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Surname

Other names

Pearson Edexcel
Level 3 Certificate

Centre Number

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Candidate Number

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Mathematics in Context

Paper 1: Comprehension

Wednesday 18 May 2016 – Morning
Time: 1 hour 40 minutes

Paper Reference

7MC0/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator.
Source booklet.

Total Marks

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Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Calculators may be used.**



Information

- The total mark for this paper is 60
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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SECTION A

Answer ALL questions. Write your answers in the spaces provided.

CARS

Refer to **data source A** in the source booklet for Question 1.

1 Caitlin learnt to drive.

She

- had x one hour driving lessons
- took the driving theory test y times
- and took the practical test w times.

Caitlin has now passed both tests and is a qualified driver.

T is an estimate for the total cost, in pounds, of Caitlin's driving lessons, her theory tests and her practical tests.

(a) Write a formula for T in terms of x , y and w .

(2)

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The average person has 47 hours of driving lessons and passes both the theory test and the practical test at the second attempt.

(b) Work out an estimate for the total cost for the average person to become a qualified driver.

(2)

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(Total for Question 1 is 4 marks)



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Refer to **data source B** in the source booklet for Question 2.

- 2 For the age group 17 to 20 years old, compare the percentage of males and the percentage of females holding a full car driving licence.

You should refer to the period 1975/76 to 2013.

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(Total for Question 2 is 2 marks)

Refer to **data source C** in the source booklet for Questions 3 and 4.

- 3 Which car, the Honda Civic or the VW Golf, increased in size more over the 35 year periods shown?

You should consider both the length and the width and use percentage increase to support your conclusion.

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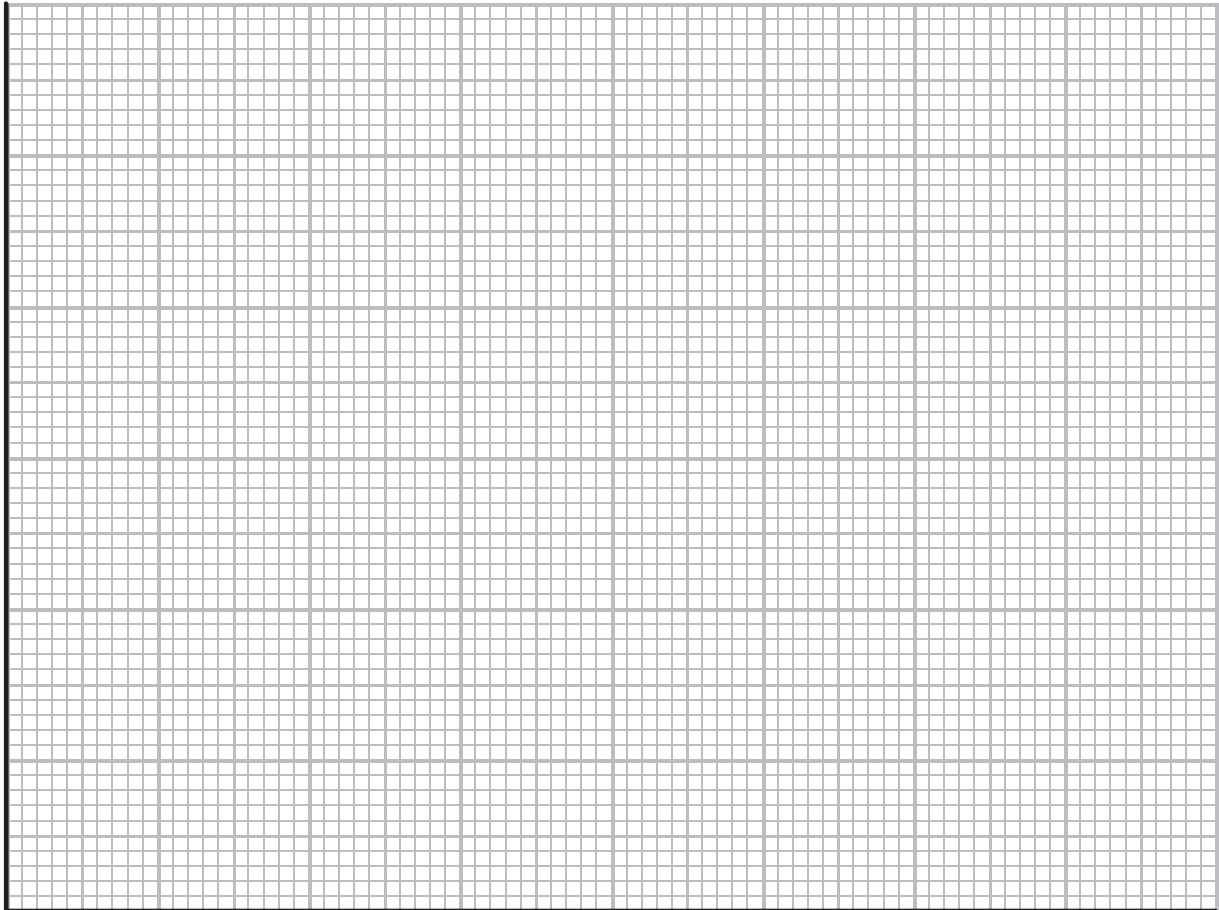
(Total for Question 3 is 3 marks)



