EFFECTS OF SELF-STUDY OF TEST FAMILIARIZATION MATERIALS FOR THE ANALYTICAL SECTION OF THE GRE APTITUDE TEST

Donald E. Powers
and
Spencer S. Swinton

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EDUCATIONAL TESTING SERVICE, PRINCETON, NJ
Effects of Self-Study of Test Familiarization Materials for the Analytical Section of the GRE Aptitude Test

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An experimental study was conducted to (a) provide further information on the possible differential susceptibility to special preparation of three GRE analytical item types, (b) determine whether candidates' self-study of test familiarization materials might result in analytical ability score improvements comparable to those resulting from formal instructional intervention, and (c) ascertain which components of the special preparation were most effective. To provide this information various sets of test preparation materials (practice tests, explanations of answers to practice questions, and suggested strategies for approaching each analytical item type) were mailed to random samples of GRE candidates approximately four to five weeks before the test date. Candidates' use of each set of materials was manipulated by encouraging random samples of candidates to study the materials.

Comparisons of the subsequent GRE scores of the various groups of candidates (a) confirmed the susceptibility to special preparation of two of the analytical item types (analysis of explanations and logical diagrams), (b) suggested little susceptibility for either of the two subtypes of the third item type (analytical reasoning), (c) provided strong evidence that candidates can undertake effective self-preparation for "coachable" item types like the ones studied here, (d) pointed to some components of test preparation (e.g., extra test practice) as more effective than others, and (e) strongly suggested that, even more than the particular kind of preparation undertaken, being engaged in some preparation is necessary for successful performance on these item types.
Effects of Self-Study of Test Familiarization Materials for the Analytical Section of the GRE Aptitude Test

As evidence accumulates on the effects of special test preparation, the question "Does special preparation, or coaching, work?" seems less and less amenable to a simple answer. Different tests are, with virtual certainty, differentially responsive to different types of intervention. Various test item types are also very likely to differ in the degree to which they are susceptible to special preparation: verbal analogy items seem slightly more responsive to preparation than some other verbal reasoning item types such as reading comprehension (e.g., Moore, 1971; Alderman & Powers, 1980), some quantitative item types are more prone to improvement through special instruction than others (e.g., Evans & Pike, 1973), and item types that have complex formats, irrespective of the ability domain, have been found to be more susceptible to coaching and practice than item types having simpler formats (e.g., Evans & Pike, 1973; Loret, 1960; Vernon, 1954).

Recently, Swinton and Powers (1982) developed and administered a brief program of special preparation for the analytical section of the GRE Aptitude Test to a self-selected sample of GRE candidates at a large eastern university. The effect of the program on analytical scores was determined by comparing the scores subsequently obtained by the candidates who had been given the preparation course with those of the other candidates who took the test on the same date at the university. The effect on analytical total scores was estimated to be 66 points on the 200-800 GRE Aptitude Test scale, an effect that stemmed from improved performance on two of the three analytical item types (analysis of explanations and logical diagrams) that were used in the test from 1977 to the fall of 1981.* The techniques employed in the program entailed (a) providing hints or strategies for approaching each item type, (b) practicing on sample analytical tests, and (c) giving knowledge of results in the form of explanations to practice questions. The hints included, for example,

*The analytical section of the GRE Aptitude Test was instituted in 1977. Although it has been administered with the operational verbal and quantitative sections of the test, the score derived from the analytical items has been given in a shaded area on the score report form. The score report also includes a caveat, advising institutional score recipients that the analytical test is not yet fully operational because more study of analytical scores is needed before they can be used with any confidence. Two of the item types, analysis of explanations and logical diagrams, that have been used in the original analytical section were recently deleted from the test because the preliminary results of the study reported here and those of two other studies (Swinton & Powers, 1982; Wild, Swinton, & Wallmark, 1981) suggested that these item types were overly susceptible to within-test practice and preexamination special preparation.
suggestions to learn test directions and response formats ahead of time and to become familiar with the particular demands of each item type (e.g., the need to consider response choices in a sequential manner for the analysis of explanations item type and the desirability of drawing an appropriate diagram for the analytical reasoning item type). Swinton and Powers (in press) hypothesized that because the special preparation they administered contained no "inside information" or tricks, any candidate who (a) took the sample test (included in the GRE Information Bulletin) under timed conditions, (b) learned instructions for item formats completely, (c) thought carefully about the rationale for correct answers, and (d) applied pacing and guessing strategies (as suggested in the Bulletin) would probably have done as well as students who received the special preparation.

