

Pearson Edexcel Level 3 Certificate

Wednesday 15 May 2019

Morning (Time: 1 hour 40 minutes)

Paper Reference **7MC0/01**

Mathematics in Context

Paper 1: Comprehension

Source booklet

Do not return this source booklet with the question paper.

Turn over ►

P60689A

©2019 Pearson Education Ltd.

1/2/1/1/1/1/



Pearson

Formulae sheet

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

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

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

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

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

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

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

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: AIR TRAVEL

Data source A

Heathrow Airport is the UK's largest airport. Heathrow is the third busiest airport in the world by international passenger traffic. It is the busiest airport in Europe by passenger traffic, and the sixth busiest airport in the world. In 2016, it handled a record 75.7 million passengers, a 1.0% increase from 2015.

Table 1: Passenger traffic statistics at Heathrow 2000–2016

Year	Number of passengers handled (millions)	Percentage change from previous year*	Aircraft movements** (thousands)	Percentage change from previous year*
2000	64.6	3.8	467	1.85
2001	60.8	−6.0	464	−0.69
2002	63.4	4.3	467	0.64
2003	63.5	0.2	464	−0.62
2004	67.3	6.1	476	2.66
2005	67.9	0.8	478	0.40
2006	67.5	−0.6	477	−0.18
2007	68.1	0.8	481	0.93
2008	67.1	−1.5	479	−0.58
2009	66.0	−1.5	466	−2.57
2010	65.9	−0.2	455	−2.48
2011	69.4	5.4	481	5.73
2012	70.0	0.9	475	−1.19
2013	72.4	3.3	472	−0.68
2014	73.4	1.4	473	0.18
2015	75.0	2.2	474	0.27
2016	75.7	1.0	475	0.18

*Percentage change figures have been calculated using raw data.

**An aircraft movement is defined as an aircraft taking off or landing at an airport.

For airport traffic purposes, one arrival and one departure are counted as two movements.

Data source B

Understanding the reporting of causes of flight delays and cancellations

There are five categories that flight delays fall into.

- **Aircraft arriving late:** A previous flight with the same aircraft arrived late, causing the present flight to depart late.
- **Air carrier:** The cause of the cancellation or delay was due to circumstances within the airline's control (e.g. maintenance or crew problems, aircraft cleaning, baggage loading, fuelling).
- **National Aviation System (NAS):** Delays and cancellations attributable to the NAS refer to a broad set of conditions, such as non-extreme weather conditions, airport operations, heavy traffic volume and air traffic control.
- **Security:** Queues lasting in excess of 29 minutes at screening areas.
- **Extreme weather:** Significant meteorological conditions such as tornado, blizzard or hurricane (actual or forecasted) that, in the judgement of the carrier, delays or prevents the operation of a flight.

Table 2: Causes of aircraft delays 2014

Cause of Delay	Percentage
Aircraft arriving late	41.9
Air carrier	30.2
National Aviation System	23.5
Security	0.1
Extreme weather	4.3

SECTION B: MUSIC

Data source C

The death of the CD has been greatly exaggerated. CD sales in the UK fell at the slowest rate in a decade last year, according to figures from the Entertainment Retailers Association (ERA), a trade body that represents high street retailers such as HMV and Tesco as well as digital services such as Spotify.

Total sales of CDs fell just 3.7% to 53.6m in 2015 compared with the previous year whereas in 2014 they dropped 8%, in 2013 they fell 12% and in 2012 they plunged 20%. The format, which generated revenues of £468m in 2015, is proving much more resilient to competition from downloads and streaming than many industry executives had predicted.

CD sales are also proving more robust than downloads – a format once tipped to replace them. Download sales dropped 13% last year to less than £300m. “It is clearly way too soon to write off the CD or other disc-based formats,” said Kim Bayley, ERA Chief Executive. “The fact is that different formats provide different benefits to different groups of entertainment fans. That diversity is proving to be the entertainment market’s greatest strength.”