4 Cedi models the width, w inches, of the VW Golf with the following formula

$$w = 63 + \frac{1}{6}x \quad \text{where } x = \text{year} - 1970$$

Use the graph paper to determine if Cedi's model is suitable.



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(Total for Question 4 is 7 marks)

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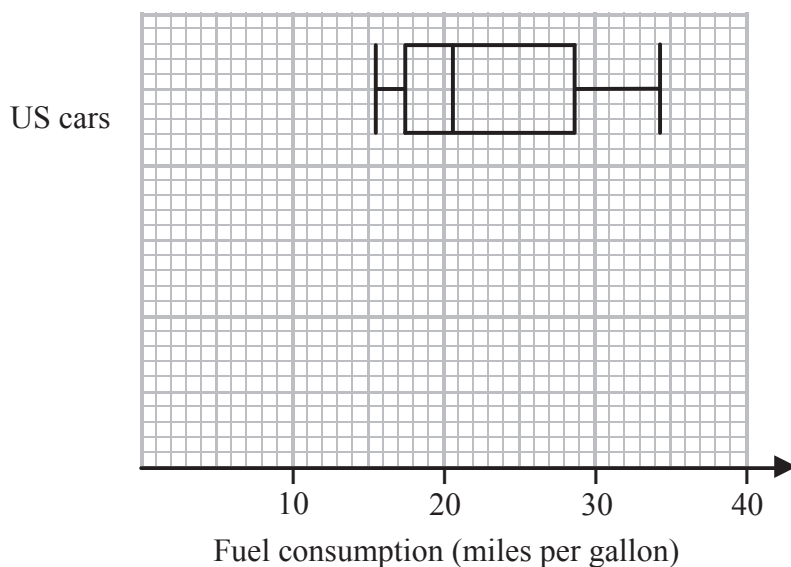
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Refer to **data source D** in the source booklet for Questions 5 and 6.

- 5 The data from the fuel consumption column in the table for **US cars** is summarised in the box plot.



An outlier is defined as any value that is

greater than the upper quartile + $(1.5 \times \text{interquartile range})$

or

less than the lower quartile - $(1.5 \times \text{interquartile range})$

- (a) Using the fuel consumption data for **non US cars**

- (i) show there are no outliers,

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(ii) draw, on the grid opposite, a box plot to show this data.

(6)

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(b) For the given data, compare the fuel consumption of the US cars and the non US cars.

(2)

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(Total for Question 5 is 8 marks)



6 A recent article states:

“A gallon of fuel lasts longer if the horsepower is low.”

Do you agree with this statement?

Calculate a suitable correlation coefficient for the non US car data to support your answer.

