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# A Level Mathematics B (MEI)

## H640/02 Pure Mathematics and Statistics

Sample Question Paper Version 2

## Date – Morning/Afternoon

Time allowed: 2 hours

**You must have**:
- Printed Answer Booklet

**You may use:**
- a scientific or graphical calculator

Model Answers

**INSTRUCTIONS**
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Complete the boxes provided on the Printed Answer Booklet with your name, centre number and candidate number.
- Answer **all** the questions.
- **Write your answer to each question in the space provided in the Printed Answer Booklet.** Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.
- You are permitted to use a scientific or graphical calculator in this paper.
- Final answers should be given to a degree of accuracy appropriate to the context.

**INFORMATION**
- The total number of marks for this paper is **100**.
- The marks for each question are shown in brackets **[ ]**.
- You are advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is used. You should communicate your method with correct reasoning.
- The Printed Answer Book consists of **20** pages. The Question Paper consists of **16** pages.

# Formulae A Level Mathematics B (MEI) H640

## Arithmetic series

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

## Geometric series

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

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

## Binomial series

$$(a+b)^n = a^n + {}^nC_1\, a^{n-1}b + {}^nC_2\, a^{n-2}b^2 + \ \dots\ + {}^nC_r\, a^{n-r}b^r + \ \dots\ + b^n \qquad (n \in \mathbb{N}),$$

where ${}^nC_r = {}_nC_r = \binom{n}{r} = \dfrac{n!}{r!(n-r)!}$

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \ \dots\ + \frac{n(n-1)\dots(n-r+1)}{r!}x^r + \ \dots \qquad \left(|x|<1,\ \ n \in \mathbb{R}\right)$$

## Differentiation

| $\mathrm{f}(x)$ | $\mathrm{f}'(x)$ |
|---|---|
| $\tan kx$ | $k\sec^2 kx$ |
| $\sec x$ | $\sec x \tan x$ |
| $\cot x$ | $-\operatorname{cosec}^2 x$ |
| $\operatorname{cosec} x$ | $-\operatorname{cosec} x \cot x$ |

Quotient Rule $y = \dfrac{u}{v}$, $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{v\dfrac{\mathrm{d}u}{\mathrm{d}x} - u\dfrac{\mathrm{d}v}{\mathrm{d}x}}{v^2}$

## Differentiation from first principles

$$\mathrm{f}'(x) = \lim_{h\to 0}\frac{\mathrm{f}(x+h)-\mathrm{f}(x)}{h}$$

## Integration

$$\int \frac{\mathrm{f}'(x)}{\mathrm{f}(x)}\,\mathrm{d}x = \ln|\mathrm{f}(x)| + c$$

$$\int \mathrm{f}'(x)\left(\mathrm{f}(x)\right)^n \mathrm{d}x = \frac{1}{n+1}\left(\mathrm{f}(x)\right)^{n+1} + c$$

Integration by parts $\displaystyle\int u\frac{\mathrm{d}v}{\mathrm{d}x}\,\mathrm{d}x = uv - \int v\frac{\mathrm{d}u}{\mathrm{d}x}\,\mathrm{d}x$

## Small angle approximations

$\sin\theta \approx \theta$, $\cos\theta \approx 1-\frac{1}{2}\theta^2$, $\tan\theta \approx \theta$ where $\theta$ is measured in radians

**Trigonometric identities**

$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$

$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$

$\tan(A \pm B) = \dfrac{\tan A \pm \tan B}{1 \mp \tan A \tan B} \qquad (A \pm B \neq (k + \tfrac{1}{2})\pi)$

**Numerical methods**

Trapezium rule: $\int_a^b y\,\mathrm{d}x \approx \frac{1}{2}h\{(y_0 + y_n) + 2(y_1 + y_2 + \ldots + y_{n-1})\}$, where $h = \dfrac{b-a}{n}$

The Newton-Raphson iteration for solving $\mathrm{f}(x) = 0$: $x_{n+1} = x_n - \dfrac{\mathrm{f}(x_n)}{\mathrm{f}'(x_n)}$

**Probability**

$\mathrm{P}(A \cup B) = \mathrm{P}(A) + \mathrm{P}(B) - \mathrm{P}(A \cap B)$

$\mathrm{P}(A \cap B) = \mathrm{P}(A)\mathrm{P}(B \mid A) = \mathrm{P}(B)\mathrm{P}(A \mid B)$ **or** $\mathrm{P}(A \mid B) = \dfrac{\mathrm{P}(A \cap B)}{\mathrm{P}(B)}$

**Sample variance**

$s^2 = \dfrac{1}{n-1} S_{xx}$ where $S_{xx} = \sum (x_i - \bar{x})^2 = \sum x_i^2 - \dfrac{\left(\sum x_i\right)^2}{n} = \sum x_i^2 - n\bar{x}^2$

