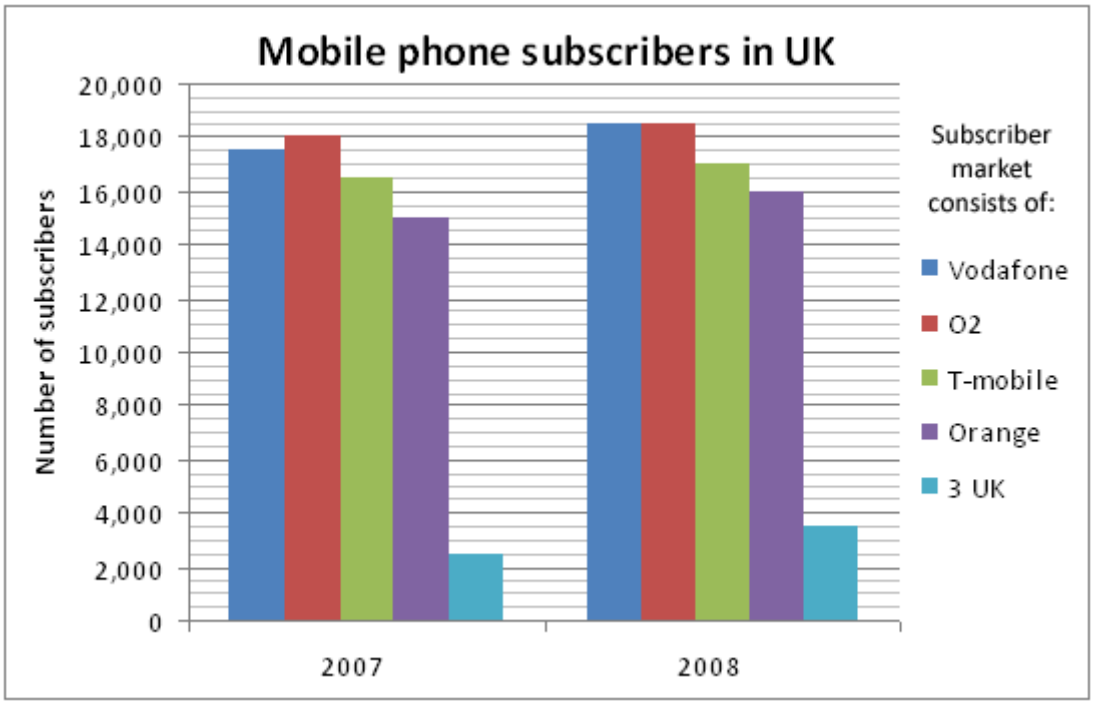
The approximate price in 2009 = 0.963… × £260,000 = £250,370

The approximate price in 2010 = 0.963… × £250,370 = £241,097

The approximate price in 2011 = 0.963… × £241,097 = £232,168

The approximate price in 2012 = 0.963… × £232,168 = £223,569

The approximate price in 2013 = 0.963… × £223,569 = £215,289 - Somewhere between 2012 and 2013 the £220,000 mark was crossed. Given the available answers, the correct one must be 2013.



Q8 Which provider showed the greatest percentage increase in subscribers between 2007 and 2008?

Vodafone T-mobile Orange **3 UK**

The increases and percentage increases were:

	2007	2008	Increase	% increase
Vodafone	17,500	18,500	1,000	5.7%
O2	18,000	18,500	500	2.8%
T-mobile	16,500	17,000	500	3.0%
Orange	15,000	16,000	1,000	6.7%
3 UK	2,500	3,500	1,000	40.0%

3 UK showed the greatest percentage increase. This can also be done just by inspection.

Q9 Which provider maintained the same percentage of the subscriber market share for both 2007 and 2008?