Car	Fuel consumption (miles per gallon)	Horsepower		
Datsun 210	31.8	65		
Mazda GLC	34.1	65		
Honda Accord LX	29.5	68		
Fiat Strada	37.3	69		
VW Scirocco	31.5	71		
VW Rabbit	31.9	71		
VW Dasher	30.5	78		
Dodge Colt	35.1	80		
Toyota Corona	27.5	95		
Datsun 810	22.0	97		
Audi 500	20.3	103		
BMW 320i	21.5	110		
Saab 99 GLE	21.6	115		
Volvo 240 GL	17.0	125		
Peugeot 694 SL	16.2	133		

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(Total for Question 6 is 6 marks)

(Total for CARS is 30 marks)

TOTAL FOR SECTION A IS 30 MARKS



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Refer to **data source F** in the source booklet for Questions 8 and 9.

8 Data source F is taken from a spreadsheet that has figures for 233 countries. Faith wants to work out an estimate for the mean number of pupils per teacher for these 233 countries in the year 2000.

She decides to take a sample of 20 of these countries.

(a) (i) Write down one advantage of taking a sample.

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.....

(ii) Write down one disadvantage of taking a sample.

.....
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(2)



Here is some information about the number of pupils per teacher and the total population.

1	A	B	C
2		Total population (millions)	Number of pupils per teacher in 2012
3	Developed countries	1 243	12.23
4	Developing countries	5 814	17.67
5	World	7 058	15.95

Population figures from 2012 Population Reference Bureau - 2012 World Population Data Sheet

Clive thinks that the formula used to calculate the figures in cell C5 is

$$= (C3 + C4)/2$$

(b) Determine whether or not Clive is correct and state one assumption implied by his formula.

(2)

Darcy thinks that the formula used to calculate the figures in cell C5 is

$$= (B3/B5 * C3) + (B4/B5 * C4)$$

(c) Determine whether or not Darcy is correct and state one assumption implied by her formula.

(3)

(Total for Question 8 is 7 marks)



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- 9 (a) Calculate the mean and standard deviation of the number of pupils per teacher for all the data for Portugal on the spreadsheet.

$$\sum x = 87.31 \quad \sum x^2 = 646.4205 \quad (3)$$

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For the number of pupils per teacher in Mexico

the mean is 14.88

and the standard deviation is 0.62

- (b) Compare and interpret, in context, the figures for Mexico with the figures for Portugal. (3)

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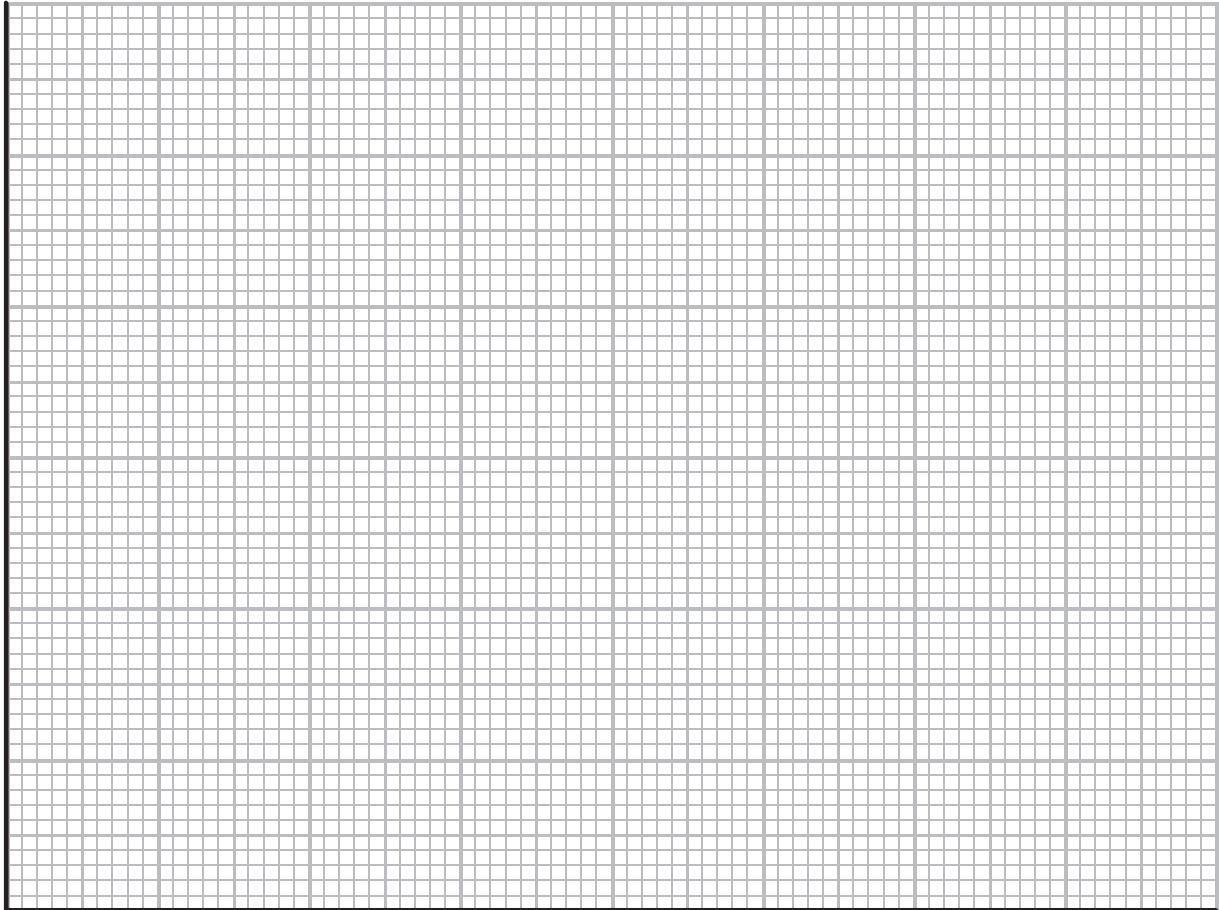
(Total for Question 9 is 6 marks)