Standard deviation, $s = \sqrt{\text{variance}}$

**The binomial distribution**

If $X \sim \mathrm{B}(n,\ p)$ then $P(X = r) = {}^n\mathrm{C}_r\, p^r q^{n-r}$ where $q = 1 - p$

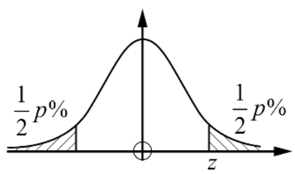
Mean of $X$ is $np$

**Hypothesis testing for the mean of a Normal distribution**

If $X \sim \mathrm{N}(\mu, \sigma^2)$ then $\bar{X} \sim \mathrm{N}\left(\mu, \dfrac{\sigma^2}{n}\right)$ and $\dfrac{\bar{X} - \mu}{\sigma / \sqrt{n}} \sim \mathrm{N}(0, 1)$

**Percentage points of the Normal distribution**

| $p$ | 10 | 5 | 2 | 1 |
|---|---|---|---|---|
| $z$ | 1.645 | 1.960 | 2.326 | 2.576 |




**Kinematics**

Motion in a straight line

$v = u + at$

$s = ut + \frac{1}{2}at^2$

$s = \frac{1}{2}(u + v)t$

$v^2 = u^2 + 2as$

$s = vt - \frac{1}{2}at^2$

Motion in two dimensions

$\mathbf{v} = \mathbf{u} + \mathbf{a}t$

$\mathbf{s} = \mathbf{u}t + \frac{1}{2}\mathbf{a}t^2$

$\mathbf{s} = \frac{1}{2}(\mathbf{u} + \mathbf{v})t$

$\mathbf{s} = \mathbf{v}t - \frac{1}{2}\mathbf{a}t^2$

Answer **all** the questions.

**Section A** (23 marks)

**1 In this question you must show detailed reasoning.**

Find the coordinates of the points of intersection of the curve $y = x^2 + x$ and the line $2x + y = 4$. **[5]**

1 $y = x^2 + x$ and $y = 4 - 2x$

$x^2 + x = 4 - 2x$

$x^2 + 3x - 4 = 0$

$(x + 4)(x - 1) = 0$

$x = 1$ or $x = -4$

$y = 4 - 2 = 2$ $y = 4 + 8 = 12$

Coordinates are $(1, 2)$ and $(-4, 12)$

**2** Given that $f(x) = x^3$ and $g(x) = 2x^3 - 1$, describe a sequence of two transformations which maps the curve $y = f(x)$ onto the curve $y = g(x)$. **[4]**

2 Stretch of scale factor 2 in the y direction, followed by a translation of $\begin{pmatrix} 0 \\ -1 \end{pmatrix}$.

**3** Evaluate $\int_0^{\frac{\pi}{12}} \cos 3x \, dx$, giving your answer in exact form. **[3]**

3 $\int_0^{\frac{\pi}{12}} \cos 3x \, dx = \left[\frac{1}{3}\sin 3x\right]_0^{\frac{\pi}{12}}$

$= \frac{1}{3}\sin\frac{\pi}{4}$

$= \frac{\sqrt{2}}{6}$

**4** The function $f(x)$ is defined by $f(x) = x^3 - 4$ for $-1 \le x \le 2$.

For $f^{-1}(x)$, determine

- the domain
- the range. **[5]**

4 $f(x) = x^3 - 4$

let $x = y^3 - 4$

$y^3 = x + 4$

$y = \sqrt[3]{x + 4}$

$f^{-1}(x) = \sqrt[3]{x + 4}$

Range of $f^{-1}$ is the domain of $f$, so
$-1 \leqslant f^{-1} \leqslant 2$

Range of $f$ is the domain of $f^{-1}$, so
$-5 \leqslant x \leqslant 4$

**5** In a particular country, 8% of the population has blue eyes. A random sample of 20 people is selected from this population.
Find the probability that exactly two of these people have blue eyes. **[2]**

5 $X \sim B(20, 0.08)$

$P(X = 2) = \binom{20}{2} \times 0.08^2 \times 0.92^{18}$
$= 0.2711$

**6** Each day, for many years, the maximum temperature in degrees Celsius at a particular location is recorded. The maximum temperatures for days in October can be modelled by a Normal distribution. The appropriate Normal curve is shown in **Fig. 6**.

