

Foundation ActEd Course

Initial Assessment for students

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What is the Foundation ActEd Course?

ActEd has created the Foundation ActEd Course (FAC) to help students to refresh and improve their mathematical skills in preparation for the Core Technical subjects. FAC covers the mathematical material needed as the background for Subjects CT1, CT3 to CT6 and Subject CT8. The Institute and Faculty produce guidance on the mathematics skills required by students joining the profession. FAC reflects this guidance and therefore comprehensively covers all the mathematics required for the Core Technical subjects. Unlike other mathematical textbooks it is geared specifically towards actuarial students.

FAC is designed as a reference document to which students can refer when they need help on a particular topic. Each chapter contains explanatory notes, examples and self-assessment questions to test understanding. There is also a summary test and a Question and Answer Bank providing extra practice for students.

The full Syllabus for FAC and a sample of the Course Notes can be found on our website at www.ActEd.co.uk.

Would you find FAC useful?

We have written a short test to help students assess whether or not they would benefit from the Foundation ActEd Course. There are 20 questions, which are typical of problems that will be encountered in the context of the actuarial exams and which are covered in detail in the course. The test should take you about 60 minutes to complete.

You should attempt the test without reference to a textbook. We have provided a copy of the solutions to your employer.

Questions

1. Simplify $3\ln(1+i) + \ln(1+i)^5$.
2. Find $\frac{d}{dx} \left(\frac{1 - (1+x)^{-4}}{\ln(1+x)} \right)$.
3. What is the definition of $\Gamma(x)$?
4. Solve the equations $2x^2 - 4x + 1 = 0$
5. What is the formula for the sum to n terms of a geometric progression?
6. Find $\frac{\partial f}{\partial y}$, where $f = (x + 2y)^2 e^y \ln xy$.

7. The quantities $\alpha, \beta, \gamma, \phi, \psi$ are related by the equation $\psi = \frac{\beta + \phi^\gamma}{\alpha}$. Given that $\alpha = 2.3323$, $\beta = 0.18224$, $\gamma = 2.233$ and $\psi = 0.0789879$, find the value of ϕ , quoting your answer correct to 4 significant figures.
8. Solve the inequality $x^2 - x - 6 < 0$.
9. Find $\int_{-1}^1 \frac{4 + 3x}{5 + 4x} dx$
10. What is the Taylor series expansion of e^x ?
11. Find the general solution of the differential equation $\frac{1}{t^2} \frac{dr}{dt} = rt + r^2 t$.
12. Let $g(x) = e^x - 2x - 1$. The nontrivial root of the equation $g(x) = 0$ is denoted by ξ . By applying linear interpolation to the values of $g(1)$ and $g(2)$, find an approximate value of ξ , quoting your answer to 3 significant figures.
13. What is the real part of the complex number $\frac{2 + 3i}{4 - i}$?
14. What is the condition that two vectors, \mathbf{a} and \mathbf{b} , are perpendicular?
15. Find $\int_{x=2}^{10} \int_{y=1}^{20} 3x + 2y \, dx \, dy$.
16. Find the inverse and the eigenvalues of the matrix $\mathbf{M} = \begin{pmatrix} 5 & 3 \\ 4 & 9 \end{pmatrix}$.
17. Calculate the value of λ which maximises $\ln \frac{e^{-\lambda n} \lambda^{\sum_{i=1}^n x_i}}{\prod_{i=1}^n x_i}$.
18. What is an alternative expression (involving single angle trig functions) for $\sin(A + B)$?
19. What is the definition of e^{ix} ?
20. Simplify $\prod_{i=1}^n \lambda e^{-\lambda x_i}$.

If you found these questions difficult, the Foundation ActEd Course will help you to improve your mathematical skills.