Refer to **data source G** in the source booklet for Question 10.

- 10 (a) Draw an appropriate diagram on the graph paper that could be used to determine the nature of the correlation between years in education (x) and personal earnings in dollars (y).

(2)



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Formulae sheet

There will be no credit for anything you write on this formulae sheet.

$$\text{Mean of a frequency distribution} = \frac{\sum fx}{\sum f}$$

$$\text{Mean of a grouped frequency distribution} = \frac{\sum fx}{\sum f}, \text{ where } x \text{ is the mid-interval value}$$

$$\text{Variance} = \frac{\sum (x - \bar{x})^2}{n}$$

$$\text{Standard deviation (set of numbers)} = \sqrt{\left[\frac{\sum x^2}{n} - \left(\frac{\sum x}{n} \right)^2 \right]}$$

or

$$\sqrt{\left[\frac{\sum (x - \bar{x})^2}{n} \right]}$$

where \bar{x} is the mean of the set of values

$$\text{Standard deviation (discrete frequency distribution)} = \sqrt{\left[\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2 \right]}$$

or

$$\sqrt{\left[\frac{\sum f(x - \bar{x})^2}{\sum f} \right]}$$

$$\text{Spearman's rank correlation coefficient} = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

The product moment correlation coefficient is

$$r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{\sum x_i y_i - \frac{(\sum x_i)(\sum y_i)}{n}}{\sqrt{\left(\sum x_i^2 - \frac{(\sum x_i)^2}{n}\right)\left(\sum y_i^2 - \frac{(\sum y_i)^2}{n}\right)}}$$

The regression coefficient of y on x is $b = \frac{S_{xy}}{S_{xx}}$

Least squares regression line of y on x is $y = a + bx$ where $a = \bar{y} - b\bar{x}$

Arithmetic series

$$u_n = a + (n - 1)d$$

$$S_n = \frac{1}{2}n(a + l) = \frac{1}{2}n[2a + (n - 1)d]$$

Geometric series

$$u_n = ar^{n-1}$$

$$S_n = \frac{a(1 - r^n)}{1 - r}$$

$$S_\infty = \frac{a}{1 - r} \text{ for } |r| < 1$$

There will be no credit for anything you write in this source booklet.

