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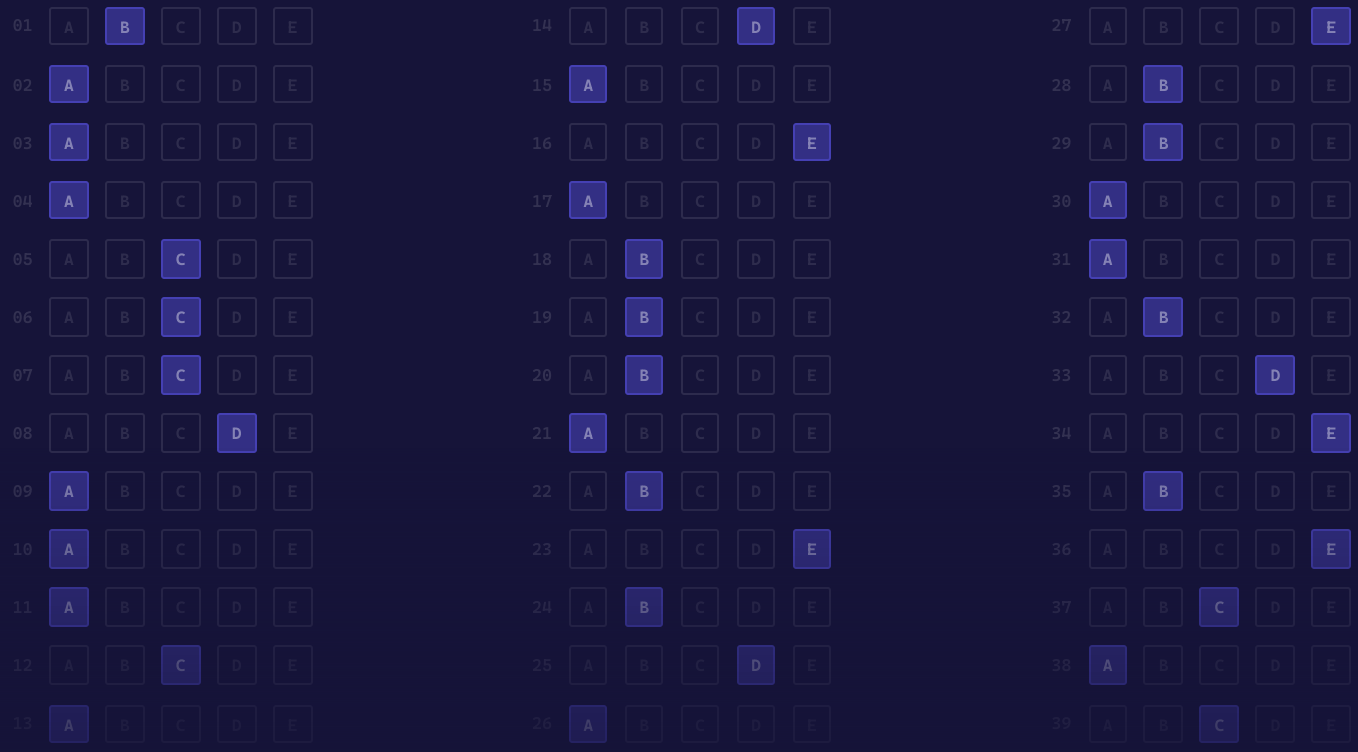

PRACTICE QUESTIONS

American Society For Quality (ASQ)

CRECH

Certified Reliability Engineer (PBT)

EDITION	QUESTIONS	FORMAT
Demo	9	Limited Edition PDF

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Before you begin

What this is

9 practice questions for American Society For Quality (ASQ) `CRECH`, each with its answer key and an explanation. Answer a question before you read its key — the explanation is worth more once you have committed.

If something looks wrong

Send us three things and we will check it:

- the exam code, `CRECH`
- the question number
- the email address on your order

Write to **support@mometrix.net**. We reply within one business day.

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QUESTION 1 SINGLE CHOICE

A printed circuit board has two failure modes: solder joint cracks and component failure. Historical data show P(solder joint crack) = 0.04 and P(component failure) = 0.03. The events are independent. What is the probability that a randomly selected board fails due to solder joint cracks AND component failure?

A **0.0012**

B 0.0700

C 0.0488

D 0.0704

ANSWER **A**

WHY For two independent events A and B, $P(A \cap B) = P(A) \times P(B) = 0.04 \times 0.03 = 0.0012$. Option B is the union probability computed incorrectly, option C is the union ($0.04 + 0.03 - 0.0012 = 0.0688$, not 0.0488), and option D uses an invalid multiplication.

QUESTION 2 SINGLE CHOICE

Which of the following best distinguishes predicted reliability from demonstrated reliability?

A Predicted reliability is based on accelerated test results, while demonstrated reliability is based on field warranty data.