The present study was undertaken therefore to provide additional information regarding the differential susceptibility of the three analytical item types and also to determine if the successful formal instructional special preparation employed in the previous study could be adapted for successful self-study by GRE candidates. The results of this study were anticipated to have implications for equity of access to effective special preparation: If candidates could achieve results with self-study materials that were comparable to the results of more expensive instructor-based coaching, then the potential for inequity would be less. Also, by using a randomized design in which both access to and use of several preparation resources was experimentally manipulated, we hoped to learn which combinations of resources were more effective than others (at least for the specific item types under consideration here). The particular components of interest were test practice, feedback or knowledge of test results, and test-taking strategies for each item type.

Procedures

Materials

The materials used in the instructor-based special preparation study were revised according to suggestions made by study participants and by GRE test development staff, and subsequently packaged in a manner suitable for mail distribution. The final set of materials included:

(a) sample analytical test 1 (the 50-minute analytical portion of the full-length sample Aptitude Test that was included in the 1980-81 GRE Information Bulletin);

(b) sample analytical test 2 (the 50-minute analytical portion of the full-length Aptitude Test that was made available in March 1980 to all students under the GRE Board's test disclosure policy);

(c) explanations to sample analytical test 1;
(d) explanations to sample analytical test 2; and
(e) a set of tips and strategies for answering the three GRE analytical item types.

Appendix A includes all of the study materials. Each candidate also received a page of "Suggestions for Using GRE Analytical Preparation Materials," which outlined a strategy for using the particular set of materials the candidate received (see Appendix B).

Design

A two-factor design was employed in which both preparation materials (five levels) and encouragement to use them (two levels) were manipulated. Table 1 shows this 5 x 2 factorial design and the numbers of students who were randomly assigned to each cell. The first factor—materials sent—entailed providing candidates with various combinations of the materials mentioned above. The conditions ranged from a control group that received no additional materials to a group that received the full complement of materials. It should be noted that, as shown in Table 1, the receipt of some materials was necessarily confounded. For instance, the explanation of correct answers could not be provided without the test questions themselves. In addition, the tips or hints for approaching the analytical test were provided only in conjunction with other materials. The second factor—encouragement to use the analytical test preparation materials—involved sending strongly worded letters of encouragement to use the special materials to prepare for the test. Encouraged students also received follow-up postcards about two weeks before the test to remind them of the approaching test and of the preparation materials that had been sent earlier. (Appendix C contains copies of the letters of encouragement and the follow-up postcards). The nonencouraged students received only a very brief explanatory letter that provided no particular encouragement to study the materials they had received.

Sample Selection

Candidates were randomly selected in the numbers shown in Table 1 from the total number of candidates who had registered at least seven weeks before the test administration in June 1980. The study sample was necessarily restricted to early registrants so that students would receive the study materials approximately one month before the test—an interval that was thought to be sufficient to allow their effective use. Materials were mailed approximately five weeks before the test date.

