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2003 EA-2B EXAM SOLUTIONS

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2003 EA-2B Exam Solutions

These solutions were prepared based on the law as in effect at December 31, 2002.

These solutions have been compared with those produced by other technical actuaries, and they represent my best understanding of the correct way to solve these problems. As usual, it seems easy to get an answer in the correct range as long as you are not actually taking the exam!

Revision History:

May 10, 2013	Corrected solutions for problems 28 and 29
May 20, 2011	Corrected solution for problem 16
April 5, 2010	Corrected solutions for problems 9 and 38
April 21, 2009	Corrected solution for problem 16 (pages 2 and 3)
March 30, 2008	Clarified solution for problem 15 (pages 1 and 2)
April 24, 2006	Clarified solution for problem 27 (page 1)
April 21, 2006	Added note to solution for problem 14 (pages 2 and 3), clarified solution for problem 28
February 22, 2006	Corrected solution for problem 27 (page 2)
December 22, 2005	Corrected solution for problem 36 (page 2)
May 06, 2005	Reversed correction to solution for problem 36 (page 2)
May 04, 2005	Corrected solution for problem 36 (page 2)
May 02, 2005	Corrected solution for problem 34 (page 1)
April 11, 2005	Corrected solution for problem 19 (page 2)
December 9, 2004	Corrected solution for problem 16 (page 3), added note for problem 19
May 2, 2004	Corrected solution for problem 28
April 30, 2004	Added clarification to solution for problems 13
April 27, 2004	Corrected solutions for problems 13 and 18
April 23, 2004	Corrected solutions for problems 14, 17, 18, 25, 27, 33 and 34
February 19, 2004	Corrected answer letters at end of solutions for problems 16, 27 and 29
February 18, 2004	Original solutions

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Problem 1

Similar to 2001 #11

FALSE

PBGC regulation 4043.81 specifies that notice is required for failure to pay the required installments. At 4043.4(d), it states that the PBGC may grant waivers or extensions to the notice requirement.

In the PBGC Form 10 instructions, there are two waivers:

- 1) Payment of the quarterly installment by the 30th day after the payment is due, or
- 2) Small plan waiver
 - A) If plan has 500 or less participants, or
 - B) If underfunding notice to participants is required for prior plan year and year the contribution is owed, and plan has 100 or less participants

Answer is B

Problem 2

TRUE

Under the 1.411(d)-4 regulation, it lists the following as protected benefits:

- Accrued benefits
- Optional forms of benefit
- Early retirement benefits and retirement type subsidies

At Q&A-1(a)(2) it states that retirement type subsidies include qualified social security supplements as described at 1.401(a)(4)-12.

Answer is A

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Problem 3

FALSE

In 411(a)(7)(B), a plan may disregard service for which a participant has received a distribution of the entire nonforfeitable benefit. In 411(a)(7)(C), a plan may not disregard such service unless it allows a participant to repay the distribution with interest. After repayment, the plan would restore the past service credits. 411(a)(7)(C) only applies if the distribution to the participant was less than the full present value of the accrued benefit.

Smith was 100% vested, so the distribution they received was equal to the full present value of their accrued benefit. As a result, the plan does not have to allow Smith to repay the distribution.

Answer is B

Problem 4

TRUE

Under EGTRRA, the 415 dollar limit is available unreduced between ages 62 and 65. The same 160,000 applies at those ages. Even if the plan benefit were actuarially increased based on NRA of 62, the benefit that could be paid at age 63 would still be limited to 160,000.

See 415(b)(1)(C) and 415(b)(1)(D).

Answer is A

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Problem 5

TRUE

This rule was added by EGTRRA in 2001. See 415(f)(3).

Answer is A

Problem 6

FALSE

For the Top heavy determination, you should add together the present value of vested and non-vested accrued benefits and the account balances as of the determination date for all participants and the key employees. The amounts should exclude values for terminated employees who have not been employed in the 12 months ending on the determination date, or values for former key employees.

These amounts should include distributions (including benefit payments) within the 12 months ending on the determination date. These amounts should also include any in-service distributions within the 5 years ending on the determination date. This is the key point to this problem - to see if you knew that EGTRRA changed these rules in 2001.

See 416(g)(3)(B).

Answer is B

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Problem 7

TRUE

This item seems to be true. In 1.416(g)(2)(A)(i), it defines a required aggregation group:

- All plans with any key employee
- Other plans that must be aggregated for a "key employee plan" to pass 401(a)(4) or 410(b)

Based on having no key employees, it seems that the collectively bargained plan would not be part of the required aggregation group. It is unlikely that a collectively bargained plan would need to be aggregated to enable a "key employee plan" to pass 401(a)(4) or 410(b).

Answer is A

Problem 8

Similar to 2001 #12

FALSE

In ERISA section 4213(a), it allows two choices for assumptions used in calculation of the UVB:

- Regulations prescribed by the PBGC (if any)
- Reasonable assumptions, the description of which sounds like the IRC section 412 "best estimate in the aggregate"

In ERISA section 4213(b), it states that the actuary may rely on the most recent valuation, and reasonable estimates for the interim years.

Answer is B

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Problem 9

Revised 04/05/10

FALSE

IRC section 4975(c)(1) defines the term "Prohibited Transaction". 4975(c)(1)(A) includes the exchange of property with a "disqualified person". In ERISA, the definition of "party in interest" is similar to the definition in 4975(e)(2) of "disqualified person".

There are various exemptions in 4975(d)(1) through 4975(d)(15). Lack of knowledge by the plan trustee is not one of these exemptions.

Answer is B

Problem 10

TRUE

This is almost a direct quote from ERISA Section 402(a)(1). The title of this section of ERISA is "Establishment of a Plan".

Answer is A

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Problem 11

TRUE

This is virtually a direct quote from the regulation at 901.20(h).

Answer is A

Problem 12

FALSE

This is false, due to one word. In IRC section 411(d)(3), it refers to "the rights of all affected employees", not "the rights of all employees".

For example, if a particular location is closed, then there may be a partial termination of the plan. The benefits for the affected employees would become 100% vested (but not for any other employees).

Answer is B

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Problem 13

Revised 04/30/04

This is the first question asked on PBGC Technical Update 96-3. You are given information for three plans sponsored by Company X.

Company X has a fiscal year that equals the calendar year. You have information as of two dates for each of Plans A, B, and C. Based on Q-5 of TU 96-3, you should use information at the end of the plan year ending in X's "information year" (which is the 2002 calendar year).

You are told that the liabilities are calculated at the 30 year Treasury rate for the last month of the plan year. You are given assets as actuarial values and market values. Q-12 shows the following alternative sets of assumptions (updated for post-1997 plan years) for calculating the unfunded vested benefits liability (UVB):

Unfunded Vested Benefit Calculation Method	Interest Rate	Asset Value
General Method	85% of 30-year Treasury rate	Actuarial Value
Alternative Calculation Method: Valuation at first day of the plan year	85% of 30-year Treasury rate	Actuarial Value
Other valuation dates	85% of 30-year Treasury rate	Market Value
General Method Using Optional §4010 Assumptions	100% of 30-year Treasury rate	Market Value

You should use the market value of assets to calculate the UVB, not actuarial value. The key point is that the question asks for values under ERISA Section 4010. Note that is the only set of assumptions that matches the 100% of the 30 year Treasury rate used to produce the liabilities given in the problem.

Plan	Date	Vested CL	MVA	UVB
A	12/31/02	980,000,000	955,000,000	25,000,000
B	01/31/02	100,000,000	80,000,000	20,000,000
C	12/31/02	220,000,000	230,000,000	0

The total UVB is 45,000,000.

Answer is B

NOTE:

JCWAA '02 temporarily changed the interest rates for UVB calculations from 85% to 100%. This is only applicable to plan years beginning in 2002 and 2003. Since the question asks for "the minimum amount of unfunded liability", you should do your calculations as shown above. Only the Section 4010 assumptions use the market value.

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Problem 14 – Page 1

Similar to 2002 #22

Revised 04/23/04

This is the second question asked on plan design using the annual disparity fraction and the cumulative disparity fraction. The annual disparity fraction (ADF) is designed to prevent multiple 401(l) plans from exceeding the .75% permitted disparity limit. The cumulative disparity fraction (CDF) is designed to keep a single defined benefit plan from exceeding 35 years of accruals at the .75% permitted disparity limit.

The total annual disparity fraction (at 1.401(l)-5(b)(2)) is defined as the sum of the ADF for all plans whose plan year ends in the current plan year of the plan being tested. The ADF is defined as follows:

DC plan – $\frac{\text{Disparity for the year}}{\text{Maximum excess allowance}}$

DB excess – $\frac{\text{Disparity for the year}}{\text{Maximum excess allowance}}$

DB offset – $\frac{\text{Disparity for the year}}{\text{Maximum offset allowance}}$

ADF – 1.0 for imputed permitted disparity plans

The cumulative disparity fraction (CDF) at 1.401(l)-5(c)(2) is the sum of the ADF for all plans for all years of service. The CDF must not exceed 35. This is essentially a limit that applies to defined benefit (DB) plans. The reason is that the CDF limit is deemed automatically satisfied for an employee who does not benefit under any DB plans (see 1.401(l)-5(c)(1)(ii)).

You should determine the ADF for the profit sharing plan. To satisfy the total annual disparity fraction limit, the ADF for the DB plan must be less than 1.0 less the DC ADF. Since the DB plan accrues benefits for more than 35 years, the DB plan ADF must be further reduced to satisfy the CDF.