SECTION A : CARS

Data source A

The cost of driving is keeping young people off the road

Driving lessons, the test itself, buying and insuring a car all add to the expense, but there are ways to limit the damage.

Passing your driving test has long been seen as a rite of passage, but the rising cost of running a car is driving more and more young people off the roads. The Department for Transport's recent National Travel Survey shows a sharp drop over the past 18 years in the number of young people holding a full driving licence. While in 1995, some 43% of 17 to 20 year olds held a full driving licence, that has plunged to just 31%. The fall is sharpest among young men, where it has dropped from 51% to 30%, while the percentage of young women with a full driving licence has slipped from 36% to 31%. Over the same period the proportion of 21 to 29 year olds with full driving licences has also fallen.

The main reason fewer young people are driving is cost, says Stephen Glaister, director at the RAC Foundation. "Younger people were hit disproportionately hard by the downturn. Even though employment is now rising, incomes are stagnant, and many are only in part-time work, and find running a car too expensive."

Spiralling student debt and rising housing costs leave little money for driving lessons, at around £25 an hour, and the test itself. With the practical test costing up to £75, and the theory test adding another £31, the cost of buying a car is the least of the problems facing young drivers. In 1995 a five-year-old Ford Fiesta, a typical first car, cost £3,250, against £5,510 today, according to figures from motoring guide Glass's. That is a rise of nearly 70%, almost exactly in line with the increase in average earnings over the period, says Andrew Jackson, head of analytics at Glass's. "In real terms, the Fiesta isn't any more expensive than it was in 1995, even though the materials, technology and manufacturing quality are incomparably better."