Data Collection

Background data, which a majority of GRE test takers supply when registering for the test, and test scores were subsequently retrieved from GRE Program files. Total scaled scores on the verbal, quantitative, and
Table 1
Study Design

<table>
<thead>
<tr>
<th>Materials Sent(^a)</th>
<th>Not Encouraged</th>
<th>Encouraged</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 None</td>
<td>1,200</td>
<td>600(^b)</td>
</tr>
<tr>
<td>1 Explanations to Sample Analytical Test 1</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>2 Sample Analytical Test 2</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>3 Explanations to Sample Analytical Test 1; Tips for Answering Analytical Questions</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>4 Explanations to Sample Analytical Test 1; Sample Analytical Test 2; Explanations to Sample Analytical Test 2; Tips for Answering Analytical Questions</td>
<td>600</td>
<td>600</td>
</tr>
</tbody>
</table>

\(^a\) All candidates received the GRE Information Bulletin as part of the regular test registration procedures. The Bulletin includes a full-length sample analytical test section, which we have designated as Sample Analytical Test 1. The Bulletin also contains a limited number of additional practice questions and explanations.

\(^b\) These students received no additional materials other than a reprint of the portion of the GRE Information Bulletin that deals with the analytical section of the test, including the analytical section of the sample test.

Note. Only the numerical designation (0-4) of each materials level will appear on all subsequent tables.
analytical sections as well as raw scores on each of the analytical item types were obtained. Immediately after the test, questionnaires were sent to all students to assess their use of the materials, their reactions to them, and their perceptions of the effects on their test performance. Questionnaires were tailored for each group according to which, if any, of the special materials they had received.

**Data Analysis**

Analyses of variance were performed in which verbal, quantitative, and analytical ability scores and each of the analytical item type subscores served as dependent variables. Encouragement and materials sent were the independent variables. Post hoc comparisons were made (a) between each pair of material levels, (b) between the encouraged Bulletin-only group and each of the other encouraged groups, (c) between the not-encouraged Bulletin-only group and each of the other not-encouraged groups, and (d) between the encouraged and not-encouraged group within each material level. A multiple regression analysis was also performed for each of the analytical item type subscores, regressing each of them on the particular materials received and the encouragement provided. That is, the independent variables were (a) whether an additional practice test was provided, (b) whether explanations to questions were given, (c) whether hints and strategies were sent, and (d) whether encouragement was made. This second analysis provided further evidence regarding which materials might be responsible for any analytical score increases. Each of the two test forms given in June 1980 were analyzed separately. Separate analyses by form served to provide independent replications of results, but they were also desirable because of a slight difference in the number of analysis of explanations items between the two forms. Questionnaire data were summarized and responses compared across treatment groups.

A final analysis was undertaken to determine the relationship between time devoted to preparation and analytical ability scores. This analysis was thought to come closer to estimating the effects of actually using the materials provided, not merely of being encouraged to use them. The estimated effect of encouragement was believed to underestimate the effects of actual usage, because some examinees who were encouraged did not use the materials and because some examinees who were not encouraged did use them. However, a straightforward comparison of the test scores of examinees who used the materials with those who did not use them was thought to be potentially misleading because of self-selection factors. That is, a number of personal characteristics related to students' decisions to use or not to use the materials might be reflected in test performances, thus producing the appearance of effects of using the materials. Hence, this final analysis was designed to disentangle the effects of actual use from the apparent effects that resulted from self-selection.
Results

Description of the Sample

Of the 6,600 early registrants that comprised the initial sample, 5,107 (77.4%) eventually received test scores, which were retrieved from GRE test files. Of those who were tested, 3,986 (78.1%) returned either complete questionnaires or postcards indicating the amount of time they devoted for the analytical test section.

Effects of Encouragement on Use of Materials

The amount of time candidates devoted to preparing for each section of the GRE Aptitude Test was ascertained through questionnaire responses. As intended, the encouragement had no significant effect on time spent preparing for either the verbal or the quantitative sections of the test. All differences in preparation time between encouraged and not encouraged groups were nonsignificant (p > .05) for these two sections of the test. Overall, not-encouraged candidates spent an average of 2.89 hours preparing for the verbal section and 3.04 hours for the quantitative section; encouraged candidates spent an average of 2.90 hours and 3.14 hours preparing for these sections, respectively.