DC PLAN

In the given plan, the disparity is 1%, which equals the excess contribution percentage (6%) minus the base contribution percentage (5%).

The annual disparity fraction for DC plans depends on the percentage of the Taxable Wage Base (TWB) used as the integration level. The maximum excess allowance is defined at 1.401(l)-2(b)(2) as the lesser of

- The base contribution percentage, or
- The greater of 5.7% (as reduced under 1.401(l)-2(d)(4)), or the old age FICA rate

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Problem 14 – Page 2

Revised 04/21/06

This is the first problem that tested knowledge of the table at 1.401(l)-2(d)(4):

Greater of 10,000 or 20% of TWB	< Integration level ≤ 80% of TWB	<u>Reduce 5.7% to</u> 4.3%
80% of TWB	< Integration level < 100% of TWB	5.4%

The ADF for the DC plan equals $1.0\% / 4.3\% = .2326$.

DB PLAN

Based on the prior calculations, the ADF for the DB plan can't exceed .7674, which equals $1.0 - .2326$.

In the given plan, the disparity is $X\% - .70\%$, which equals the excess contribution percentage minus the base contribution percentage.

The annual disparity fraction for DB excess plans depends on several factors. The maximum excess allowance is defined at 1.401(l)-3(b)(2) as the lesser of

- .75% reduced as required under 1.401(l)-3(d), or 1.401(l)-3(e), or
- The base benefit percentage

1.401(l)-3(d) contains adjustments based on the integration level. In this problem (as in all prior problems), the integration level equals 100% of covered compensation. If the integration level were greater, then the .75% would be reduced based on the table at 1.401(l)-3(d)(9).

1.401(l)-3(e) contains adjustments based on benefit commencement ages other than Social Security Retirement Age (SSRA). These adjustment tables are given with the EA-2B exam each year. Since the plan allows early retirement at age 62, the .75% must be reduced to reflect that benefit commencement age.

In this problem, you must be careful to check the simplified table. The reason is that the adjusted percentage is .50% at age 62 using the table for SSRA 67, but it is .52% at age 62 under the simplified table.

Some prior problems have told you to ignore the simplified table. This is the first problem where use of the simplified table is required to produce the correct answer range.

The ADF for the DB plan equals $(X\% - .70\%) / .52\%$. If you now solve for $X\%$, you will get the wrong answer:

$$[(X\% - .70\%) / .52\%] = .7674 = 1 - .2326$$
$$X\% = 1.0990\%$$

Problem 14 – Page 3**Revised 04/21/06**

The prior calculation guarantees that the DB and the DC plan meet the ADF limit. But this incorrectly ignores the CDF. Since the DB plan allows benefits to accrue for 40 years, you should add the disparity fractions for each year of benefit accrual, and compare them to the CDF:

$$\begin{aligned} 40 * [(X\% - .70\%) / .52\%] &\leq 35 * (.7674) \\ [(X\% - .70\%) / .52\%] &\leq (35/40) * (.7674) \\ X\% &\leq 1.0492\% \end{aligned}$$

Answer is B**NOTES:**

1. Many students are confused by the use of the simplified table in this problem. The wording in this problem says "what is the maximum value of X?" which is typical on 401(l) exam questions. There are two ways to design the plan, which gives 2 different values for X.

In most problems, you use the table of permitted disparity factors that is different for the 3 SSNRA values of 65, 66 and 67. When you design the plan using this table, you must determine the value of X that works for ALL the participants.

You could calculate 3 different values of X, one for each SSNRA. What you will see is that the SSNRA of 65 gives the highest value of X, and SSNRA 67 gives the lowest value of X. But you have to pick one value for X, and the only one that satisfies 401(l) for all 3 SSNRA values is the lowest one. This is always based on SSNRA 67, and the resulting factor is 1.0358%.

The 2nd approach is to use the simplified table of permitted disparity factors that is the same for all participants. When you design the plan using this table, you must determine the value of X that works for ALL the participants. The resulting value of X is 1.0492%.

As the designer of the plan, you get to choose whether to use the simplified table or not. The maximum value of X that you can use is 1.0492%, which is based on the simplified table.

2. There are several ways to get the problem wrong. As mentioned earlier, if you ignore the simplified table, you will get $X = 1.0358\%$, which is Answer A. There is only one way to get in the right answer range, while working the problem incorrectly. If you use 5.7%, and you ignore the simplified table, you will get $X = 1.0607\%$, which is Answer B.

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Problem 15 – Page 1

Revised 03/30/08

One key point of the problem is knowing the definition of a rate group. It consists of all employees with both a normal accrual rate (NAR) and a most valuable accrual rate (MVAR) greater than or equal to those rates for a given HCE.

Based on the information given, employees in the first and the last column will be in the rate group with a NAR of at least 1.20% and a MVAR of at least 2.20%:

NAR	1.20%	1.30%	Total
MVAR	2.20%	2.30%	
Non-union HCEs	10	10	20
Non-union NHCEs	40	20	60
Union NHCEs	20	20	40

Ratio Percentage Test - Entire Plan

The ratio percentage is defined under the regulations at §1.410(b)-9 as the percentage of non-highly compensated employees (NHCEs) who benefit under the plan divided by the percentage of highly compensated employees (HCEs) who benefit under the plan:

$$\text{Ratio \% test: } \frac{\left(\frac{\text{NHCEs who benefit}}{\text{Total Non-excludable NHCEs}} \right)}{\left(\frac{\text{HCEs who benefit}}{\text{Total Non-excludable HCEs}} \right)}$$

The percentage of NHCEs who benefit under the plan equals the number of NHCEs in the plan divided by the total number of non-excludable NHCEs. The percentage of HCEs who benefit under the plan equals the number of HCEs in the plan divided by the total number of non-excludable HCEs.

Depending on whether the employer elects to aggregate plans, you may use only the employees benefiting under a single plan for the numerator in the ratio percentage test. There are some complicated rules in the 1.410(b)-7 regulation that govern when you can voluntarily aggregate plans, as well as when you must mandatorily disaggregate plans.

The ratio denominators should be based on counts for the entire controlled group, not just for the single plan being tested. The excludable employees include those who do not meet the minimum participation requirements, collectively bargained employees who are not benefiting, and nonresident aliens.

Ratio Percentage Test - Rate Group

The general test for a defined benefit plan is described at 1.401(a)(4)-3(c). The regulation states that the general test is satisfied if each rate group satisfies 410(b). It then points to 1.401(a)(4)-2(c)(3) to define how a rate group satisfies 410(b).

1.401(a)(4)-2(c)(3)(i) states that a rate group must be treated as a separate plan. The numerator of the ratio percentage includes employees in the rate group. The denominator must include all non-excludable employees, even if they are not benefiting under the plan.

$$\text{Ratio \% test: } \left(\frac{\text{NHCEs in Rate Group}}{\text{Total Non-excludable NHCEs}} \right) \div \left(\frac{\text{HCEs in Rate Group}}{\text{Total Non-excludable HCEs}} \right)$$

The second key point of the problem is that you should ignore the union (collectively bargained) employees. The plan benefits both union employees and non-union employees. The rules in 1.410(b)-6(d) specify that collectively bargained employees who are benefiting should be disaggregated, and tested as a separate plan.

The denominators for the ratio percentage equal the total number of non-union employees who meet the plan's age and service requirements:

$$\begin{aligned} \text{Ratio \%} &= [60 / 300] / [20 / 50] \\ &= 20.0\% / 40.0\% \\ &= 50.0\% \end{aligned}$$

Answer is C

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Problem 16 - Page 1

Similar to 2002 #36

This problem gives you information about two defined benefit plans sponsored by the same company. Plan A has no eligibility requirements. Plan B has an eligibility requirement of age 21 and 1 year of service.

This is the second 410(b) question on the exam that has two plans with differing eligibility requirements. The key points of the problem are the determination of the Ratio Percentage test and the number of employees in the testing group.

Ratio Percentage test

The ratio percentage is defined under the regulations at §1.410(b)-9 as the percentage of non-highly compensated employees (NHCEs) who benefit under the plan divided by the percentage of highly compensated employees (HCEs) who benefit under the plan:

$$\text{Ratio \% test: } \left(\frac{\text{NHCEs who benefit}}{\text{Total Non-excludable NHCEs}} \right) \div \left(\frac{\text{HCEs who benefit}}{\text{Total Non-excludable HCEs}} \right)$$

The percentage of NHCEs who benefit under the plan equals the number of NHCEs in the plan divided by the total number of non-excludable NHCEs. The percentage of HCEs who benefit under the plan equals the number of HCEs in the plan divided by the total number of non-excludable HCEs.

Depending on whether the employer elects to aggregate plans, you may use only the employees benefiting under a single plan for the numerator in the ratio percentage test. There are some complicated rules in the 1.410(b)-7 regulation that govern when you can voluntarily aggregate plans, as well as when you must mandatorily disaggregate plans.

The ratio denominators should be based on counts for the entire controlled group, not just for the single plan being tested. The excludable employees include those who do not meet the minimum participation requirements, collectively bargained employees, and nonresident aliens.

If you aggregate plans for the Ratio Percentage test, the excludable employees will be those who meet none of the eligibility requirements for the plans that are aggregated.

In this problem, you are told that the otherwise excludable employees are not tested separately. Otherwise, you would treat as a separate plan all employees who do not satisfy the 410(a)(1) minimum participation requirements (age 21 and 1 year of service). Then you would have to meet the requirements in 1.410(b)-6(b)(3).