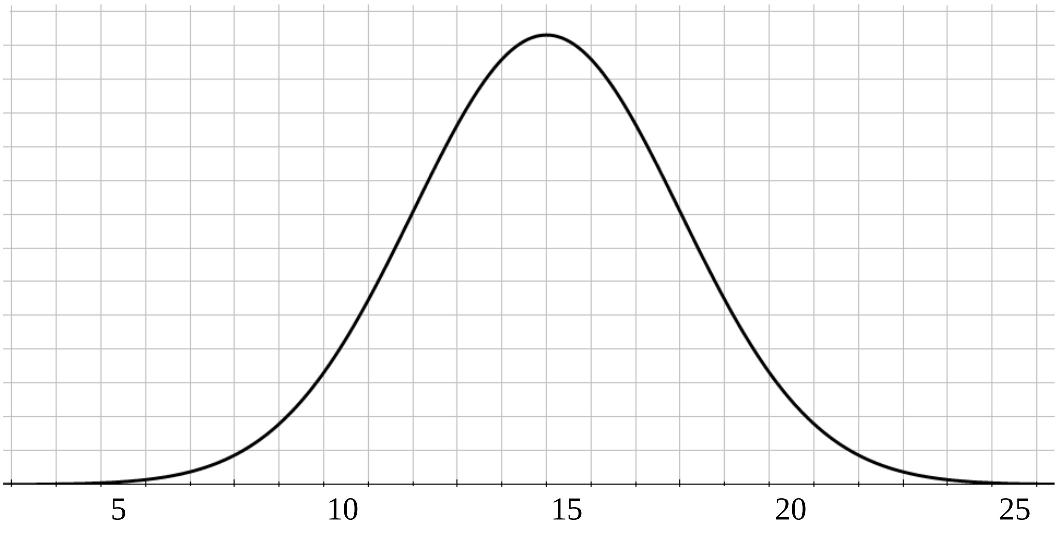



**Fig. 6**

**(a)** **(i)** Use the model to write down the mean of the maximum temperatures. **[1]**

6 a) i. mean = ~~15~~ 17

**(ii)** Explain why the curve indicates that the standard deviation is approximately 3 degrees Celsius. **[1]**

ii. The limits are approximately 9 above / below the mean

$9 = 3 \times SD$

$SD = 3$

Temperatures can be converted from Celsius to Fahrenheit using the formula $F = 1.8C + 32$, where $F$ is the temperature in degrees Fahrenheit and $C$ is the temperature in degrees Celsius.

**(b)** For maximum temperature in October in degrees Fahrenheit, estimate

- the mean
- the standard deviation. **[2]**

b) mean $= 1.8(17) + 32 = 62.6$

SD $= 1.8 \times 3 = 5.4$

**Section B** (77 marks)

**7** Two events $A$ and $B$ are such that $\mathrm{P}(A) = 0.6$, $\mathrm{P}(B) = 0.5$ and $\mathrm{P}(A \cup B) = 0.85$. Find $\mathrm{P}(A \mid B)$. **[4]**

7. $P(A \cap B) = P(A) + P(B) - P(A \cup B)$

$= 0.6 + 0.5 - 0.85$

$= 0.25$

$P(A \mid B) = \dfrac{P(A \cap B)}{P(B)}$

$= \dfrac{0.25}{0.5}$

$= 0.5$

**8** Alison selects 10 of her male friends. For each one she measures the distance between his eyes. The distances, measured in mm, are as follows:

51 57 58 59 61 64 64 65 67 68

The mean of these data is 61.4. The sample standard deviation is 5.232, correct to 3 decimal places.

One of the friends decides he does not want his measurement to be used. Alison replaces his measurement with the measurement from another male friend. This increases the mean to 62.0 and reduces the standard deviation.

Give a possible value for the measurement which has been removed and find the measurement which has replaced it. **[3]**

8. $62 - 61.4 = 0.6$
So the distance of the extra person is $0.6 \times 10 = 6$ mm more than the original person she chose

So it could be that the 51 changes to $51 + 6 = 57$

**9** A geyser is a hot spring which erupts from time to time. For two geysers, the duration of each eruption, $x$ minutes, and the waiting time until the next eruption, $y$ minutes, are recorded.

**(a)** For a random sample of 50 eruptions of the first geyser, the correlation coefficient between $x$ and $y$ is 0.758.
The critical value for a 2-tailed hypothesis test for correlation at the 5% level is 0.279.
Explain whether or not there is evidence of correlation in the population of eruptions. **[2]**

9 a) $0.758 > 0.279$ so there is sufficient evidence to suggest a correlation

The scatter diagram in **Fig. 9** shows the data from a random sample of 50 eruptions of the second geyser.