Vodafone O2 T-mobile Orange 3 UK

The totals and the percentage of the market share were:

	2007	Percentage	2008	Percentage
Vodafone	17,500	25.2%	18,500	25.2%
O2	18,000	25.9%	18,500	25.2%
T-mobile	16,500	23.7%	17,000	23.1%
Orange	15,000	21.6%	16,000	21.8%
3 UK	2,500	3.6%	3,500	4.8%
Total	69,500		73,500	

Vodafone's market share remained at 25.2%.

Q10 If 3 UK continued to increase its share of the subscriber market by the same percentage growth as it did between 2007 and 2008, approximately how many more years (after 2008) would it take until it has more than a 20% share of the subscriber market?

3 4 5 **6**

First work out 3 UK's share of the market in 2007. 3 UK had 2,500 subscribers out of (2,500 + 15,000 + 16,500 + 18,000 + 17,500). So this is a market share of 3.5971%. Next, work out the market share for 2008, which is 3,500 out of 73,500 (a share of 4.7619%). So 3 UK's rate of increase is 4.7619 ÷ 3.5971 = 1.32381.

In 2008, 3 UK had a market share of 4.7619%. So to find how many years it takes to reach 20%, multiply by 1.32381 for every year. Store this number in your calculator to save time.

2008: 4.7619%
2009: 6.3038%
2010 8.3451%
2011: 11.0473%
2012: 14.6245%
2013: 19.3601%
2014: 25.6291 (6 years).

Percent of each age group who participated in a particular activity

Age	16 - 19	20 - 24	25 - 29	30 - 44	45 - 59	60 - 69	70+	Total for Adult Sample Group
Walking	29	31	33	39	40	37	22	35
Swimming	19	17	17	20	13	7	3	14
Keep fit	15	16	19	16	11	7	4	12
Cycling	18	12	12	13	8	4	2	9
Jogging	11	9	11	8	3	1	0	5
Soccer	24	13	11	6	1	0	0	5
Other	44	34	32	23	14	7	2	19

Survey of the participation rates in a selection of sports, and physical activities. The survey was conducted on a sample of 14,800 adults aged 16 years and over in Great Britain in 2002 and shows the percentage of interviewees who participated in the sports or physical activities in the 4 weeks prior to being interviewed

Q11 How many of the interviewees played soccer in the four week period?

8,880 750 **740** 700

5% in total played soccer and there were 14,800 interviewees.
∴ Number who played soccer = 5% of 14,800 = 740.

Be careful to note the table gives percentages, but does not give the total number of participants in each age group. And you must also appreciate that some participants will have participated in more than one activity.

Q12 The number of people interviewed in the 16 – 19, 20 – 24 and 25 – 29 age ranges were 750, 1,250 and 1,000 respectively. How many interviewees under 30 years of age cycled during the four week period?

1,260 **405** 395 297

Number in the group 16 – 19 who cycled = 18% of 750 = 135

Number in the group 20 – 24 who cycled = 12% of 1,250 = 150

Number in the group 25 – 29 who cycled = 12% of 1,000 = 120

∴ Total under the age of 30 who cycled = 135 + 150 + 120 = 405

Q13 The number interviewed in the 30 - 44 age range was 3,800 in total. Of those, 5% said they participated in both walking and swimming during the four week period. How many interviewees in the 30 - 44 age range walked but did not swim?