Nondiscriminatory classification requirement

The average benefit test in 1.410(b)-2(b)(3) requires that a plan satisfy both the nondiscriminatory classification test, and the average benefit percentage test (ABPT). 1.410(b)-4(c) states that a plan satisfies the nondiscriminatory classification test when the plan's ratio percentage is greater than or equal to the Safe harbor percentage, and the plan has a reasonable classification of employees.

1.410(b)-4(c)(4) defines the Safe and Unsafe harbor percentages based on the non-highly compensated concentration percentage (NHCCP). The NHCCP is defined under the regulations at §1.410(b)-4(c)(4)(iii) as the ratio of non-excludable NHCEs to total non-excludable employees.

The regulation defines the NHCCP as "for all employees of the employer." For the NHCCP, the regulation states that the excludable employees are the same as under the ABPT, which uses "all plans in the testing group."

Average Benefit Percentage test

The average benefit percentage test is defined under the regulations at §1.410(b)-5 as the ratio of the actual benefit percentage (ABP) for non-highly compensated employees (NHCEs) who benefit under the plan divided by the ABP for highly compensated employees (HCEs) who benefit under the plan.

1.410(b)-7(e) states that "all plans in the testing group" must be taken into account for the average benefit percentage test. It goes on to define "all plans in the testing group" as the plan being tested, plus all plans that could be permissively aggregated under 1.410(b)-7(d). This permissive aggregation for ABPT ignores

- 1.410(b)-7(d)(4) QSLOB rule
- 1.410(b)-7(d)(5) requirement re: same plan years
- Mandatory disaggregation rules for 401(k) / 401(m), and ESOP / non ESOP

The ABP for NHCEs equals the sum of benefit accrual rates for NHCEs in the plan divided by the total number of non-excludable NHCEs. The ABP for HCEs equals the sum of benefit accrual rates for HCEs in the plan divided by the total number of non-excludable HCEs.

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Problem 16 - Page 3

Revised 05/20/11

I. If plans are tested separately, Plan B testing group has 385 NHCEs

TRUE

When Plan B is tested alone, use its age 21 and one year eligibility requirement to construct the denominator for the Ratio Percentage Test:

	Plan A	Plan B	Total
HCEs Non-excludable	40	10	50
NHCEs Non-excludable	100	235	335
Total			385

II. If plans are permissively aggregated, the NHCCP is at least 87%

TRUE

For the non-highly compensated concentration percentage, you use the same excludables as the Average Benefits Percentage test. Under the Average Benefits Percentage test, you must aggregate all plans. The excludable employees are those who meet none of the eligibility requirements for the two plans. Since Plan A has no eligibility requirement, that means no employees are excluded:

	Plan A	Plan B	Total
HCEs Non-excludable	44	11	55
NHCEs Non-excludable	120	265	385
Total			440

$$\begin{aligned}\text{NHCCP} &= [385 / (385+55)] \\ &= 87.50\%\end{aligned}$$

As discussed earlier, the NHCCP should be truncated to 87%.

III. If plans are permissively aggregated, the testing group has less than 425 employees

FALSE

As shown in item II, the testing group has 440 employees when the plans are permissively aggregated.

Only items I and II are true.

Answer is A

One key point of the problem is knowing what it means for the plans to pass the general nondiscrimination test. The problem tells you that the plans are tested on a benefits basis, using annual accruals. In order to cross-test a defined contribution plan on a benefits basis, you must satisfy the new gateways at 1.401(a)(4)-8. You need to check this as the last step in the problem.

Ratio Percentage Test - Rate Group

The general test for a defined benefit plan is described at 1.401(a)(4)-3(c). The regulation states that the general test is satisfied if each rate group satisfies 410(b). It then points to 1.401(a)(4)-2(c)(3) to define how a rate group satisfies 410(b).

1.401(a)(4)-2(c)(3)(i) states that a rate group must be treated as a separate plan. The numerator of the ratio percentage includes employees in the rate group. The denominator must include all non-excludable employees, even if they are not benefiting under the plan.

$$\text{Ratio \% test: } \left(\frac{\text{NHCEs in Rate Group}}{\text{Total Non-excludable NHCEs}} \right) \div \left(\frac{\text{HCEs in Rate Group}}{\text{Total Non-excludable HCEs}} \right)$$

One key point of the problem is knowing the definition of a rate group. It consists of all employees with both a normal accrual rate (NAR) and a most valuable accrual rate (MVAR) that are equal to or exceed those rates for a given HCE.

In this problem, you have two HCEs. They both have a NAR of 5.0%, using annual accruals on a benefits basis. You are told nothing about early retirement provisions, or the plan's Joint and Survivor provisions. You would need both items to calculate the MVAR. In the absence of any other information, you should assume the MVAR will also equal 5.0%

In order for the plan to pass the general test, the equivalent accrual rate (on a benefits basis) for NHCE Smith must be at least 5.0%. This would place Smith in the same rate group as the two HCEs. Otherwise, the ratio percentage for the rate group would be zero, and the plans would not pass the general test on an aggregated basis.

$$\begin{aligned} \text{Ratio \%} &= [1 / 1] / [2 / 1] \\ &= 100.0\% / 100.0\% \\ &= 100.0\% \end{aligned}$$

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Problem 17 - Page 2

Note that the problem says "Grouping: None". This implies that you should not use the optional rule that allows you to treat accrual rates within 5% of the midpoint of a range as being equal. Otherwise, you could allow Smith's equivalent accrual rate to be as low as $4.75\% = .95(5.0\%)$.

Cross-Testing on Benefits Basis

You need to convert the allocation for the plan year to an equivalent annual benefit payable at 65, which is testing age. Then convert that to an accrual rate based on the plan year measurement period. This is the normal accrual rate, calculated under the annual method.

Smith is age 39 at 12/31/2003, and has 26 years until age 65. Let X be the allocation rate under the profit sharing plan:

$$\begin{aligned} \text{2003 Allocation} &= X\% * 50,000 \\ \text{Accum. value at 65} &= X\% * 50,000 * (1.08)^{(65-39)} \\ \text{Annual benefit at 65} &= X\% * 50,000 * (1.08)^{(65-39)} / 9.35 \\ \text{Equivalent accrual} &= (X/100) * (1.08)^{(65-39)} / 9.35 \\ &= .79X \end{aligned}$$

As described previously, the equivalent accrual rate for Smith must be at least 5.0%:

$$\begin{aligned} .79X &\geq .0500 \\ X &\geq .0632 \end{aligned}$$

Cross-Testing Gateways

In order to cross-test a defined contribution plan on a benefits basis, you must satisfy one of three new gateways at 1.401(a)(4)-8. This is the first question where these were tested.

I. Primarily defined benefit in character

This gateway requires you to determine the normal accrual rates (NAR) under the DB plans, and compare them to the equivalent accrual rate produced by cross testing the DC plans. Both the DB and the DC plans are part of the aggregated DB/DC plan. You are not allowed to impute permitted disparity in determining the accrual rates.

The plan is primarily DB in character if more than 50% of the NHCEs benefiting have the NAR under the DB plans that exceeds the equivalent accrual rate under the DC plans. Since Smith is not covered under the DB plan, the aggregated DB/DC plan does not pass the "Primarily DB in character" gateway test.

II. Broadly available separate plans

To pass this gateway, you must demonstrate that the DB plans (that are part of the aggregated DB/DC plan) would pass 401(a)(4) and 410(b), assuming that the Average Benefits Percentage Test of 1.410(b)-5 is satisfied. You must also demonstrate the same thing for the DC plans (that are part of the aggregated DB/DC plan). You are allowed to impute permitted disparity in determining the rates for either the DB plans or the DC plans, but not for both.

If you look at the data for the defined benefit plan, it should be clear that it could not pass 401(a)(4) by itself. Smith is not covered under that plan, so the HCE rate group has zero for the ratio percentage.

$$\begin{aligned}\text{Ratio \%} &= [0 / 1] / [2 / 2] \\ &= 0.0\% / 100.0\% \\ &= 0.0\%\end{aligned}$$

III. Minimum aggregate allocation

The minimum aggregate allocation gateway consists of two different rules. The plan only has to satisfy one of the two rules.

This gateway test requires you to calculate an equivalent normal allocation rate under the DB plans. The test uses the aggregate allocation rate for the aggregated DB/DC plan. You are not allowed to impute permitted disparity in determining the allocation rates.

The first step is to calculate the equivalent allocation rates for the HCEs. This requires cross testing them on a contributions basis:

	HCE1	HCE2
Date of birth	12/31/1954	12/31/1944
12/31/2003 age	49	59
Annual accrual rate	5%	5%
Lump sum value at 65	$46.75\% = 5\%(9.35)$	$46.75\% = 5\%(9.35)$
Discounted value at 8%	$13.65\% = 46.75\%(1.08)^{(65-49)}$	$29.46\% = 46.75\%(1.08)^{(65-59)}$

The final result is the equivalent allocation rate for 2003. You don't need to multiply the accrual rate by compensation, because you would divide through by compensation in the last step.

III. Minimum aggregate allocation gateway (continued)

Here are the aggregate allocation rates for the aggregated DB / DC plan:

DB / DC plan	
Equivalent Total	
ID	Allocation Rate
HCE 1	13.65%
HCE 2	29.46%
Smith	6.32%

To satisfy this gateway test, the NHCEs must have an allocation rate equal to at least 1/3 of the highest allocation rate for any HCE in the plan, if the HCE rate is 15% or less. If the HCE rate is above 15%, but less than or equal to 25%, then the minimum allocation rate for the NHCEs is 5%.