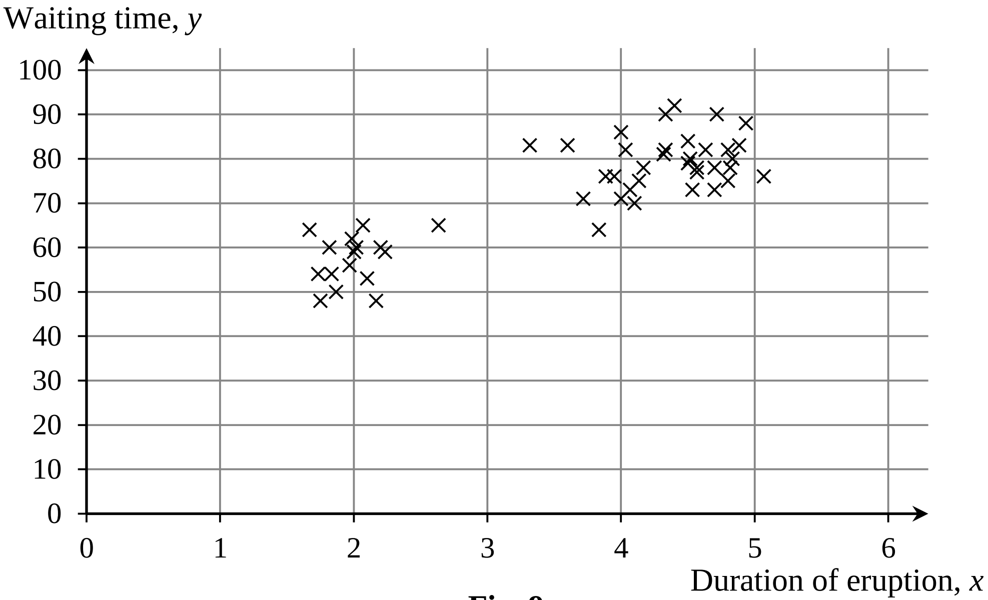



**Fig. 9**

**(b)** Stella claims the scatter diagram shows evidence of correlation between duration of eruption and waiting time. Make two comments about Stella's claim. **[2]**

b) Overall you can see a positive correlation, but within each of the two clusters there is no evidence of a correlation

**10** A researcher wants to find out how many adults in a large town use the internet at least once a week. The researcher has formulated a suitable question to ask.

For each of the following methods of taking a sample of the adults in the town, give a reason why the method may be biased.

Method A: Ask people walking along a particular street between 9 am and 5 pm on one Monday.

Method B: Put the question through every letter box in the town and ask people to send back answers.

Method C: Put the question on the local council website for people to answer online. **[3]**

10 A : You will not be sampling people who do not walk down the street at that time

B : You will only get an answer from people who have the time to and want to answer

C : Only getting answers from people who use the website

**11** Suppose $x$ is an irrational number, and $y$ is a rational number, so that $y = \frac{m}{n}$,

where $m$ and $n$ are integers and $n \neq 0$.
Prove by contradiction that $x + y$ is not rational. **[4]**

11 Suppose $x + y$ is rational

Let $x + y = p$ where $p$ and $q$ are integers

$x + y = \frac{p}{q}$

$x = \frac{p}{q} - y$

$x = \frac{p}{q} - \frac{m}{n}$

$x = \frac{pn - mq}{qn}$ which is rational

$x$ is irrational so this is a contradiction

Therefore, $x + y$ is irrational

**12** **Fig. 12** shows the curve $2x^3 + y^3 = 5y$.

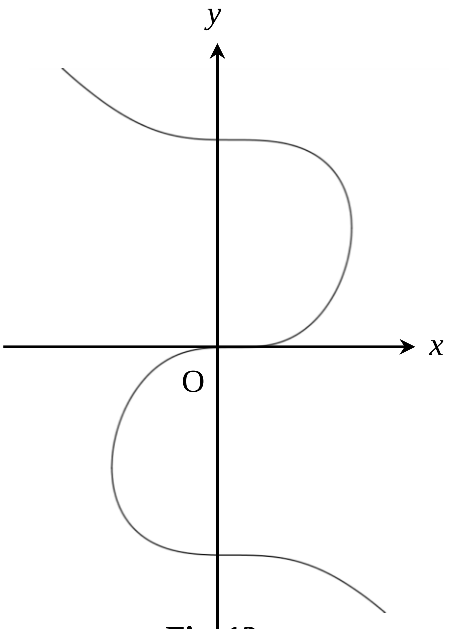


**Fig. 12**

**(a)** Find the gradient of the curve $2x^3 + y^3 = 5y$ at the point $(1, 2)$, giving your answer in exact form. **[4]**

12 a) $2x^3 + y^3 = 5y$

Use implicit differentiation:

$6x^2 + 3y^2 \frac{dy}{dx} = 5\frac{dy}{dx}$

Sub in $x = 1$, $y = 2$

$6 + 3(4)\frac{dy}{dx} = 5\frac{dy}{dx}$

$7\frac{dy}{dx} = -6$

$\frac{dy}{dx} = -\frac{6}{7}$

**(b)** Show that all the stationary points of the curve lie on the $y$-axis. **[2]**

b) at the stationary points, $\frac{dy}{dx} = 0$

$6x^2 + 3y^2(0) = 5(0)$

$6x^2 = 0$

$x = 0$

So all points lie on $y$ axis

**13** Evaluate $\int_0^1 \frac{1}{1+\sqrt{x}}\,dx$, giving your answer in the form $a + b\ln c$, where $a$, $b$ and $c$ are integers.