190 570 722 **1,292**

Number who walked = 39% of 3,800 = 1,482

Number who swam = 20% of 3,800 = 760

Number who walked and swam = 5% of 3,800 = 190

∴ Number who walked but did not swim = 1,482 – 190 = 1,292

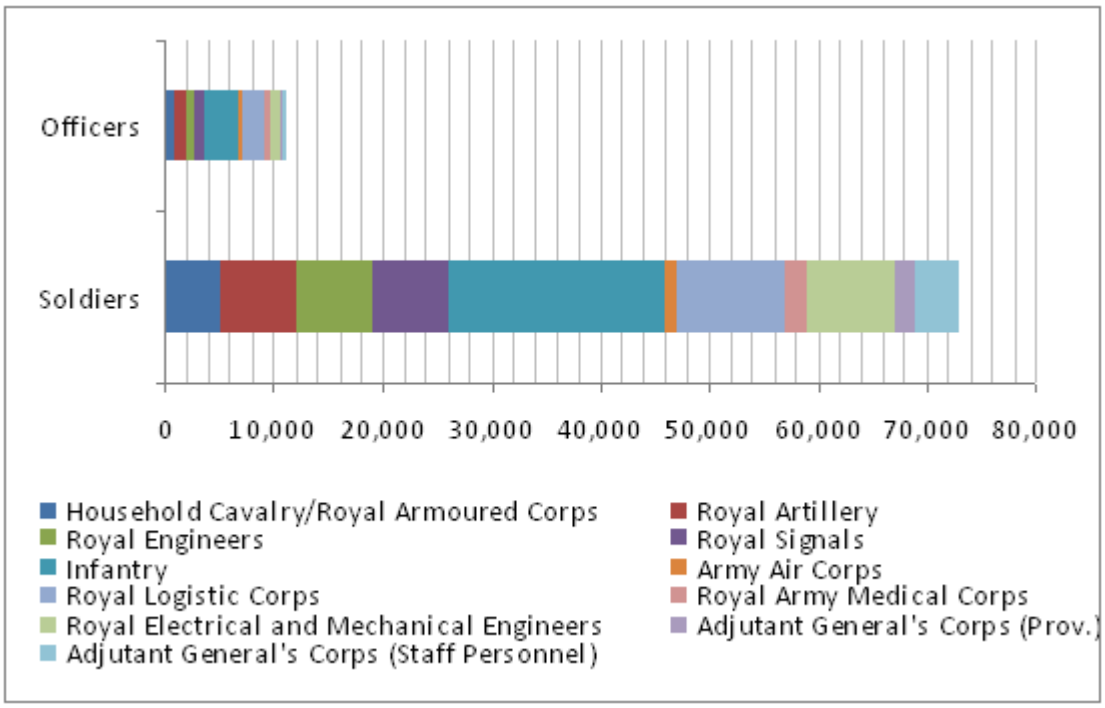
Q14 The number interviewed in the 70+ age range was 360. None of the interviewees in this age range participated in more than one activity during the four week period. How many of them did not participate in any activity at all?

119 231 238 **241**

Percentage who participated in an activity = (22 + 3 + 4 + 2 + 2)% = 33%

∴ Percentage who participated in no activity = 67%

67% of 360 = 241.2 = 241 to the nearest whole number.



Q15 Approximately what percentage of personnel were in the Infantry?

10% 20% **30%** 40%

There were approximately 84,000 personnel altogether (73,000 soldiers and 11,000 officers). Of these approximately 23,000 were infantry (20,000 soldiers and ~3,000 officers). Percentage in the Infantry ≈ 23000 ÷ 84000 = 27.4%.

Q16 Which of the following divisions had the highest ratio of officers to soldiers?

Royal Army Medical Corps

Household Cavalry/Royal Armoured Corps

Infantry

Adjutant General's Corps (Provost)

The Royal Army Medical Corps had an officer to soldier ratio of about 1:3, higher than any other division except possibly the Army Air Corps which is not included as an option here. This can be seen simply by inspection, don't waste time calculating it.

Q17 The total number of new trained soldiers was 20,964. Assuming each division has an equal percentage of new recruits, approximately how many of these soldiers would have been in the Royal Logistics Corps?