If the HCE rate is above 25%, but less than or equal to 30%, then the minimum allocation rate for the NHCEs is 6%. For each higher range of 5% for the HCE rate, the NHCE minimum allocation rate is 1/5 of the top end of the range.

Smith's allocation rate of 6.32% for Plan B was determined earlier to pass the 401(a)(4) rate group test. Based on that rate, the aggregated DB / DC plan does pass this cross testing gateway.

Answer is D

There is a lot more to this last gateway, which we could ignore for the problem solution:

A second alternative rule is that each NHCE has an allocation rate of 7.5% or more. This calculation must use a 415(c) definition of compensation, which is essentially total compensation. Total compensation is used so the dollar allocation based on the 7.5% rate is as large as possible.

One thing to realize is that not all NHCEs would get this minimum allocation. The only ones who must receive the minimum allocation are those participants that also benefit under the profit sharing plan.

One final wrinkle in this gateway is that you have a more favorable alternative than requiring every NHCE to receive the minimum aggregate allocation. Instead of using each participant's equivalent normal allocation rate under the DB plan, you can use the average of the equivalent normal allocation rate under the DB plan for all NHCEs benefiting under the plan.

Problem 18

Revised 04/27/04

Code section 401(a)(26) contains additional participation requirements beyond those in 410(b). In general, a trust is not qualified unless the plan, on each day of the plan year, benefits the lesser of 50 employees, or 40% or more of the employees of the employer. SBJPA added a floor to the 40%, which is 2 employees - unless there is only one employee, in which case the one employee must be covered.

Plan B automatically satisfies 401(a)(26), since no HCEs are covered (see 1.401(a)(26)-1(b)(1)). Plan A does not satisfy 401(a)(26), since less than 40% of the employees are covered:

$$33\% = 35/(35+70)$$

The key idea in this problem is that some of the non-highly compensated employees (NHCEs) must be shifted from Plan B to allow Plan A to satisfy 401(a)(26). This is based on the wording of the question, which implies that we would not hire additional NHCEs.

Let X equal the number of employees to shift from Plan B to Plan A:

$$40\% \leq (35+X) / (35+70)$$

$$42 \leq 35+X$$

$$7 \leq X$$

Answer is C

If you assumed that you would hire additional employees to be covered under Plan A, this produces the incorrect result of 12 employees:

$$40\% \leq (35+X) / (35+X+70)$$

$$42+.4X \leq 35+X$$

$$11.7 \leq X$$

2003 EA-2B Exam Solutions

Problem 19 - Page 1

Similar to 2002 #24

The key to this problem is knowing details on the determination of the top-paid group. Similar to earlier exam questions, this problem requires knowledge of minute details from the 414(q) regulation.

You need to determine the total number of employees. Then you can determine the top 20% for the top-paid group.

IRC section 414(q)(1) defines an HCE as any employee who

- A. Was a 5% owner at any time during the current year or the prior year, or
- B. For the preceding year
 - i. Had compensation from the employer in excess of "90,000", and
 - ii. If the employer elects application of this clause for the prior year, was in the top paid 20% of employees for the prior year

The value of 90,000 shown above is from the table furnished with the exam. Even though the HCE determination is made for 2003, the 90,000 from the table is compared against the 2002 pay.

Of the four employees shown, one is an HCE due to stock ownership. The three other employees may also be HCEs based on 2002 compensation, since they earned more than 90,000. The next step is to determine 20% of the total number of employees for 2002.

IRC section 414(q)(5) defines exclusions that apply to the determination of the top paid group, and to the 414(r) rules on separate lines of business:

- A. Employees who have not completed 6 months of service
- B. Employees who normally work less than 17 ½ hours per week
- C. Employees who normally work during not more than 6 months during any year
- D. Employees who have not attained age 21
- E. Employees who are included in a unit of employees covered by a collective bargaining agreement

NOTE: the employer may elect to apply 414(q)(5)(A), (B), (C), or (D) by substituting a shorter period of service, smaller number of hours or months, or lower age than that specified in such subparagraph.

If you take these exclusions at face value, you will get the wrong answer. There are some small details in the 1.414(q)-1T regulation that are "unusual". For example, the exclusion for less than 6 months of service is based on the sum of service for two years. See 1.414(q)-1T Q&A-9 (b)(1)(i)(A), which states " ... service in the immediately preceding year is added to service in the current year in determining whether the exclusion is applicable ..."

Problem 19 - Page 2

Revised 04/11/05

Based on the 6 months of service exclusion, you can ignore the 30 employees shown with less than 6 months of service.

The key point of the problem is the exclusion for employees covered by a collective bargaining agreement (CBA). It does not apply unless 90 per cent or more of the employees are covered under a CBA, and the plan being tested only covers employees who are not covered under a CBA. See 1.414(q)-1T Q&A-9 (b)(1)(iii)(A) and (B).

As a result, you can not ignore the 20 collectively bargained employees. For purposes of the top-paid group determination, you have the 170 non-union employees, plus the 20 collectively bargained employees, for a total of 190.

20% of the 190 employees equals 38 employees. There can be up to 38 HCEs in the top-paid group.

You are given detailed data for four of the employees. Based on ranking by pay, Smith and Brown are in the top-paid group, and both are HCEs.

Green and Jones are not in the top-paid group. Green is an HCE, since they were a 5% owner in 2003. Jones is the only one not considered an HCE.

Answer is B

NOTES:

1. Rounding and tie-breaking rules may be needed for determining the members of the top-paid group. The employer may adopt any rule, as long as it is reasonable, nondiscriminatory, and uniformly and consistently applied. See the regulation at 1.414(q)-1T, A-3(b).
2. Green is also considered an HCE based on stock ownership. But you still include them when you determine the top-paid group. This is based on the regulation at 1.414(q)-1T, Q&A-3 (d). If someone falls into more than one group under 414(q)(1), they should not be ignored when determining if another employee belongs to any group under 414(q)(1).
3. The information on 401(k) deferrals is extraneous. Under 414(s), the definition of compensation includes 401(k) deferrals (and others) by default.

2003 EA-2B Exam Solutions

Problem 20

Similar to 1999 #10

In the 1.411(d)-4 regulation, it describes benefits that are protected:

1. Accrued benefits
2. Early retirement benefits
3. Retirement type subsidies
4. Optional forms of benefit payment

I. TRUE

Ancillary death or disability benefits and life insurance benefits are not protected, and may be removed from the plan.

II. FALSE

A lump sum benefit is an optional form of benefit, and may not be removed from the plan.

III. TRUE

Q-2 of the regulation discusses the reduction or elimination of §411(d)(6) protected benefits. A plan with three or more actuarially equivalent J&S options may eliminate one or more of the options. You can't eliminate the options with the highest or lowest survivor continuation percentage. This is allowed even if the §417 Qualified J&S is changed.

Only items I and III are true.

Answer is B

2003 EA-2B Exam Solutions

Problem 21

Similar to 2002 #18

The key point of this problem is whether you know how the RPA '94 change in the §417(e) minimum lump sum rules relates to §411(d)(6). §411(d)(6) contains a prohibition against decreases in the accrued benefit. When the minimum lump sum rules changed, the net effect could have decreased the benefit payable as a lump sum.

The 1.417(e)-1 regulation requires grandfathering of lump sum benefits when the assumptions change in certain cases. Revenue Ruling 2001-62 changed the mortality basis for the minimum lump sum calculation in 417(e).

The new 94 GAR mortality table must be used to calculate the present value of benefits under §411, which may result in a decrease in certain §411(d)(6) protected benefits. This is allowable if the decrease is due to adoption of an amendment that changes from the old mortality table specified in Revenue Ruling 95-6 to the new table.

In this problem, the plan also changed the lookback period for the interest rate. Under 1.417(e)-1(d)(10), if a plan which uses the applicable rate changes the date used for determination of interest rates, §411(d)(6) can be avoided by using a one year transition period. Benefits paid during the 12 months after the amendment effective date must be the greater of the benefits based on the new interest rate, and either the old or the new rules for the date of determination of the interest rate.

The participant is age 65 at 01/01/2003. You need to calculate two lump sum values based on the new mortality table. One lump sum uses the September 2002 rate of 5.08%, and the other uses the October 2002 rate of 4.76%. It should be clear that the lump sum based on 4.76% is larger:

$$01/01/2003 \text{ lump sum} = 144,480 = 12(1,000)(12.04)$$

Answer is E

2003 EA-2B Exam Solutions

Problem 22

This is a general knowledge question on calculation of vesting service, which has never been tested before. There are several points to the problem:

- Vesting service starts at age 18
- The vesting computation period is the plan year

The plan year definition changed at July 1, 2000 from the calendar year to a plan year ending June 30. The key point of the problem is how to handle the change of the plan year in 2000.

The simplest way to think about this is that Smith earns a year of vesting service for the "plan year" ending 12/31/2000. There is actually a short plan year from 01/01/2000 to 06/30/2000.

The hours earned from 07/01/2000 to 12/31/2000 are counted twice - once for the period ending 12/31/2000 and once for the period ending 06/30/2001. This should seem reasonable to you. It would NOT make any sense for the vesting service to be based on completion of 1,000 hours in the 6 month period from 01/01/2000 to 06/30/2000.