**[6]**

13 let $u = 1 + \sqrt{x}$ when $x = 1$, $u = 2$

$\frac{du}{dx} = \frac{1}{2}x^{-\frac{1}{2}}$ $x = 0$, $u = 1$

$dx = 2x^{\frac{1}{2}}du = 2(u-1)\,du$

$\int_0^1 \frac{1}{1+\sqrt{x}}\,dx = \int_1^2 \frac{1}{u} \cdot 2(u-1)\,du$

$= 2\int_1^2 \frac{u-1}{u}\,du$

$= 2\int_1^2 1 - \frac{1}{u}\,du$

$= 2\left[u - \ln u\right]_1^2$

$= 2\left[2 - \ln 2 - 1 + \ln 1\right]$

$= 2 - 2\ln 2$

$= 2 - \ln 4$

**14** In a chemical reaction, the mass $m$ grams of a chemical at time $t$ minutes is modelled by the differential equation

$$\frac{\mathrm{d}m}{\mathrm{d}t} = \frac{m}{t(1+2t)} .$$

At time 1 minute, the mass of the chemical is 1 gram.

**(a)** Solve the differential equation to show that $m = \frac{3t}{(1+2t)}$. **[8]**

14 a) $\frac{dm}{dt} = \frac{m}{t(1+2t)}$

$\int \frac{1}{m}\,dm = \int \frac{1}{t(1+2t)}\,dt$

$\frac{1}{t(1+2t)} = \frac{A}{t} + \frac{B}{1+2t}$

$1 = A(1+2t) + Bt$

$1 = A$ $\qquad 0 = 2A + B$

$B = -2$

$\therefore \frac{1}{t(1+2t)} = \frac{1}{t} - \frac{2}{1+2t}$

$\int \frac{1}{m}\,dm = \int \frac{1}{t} - \frac{2}{1+2t}\,dt$

$\ln m = \ln t - \ln(1+2t) + c$

$\ln m = \ln\left(\frac{At}{1+2t}\right)$

$m = \frac{At}{1+2t}$

when $t = 1$, $m = 1$

$$1 = \frac{A}{1+2}$$

$$A = 3$$

$$m = \frac{3t}{1+2t}$$

**(b)** Hence

**(i)** find the time when the mass is 1.25 grams, **[2]**

b) i. $1.25 = \frac{3t}{1+2t}$

$1.25 + 2.5t = 3t$

$0.5t = 1.25$

$t = 2.5$ minutes

**(ii)** show what happens to the mass of the chemical as *t* becomes large. **[2]**

ii. $m = \frac{3t}{1+2t} = \frac{3}{\frac{1}{t} + 2}$

As $t \to \infty$, $\frac{1}{t} \to 0$

$m \to \frac{3}{2}$ grams

**15** A quality control department checks the lifetimes of batteries produced by a company.

The lifetimes, $x$ minutes, for a random sample of 80 ‘Superstrength’ batteries are shown in the table below.

| Lifetime | $160 \le x < 165$ | $165 \le x < 168$ | $168 \le x < 170$ | $170 \le x < 172$ | $172 \le x < 175$ | $175 \le x < 180$ |
|---|---|---|---|---|---|---|
| Frequency | 5 | 14 | 20 | 21 | 16 | 4 |

**(a)** Estimate the proportion of these batteries which have a lifetime of at least 174.0 minutes. **[2]**

15 a) $4 + \frac{16}{3} = \frac{28}{3}$

$\frac{\frac{28}{3}}{80} = 0.1167 =$ proportion

**(b)** Use the data in the table to estimate

- the sample mean, **[3]**
- the sample standard deviation.

**(b)** Use the data in the table to estimate
- the sample mean,
- the sample standard deviation. **[3]**

b) For the mean, the midpoint is the $40^{th}$ value.
This lies in $170 \leq x \leq 172$ and is right
at the start of this interval
So the mean $\approx 170$

68% of the data lies between $\pm$ SD of the
mean
68% of 80 batteries is $\approx 55$
Around 55 batteries lie in $167 \leq x \leq 173$
So $173 - 167 = 2SD$
$SD \approx 3$

The data in the table on the previous page are represented in the following histogram, **Fig 15**:

