2. Proof by direct methods.
3. Proof of the quadratic formula.
4. Area under curves requiring $\int x\,dy$.
5. The equation of a circle in the form $x^2 + y^2 + 2gx + 2fy + c = 0$.
6. Odd and even functions.
7. The knowledge and use of identities such as $2\cos A\cos B \equiv \cos(A + B) + \cos(A - B)$ to solve equations and prove identities.
8. Partial fractions with quadratic factors in the denominator.
9. Sketching a curve from its parametric equations.
10. Volumes of revolution requiring $\pi \int x^2\,dy$.

**Appendix 2: Applications Units No Longer Examined in 'A' Level Mathematics**

Unit M3 (Elevated to Further Mathematics):

1. Kinematics of a particle moving in a straight line when the acceleration is a function of displacement ($x$) or time ($t$).
2. Elastic strings and springs.
3. Hooke's Law.
4. Energy stored in an elastic string or spring.
5. Newton's laws of motion, for a particle moving in one dimension, when the applied force is variable.
6. Simple harmonic motion.
7. Oscillations of a particle attached to the end of an elastic string or spring.
8. Angular speed.
9. Radial acceleration in circular motion.
10. The forms $r\omega^2$ and $\frac{v^2}{r}$.
11. Uniform motion of a particle moving in a horizontal circle.
12. Motion of a particle in a vertical circle.
13. Centre of mass of uniform rigid bodies and simple composite bodies.
14. Simple cases of equilibrium of rigid bodies.

or

Unit S3 (Elevated to Further Mathematics):

1. Distributions of linear combinations of independent Normal random variables.
2. Methods for collecting data. Simple random sampling. Use of random numbers for sampling.
3. Other methods of sampling: stratified, systematic, quota.
4. Concepts of standard error, estimator, bias.
5. The distribution of the sample mean $\overline{X}$.
6. Concept of confidence interval and its interpretation.
7. Confidence limits for a Normal mean, with variance known.
8. Hypothesis tests for the mean of a Normal distribution with variance known.
9. Use of the Central Limit Theorem to extend hypothesis tests and confidence intervals to samples from non-Normal distributions.Use of large samples results to extend to the case in which the variance is unknown.
10. Hypothesis test for the difference between the means of two Normal distributions with variances known.
11. Use of large sample results to extend to the case in which the population variances are unknown.

12. The null and alternative hypotheses. The use of $\sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$ as an approximate $\chi^2$ statistic.
13. Degrees of freedom.
14. Spearman's rank correlation coefficient, its use, interpretation and limitations.
15. Testing the hypothesis that a correlation is zero.

**Appendix 3: Applications Units Removed From 'A' Level Further Mathematics**

Unit M6 (Removed):

1. Differentiation of unit vectors in two dimensions. Velocity and acceleration components using Cartesian coordinates, polar coordinates and intrinsic coordinates.
2. Motion of a particle on a smooth curve, given in intrinsic form.
3. Motion under a central force.
4. Motion of projectiles.
5. Motion of centre of mass.
6. Independence of rotational and translation motion.
7. The effect of an impulse on a rigid body which is unconstrained. Conservation of linear momentum. Conservation of angular momentum.

Unit S6 (Removed):

1. Hypothesis test and confidence interval for β, the gradient of a linear regression model, assuming a Normal distribution.
2. Residuals. The residual sum of squares.
3. Sign test for a population median based on a single sample. Sign test for equality of two distributions based on paired samples.
4. Wilcoxon signed-rank test.
5. Wilcoxon rank sum test.
6. Control charts for mean, range, standard deviation and fraction defective.
7. One-way analysis of variance.
8. Two-way analysis of variance.

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