Plan year ends	Hours worked	Service Earned	Explanation
12/31/97	1,000	0	Less than age 18
12/31/98	1,000	0	Less than age 18
12/31/99	900	0	Less than 1000 hours
12/31/00	1,000	1	
06/30/01	1,000	1	
06/30/02	1,000	1	
06/30/03	1,000	1	

The participant has 4 years of vesting service at 06/30/2003.

Answer is C

2003 EA-2B Exam Solutions

Problem 23

Similar to 2002 #6

The key to this problem is knowing the definitions of the lookback period and the stability period. These terms are defined in the regulation at 1.417(e)-1(d)(4).

The stability period is the length of time that the interest rate remains level. The stability period can be a month, a plan quarter, a calendar quarter, a plan year or a calendar year. The lookback month can precede the stability period by from one to five months.

If there was no lookback period, you would use the interest rate for January 2003 to calculate lump sums for the 2003 calendar year. In practice, this is rarely done - you would have to wait a month before you could calculate the lump sum for January retirees. The purpose of the lookback period is to ease administration of the plan, so the interest rate would be known in advance for January retirees.

With a four month lookback, you should use the September 2002 interest rate to calculate Smith's lump:

$$144,456 = 12(1,000)(12.038)$$

Answer is E

2003 EA-2B Exam Solutions

Problem 24 - Page 1

This is a fairly typical problem on 415. This tests your ability to calculate the 415 limits under EGTRRA. The first step is calculation of the plan benefit without the 415 limits.

As of 01/01/2003:

Age	55	Birth date	1/1/1948
Service	8 years	Hire date	1/1/1995
Participation	7 years	Entry date	1/1/1996

One key point of the problem is the entry requirement of age 21 and 1 year of service. This results in Smith having only 7 years of participation service at retirement.

$$\begin{aligned}\text{Accrued benefit at age 55} &= 170,000 * 100\% \text{ (limited by 401(a)(17))} \\ &= 170,000\end{aligned}$$

$$\begin{aligned}\text{Early retirement benefit at age 55} &= 170,000 * [1 - .03*(65-62) - .06*(62-55)] \\ &= 83,300\end{aligned}$$

$$\begin{aligned}\text{Plan lump sum at 5.0\% GAM-83} &= 1,135,379 = 83,300 * 13.63 \\ \text{417 lump sum at 5.68\% Applicable} &= 1,115,387 = 83,300 * 13.39 \\ \text{Greater of two lump sum values} &= 1,135,379\end{aligned}$$

The second step is calculation of the §415 compensation limit. Earnings used for the §415 compensation limit are not subject to the §401(a)(17) limit. The §415(b)(1)(B) compensation limit is reduced when service is less than ten years.

$$100\% \text{ 3 year comp. } §415 \text{ limit} = 170,000 = (170,000 + 170,000 + 170,000) / 3$$

$$\text{Reduced } §415 \text{ compensation limit} = 136,000 = 170,000 * (8/10)$$

The third step is calculation of the §415 dollar limit under §415(b)(1)(A). The dollar limit is reduced when participation is less than ten years. Under EGTRRA, the dollar limit is available unreduced between ages 62 and 65:

$$\begin{aligned}§415 \text{ dollar limit at age 62} &= 160,000 * (7/10) \\ &= 112,000\end{aligned}$$

§415(b)(2)(E)(i) says to use the greater of 5% and the interest rate specified in the plan to reduce the §415 dollar limit prior to age 62, but here the code is misleading. The examples in Revenue Ruling 98-1 clarify that the §415 dollar limit is reduced using the lower of the factors calculated based on the mandated mortality and interest rate, and the plan basis for actuarial equivalence. Based on the general conditions for the EA-2B exam, if you have no optional form factors, you would assume that the basis for actuarial equivalence is the same as the funding assumptions.

2003 EA-2B Exam Solutions

Problem 24 - Page 2

In this problem, you are given the factors for $\ddot{a}_{55}^{(12)}$ and $\ddot{a}_{62}^{(12)}$ on several bases. This is consistent with the definition of the death benefit under the plan. If your death benefit were anything except 100% of the present value of the accrued benefit, then you would use the "N/N" factors to reduce the dollar limit prior to age 62.

$$\begin{aligned}\text{Actuarial reduction from 62 to 55} &= (1+i)^{-7} (\ddot{a}_{62}^{(12)} / \ddot{a}_{55}^{(12)}) \\ \text{Mandated 5.0\% Applicable basis} &= .6171 = (1.05)^{-7} (12.46 / 14.35)\end{aligned}$$

One detail in this problem is the definition of the actuarial reduction before age 62 on the plan basis. This is the first problem with both percent per year age reduction factors, and plan actuarial equivalence factors.

It is not entirely clear how this situation is handled in practice. Here is the wording in Step 2 of Q&A 7 of Revenue Ruling 98-1:

"If the age at which the benefit is payable is less than 62, the age-adjusted dollar limit is determined by reducing the age-adjusted dollar limit at age 62 on an actuarially equivalent basis. In general, sections 415(b)(2)(E)(i) and (v) require that the reduced age-adjusted dollar limit be the lesser of the equivalent amount computed using the plan rate and plan mortality table (or plan tabular factor) used for actuarial equivalence for early retirement benefits under the plan and the amount computed using 5 percent interest and the applicable mortality table (used to the extent described in Q&A-6)."

To me, this implies we should use the percent per year early retirement reductions for actuarial reduction of the 415 dollar limit on the plan basis. When given both sets of factors, I would only use the actuarial equivalence factors if the problem identified these as "for actuarial equivalence for early retirement benefits under the plan".

You are told that the plan's early retirement reduction is 3% per year from 65 down to age 62, and 6% per year before age 62. The example in Q-9 of Revenue Ruling 98-1 calculates the actuarial reduction on the plan basis as the ratio of the plan's "tabular" reduction factor at the early retirement age to the factor at age 62.

$$\begin{aligned}\text{Actuarial reduction from 62 to 55} &= \text{ERF}_{55} / \text{ERF}_{62} \\ \text{(plan "tabular" basis)} &= .5385 = [1 - .03(3) - .06(7)] / [1 - .03(3)] \\ \$415 \text{ dollar limit at age 55} &= 112,000 * \text{lesser of } [.6171 \text{ or } .5385] \\ &= 60,308 \\ \text{Final } \$415 \text{ limit at age 55} &= 60,308 = \text{lesser of } 60,308 \text{ and } 136,000\end{aligned}$$

2003 EA-2B Exam Solutions

Problem 24 - Page 3

There is one more step, which is conversion of the 415 limit to a lump sum. Under §415(b)(2)(E)(ii), it says to use the greater of the applicable interest rate under 417(e)(3) and the interest rate specified in the plan to convert the 415 limit to a form of payment that is subject to 417(e)(3). The examples in Revenue Ruling 98-1 clarify that the §415 dollar limit is converted using the lower of the factors calculated based on the applicable mortality and applicable interest rate, and the plan basis for optional forms.

Mandated basis:	5.68% Applicable	=	13.39
Plan basis:	5.0% GAM-83	=	13.63

§415 Lump sum at age 55	=	60,308 * lesser of [13.39 or 13.63]
	=	807,520

Since the lump sum under 415 is lower than the plan lump sum of 1,135,379, the participant's lump sum benefit must be limited to 807,520.

Answer is A

Smith's benefit is so large that you can simply ignore the 10,000 floor. It does not apply in this problem.

2003 EA-2B Exam Solutions

Problem 25

Revised 04/23/04

This is a simplified problem on 415. This tests your ability to calculate the 415 dollar limit under §415(b)(1)(A). The dollar limit is reduced when participation is less than ten years. Under EGTRRA, the dollar limit is available unreduced between ages 62 and 65:

$$\begin{aligned}\$415 \text{ dollar limit at age 62} &= 160,000 * (10/10) \\ &= 160,000\end{aligned}$$

§415(b)(2)(E)(i) says to use the greater of 5% and the interest rate specified in the plan to reduce the §415 dollar limit prior to age 62, but here the code is misleading. The examples in Revenue Ruling 98-1 clarify that the §415 dollar limit is reduced using the lower of the factors calculated based on the mandated mortality and interest rate, and the plan basis for actuarial equivalence. Based on the general conditions for the EA-2B exam, if you have no optional form factors, you would assume that the basis for actuarial equivalence is the same as the funding assumptions.

In this problem, you are given the factors for $\ddot{a}_{55}^{(12)}$ and $\ddot{a}_{62}^{(12)}$ on several bases. You are also given factors for $v^{10}_{10}p_{55}$ and $v^3_3p_{62}$. This is consistent with the definition of the death benefit under the plan. Since your death benefit is not equal to 100% of the present value of the accrued benefit, you should use $N_{62}^{(12)} / N_{55}^{(12)}$ factors to reduce the dollar limit prior to age 62.

$$\begin{aligned}\text{Actuarial reduction from 62 to 55} &= N_{62}^{(12)} / N_{55}^{(12)} \\ &= v^7_7p_{55} (\ddot{a}_{62}^{(12)} / \ddot{a}_{55}^{(12)}) \\ &= [v^{10}_{10}p_{55} \ddot{a}_{62}^{(12)}] / [v^3_3p_{62} \ddot{a}_{55}^{(12)}]\end{aligned}$$

$$\begin{aligned}\text{Mandated basis 5.0\% Applicable} &= [.5775 * 12.68] / [.8408 * 14.57] \\ &= .5977\end{aligned}$$

$$\begin{aligned}\text{Plan basis 6.0\% Applicable} &= [.5253 * 11.61] / [.8172 * 13.15] \\ &= .5675\end{aligned}$$

$$\begin{aligned}\$415 \text{ dollar limit at age 55} &= 160,000 * \text{lesser of } [.5977 \text{ or } .5675] \\ &= 90,804\end{aligned}$$

Answer is C

Since the plan and mandated basis both use the applicable mortality table, you would expect the smaller reduction factor to be produced by the higher interest rate.