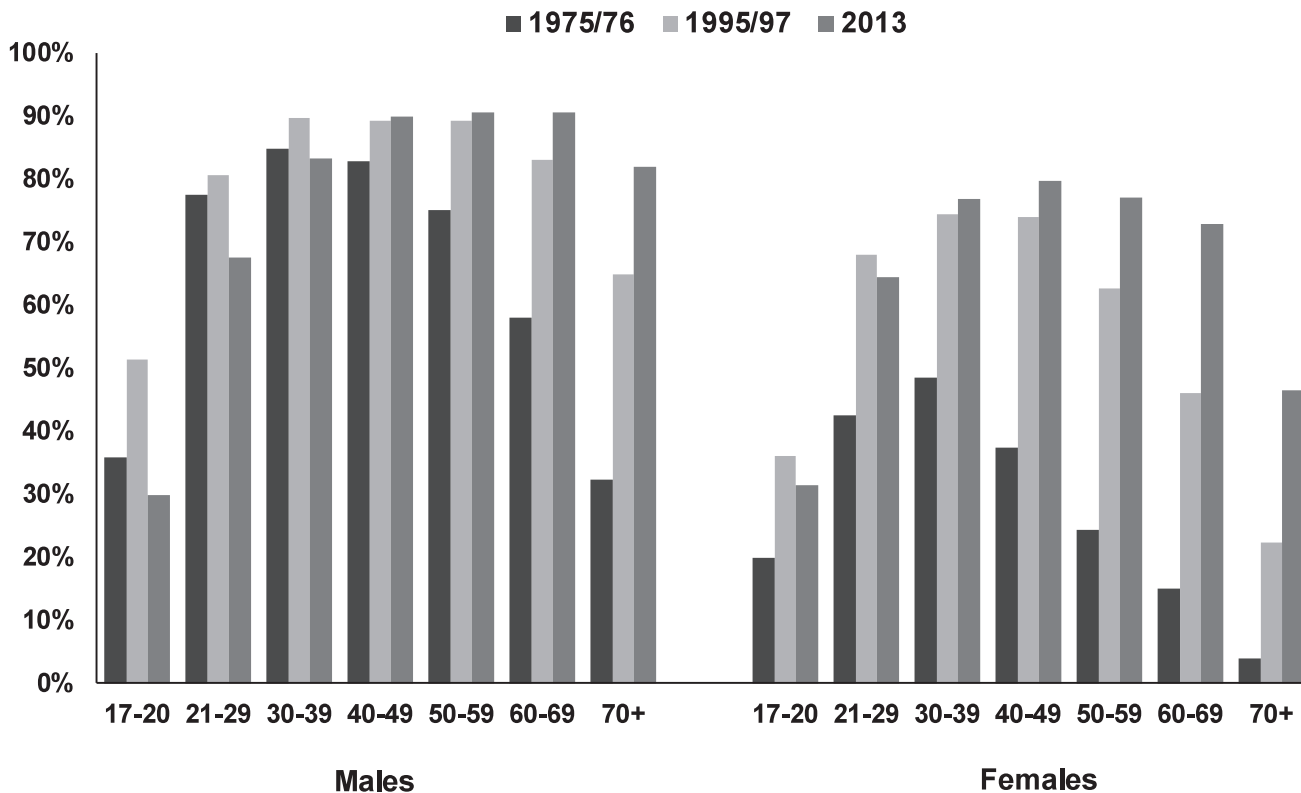
Data source B

National Travel Survey is abbreviated to NTS throughout this document.

Driving licence holding

The NTS estimates that 74% of all adults aged 17+ in England held a full car driving licence in 2013 – an estimated 32 million licence holders. Of these, 17 million were men and 15 million were women.

Chart 18: Full car driving licence holders, by age and gender England: 1975/76 to 2013 [NTS0201]



Over the long term there has been an increase in the proportion of both men and women holding a full driving licence for most age groups. In 1975/76, overall 69% of men and 29% of women had a licence. In 2013, 81% of men and 68% of women had a licence. While the proportion of men holding a full driving licence remained fairly stable since the early 1990s, the proportion of women with a licence continued to increase – now at its highest level.

Data source C

Summary data for the lengths and widths of Honda Civic cars and VW Golf cars.

Honda Civic		
Year	Length (inches)	Width (inches)
1973	139.8	59.3
1982	148.0	61.6
1987	150.0	63.9
1990	157.1	66.3
1994	160.2	66.9
1999	164.5	67.1
2003	165.6	66.7
2008	168.1	70.3

VW Golf		
Year	Length (inches)	Width (inches)
1974	145.9	63.4
1983	158.0	65.6
1991	160.4	66.7
1997	163.3	68.3
2003	165.5	69.3
2009	165.3	70.0

Data source D

US Cars 1978–1979

Car make and model	Fuel consumption (miles per gallon)	Horsepower
Buick Estate Wagon	16.9	155
Ford Squire Wagon	15.5	142
Chevy Malibu Wagon	19.2	125
Chevette	30.0	68
Dodge Omni	30.9	75
Buick Century Special	20.6	105
Dodge Aspen	18.6	110
AMC Concord D/L	18.1	120
Chevy Caprice Classic	17.0	130
Ford LTD	17.6	129
Mercury Grand Marquis	16.5	138
Dodge St Regis	18.2	135
Ford Mustang 4	26.5	88
Ford Mustang Ghia	21.9	109
AMC Spirit	27.4	80
Buick Skylark	28.4	90
Chevy Citation	28.8	115
Pontiac Phoenix	33.5	90
Plymouth Horizon	34.2	70

non US Cars 1978–1979

Car make and model	Fuel consumption (miles per gallon)	Horsepower
Toyota Corona	27.5	95
Audio 500	20.3	103
Volvo 240 GL	17.0	125
Saab 99 GLE	21.6	115
Peugeot 694 SL	16.2	133
Mazda GLC	34.1	65
Dodge Colt	35.1	80
VW Scirocco	31.5	71
Honda Accord LX	29.5	68
Datsun 210	31.8	65
Fiat Strada	37.3	69
VW Dasher	30.5	78
Datsun 810	22.0	97
BMW 320i	21.5	110
VW Rabbit	31.9	71