For the analytical section, however, differences between encouraged and not-encouraged students were significantly different (p < .01) for all levels (Table 2). On the average, encouraged candidates spent 3.37 hours in preparation for the analytical test, whereas not-encouraged candidates devoted an average of 2.80 hours. Also, the more materials candidates received, the greater the time they devoted to preparing. As anticipated, the general effect of encouragement was to "move" examinees from the lower categories to the higher ones. For examinees getting no materials (level 0) and for those getting only explanations to one test (level 1), the shift was most dramatic at the lower levels. For example, whereas 14.4 percent of the not-encouraged, no-materials group reported no preparation at all, only 2.6 percent of their encouraged counterparts did not prepare at all.

Because encouragement to use the special analytical materials could also have changed students' patterns of involvement in other methods of test preparation, examinees were asked about their use of other test preparation resources for each section of the test. Table 3 shows virtually identical patterns of preparation for encouraged and not-encouraged students for the verbal and quantitative sections of the test. The pattern of preparation is also very similar for the two groups for the analytical section, except that, as planned, a much greater percentage of encouraged students reported the use of the special analytical test preparation materials that were sent. Thus, the encouragement appears to have had, as intended, a highly specific effect--only on preparation for the analytical section of the test and only on the use of the analytical preparation materials that were developed expressly for this study.
### Table 2

Time Spent Preparing for the Analytical Section of the GRE Aptitude Test

<table>
<thead>
<tr>
<th>Materials Sent</th>
<th>Encouragement</th>
<th>N</th>
<th>None</th>
<th>Less than 1 hour</th>
<th>1 - 2 hours</th>
<th>3 - 5 hours</th>
<th>6 or more hours</th>
<th>$\chi^2$</th>
<th>Mean hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>NE</td>
<td>701</td>
<td>14.4</td>
<td>25.1</td>
<td>22.7</td>
<td>17.1</td>
<td>18.8</td>
<td></td>
<td>2.47</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>380</td>
<td>2.6</td>
<td>16.8</td>
<td>36.8</td>
<td>22.6</td>
<td>19.2</td>
<td>$p&lt;.01$</td>
<td>2.89</td>
</tr>
<tr>
<td>1</td>
<td>NE</td>
<td>347</td>
<td>7.2</td>
<td>21.0</td>
<td>33.1</td>
<td>19.6</td>
<td>17.3</td>
<td></td>
<td>2.60</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>372</td>
<td>2.7</td>
<td>11.6</td>
<td>33.6</td>
<td>27.4</td>
<td>22.3</td>
<td>$p&lt;.01$</td>
<td>3.22</td>
</tr>
<tr>
<td>2</td>
<td>NE</td>
<td>360</td>
<td>4.7</td>
<td>20.6</td>
<td>33.1</td>
<td>20.8</td>
<td>20.3</td>
<td>$p&lt;.01$</td>
<td>2.85</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>376</td>
<td>3.2</td>
<td>8.5</td>
<td>28.2</td>
<td>35.1</td>
<td>24.5</td>
<td>$p&lt;.01$</td>
<td>3.58</td>
</tr>
<tr>
<td>3</td>
<td>NE</td>
<td>363</td>
<td>5.2</td>
<td>15.4</td>
<td>28.9</td>
<td>29.5</td>
<td>19.8</td>
<td>$p&lt;.01$</td>
<td>3.08</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>369</td>
<td>1.6</td>
<td>13.0</td>
<td>32.8</td>
<td>29.0</td>
<td>22.5</td>
<td>$p&lt;.01$</td>
<td>3.29</td>
</tr>
<tr>
<td>4</td>
<td>NE</td>
<td>350</td>
<td>3.1</td>
<td>12.3</td>
<td>28.9</td>
<td>32.3</td>
<td>21.7</td>
<td>$p&lt;.01$</td>
<td>3.31</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>368</td>
<td>2.4</td>
<td>9.0</td>
<td>21.2</td>
<td>38.9</td>
<td>28.3</td>
<td>$p&lt;.01$</td>
<td>3.90</td>
</tr>
<tr>
<td>Total</td>
<td>NE</td>
<td>2121</td>
<td>8.2</td>
<td>19.9</td>
<td>28.2</td>
<td>22.8</td>
<td>19.5</td>
<td>$p&lt;.01$</td>
<td>2.80</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>1865</td>
<td>2.5</td>
<td>11.8</td>
<td>30.6</td>
<td>30.6</td>
<td>23.3</td>
<td>$p&lt;.01$</td>
<td>3.37</td>
</tr>
</tbody>
</table>