2,900 3,400 4,400 5,400

There were about 10,000 soldiers in the Royal Logistics Corps out of approximately 73,000 soldiers altogether. That's 10/73 × 100% = 13.70%

∴ The number of new recruits to the Royal Logistics Corps

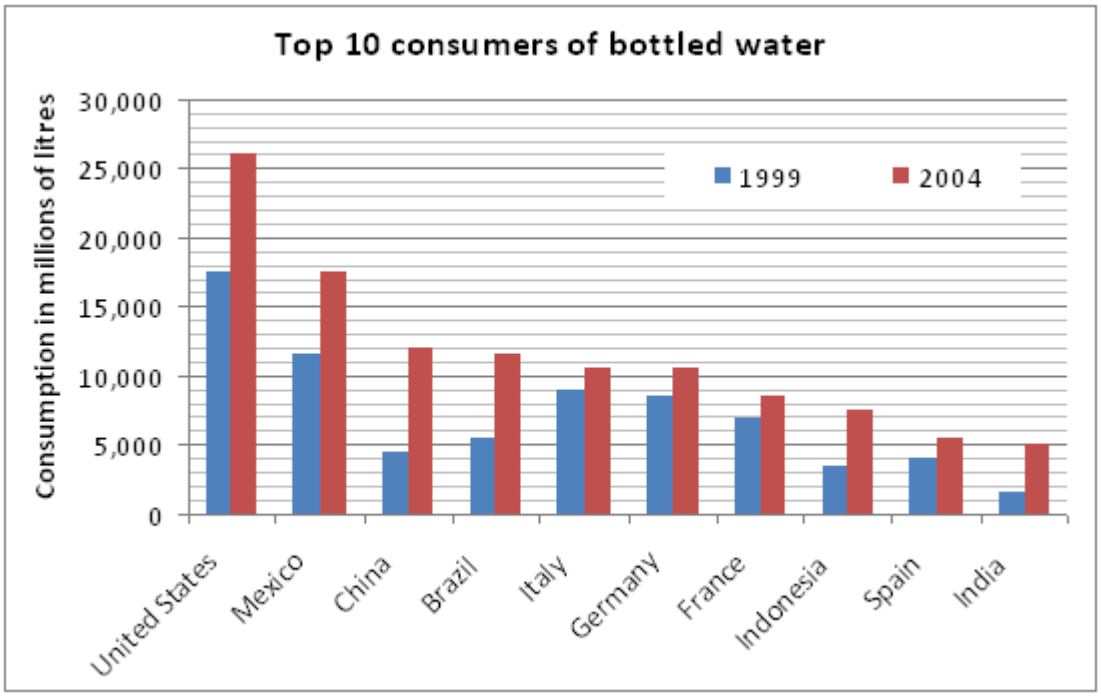
≈ 13.7% of 20,964

≈ 2,870

Q18 The total strength of the British soldiers 100 years ago was 372,000. By what percentage has the number of soldiers shrunk over the last 100 years?

19% 67% 73% **80%**

Number of soldiers now = 73,000, number of soldiers 100 years ago = 372,000. Now (73,000 ÷ 372,000) = 0.1962 so the decrease in number of soldiers was 1-0.1962 = 80.4%.



Q19 Which country showed the greatest percentage increase in the consumption of bottled water between 1999 and 2004?

Brazil **India** China Indonesia

From the graph it can be seen that only Brazil, China, Indonesia and India have more than doubled their consumption.

This can be seen by inspection, however here are the increases and percentage increases for these four countries:

Country	*Increase*	*Percentage increase*
Brazil	*(11,500 – 5,500) million litres = 6,000 million litres*	*6,000/5,500 × 100% = 109%*
China	*(12,000 – 4,500) million litres = 7,500 million litres*	*7,500/4,500 × 100% = 167%*
Indonesia	*(7,500 – 3,500) million litres = 4,000 million litres*	*4,000/3,500 × 100% = 114%*
India	*(5,000 – 1,500) million litres = 3,500 million litres*	*3,500/1,500 × 100% = 233%*

∴ India had the greatest percentage increase in consumption.

Q20 Assuming the consumption in the United States increased by the same percentage each year over the five year period, what was the annual percentage increase?

8.24% 8.67% 8.91% 9.52%

The consumption in the U.S. increased from 17,500 million litres in 1999 to 26,000 million litres in 2004.

Let the annual percentage increase be x%, so each successive year's consumption is (1 + x/100) × Previous year's consumption.