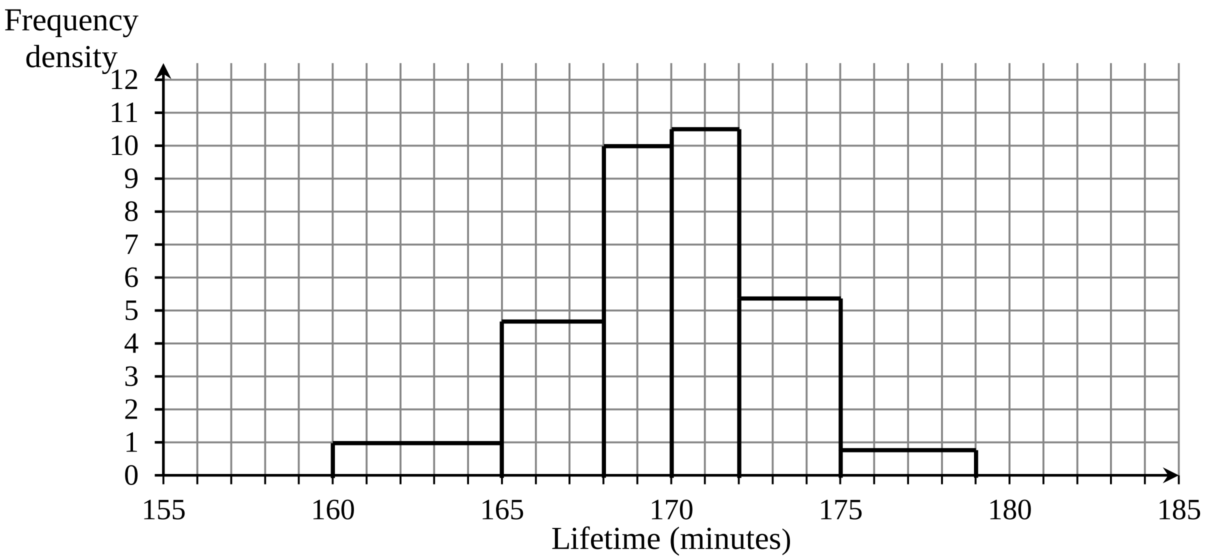



**Fig. 15**

A quality control manager models the data by a Normal distribution with the mean and standard deviation you calculated in part **(b)**.

**(c)** Comment briefly on whether the histogram supports this choice of model. **[2]**

c) Histogram is roughly symmetrical and bell shaped.
It also has all the data points within 3
standard deviations of the mean
So this does support the manager's belief

**(d)** **(i)** Use this model to estimate the probability that a randomly selected battery will have a lifetime of more than 174.0 minutes.

d) i. let $X \sim N(170, 3^2)$

$P(X > 174) = P\left(Z > \frac{174-170}{3}\right)$

$= P(Z > 1.33)$

$= 1 - 0.9082$

$= 0.0918$

**(ii)** Compare your answer with your answer to part **(a)**. **[3]**

ii Answer is similar to part a)

The company also manufactures 'Ultrapower' batteries, which are stated to have a mean lifetime of 210 minutes.

**(e)** A random sample of 8 Ultrapower batteries is selected. The mean lifetime of these batteries is 207.3 minutes.

Carry out a hypothesis test at the 5% level to investigate whether the mean lifetime is as high as stated. You should use the following hypotheses $H_0 : \mu = 210$, $H_1 : \mu < 210$, where $\mu$ represents the population mean for Ultrapower batteries.

You should assume that the population is Normally distributed with standard deviation 3.4. **[5]**

e) $H_0 : \mu = 210$

$H_1 : \mu < 210$

Under $H_0$, $\bar{X} \sim N\left(210, \frac{3.4^2}{8}\right)$

$P(\bar{X} \leq 207.3) = P\left(\frac{\bar{x} - 210}{\frac{3.4}{\sqrt{8}}} \leq \frac{207.3 - 210}{\frac{3.4}{\sqrt{8}}}\right)$

$= P(Z \leq -2.246)$

$= 1 - 0.9878$

$= 0.0122$

$0.0122 < 0.05$ so reject $H_0$

There is sufficient evidence to suggest that the mean lifetime is less than 210 minutes

**TURN OVER FOR THE NEXT QUESTION**

**16** **Fig. 16.1**, **Fig. 16.2** and **Fig. 16.3** show some data about life expectancy, including some from the pre-release data set.