The benefit is so large that you can simply ignore the 10,000 floor. It does not apply in this problem.

2003 EA-2B Exam Solutions

Problem 26

This is a simplified problem on 415. This tests your ability to calculate the 415 compensation limit under §415(b)(1)(B).

Earnings used for the §415 compensation limit are not subject to the §401(a)(17) limit. The §415(b)(1)(B) compensation limit is reduced when service is less than ten years.

The key point of the problem is that the earnings used for the §415 compensation limit are not the final three years. Instead, they are the highest three consecutive years of pay.

$$100\% \text{ 3 year comp. } \$415 \text{ limit} = 23,333 = (25,000 + 23,000 + 22,000) / 3$$

Since Smith has ten years of service at retirement, there is no reduction in the §415 compensation limit. This limit is not based on age or form of benefit, so there are no other reductions applied.

Smith's early retirement benefit is $36,000 = 12(300)(10)$. Since the §415 compensation limit is lower, the retirement benefit is limited to 23,333.

Answer is C

Smith's benefit is so low that you don't need to do any calculations for the §415 dollar limit. The benefit is large enough that you can simply ignore the 10,000 floor. It does not apply in this problem.

2003 EA-2B Exam Solutions

Problem 27 - Page 1

Similar to 2000 #24

Revised 04/24/06

This is a fairly typical problem on 415. This tests your ability to calculate the 415 limits under EGTRRA. The first step is calculation of the plan benefit without the 415 limits.

As of 01/01/2003:

Age	60	Birth date	1/1/1943
Service	10 years	Hire date	1/1/1993
Participation	9 years	Entry date	1/1/1994

One key point of the problem is the entry requirement of 1 year of service. This results in Smith having only 9 years of participation service at retirement.

Final average earnings at 01/01/03 = 200,000

The problem does not state the final average period for plan benefits. This is a strong hint. You must assume that the 200,000 compensation limit under 401(a)(17) is retroactive prior to 2002. Otherwise, you can't calculate the FAE or the plan benefit.

Accrued benefit at age 60 = $200,000 * 10\% * 10$
= 200,000

Early retirement life annuity at 60 = $200,000 * [1 - .065*(65-60)]$
= 135,000

You are told that Smith elected a Joint and 50% Survivor annuity form, so the optional form adjustment must be applied to the plan benefit:

50% J&S annuity at 60 = $128,250 = .95 * 135,000$

The second step is calculation of the §415 compensation limit. Earnings used for the §415 compensation limit are not subject to the §401(a)(17) limit. The §415(b)(1)(B) compensation limit is reduced when service is less than ten years.

100% 3 year comp. §415 limit = $200,000 = (200,000 + 200,000 + 200,000) / 3$

Reduced §415 compensation limit = $200,000 = 200,000 * (10/10)$

The third step is calculation of the §415 dollar limit under §415(b)(1)(A). The dollar limit is reduced when participation is less than ten years. Under EGTRRA, the dollar limit is available unreduced between ages 62 and 65:

§415 dollar limit at age 62 = $160,000 * (9/10)$
= 144,000

§415(b)(2)(E)(i) says to use the greater of 5% and the interest rate specified in the plan to reduce the §415 dollar limit prior to age 62, but here the code is misleading. The examples in Revenue Ruling 98-1 clarify that the §415 dollar limit is reduced using the lower of the factors calculated based on the mandated mortality and interest rate, and the plan basis for actuarial equivalence. Based on the general conditions for the EA-2B exam, if you have no optional form factors, you would assume that the basis for actuarial equivalence is the same as the funding assumptions.

In this problem, you are given the factors for $\ddot{a}_{60}^{(12)}$ and $\ddot{a}_{62}^{(12)}$ on several bases. You are also given factors for $v^5 {}_5p_{60}$ and $v^3 {}_3p_{62}$. This is consistent with the definition of the death benefit under the plan. Since your death benefit is not equal to 100% of the present value of the accrued benefit, you should use $N_{62}^{(12)} / N_{60}^{(12)}$ factors to reduce the dollar limit prior to age 62.

$$\begin{aligned} \text{Actuarial reduction from 62 to 60} &= N_{62}^{(12)} / N_{60}^{(12)} \\ &= v^2 {}_2p_{60} (\ddot{a}_{62}^{(12)} / \ddot{a}_{60}^{(12)}) \\ &= [v^5 {}_5p_{60} \ddot{a}_{62}^{(12)}] / [v^3 {}_3p_{62} \ddot{a}_{60}^{(12)}] \end{aligned}$$

$$\text{Mandated 5.0\% Applicable basis} = .8568 = (.753 * 12.680) / (.841 * 13.251)$$

You are told that the plan's early retirement reduction is 6.5% per year before age 65. The example in Q-9 of Revenue Ruling 98-1 calculates the actuarial reduction on the plan basis as the ratio of the plan's "tabular" reduction factor at the early retirement age to the factor at age 62.

$$\begin{aligned} \text{Actuarial reduction from 62 to 60} &= \text{ERF}_{60} / \text{ERF}_{62} \\ \text{(plan "tabular" basis)} &= .8385 = [1 - .065(5)] / [1 - .065(3)] \end{aligned}$$

$$\begin{aligned} \text{\$415 dollar limit at age 60} &= 144,000 * \text{lesser of } [.8568 \text{ or } .8385] \\ &= 120,745 \end{aligned}$$

Note that there is no optional form adjustment necessary for the §415 dollar limit or the §415 compensation limit, unlike the plan benefit. This is based on the definition at §415(b)(2)(B), which excludes a qualified joint and survivor benefit from the adjustment for form of benefit payment.

$$\text{Final §415 limit at age 60} = 120,745 = \text{lesser of } 120,745 \text{ and } 200,000$$

Since the §415 limit at age 60 is less than the plan benefit of 128,250, the benefit payable in 2003 is limited to 120,745.

Answer is C

2003 EA-2B Exam Solutions

Problem 28 – Page 1

Revised 05/10/13

In general, the Top Heavy (T-H) determination date is the last day of the preceding plan year. An exception to this is the first plan year, when the determination date is the last day of the first plan year. For this problem the determination date is 12/31/2002.

Based on questions T-24 and T-25 of the 1.416 regulation, the present value of accrued benefits for the DB plan (or account balance for the DC plan) is calculated as of the valuation date in the 12 month period ending on the determination date. The accrued benefit is normally calculated at that same valuation date.

Based on question T-25, the accrued benefit must be calculated as of the determination date in the first and second plan years. This makes sense based on the plan design in this problem, since you need a non-zero benefit to calculate the T-H ratio.

2002 Top Heavy Determination

When the plan is established, it is not T-H. The initial calculation of the T-H ratio at 12/31/2002 would not include any T-H minimums:

	Smith	Jones
Key ee?	YES	NO
12/31/02 benefit service	1.0	1.0
Compensation	100,000	84,000
12/31/02 Accrued benefit	$1\%(100,000)(1) = 1,000$	$1\%(84,000)(1) = 840$
01/01/02 age	54	47
01/01/02 PV of AB	$1,000(D_{65}/D_{54}) \ddot{a}_{65}^{(12)}$ $= 1,000(1.05)^{-11}(10.0)$ $= 5,847$	$840(D_{65}/D_{47}) \ddot{a}_{65}^{(12)}$ $= 840(1.05)^{-18}(10.0)$ $= 3,490$

Based on this T-H determination for 2002, the plan's T-H ratio exceeds 60%, and the plan is T-H for 2002:

$$\text{T-H ratio} = 62.62\% = 5,847 / (5,847 + 3,490)$$

2003 Top Heavy Determination

The T-H determination date is the last day of the preceding plan year, which is 12/31/02. The present value of accrued benefits for the DB plan (or account balance for the DC plan) is calculated as of the valuation date in the 12 month period ending on the determination date. You must use the same valuation date and determination date as was used for 2002. Based on question T-25 you still calculate the accrued benefit at 12/31/02.

2003 EA-2B Exam Solutions

Problem 28 – Page 2

Revised 04/21/06

The key point of this problem is that the determination of the Top Heavy ratio for the 2003 year should reflect whether the plan is T-H for 2002. This calculation of the accrued benefit at 12/31/02 does include the T-H minimum for Jones, but not for Smith. This is specified in the problem's definition of the T-H minimum.

The calculations are almost identical to those for 2002. Jones' T-H minimum is $1,680 = 2\%(84,000)(1)$, which is twice as large as the plan's accrued benefit. Jones' revised PVAB is $6,981 = 2(3,490)$.