∴ $17,500 \times (1 + x/100)^5 = 26,000$

∴ $(1 + x/100)^5 = 26,000/17,500 = 1.4857$

∴ $1 + x/100 = 1.4857^{1/5} = 1.082398$

∴ $x/100 = 0.082398$

∴ $x = 8.2398 = 8.24$

Q21 In Spain the consumption of bottled water continued to rise by 6% per annum for the next two years (2005 and 2006), but then the consumption in 2007 declined by 4% on the 2006 levels. What was the consumption (in millions of litres) in 2007?

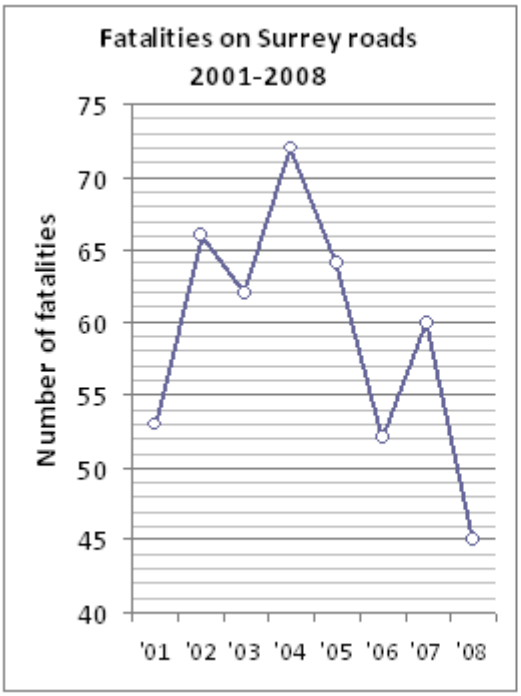
6,427 6,083 **5,933** 5,606

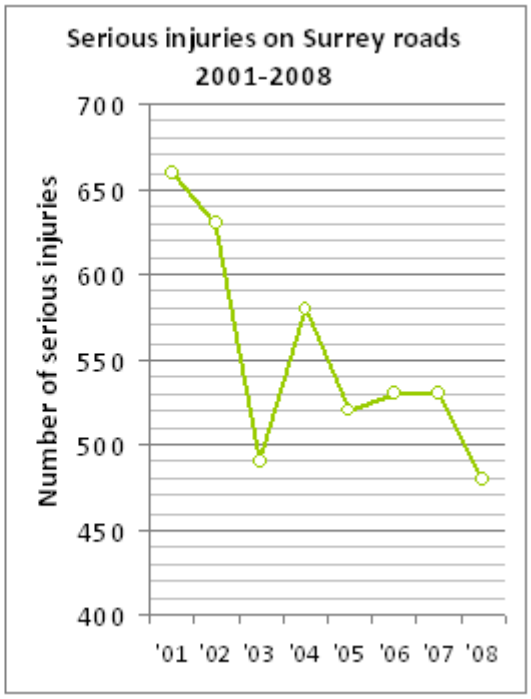
Consumption in Spain in 2004 = 5,500 million litres

Consumption in Spain in 2005 = (5,500 × 1.06) million litres = 5,830 million litres

Consumption in Spain in 2006 = (5,830 × 1.06) million litres = 6,180 million litres

Consumption in Spain in 2007 = (6,180× 0.96) million litres = 5,933 million litres





Q22 In which year was the combined number of fatalities and serious injuries greatest?

2001 2002 2004 2005

The numbers of fatalities can be read accurately from the first graph. The number of serious injuries can be given to the nearest 10 from the second graph:

	Number of fatalities	*Number of serious injuries(nearest 10)*	*Total*
2001	*53*	*660*	*713*
2002	*66*	*630*	*696*
2004	*72*	*580*	*652*
2005	*64*	*520*	*584*
2007	*60*	*530*	*590*

The greatest total was in 2001.

Q23 Which year showed the greatest decrease in the number of serious injuries over the previous year?