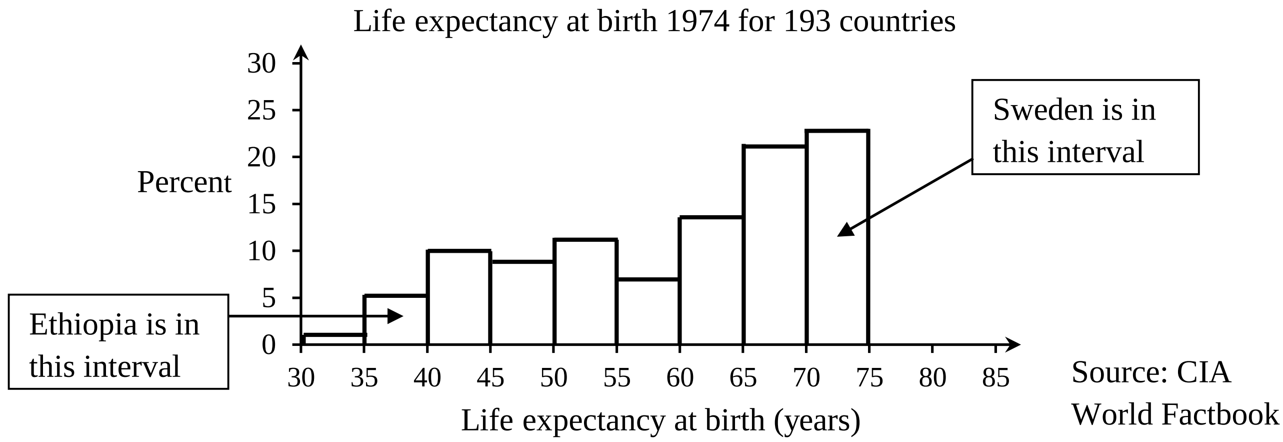



**Fig. 16.1**

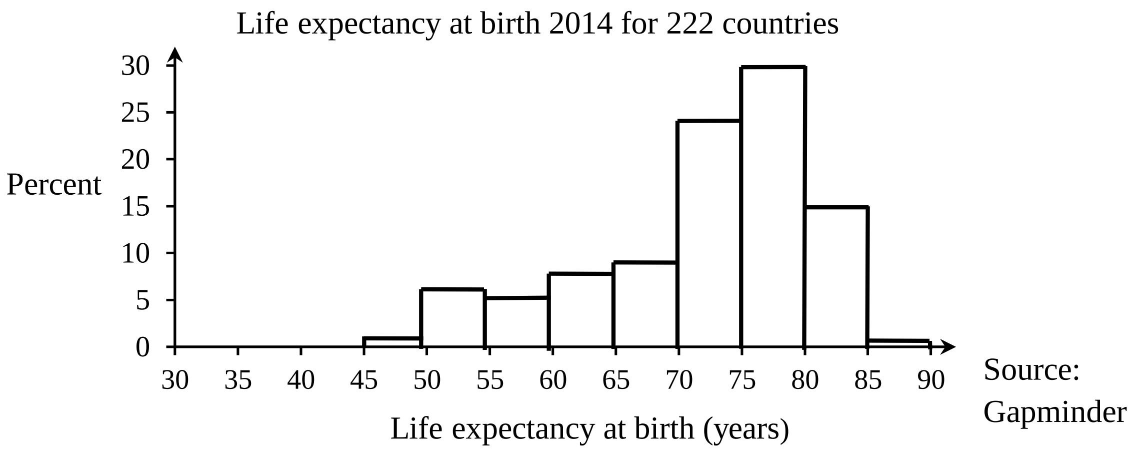
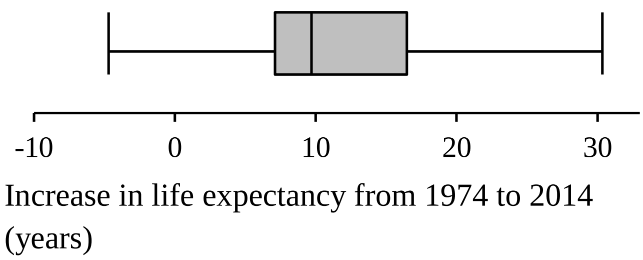



**Fig. 16.2**




Source: CIA World Factbook and

| Increase in life expectancy for 193 countries from 1974 to 2014 | |
|---|---|
| Number of values | 193 |
| Minimum | - 4.618 |
| Lower quartile | 6.9576 |
| Median | 9.986 |
| Upper quartile | 15.873 |
| Maximum | 30.742 |

**Fig. 16.3**

**(a)** Comment on the shapes of the distributions of life expectancy at birth in 2014 and 1974. **[2]**

16 a) The 1974 distribution has a greater spread, and both distributions are negatively skewed

**(b)** **(i)** The minimum value shown in the box plot is negative.
What does a negative value indicate? **[1]**

b) i. Life expectancy went down in at least one of the countries

**(ii)** What feature of **Fig 16.3** suggests that a Normal distribution would **not** be an appropriate model for increase in life expectancy from one year to another year? **[1]**

ii. The boxplot is not symmetrical

**(iii)** Software has been used to obtain the values in the table in **Fig. 16.3**. Decide whether the level of accuracy is appropriate. Justify your answer. **[1]**

iii. It is not appropiate as some life expectancy values will not be available at a high level of accuracy

**(iv)** John claims that for half the people in the world their life expectancy has improved by 10 years or more.
Explain why **Fig. 16.3** does **not** provide conclusive evidence for John's claim. **[1]**

iv. The data is about countries as a whole and not individual people

**(c)** Decide whether the maximum increase in life expectancy from 1974 to 2014 is an outlier. Justify your answer. **[3]**

c) $IQR = 15.873 - 6.9576$
$= 8.9154$

$Q_3 + 1.5 \times IQR = 15.873 + 1.5 \times 8.9154$
$= 29.2461$

The maximum value is 30.742, and $30.742 > 29.2461$ so it is an outlier

Here is some further information from the pre-release data set.

| Country | Life expectancy at birth in 2014 |
|---|---|
| Ethiopia | 60.8 |
| Sweden | 81.9 |

**(d)** **(i)** Estimate the change in life expectancy at birth for Ethiopia between 1974 and 2014.

d) i. From the histogram you are told that in 1974 Ethiopia has a life expectancy of between 35 and 40 years. Take the average of this

Change = 60.8 - 37.5

= 23.3 years

**(ii)** Estimate the change in life expectancy at birth for Sweden between 1974 and 2014. **[4]**

ii. Change = 81.9 - 72.5

= 9.4 years

**(iii)** Give **one** possible reason why the answers to parts **(i)** and **(ii)** are so different.

16) d) iii) Countries with a lower life expectancy in 1974 have greater opportunity to increase life expectancy in 2014.