SECTION B: EDUCATION

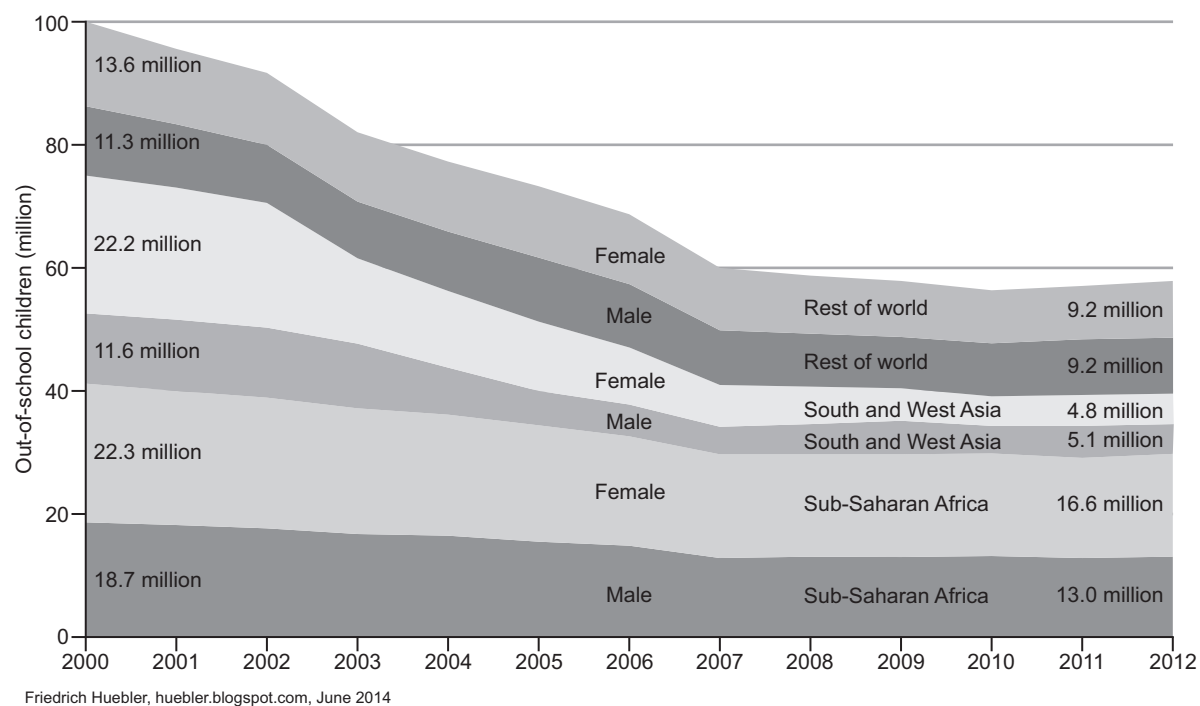
Data source E

International Education Statistics

Out-of-school children of primary school age, 2000–2012

The Education for All and Millennium Development Goal of universal primary education by 2015 is the most prominent international goal in the field of education. Over the past years it has become increasingly apparent that the world will not reach this goal by the target year. New statistics, released by the UNESCO Institute for Statistics on 26 June 2014, confirm that the number of out-of-school children has remained at nearly the same level since 2007.