2003 2004 2005 2006

The greatest decrease occurred from 2002 to 2003 where the number of fatalities dropped by 140 from approximately 630 to 490. This is also shown by the part of the graph with the greatest negative gradient.

Q24 What is the average (mean) number of fatalities over the eight years?

58 **59.25** 60.5 61

The mean is found by dividing the total number of fatalities from the eight years by eight.

Mean = (53 + 66 + 62 + 72 + 64 + 52 +60 + 45) ÷ 8 = 474 ÷ 8 = 59.25

	Size			
	250 ml	300 ml	400 ml	500 ml
Brand A	£2.19			
Brand A			£3.26	
Brand B	£2.11			
Brand B			£3.16	
Brand C	£2.43			
Brand C			£2.97	
Brand D	£2.34			
Brand D				£4.49
Brand E		£2.12		

Prices of five brands of shampoo in a national supermarket.

Q25 Which size of which brand gives the best value in terms of quantity per cost?

400 ml of Brand B 400ml of Brand C

500ml of Brand D **300ml of Brand E**

As expected, in all cases the larger quantity gives better value for money. So we need only to compare the 400 ml of Brand C, the 500 ml of Brand D and the 300ml of Brand E.

The 400ml of Brand C costs £2.97÷ 4 = 74.25p per 100 ml

The 500ml of Brand D costs £4.49 ÷ 5 = 89.8p per 100 ml

The 300ml of Brand E costs £2.12 ÷ 3 = 70.7p per 100 ml

∴ The 300ml of Brand E is the best value for money

Q26 A customer needs to buy at least 500 ml of each brand. What is the minimum amount they will need to spend at this supermarket?

GBP 25.07 GBP 23.89 **GBP 22.19** GBP 18.12

They will need to buy two 250 ml bottles of each of Brands A, B and C, a 500 ml bottle of Brand D and two 300 ml bottles of Brand E.

∴ Cost = 2 × (£2.19 + £2.11 + £2.43) + £4.49 + 2 × £2.12

= £13.46 + £4.49 + £4.24

= £22.19

Q27 The supermarket increases the cost of Brand E by 19%. How many 300ml bottles of Brand E could then be bought with GBP 20?

9 8 **7** 6

New cost of 300 ml of Brand E = £2.12 × 1.19 = £2.52

£20 ÷ £2.52 = 7.936

∴ There is only enough to buy 7 whole bottles.

	1980	1990	2000
Africa	650	600	550
Asia	311	275	239
The Americas	923	839	756
World total	1884	1714	1545

Area of Rainforests in millions of hectares in three continents and worldwide over the twenty year period 1980 to 2000.

Q28 By what percentage did the area of rainforests in The Americas decrease over the twenty year period?

15% **18%** 20% 22%

The area decrease by (923 – 756) million hectares = 167 million hectares.

The percentage decrease was 167/923 × 100% = 18%. Or another way of working out percentages: 756 ÷ 923 = 0.819 which is a decrease of 18.09%

Q29 In which continent and during which 10 year period was there the sharpest percentage decline in the area of rainforests?

Asia 1980-1990 **Asia 1990-2000**

The Americas 1980-1990 The Americas 1990-2000

The percentage decreases are found by the formula:

(Decrease in area)/(Area at the start of the decade)$\times$ 100%

The results are given in the following table:

	1980 -90	1990-2000
Africa	7.7%	8.3%
Asia	11.6%	13.1%
The Americas	9.1%	9.9%

The greatest percentage decrease was in Asia between 1990 and 2000.

Q30 The area of global rainforest is being depleted by 1% per year. If this rate continued from 2000 onwards, what will be the total area (in millions of hectares) of world rainforest in 2020?

1,056 1,236 1,251 **1,264**

The area for each successive year is found by multiplying that of the previous year by 99% or 0.99

$\therefore$ Area in 2020 = Area in 2000 $\times (0.99)^{20}$ = 1,545 $\times (0.99)^{20}$ = 1,264