Note. Ns are numbers of test takers who returned questionnaires. Percentages total slightly less than 100 because of nonresponse to this question.
Table 3

Percentages of Encouraged and Not-Encouraged Students Who Used Various Methods of Preparation for Each Section of the GRE Aptitude Test

<table>
<thead>
<tr>
<th>Test Section</th>
<th>Method of Preparation</th>
<th>Not Encouraged</th>
<th>Encouraged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal</td>
<td>Read GRE Bulletin</td>
<td>87.7</td>
<td>87.2</td>
</tr>
<tr>
<td></td>
<td>Took GRE sample test</td>
<td>71.8</td>
<td>71.7</td>
</tr>
<tr>
<td></td>
<td>Reviewed material from undergraduate courses</td>
<td>3.8</td>
<td>3.9</td>
</tr>
<tr>
<td></td>
<td>Used a test preparation book</td>
<td>45.1</td>
<td>45.3</td>
</tr>
<tr>
<td></td>
<td>Attended a review or coaching session</td>
<td>2.6</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td>Took the test before for practice</td>
<td>4.4</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td>Other preparation</td>
<td>2.3</td>
<td>1.9</td>
</tr>
<tr>
<td>Quantitative</td>
<td>Read GRE Bulletin</td>
<td>86.4</td>
<td>86.4</td>
</tr>
<tr>
<td></td>
<td>Took GRE sample test</td>
<td>69.9</td>
<td>70.9</td>
</tr>
<tr>
<td></td>
<td>Reviewed material from undergraduate courses</td>
<td>9.1</td>
<td>9.2</td>
</tr>
<tr>
<td></td>
<td>Used a test preparation book</td>
<td>45.9</td>
<td>46.4</td>
</tr>
<tr>
<td></td>
<td>Attended a review or coaching session</td>
<td>3.3</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td>Took the test before for practice</td>
<td>4.3</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>Other preparation</td>
<td>2.8</td>
<td>2.4</td>
</tr>
<tr>
<td>Analytical</td>
<td>Read GRE Bulletin</td>
<td>86.4</td>
<td>88.5</td>
</tr>
<tr>
<td></td>
<td>Took GRE sample test</td>
<td>70.9</td>
<td>74.7</td>
</tr>
<tr>
<td></td>
<td>Reviewed material from undergraduate courses</td>
<td>3.0</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>Used a test preparation book</td>
<td>41.4</td>
<td>41.1</td>
</tr>
<tr>
<td></td>
<td>Attended a review or coaching session</td>
<td>2.0</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>Took the test before for practice</td>
<td>4.1</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td>Other preparation</td>
<td>1.4</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td>Studied the special analytical materials</td>
<td>45.6</td>
<td>82.7</td>
</tr>
</tbody>
</table>

Note. Percentages are in terms of total numbers of not-encouraged and encouraged students who returned questionnaires (N = 2121 and 1865).
Effects on GRE Verbal, Quantitative, and Analytical Ability Scores

