Certificate in Use of Mathematics
Foundation Level

Use of Mathematics   43503F/PM

Core

Preliminary Material

Data Sheet

Specimen Data Sheet

To be opened and issued to candidates one to three weeks prior to the examination

REMINDER TO CANDIDATES

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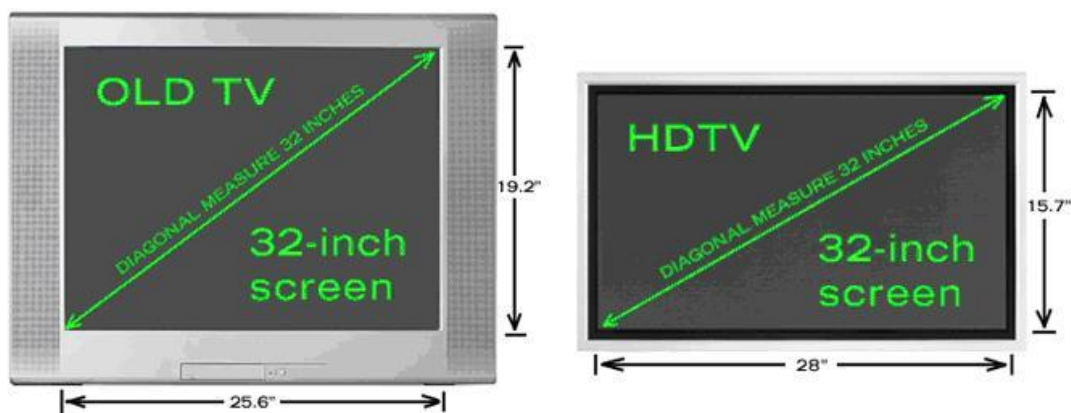A CLEAN COPY WILL BE MADE AVAILABLE.

High Definition Televisions

The shape of televisions has changed in recent years, partly as a result of the introduction of high definition (HD) or HD Ready Televisions. Televisions are sold by size, in inches, where the size relates to the diagonal measurement of the screen. When shown on a widescreen television, old television programmes often have the two sides of the screen blank.
Sometimes the television allowed you to change its format to fill the screen; this would distort the shapes of objects on the screen making them look fatter or thinner.

The diagrams below show the typical shape of a 32 inch non-HD television, and of a HD 32 inch television.

The table below shows for certain heights of the television screen, the diagonal size of the television screen for both non-HD and for HD televisions.

Screen Height (inches)	Non-HD Screen Size (Diagonally, inches)	HDTV Screen Size (Diagonally, inches.)
12.6	21	26
19.2	32	39
24.0	40	49
30.0	50	61
36.0	60	73

Flights: London – Lisbon

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Chess grading

Many sports compare players using systems such as rankings, seedings and handicaps. Chess federations use a relatively precise system of grading players which is based upon the outcome of games with other graded players. A match between two chess players consists of a number of games. Each player's performance is summarized as a percentage.

Alexandra Kosteniuk

The final match in the 2008 championship consisted of four games. Alexandra Kosteniuk won this final match with results as shown in the table below. Each win is awarded 1 point and each draw is awarded 0.5 of a point; hence she scored 2.5 points

	Played	Won	Drawn	Lost	Points
Alexandra Kosteniuk	4	1	3	0	2.5

Because she scored 2.5 points out of a maximum possible score of 4, her performance is described as scoring 62.5% because $\frac{2.5}{4}$ x 100 = 62.5.

The British Chess Federation (BCF) uses a system designed in such a way that if player A is graded x points higher than player B, then in a match between the two players player A would be expected to score $(50 + x)$ %. For example, if player A was 20 grades higher than player B, in a match between the players A and B, player A would be expected to score 70% (for example: scoring $3\frac{1}{2}$ points out of 5) and

player B would be expected to score 30% (for example: scoring $1\frac{1}{2}$ points).
This system has been in operation for over 50 years. The grades themselves range roughly from 0 to 270.

With the computing power of modern computers it became possible to analyse the results of matches very carefully and by 2008 it was realized that the results of matches were **not** matching the predictions accurately enough. Mathematical modelling was used to study the results and it was realized that over the years the system of grades had gradually become "stretched". In general, therefore, the difference in the grades of two players was greater than it should have been.

In readiness for the 2009 season, all the grades were therefore recalculated. An approximate formula for converting an old grade to the ones now in use was:-

New grade = Old grade $\times$ 0.8 + 43.
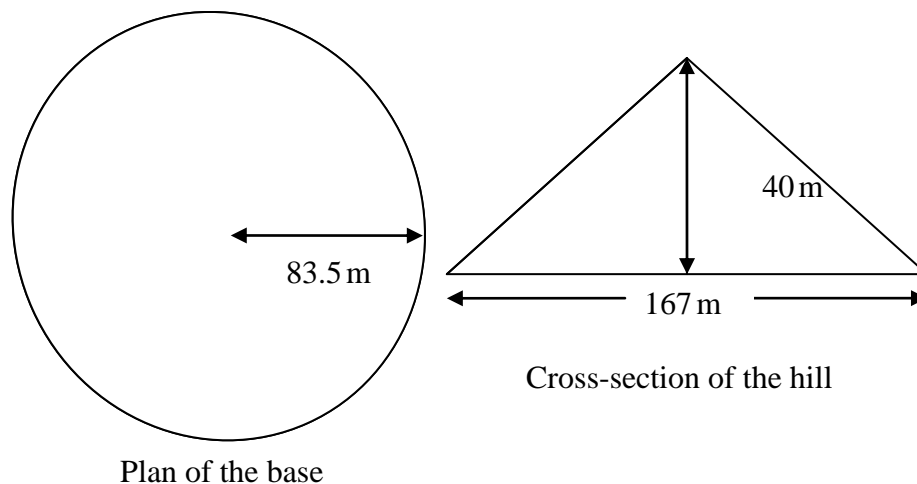
Silbury Hill

Across the world, many cultures have constructed mounds and pyramids.
The Great Pyramid of Giza in Egypt is the tallest with a height of 139 metres.
The largest monument ever constructed is the Great Pyramid of Cholula in Mexico which has a volume of nearly 4.5 million metres.

The tallest prehistoric mound in Europe is Silbury Hill in Wiltshire.

Silbury Hill is a cone shaped mound which dates from about 2500 BC.

It is 40 metres high and the radius of its circular base is approximately 83.5 metres.

83.5 m

Plan of the base

40 m

167 m

Cross-section of the hill

Roughly 250 000 m^3 of earth and chalk were moved and shaped on top of a natural hillock.
It has been estimated that its construction involved approximately 18 million man-hours of work.

END OF DATA SHEET

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