B **Predicted reliability is obtained from a mathematical model of the design, while demonstrated reliability is obtained from test data on actual units produced to that design.**

C Predicted reliability is reported by suppliers and demonstrated reliability is reported by customers.

D Predicted reliability applies to hardware and demonstrated reliability applies to software.

ANSWER **B**

WHY ASQ reliability engineering body of knowledge defines predicted reliability as that derived analytically from a design model (e.g., parts count, parts stress), while demonstrated reliability is empirically established by testing production units against an established reliability test plan. The other options confuse sources of data or arbitrarily limit the definitions to one domain.

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QUESTION 3 SINGLE CHOICE

During which region of the reliability bathtub curve is preventive maintenance typically LEAST effective at reducing the hazard rate?

A Infant mortality region

B Useful life region

C Wear-out region

D All three regions show equal benefit from preventive maintenance.

ANSWER B

WHY In the useful life region the hazard rate is approximately constant and failures are largely random, so scheduled preventive maintenance provides little benefit and may even introduce damage. In infant mortality, burn-in helps; in wear-out, preventive replacement of aging components is most effective.

QUESTION 4 SINGLE CHOICE

A system consists of three independent components arranged in parallel, with reliabilities R1 = 0.90, R2 = 0.95, and R3 = 0.85. What is the system reliability?

A 0.7268

B 0.9975

C 0.2700

D 0.9992

ANSWER B

WHY For a parallel configuration, the system fails only if all components fail. R_system = 1 − (1 − 0.90)(1 − 0.95)(1 − 0.85) = 1 − (0.10)(0.05)(0.15) = 1 − 0.00075 = 0.99925. Option A is the series product, option C is the series probability of failure, and option D is an incorrect subtraction.

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QUESTION 5 SINGLE CHOICE

A component's failure time is exponentially distributed with a constant failure rate λ = 0.0025 failures per hour. What is the probability that the component survives at least 200 hours?

A **e^(−0.5)**

B 1 − e^(−0.5)

C 0.5

D e^(−200)

ANSWER **A**

WHY For the exponential distribution, R(t) = e^(−λt). Substituting t = 200 and λ = 0.0025 gives R(200) = e^(−0.0025 × 200) = e^(−0.5) ≈ 0.6065. Option B is the unreliability, and options C and D misapply the formula.

QUESTION 6 SINGLE CHOICE

In the Weibull distribution for time to failure, which value of the shape parameter β indicates a hazard rate that increases with time, characteristic of wear-out failures?

A β < 1

B β = 1

C **β > 1**

D β = 0

ANSWER **C**

WHY For the Weibull distribution: β < 1 corresponds to a decreasing hazard rate (infant mortality), β = 1 reduces to the exponential with a constant hazard rate (random failures), and β > 1 corresponds to an increasing hazard rate (wear-out). β cannot be 0 for a meaningful Weibull lifetime model.

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QUESTION 7 SINGLE CHOICE

During a reliability growth test following a Duane model, the cumulative test time is doubled while the cumulative number of failures is also doubled. What happens to the observed growth rate?

A The growth rate increases.

B The growth rate decreases.

C The growth rate remains unchanged.

D The growth rate is undefined because both quantities changed.

ANSWER C

WHY The Duane model expresses cumulative MTBF as a power function of cumulative test time. If both cumulative failures and cumulative test time scale by the same factor, the implied growth rate (the slope on a log–log plot) is unchanged, because the ratio and slope remain the same.

QUESTION 8 SINGLE CHOICE

An accelerated life test uses the Arrhenius model with an activation energy of 0.7 eV. The acceleration factor between two test temperatures is 4.0. If the test is run for 1,000 hours, what is the equivalent service time at the lower use temperature?

A 250 hours

B 1,000 hours

C 4,000 hours

D 2,000 hours

ANSWER C

WHY The acceleration factor (AF) = (Test time) / (Equivalent use time) for the same reliability. Given AF = 4.0 and test time = 1,000 hours, equivalent use time = 1,000 × 4.0 = 4,000 hours. Options A and D invert or halve the AF incorrectly, and option B ignores acceleration.

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QUESTION 9 MULTIPLE CHOICE

Which of the following statements about FMEA/FMECA are TRUE? (Choose two.)

A **RPN (Risk Priority Number) is calculated as the product of Severity × Occurrence × Detection ratings.**

B Severity, Occurrence, and Detection scales typically run from 1 (worst) to 10 (best).

C **FMECA adds a criticality analysis to FMEA to rank failure modes by their impact on the mission or customer.**

D A high Detection rating indicates that a failure mode is easy to detect before reaching the customer.

ANSWER **A · C**

WHY RPN = S × O × D (Statement A is true). FMECA extends FMEA by adding criticality analysis (Statement C is true). Statement B is incorrect because the scales run from 1 (lowest severity/occurrence/detection difficulty) to 10 (highest), not the reverse. Statement D is incorrect because a high Detection score in the conventional FMEA scale means the failure is hard to detect — high detection difficulty.

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