The revised T-H ratio is now less than 60%, and the plan is not T-H for 2003:

$$\text{T-H ratio} = 45.58\% = 5,847 / (5,847 + 6,981)$$

Answer is C

NOTE:

Here are the T-H ratio calculations for the next few years:

T-H year	Determination date	Valuation date	Smith	Jones	T-H ratio
2004	12/31/03	01/01/03			
		Benefit svc	1.0	1.0	45.58%
		T-H service	N/A	1.0	
		Final AB	1,000	1,680	
		PV of AB	6,139	7,330	
2005	12/31/04	01/01/04			
		Benefit svc	2.0	2.0	62.62%
		T-H service	N/A	1.0	
		Final AB	2,000	1,680	
		PV of AB	12,892	7,696	
2006	12/31/05	01/01/05			
		Benefit svc	3.0	3.0	62.62%
		T-H service	N/A	1.0	
		Final AB	3,000	2,520	
		PV of AB	20,305	12,122	

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2003 EA-2B Exam Solutions

Problem 29

Similar to 2002 #17

Revised 05/10/13

In general, the Top Heavy determination date is the last day of the preceding plan year. An exception to this is the first plan year, when the determination date is the last day of the first plan year. For this problem the determination date is 12/31/2002.

Based on questions T-24 and T-25 of the 1.416 regulation, the present value of accrued benefits for the DB plan (or account balance for the DC plan) is calculated as of the valuation date in the 12 month period ending on the determination date. You should use the PVAB as of the 01/01/2002 valuation date for the DB plan, and the 12/31/2002 account balances for the profit sharing plan.

You should add together the present value of vested and non-vested accrued benefits and the account balances as of that date for all participants and the key employees. The amounts should exclude values for terminated employees who have not been employed in the 12 months ending on the determination date, or values for former key employees. Since participant #2 terminated during 2001, they are not included in the Top Heavy determination at 12/31/2002.

These amounts should include distributions (including benefit payments) within the 12 months ending on the determination date. These amounts should also include any in-service distributions within the 5 years ending on the determination date. This is the key point to this problem - to see if you knew that EGTRRA changed these rules in 2001.

Partic #	Status	01/01/02	12/31/02	Total
		Defined Benefit	Profit Sharing	
1	50% owner	360,000	55,000	415,000
2	50% owner	0	0	0
3	Non-key	100,000	45,000	145,000
4	Non-key	50,000	30,000	80,000
5	Non-key	40,000	75,000	115,000

Participant #5 received an in-service distribution in 1999. Their profit sharing values for the T-H ratio equal the sum of the account balance and the in-service distribution:

$$75,000 = 20,000 + 55,000$$

The Top Heavy ratio for 2003 is

$$54.97\% = 415 / (415+145+80+115)$$

Answer is B

2003 EA-2B Exam Solutions

Problem 30

Similar to 2002 #19

IRC §414(l)(2) contains provisions for allocating assets to spun off plans when the assets exceed the present value of accrued benefits on a termination basis, and when the spun off plans are members of the same controlled group. Since the plan sponsor continues to maintain both plans B and C (the other spun-off plan), they remain members of the same controlled group.

You must allocate the "applicable percentage" of the "excess assets" to each spun off plan. The "excess assets" equal the excess of the market value of assets over the present value of accrued benefits on a termination basis. In this problem, the excess assets equal $11,000,000 - 9,800,000 = 1,200,000$.

The "applicable percentage" is the ratio for a spun off plan to the total (for the original plan) of the excess, if any, of (I) the lesser of 170% of Current Liability, or 100% of normal cost plus accrued liability, over (II) the present value of accrued benefits on a termination basis. 170% is the 2003 value to be used in determining the 412(c)(6) Full Funding Limitation based on current liability.

	Description of item	Plan A	Plan B	Plan C
(1)	100% of current liability	8,400,000	1,400,000	7,000,000
(2)	Accrued liability (including NC)	12,400,000	2,500,000	9,900,000
(3)	Liability component of FFL, lesser of 170% CL or EAN AL	12,280,000	2,380,000	9,900,000
(4)	PV of AB on termination basis	9,800,000	1,600,000	8,200,000
(5)	Excess of (3) over (4)	2,480,000	780,000	1,700,000
(6)	Applicable percentage	100%	31.45%	68.55%
(7)	Market value of assets	11,000,000		
(8)	Allocated excess assets	1,200,000	377,419	822,581
(9)	Total allocated assets (4)+(8)	11,000,000	1,977,419	9,022,581

The allocated asset for Plan B is 1,977,419.

Answer is D

NOTE:

One thing to be careful of is the total amount for item (3) above. This is the first problem on the exam where the values for plan B and Plan C do not come from the same FFL component.

As a result, the total for item (3) is different than either the total for item (1) or item (2). It is simply the sum of the Plan B and Plan C values for item (3).

2003 EA-2B Exam Solutions

Problem 31

I. TRUE

II. TRUE

III. TRUE

These are all true. These items correspond to the factors relevant to the determination of the date of a merger or spinoff, which are listed at 1.414(l)-1(b)(11)(i), (ii), and (iii).

All three items are true.

Answer is D

2003 EA-2B Exam Solutions

Problem 32

Similar to 2001 #17

The key to this problem is knowing what "the minimum required death benefit" means. This refers to the qualified pre-retirement spouse annuity (QPSA). This is an annuity type similar to a qualified joint and survivor annuity, which is defined in 417(b)(1) as a joint and survivor annuity of at least 50%.

In 417(c)(1)(A)(ii), if the participant dies prior to their earliest retirement age, the annuity should commence at that earliest retirement age. Based on the plan provisions, Smith's earliest retirement age is 55, since they had completed 10 years of service at death. Jones did not have 10 years of service at death. Their spouse's benefit will commence at the date Jones would have attained NRA 65.

Since both participants have been married for more than one year, then it is necessary to provide the QPSA (see 417(d)). The remainder of the problem is a benefit calculation.

	Smith	Jones
Birth date	01/01/1953	01/01/1943
Hire date	01/01/1992	01/01/1997
Death of death	01/01/2003	01/01/2003
As of 01/01/2003		
Age	50	60
Service	11	6
Earliest Retirement Age	55	65
Early Retirement reduction	0.60 = 1 - .04*(65-55)	1.00 = 1 - .04*(65-65)
Accrued Benefit	1,200	1,200
Early Retirement benefit	720	1,200
50% J&S Reduction	95%	95%
50% J&S Benefit	684	1,140
Death benefit to spouse	342	570
Present Value factor	9.71	7.80
Lump Sum	3,321	4,446

The problem clarifies that the lump sum values should include the value of any early retirement subsidies. The total lump sum value for both participants is 7,767.

Answer is B

2003 EA-2B Exam Solutions

Problem 33

Revised 04/23/04

Since this is the 2003 PBGC premium calculation under the ACM, the determination date is 01/01/2002. You must calculate the adjusted asset value.

Use the asset value at 01/01/02, and reduce it by any included receivable contributions. Then you must add the discounted value of “contributions paid for plan years prior to the premium payment year ...” These would be both the 2001 and 2002 plan year contributions.

The interest rate used for discounting assets is always the Required Interest Rate:

$$\begin{aligned} \text{01/01/02 Adjusted assets} &= (900,000 - 180,000) + 180,000 * (1.0492)^{(-.5)} \\ &\quad + 16,000 * (1.0492)^{(-1.5)} \\ &= 910,617 \end{aligned}$$

Answer is E

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Problem 34 - Page 1

Similar to 2001 #27

Revised 05/02/05

Most PBGC problems are strictly concerned with benefits in priority categories for asset allocation purposes, or with the definition of guaranteed benefits. In this problem, the participants have benefits in both Priority Category 3 and in Priority Category 4, which is unusual for exam questions. Priority Category 4 is defined based on the five year phase-in for non-owners. After you subtract the benefit in Priority Category 3, you will have the remaining benefit allocated to Priority Category 4.

The problem asks for the assets allocated to Smith at plan termination. Plan termination date (DOPT) is 12/31/2003. One thing to test is whether the assets would be sufficient to cover the total accrued benefit at DOPT. Since Smith retired at 01/01/1998, their benefit service is limited to that date.

As of 12/31/2003	Smith	Jones
Birth date	01/01/1936	01/01/1939
Hire date	01/01/1973	01/01/1974
Retirement date	01/01/1998	N/A
Age	68	65
Service	25	30
Plan Benefit	\$55	\$55
Initial Benefit	16,500	19,800
5 COLAs	1.1593	1.0000
Accrued Benefit	19,128	19,800
3% COLA PV Factor	12.61	14.61
PV of Accrued Benefit	241,204	289,278

The plan benefit includes a 3% cost of living adjustment (COLA). For Smith, the benefit includes five COLAs (01/01/99 through 01/01/03). You should use the present value factor that includes the COLA to calculate the total present value of accrued benefits.

I assumed that the 01/01/2000 benefit increase of \$55 applied to Smith, even though they retired in 1998. In prior similar problems where the benefit increase did not apply to retirees, the wording was similar to this:

Retirements prior to 01/01/2000	\$50
Retirements after to 12/31/1999	\$55

Since the total present value of accrued benefits exceeds the market value of 300,000, you must do additional calculations. The second part of the problem is calculation of the Priority Category 3 (PC3) benefit. If the assets cover the PC3 benefit, then you will also have to calculate the benefit in PC4 to perform the asset allocation.

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Problem 34 - Page 2

Revised 05/02/05

Participants in PC3 are those who were (or could have been) in pay status at DOPT-3, or 12/31/2000. The early retirement eligibility that is used is based on the plan provisions in effect at DOPT-3, which is the same as the current plan provisions.

Priority Category 3 benefits are the lowest amount payable in the three years preceding DOPT, determined based on lowest level of plan benefits in effect for the five years preceding DOPT. There are no maximum benefit limits on PC3 benefits. For participants who were not in pay status at DOPT-3 (12/31/2000), the PC3 benefit is calculated as if they retired at DOPT-3.