Table 4 presents analysis of variance results for each of the three scores that are reported for the GRE Aptitude Test. As expected, neither the particular analytical test preparation materials that were sent nor the encouragement to use them had any effect on either verbal or quantitative scores, nor did the effects of encouragement interact with the effects of the materials. However, the analytical scores were significantly related both to encouragement to prepare, F(1, 5097) = 32.10, p < .001, and to the materials sent, F(4, 5097) = 7.40, p < .001. The verbal scores of not-encouraged students (M = 477.0, SD = 118.6) were virtually identical to those of encouraged students (M = 477.2, SD = 118.6); likewise, the quantitative scores were also nearly exactly the same (not-encouraged, M = 494.9, SD = 128.9; encouraged, M = 492.5, SD = 128.8). The verbal means for the five materials conditions ranged only from 474.3 to 479.4; the quantitative means ranged only from 487.0 to 498.4.

Table 5 shows, for each of two equivalent forms of the test, the analysis of variance results for the analytical scores and the subscores for each of the item types that have been used in the test. The effects on the analytical scores of both encouragement and materials were significant for each form of the test. The effect of each of these two variables was also significant for both the analysis of explanations and the logical diagrams item types. However, for each of the two subtypes of analytical reasoning items, no significant effects were noted for either test form (the effect of encouragement was small but significant (p < .05) for one subtype when both test forms were analyzed together). Encouragement did not interact significantly with materials in any of the analyses, indicating that its effects were uniform across materials conditions. Tables 6-8 show the analytical means and standard deviations by test form and analytical item type for each of the treatment conditions.

Table 9 contains the results of selective pairwise comparisons using a least significant difference criterion. Results are given for the analytical scaled scores and the raw subscores for the two item types for which significant effects were noted. In light of the rather large number of comparisons, only those differences that were significant at the .01 level or greater are indicated. Although Table 9 is somewhat difficult to summarize, some consistent patterns are apparent. Generally, a greater number of significant differences occurred between the various not-encouraged groups than between the encouraged groups. The only significant difference among encouraged groups was between the group (E0) that received no additional materials beyond the GRE Information Bulletin and the group (E4) that received all the available materials. Consistent differences were also observed between the encouraged and not-encouraged groups that received only the Information Bulletin. Candidates who were encouraged to use the Bulletin obtained significantly higher scores on both item types and total analytical scores. Overall, the treatment groups that received the full set of materials were involved in more significant between-group differences than any other treatment group. Likewise, the group that
Table 4

Analysis of Variance Results for GRE Verbal, Quantitative, And Analytical Ability Scores

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Source of Variance</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Score</td>
<td>Encouragement</td>
<td>1</td>
<td>34.7</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Materials</td>
<td>4</td>
<td>5970.3</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td>E x M</td>
<td>4</td>
<td>15650.5</td>
<td>1.12</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>5097</td>
<td>13998.6</td>
<td></td>
</tr>
<tr>
<td>Quantitative Score</td>
<td>Encouragement</td>
<td>1</td>
<td>1871.9</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>Materials</td>
<td>4</td>
<td>19680.1</td>
<td>1.19</td>
</tr>
<tr>
<td></td>
<td>E x M</td>
<td>4</td>
<td>3167.7</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>5097</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analytical Score</td>
<td>Encouragement</td>
<td>1</td>
<td>500971.4</td>
<td>32.10*</td>
</tr>
<tr>
<td></td>
<td>Materials</td>
<td>4</td>
<td>115480.0</td>
<td>7.40*</td>
</tr>
<tr>
<td></td>
<td>E x M</td>
<td>4</td>
<td>10338.4</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>5097</td>
<td>15609.7</td>
<td></td>
</tr>
</tbody>
</table>

Note. Analyses are based on all candidates in the study who received test scores based on either Form A or Form B of the GRE Aptitude Test.

*p < .001
Table 5
Analysis of Variance Results for Analytical Scaled Scores and Analytical Item Type Subscores for Two Forms of the GRE Aptitude Test

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Source of Variance</th>
<th>Form A</th>
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<th>Both Forms</th>
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1 Form A contained 40 analysis of explanations items; Form B contained 36.