Sales of LP records surged by 65% to £42m, with 2.1m LPs sold in 2015. After facing near extinction in 2007, when 200,000 LPs were sold, the format’s sales have increased in each of the past eight years. However, LPs still only account for about 2% of UK music consumption.

The fastest-growing part of the music business is streaming songs through services such as Spotify, Deezer and Apple Music, which tend to charge £10 a month for unlimited access to millions of songs through the internet.

Data source D

The Retail Price Index (RPI) is a measure of inflation published by the Office for National Statistics. It measures the change in the price of a representative sample of retail goods and services. The table shows the RPI at the end of each of the given years.

Table 3: Retail Price Index (RPI) year end 1986–2015

Year	RPI	Year	RPI	Year	RPI	Year	RPI	Year	RPI	Year	RPI
1986	100.0	1991	133.5	1996	152.7	2001	173.3	2006	198.1	2011	235.2
1987	101.9	1992	138.5	1997	157.5	2002	176.2	2007	206.6	2012	242.7
1988	106.9	1993	140.7	1998	162.9	2003	181.3	2008	214.8	2013	250.1
1989	115.2	1994	144.1	1999	165.4	2004	186.7	2009	213.7	2014	256.0
1990	126.1	1995	149.1	2000	170.3	2005	192.0	2010	223.6	2015	258.5

The RPI can be used to calculate the inflation adjusted price of an item for any required year.

$$\text{Inflation adjusted price} = \frac{\text{RPI of required year}}{\text{RPI of year of purchase}} \times \text{price of item in year of purchase}$$

For example, the 2010 inflation adjusted price of a television set bought for £200 in 1997 is

$$\text{Inflation adjusted price} = \frac{223.6}{157.5} \times 200 = \text{£}283.94$$

The inflation adjusted price of an item for any given year can then be compared with the actual price of the item in that year for a comparison in real terms.

Data source E

The following is from an article written in 2014

LP sales soar past the 1 million mark for the first time in nearly two decades

Annual sales of LPs have exceeded the one million mark for the first time since the Britpop era of the 90s according to Official Charts data released today by the BPI – the trade body that represents the nation’s record labels.

The milestone was achieved at the weekend. The figure is already comfortably ahead of the 780 674 sales posted in 2013, and with the key Christmas trading period still to come, it’s likely the final total for 2014 will rise towards a figure of 1.2 million unit sales – a level not seen since 1996, when 1 083 206 LPs were purchased.

Table 4: Number of LPs sold 2000–2014

Year	Number of LPs sold (thousands)
2000	752
2001	762
2002	657
2003	579
2004	453
2005	351
2006	251
2007	208
2008	209
2009	219
2010	234
2011	337
2012	389
2013	781
2014	1200*

*predicted

Source information

Data source A adapted from:

<http://www.caa.co.uk/Data-and-analysis/UK-aviation-market/Airports/Datasets/>

Data Source B adapted from:

<https://www.rita.dot.gov/bts/help/aviation/html/understanding.html>

Data source C adapted from:

<https://www.ft.com/content/b7cc252e-b3ab-11e5-b147-e5e5bba42e51>

Data source D adapted from:

<https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/chaw/mm23>

<https://www.whathifi.com/rega/planar-2/review>

<https://www.vinylengine.com/library/rega/planar-3.shtml>

<https://www.vinylengine.com/library/rega/planar-2.shtml>

https://www.hifiengine.com/manual_library/marantz/cd-52.shtml

https://www.hifiengine.com/manual_library/marantz/cd-632.shtml

<https://pricespy.co.uk/>

Data source E adapted from:

<https://www.bpi.co.uk/home/vinyl-album-sales-soar-past-the-1m-mark-for-the-first-time-in-nearly-two-decades.aspx>

BLANK PAGE

BLANK PAGE

BLANK PAGE

Every effort has been made to contact copyright holders to obtain their permission for the use of copyright material. Pearson Education Ltd. will, if notified, be happy to rectify any errors or omissions and include any such rectifications in future editions.