As of 12/31/2000	Smith	Jones
Age	65	62
Service	25	27
Plan Benefit	\$50	\$50
Accrued Benefit	15,000	16,200
2 COLAs	1.0609	1.0000
PC3 Benefit	15,914	16,200

The benefit for Smith has been increased to allow for the COLAs that occurred at 01/01/1999 and 01/01/2000 (prior to 12/31/2000). The regulation at 4044.13(a) talks about the benefits before the beginning of the 3-year period, which would indicate the PC3 benefit should be calculated as of 12/31/2000. The last sentence of regulation 4044.13(b)(5) implies that you would only use two years of increases.

As of 12/31/2003	Smith	Jones
Life annuity PV Factor	9.88	10.81
PV of PC3 benefit	157,225	175,122
Allocated MVA	141,923	158,077

The last tricky detail is that the present value is calculated using a life annuity without allowance for COLAs. This is consistent with the definition of the PC3 benefit using only two years of increases.

The total PC3 liability is 332,347. The assets of 300,000 represent 90.27% of the PC3 liability. The assets allocated to Smith are $141,923 = 90.27\% \times 157,225$.

Answer is C

(See notes on next page)

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Problem 34 - Page 3

Revised 05/02/05

NOTES:

1. I was initially concerned that this problem would require calculations other than in PC3. There does not seem to be much guidance for handling COLAs beyond PC3.
2. The answer key shows that credit is given for answer C and answer E. Answer E is based on PC3 benefits that use 3 COLAs instead of 2 COLAs:

As of 12/31/2000	Smith	Jones
Accrued Benefit	15,000	16,200
3 COLAs	1.0927	1.0000
PC3 Benefit	16,391	16,200
As of 12/31/2003		
Life annuity PV Factor	9.88	10.81
PV of PC3 benefit	161,942	175,122
Allocated MVA	144,135	155,865

The total PC3 liability is 337,064. The assets of 300,000 represent 89.00% of the PC3 liability. The assets allocated to Smith are $144,135 = 89.00\% \times 161,942$.

These calculations match the wording in ERISA section 4044(a)(3). That language says that you calculate the benefit at the beginning of the 3-year period ending on the plan's termination date.

It is open to interpretation re: exactly how many COLAs should be applied to Smith's benefit. I believe it is clear that the regulation would use the benefit at 12/31/2000, and that the more recent regulation should take precedence over the language in ERISA.

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Problem 35

I. FALSE

At 1.401(a)(4)-5(b)(3)(v), the regulation says "any reasonable and consistent method may be used for determining the value of current liabilities and the value of plan assets."

II. TRUE

At 1.401(a)(4)-5(b)(3)(ii), the regulation says "Plan provisions defining or altering this group can be amended at any time without violating 411(d)(6)."

III. FALSE

At 1.401(a)(4)-5(b)(3)(i)(A), the regulation says that the benefit must be limited to an amount no greater than the sum of

- (i) straight life annuity that is actuarially equivalent to the accrued benefit plus
- (ii) social security supplement (if any).

Only item II is true.

Answer is C

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Problem 36 - Page 1

Similar to 2002 #38

You are told that a partial withdrawal due to a 70% decline in contributions has occurred. There are two parts to this problem. The first part is determination of the fraction used to calculate the partial withdrawal liability.

The second part is determination of the employer's annual withdrawal liability payment. This has not been tested since 1985. You must do the partial withdrawal calculations first, since you don't know the actual date of the withdrawal.

Partial Withdrawal Calculations

A 70% contribution decline occurs when 30% of "units in the high base year" exceeds the units in each year of the "three year testing period". The "three year testing period" includes the year that the 70% decline occurs as the last year. The "units in the high base year" is the average of the two highest years in five years preceding the "three year testing period".

You must calculate the various items to see when a 70% decline has occurred. If you have worked these problems before, you know that the units during the three year testing period have to be much lower than the prior five years. You should guess 1997 - 1999 as a starting point:

Assumed year	1999	2000	2001	2002
3 year testing period	1997-1999	1998-2000	1999-2001	2000-2002
Highest units in 3 year testing period	85,000	85,000	73,000	55,000
Highest testing / .30	283,333	283,333	243,333	183,333
5 Base years	1992-1996	1993-1997	1994-1998	1995-1999
Any base years exceed the Highest testing/.30?	NO	NO	YES	YES

Verification of 70% decline	2001
High base years	1994, 1996
Units in high base year	$.5 \times (250,000 + 260,000)$ $= 255,000$
30% of units in high base year	76,500
70% decline occurred?	YES

As shown above, there are two years (2001 and 2002) where a partial withdrawal occurred. In this problem, you should use 2001 to do your calculations. The reason is the wording of the question, which asks for the "initial annual partial withdrawal ...". If you use 2002, you will get the wrong answer range.

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Problem 36 - Page 2

Revised 12/22/05

To calculate the partial withdrawal liability due to a 70% contribution decline,

- (1) The initial year of the three year testing period is considered as the year of withdrawal for calculation of employer share of UVB
- (2) The fraction to multiply the “complete withdrawal” liability by is

$$1.0 - \frac{\text{Base units for plan year following last year of three year testing period}}{\text{Average base units during 5 yr. period preceding three year testing period}}$$

$$\begin{aligned}\text{Fraction} &= 1.0 - \frac{2002 \text{ units}}{(\text{Sum of 1994 through 1998 units}) / 5} \\ &= 1.0 - \frac{55,000}{(250,000 + 220,000 + 260,000 + 80,000 + 85,000) / 5} \\ &= 1.0 - (55 / 179) \\ &= 69.27\%\end{aligned}$$

Withdrawal Liability Payment Calculations

The annual payment amount for a complete withdrawal is calculated as the product of two items:

1. Highest contribution rate during the ten plan years including the plan year of withdrawal
2. Highest consecutive 3 year average of base units in the ten plan years preceding the plan year of withdrawal

According to ERISA 4219(c)(1)(C)(i), you should assume the first year of the three year testing period (1999) is the year of withdrawal for calculating the employer withdrawal liability payment. The highest contribution rate during the ten plan years including 1999 is \$3.00. The highest consecutive 3 year average of base units in the ten plan years preceding 1999 is

$$243,333 = (250,000 + 220,000 + 260,000) / 3$$

The annual payment amount for a complete withdrawal is 730,000 = (3.0)*243,333. For the partial withdrawal, this amount is multiplied by the fraction calculated above:

$$505,698 = 69.27\%(730,000)$$

Answer is B

2003 EA-2B Exam Solutions

Problem 37

Similar to 1999 #25

Under the Rolling Five Method, the calculation of withdrawal liability is relatively simple. Since the withdrawal occurred in 2002, you should use the UVB at 12/31/2001. Employer A's share of the 12/31/2001 UVB is based on the ratio of employer A's contributions to the total contributions in the prior five years.

YEAR:	1997	1998	1999	2000	2001
-------	------	------	------	------	------

$$\text{ER share} = 2,030,000 * \left(\frac{140,000 + 110,000 + 125,000 + 135,000 + 125,000}{980,000 + 1,050,000 + 1,300,000 + 1,350,000 + 1,400,000} \right)$$
$$\text{ER share} = 2,030,000 * \frac{635,000}{6,080,000}$$
$$= 212,015$$

After determining Employer A's share of the UVB, the de minimis amount must be calculated. Then a deductible is calculated based on the amount of the de minimis and the employer's share of the UVB. The final withdrawal liability is calculated as the employer's share less the deductible.

The mandatory de minimis is the lesser of 50,000 or 3/4% of the plan's total UVB (.0075 * 2,030,000 = 15,225). The deductible is the de minimis amount reduced by the excess of the allocated UVB over 100,000. The deductible is 15,225 less (212,015 - 100,000), or zero. The final employer withdrawal liability is 212,015 - zero = 212,015.

Answer is C

2003 EA-2B Exam Solutions

Problem 38

Revised 04/05/10

This is the first question on the exam on the calculation of the amount of excise taxes due to prohibited transactions. This is covered in Revenue Ruling 2002-43, which was added to the EA-2B reading list in 2003.

The revenue ruling covers the situation where you have a prohibited transaction that spans multiple years that also involves a loan. In that case, a new prohibited transaction is deemed to occur at the beginning of each successive taxable year (for the duration of the original prohibited transaction).

This problem is simpler than the example used in the revenue ruling, since it does not involve a loan. The excise tax penalty rate is currently 15%. You have two years of penalties:

$$2003: 15,000 = 15\% * 100,000$$

$$2004: 15,000 = 15\% * 100,000$$

$$\text{Total excise tax} = 30,000.$$

Answer is D

2003 EA-2B Exam Solutions

Problem 39

I. TRUE

This one sounds like it should be true, but it is not specifically covered in the Joint Board regulations (20 CFR Part 901.20) governing the performance of actuarial services under ERISA.

II. FALSE

This item has been tested numerous times on past exams. In 901.20(d), it states that a conflict of interest does not prevent an actuary from performing services. Once they have made full disclosure of the conflict of interest, they can continue to provide actuarial services. The disclosure should be made to the plan trustees, any named fiduciary of the plan, and the plan administrator (and the collective bargaining representative, if applicable).

III. TRUE

This is virtually a direct quote from the regulation at 901.20(b).

Only items I and III are true.

Answer is C