Figure 1: Out-of-school children of primary school age, 2000–2012



Data source F

Dataset: Education		Indicator: Number of pupils per teacher													
Country	Time	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Mexico		14.18	14.19	14.07	14.22	14.09	14.92	14.98	14.96	15.11	15.15	15.02	15.77	15.75	15.84
Myanmar		37.92	39.69	36.01	34.98	36.86	33.00	33.11	32.47	28.36	29.90	29.70	28.30
New Zealand		13.35	13.47	13.39	..	11.87	14.18	14.14	14.29	14.50	14.21	13.77	14.19	13.94	13.92
Palestine		19.24	25.13	24.04	25.79	22.08	24.78	26.64	22.49	20.70	20.93	20.14	20.40	18.42	17.81
Panama		14.79	14.69	14.97	14.74	..	14.77	14.67	14.76	14.37	13.95	12.80	13.19	12.72	12.77
Portugal		..	8.74	9.02	8.28	8.05	6.20	..	6.07	6.93	6.52	6.39	6.83	6.98	7.30
Education For All Regions	
World		16.15	16.50	17.14	17.05	16.65	16.77	16.58	16.53	16.00	15.84	15.80	15.67	15.96	15.95
Developed countries		12.89	12.60	12.71	12.87	12.86	12.76	12.55	12.54	12.40	12.46	12.24	12.23	12.24	12.23
Developing countries		19.09	19.95	20.97	20.41	19.50	19.63	19.30	19.07	18.13	17.71	17.68	17.38	17.71	17.67
Countries in transition	
Arab States		13.12	13.24	13.49	13.68	14.36	14.65	14.22	13.63
Central and Eastern Europe	
Central Asia	
East Asia and the Pacific		15.13	16.02	17.79	17.62	16.09	16.59	16.89	17.02	15.89	15.74	15.80	15.71	16.29	16.09
Latin America and the Caribbean		17.04	17.74	18.17	17.20	16.03	15.72	15.29	15.60	15.71	15.13	14.59	14.24	14.06	13.99
North America and Western Europe		12.74	12.48	12.59	12.83	12.81	12.92	12.77	12.78	12.64	12.76	12.52	12.52	12.60	12.63
South and West Asia		29.43	29.74	29.56	27.52	27.32	27.40	25.79	24.79	23.41	22.41	21.36	20.92	20.94	20.99
Sub-Saharan Africa		23.73	24.15	22.57	21.62	20.28	27.26	22.94	22.82	..

Data source G

Indicator	Jobs			Education			Health		Life Satisfaction		Work-Life Balance	
	Employment rate	Job security	Long-term unemployment rate	Personal earnings	Educational attainment	Student skills	Years in education	Life expectancy	Self-reported health	Life satisfaction	Employees working very long hours	Time devoted to leisure and personal care
Unit	Percentage	Percentage	Percentage	US Dollar	Percentage	Average score	Years	Years	Percentage	Average score	Percentage	Hours
Country												
Australia	72	4.8	1.08	50449	76	512	19.4	82.1	85	7.3	14.02	14.41
Austria	72	3.9	1.19	45199	83	500	17	81	69	6.9	7.61	14.46
Chile	62	4.4	1.59	22101	57	436	16.5	78.9	59	6.7	15.42	14.41
Denmark	73	5.6	1.78	48347	78	498	19.4	80.1	72	7.5	2.03	16.06
Estonia	68	5.2	3.82	18944	90	526	17.5	76.5	54	5.6	3.3	14.9
Finland	69	6.9	1.73	40060	85	529	19.7	80.7	65	7.4	3.58	14.89
France	64	6.5	3.99	40242	73	500	16.4	82.1	67	6.5	8.15	15.33
Greece	49	12.2	18.39	25503	68	466	18.6	80.7	74	4.8	6.16	14.91
Japan	72	2.4	1.67	35405	94	540	16.3	83.2	30	5.9	22.26	14.93
Mexico	61	4.9	0.08	16193	37	417	14.4	74.6	66	6.7	28.83	13.89
Netherlands	74	4.5	2.4	47590	73	519	18.7	81.2	76	7.3	0.45	15.44
Norway	75	3.1	0.32	50282	82	496	17.9	81.5	76	7.4	2.82	15.56
Portugal	61	8.6	9.11	23688	38	488	17.6	80.5	46	5.1	9.62	14.95
United Kingdom	71	5.2	2.77	41192	78	502	16.4	81	74	6.8	12.7	14.83
United States	67	5.9	1.91	56340	89	492	17.2	78.7	88	7.2	11.3	14.27

Data extracted on 31 May 2015 16:49 UTC (GMT) from OECD.Stat

Source information

Data source A is taken from:

<http://www.theguardian.com/money/blog/2014/sep/16/cost-driving-young-people-off-road>
Motoring
Money blog

Data source B is taken from:

Department of Transport
National Travel Survey 2013

Data source C is taken from:

<http://oppositelock.jalopnik.com/graph-of-car-size-increases-over-the-years-508901988>

Data source D is taken from:

The Data and Story Library (adapted)
<https://lib.stat.cmu.edu/>

Data source E is taken from:

UNESCO Institute for Statistics, June 2014.

Data source F is taken from:

<http://data.uis.unesco.org/>

Data source G is taken from:

<http://stats.oecd.org/>

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