* p<.05
** p<.01
*** p<.001
Table 6

Means and Standard Deviations of Analytical Scores and Analytical Item Type Subscores by Treatment Groups (Form A)

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Table 9

Significance of Between-group Differences for Analytical Scores and Analytical Item Type Subscores

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<tr>
<td>2 - 4</td>
<td>*</td>
<td>*</td>
<td>n.s.</td>
</tr>
<tr>
<td>3 - 4</td>
<td>n.s.</td>
<td>**</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

Key: E = Encouraged
N = Not Encouraged
0-4 = Materials sent

Note. Only differences that are significant at the .01 level using a least significant difference criterion are shown.

* \( p < .01 \)
** \( p < .001 \)
received only the Bulletin with no encouragement to study it was also involved in a large number of the significant between-group differences. A total of 59 of the 207 comparisons shown in Table 9 were significantly different at the .01 level or greater. A disproportionately large number of these (43 of 81) involved an extreme group—either the noncontacted control group or the group that received all of the materials.

Effects of Treatment Components

The effects of each of the four components involved in the various treatment combinations—i.e., (a) extra test practice, (b) explanations to practice test questions, (c) hints or strategies for answering analytical question types, and (d) encouragement to use the various materials—were assessed for each of the two test forms by regressing, in turn, analytical scores, and each analytical item type subscore on the set of dichotomous variables that indicated whether or not examinees had received each of these treatment components. Verbal scores, quantitative scores, and undergraduate major field were included as covariates in these analyses. Although verbal and quantitative scores were not strictly appropriate as covariates, because they were obtained after the treatment, they were used to provide substantially more precise estimates of test-score effects. The use of these scores as covariates was justified, since analyses of these scores as dependent variables did not show them to be related to the treatments.

Table 10 shows that performance on the two kinds of analytical reasoning items was largely unaffected, although for one test form, encouragement did produce a significant ($p < .05$), though very small, effect on Type I analytical reasoning questions, i.e., those involving puzzle-like problems. For each test form, significant ($p < .001$) effects on analytical scores were associated with receiving an extra analytical practice test (i.e., beyond the one provided in the Bulletin) and with encouragement to prepare. The effects of an extra test were 10-14 points; the effects of encouragement were 21-22 points. These total score effects stemmed from significantly better performance on both the analysis of explanations and the logical diagrams item types.

Receiving hints produced effects on analytical scores of about 9-11 points. These effects were not completely consistent for both test forms. For one form, the effect was associated primarily with improvement on analysis of explanations items; for the other form, it came primarily from better performance on logical diagrams items. These differences may be related to the slightly different proportions of these two item types in the two test forms.

By and large, the effects of explanations to the practice test questions were not effective in raising analytical scores. For only one item type (logical diagrams) did this treatment component have any significant effect, but this effect was found only for one of the two test forms.
Table 10

Effects of Various Test Preparation Materials on Analytical Scaled Scores and on Analytical Raw Subscores