**Fig. 16.4** shows the relationship between life expectancy at birth in 2014 and 1974.

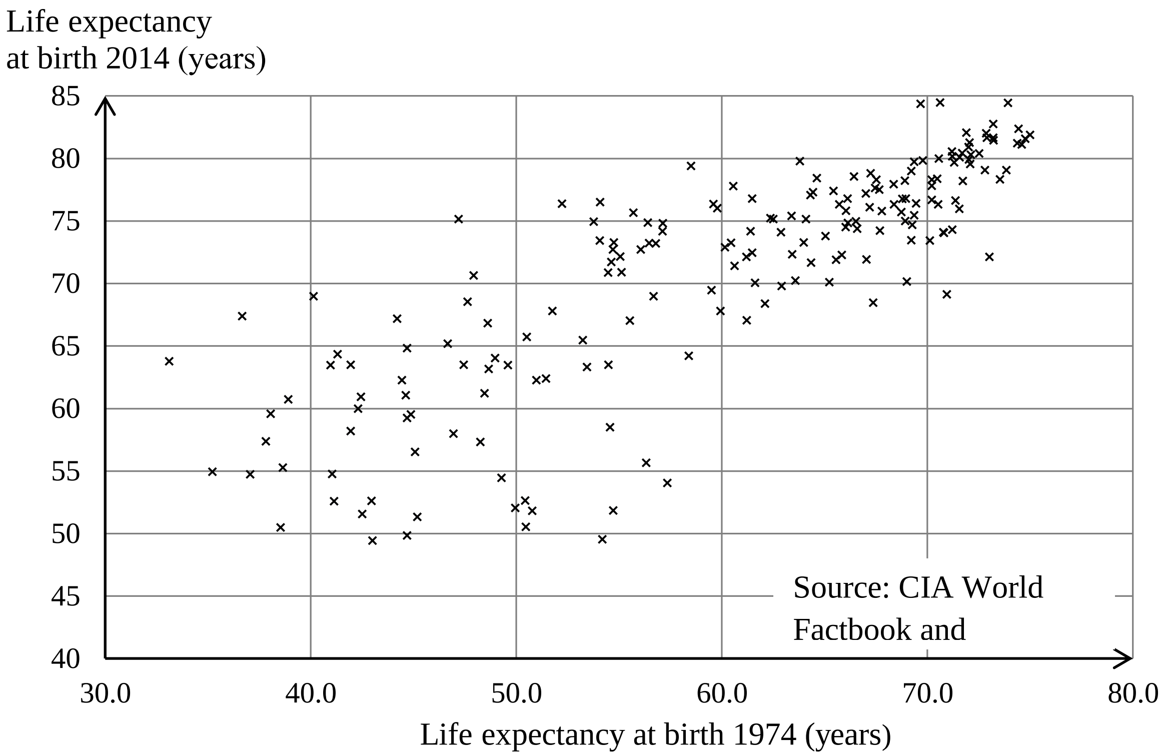



**Fig. 16.4**

A spreadsheet gives the following linear model for all the data in **Fig 16.4**.

**(Life expectancy at birth 2014) = 30.98 + 0.67 × (Life expectancy at birth 1974)**

The life expectancy at birth in 1974 for the region that now constitutes the country of South Sudan was 37.4 years. The value for this country in 2014 is not available.

**(e)** **(i)** Use the linear model to estimate the life expectancy at birth in 2014 for South Sudan.

e) i. $30.98 + 0.67 \times 37.4 = 56.0$ years

**(ii)** Give two reasons why your answer to part **(i)** is not likely to be an accurate estimate for the life expectancy at birth in 2014 for South Sudan.
You should refer to **both** information from **Fig 16.4 and** your knowledge of the large data set. **[2]**

ii. From the diagram, the lower values are fairly scattered so the prediction won't be very accurate. The true value for life expectancy in 2014 is not available. The reasons for this might also mean that South Sudan does not follow the same pattern as other countries

**(f)** In how many of the countries represented in **Fig. 16.4** did life expectancy drop between 1974 and 2014? Justify your answer. **[3]**

f) Draw the line $y = x$
Any values that fall below this line experiexced a drop in life expectancy
You can see that there are 6 values here

**END OF QUESTION PAPER**