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Formulae

Learners will be given formulae in each assessment on page 2 of the integrated answer booklet. See Section 5d for a list of these formulae.

The meanings of some instructions and words used in this specification

Exact

An exact answer is one where numbers are not given in rounded form. The answer will often contain an irrational number such as $\sqrt{3}$, e or π and these numbers should be given in that form when an exact answer is required.

The use of the word 'exact' also tells learners that rigorous (exact) working is expected in the answer to the question.

e.g. Find the exact solution of $3x = 2$.

The correct answer is $x = \frac{2}{3}$ or $x = 0.\dot{6}$, not $x = 0.67$ or similar.

Show that

Learners are given a result and have to show that it is true. Because they are given the result, the explanation has to be sufficiently detailed to cover every step of their working.

e.g. Show that the curve $y = 2x^2 - 12x + 13$ has a stationary point $(3,-5)$. In this case, candidates would be expected to show that there was a turning point at $x = 3$, by calculus or completing the square, and that when $x = 3$ then $y = -5$. A sketch of the curve would not be sufficient.

Determine

This command word indicates that justification should be given for any results found, including working where appropriate.

Give, State, Write down

These command words indicate that neither working nor justification is required.

In this question you must show detailed reasoning

When a question includes this instruction, learners must give a solution which leads to a conclusion showing a detailed and complete analytical method. Their solution should contain sufficient detail to allow the line of their argument to be followed. This is not a restriction on a learner's use of a calculator when tackling the question, e.g. for checking an answer or evaluating a function at a given point, but it is a restriction on what will be accepted as evidence of a complete method.

In these examples variations in the structure of the solutions are possible (for example using a different base for the logarithms in example 1), and different intermediate steps may be given.

Example 1:

Use logarithms to solve the equation $3^{2x+1} = 4^{100}$, giving your answer correct to 3 significant figures.

The answer is $x = 62.6$, but the learner *must* include the steps $\log 3^{2x+1} = \log 4^{100}$, $(2x+1)\log 3 = \log 4^{100}$ and an intermediate evaluation step, e.g. $2x + 1 = 126.18\ldots$. Using the solve function on a calculator to skip one of these steps would not result in a complete analytical method.

Example 2:

Evaluate $\int_0^1 x^3 + 4x^2 - 1\,dx$.

The answer is $\frac{7}{12}$, but the learner *must* include at least $\left[\frac{1}{4}x^4 + \frac{4}{3}x^3 - x\right]_0^1$ and the substitution $\frac{1}{4} + \frac{4}{3} - 1$.

Just writing down the answer using the definite integral function on a calculator would therefore not be awarded full marks.

Hence

When a question uses the word 'hence', it is an indication that the next step should be based on what has gone before. The intention is that learners should start from the indicated statement.

e.g. Show that $(x-1)$ is a factor of $2x^3 - x^2 - 7x + 6$.

Hence solve the equation $2x^3 - x^2 - 7x + 6 = 0$.

You may use the result

When this phrase is used it indicates a given result that learners would not normally be expected to know but which may be useful in answering the question.

The phrase should be taken as permissive. Use of the given result is not required.

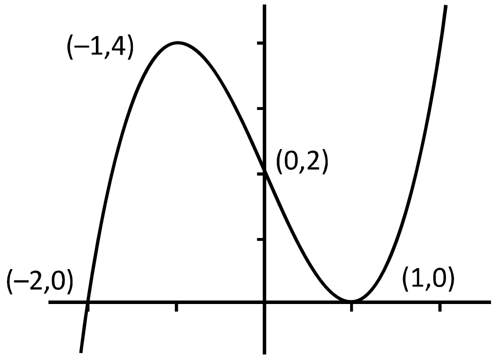
Plot
Learners should mark points accurately on the graph in their integrated answer booklet. They will either have been given the points or have had to calculate them. They may also need to join them with a curve or a straight line, or draw a line of best fit through them.
e.g. Plot this additional point on the scatter diagram.

Sketch
Learners should draw a diagram, not necessarily to scale, showing the main features of a curve. These are likely to include at least some of the following:

- turning points
- asymptotes
- intersection with the *y*-axis
- intersection with the *x*-axis
- behaviour for large *x* (+ or –).

Any other important features should also be shown.

e.g. Sketch the curve with equation $y = x^3 - 3x + 2$.



Draw
Learners should draw to an accuracy appropriate to the problem. They are being asked to make a sensible judgement about this.
e.g. Draw a line of best fit to estimate the gradient.

Other command words
Other command words, for example 'explain' or 'calculate', will have their ordinary English meaning.

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