<table>
<thead>
<tr>
<th>Independent Variable (Materials Received)</th>
<th>Test Form</th>
<th>Dependent Variable</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Analytical Scaled Score</td>
<td>Effect</td>
<td>SE</td>
<td>Effect</td>
<td>SE</td>
<td>Effect</td>
<td>SE</td>
<td>Effect</td>
<td>SE</td>
<td>Effect</td>
<td>SE</td>
</tr>
<tr>
<td>Tests</td>
<td>A</td>
<td>14.42**</td>
<td>3.60</td>
<td>1.20**</td>
<td>0.29</td>
<td>0.39**</td>
<td>0.15</td>
<td>-0.01</td>
<td>0.09</td>
<td>0.09</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>10.01**</td>
<td>3.45</td>
<td>1.10**</td>
<td>0.28</td>
<td>0.18</td>
<td>0.14</td>
<td>-0.00</td>
<td>0.10</td>
<td>-0.09</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Explanations</td>
<td>A</td>
<td>0.88</td>
<td>4.65</td>
<td>-0.00</td>
<td>0.37</td>
<td>0.07</td>
<td>0.19</td>
<td>0.07</td>
<td>0.12</td>
<td>-0.01</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>8.19</td>
<td>4.56</td>
<td>0.43</td>
<td>0.37</td>
<td>0.51**</td>
<td>0.19</td>
<td>0.09</td>
<td>0.13</td>
<td>-0.06</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Hints</td>
<td>A</td>
<td>10.60*</td>
<td>4.90</td>
<td>0.96*</td>
<td>0.39</td>
<td>0.29</td>
<td>0.20</td>
<td>-0.01</td>
<td>0.12</td>
<td>-0.03</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>8.58</td>
<td>4.80</td>
<td>0.32</td>
<td>0.39</td>
<td>0.57**</td>
<td>0.19</td>
<td>-0.01</td>
<td>0.13</td>
<td>0.13</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Encouragement</td>
<td>A</td>
<td>21.00**</td>
<td>3.22</td>
<td>1.73**</td>
<td>0.26</td>
<td>0.48**</td>
<td>0.13</td>
<td>0.13</td>
<td>0.08</td>
<td>0.07</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>22.11**</td>
<td>3.14</td>
<td>1.77**</td>
<td>0.26</td>
<td>0.57**</td>
<td>0.13</td>
<td>0.18*</td>
<td>0.09</td>
<td>0.10</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

* Analytical Scaled Score is expressed on a 200-800 converted scale.

*p<.05

**p<.01

Note. 2,301 examinees took test Form A and 2,168 took Form B. Additional covariates included in the analyses were verbal and quantitative scores and undergraduate major field.
Relationship of Preparation Time to Test Scores

The encouragement design makes it possible, in principle, to separate the actual effects of studying the materials from the preexisting differences among groups who decide to devote varying amounts of time to studying (apparent effects). In a purely descriptive analysis, the finding that those who devote more time to study achieve higher (or lower) scores might be attributed, for example, to a greater propensity to study among higher- (or lower-) ability candidates. In the present experiment, randomly selected halves of each materials group received additional encouragement to use the materials.

Merely receiving an additional practice test would not be expected to influence scores unless the candidate devoted time to using the material. Similarly, merely being encouraged to use the material could not influence scores directly, but could do so only through the mechanism of responding to encouragement by studying the available material. Since not all candidates who received the materials used them, the effect of receiving materials is a considerably attenuated estimate of the effect of both receiving and using them.

Thus the regression of score on time within any one treatment group is not sufficient information on which to separate the effects of study from those of self-selection within the group. However, according to the following model, when two or more randomly selected groups are given different levels of encouragement, and encouragement is effective in increasing the average time devoted to studying, we may compare group mean scores and time to determine the effect of study independent of the relationship of ability to study time within groups.

Let time studying, $T$, have a linear relationship to unobserved prior ability, $X$:

$$T = aX + b$$

Suppose that encouragement does not change the slope of this relationship, but adds a constant to the study time for each level of ability:

$$T' = aX' + c$$

Then, since the groups were randomly assigned, the expectation $(x) = (x)'$, and $(T' - T) = c - b$.

Now if test score, $Y$, has the same linear relationship to prior ability and study time in each group,

$$Y = d + eX + fT$$

and we wish to estimate $f$, the regression of score on time, we have
\[ Y' = d + e \cdot (X') + f \cdot T' \quad \text{and} \]
\[ Y = d + e \cdot (X) + f \cdot T \]

so \( (Y' - Y) = a + f \cdot (T' - T) \)

\[ = f \cdot (c-b) \]

and \( f = \frac{\overline{Y'} - \overline{Y}}{c-b} = \frac{\bar{Y}}{T} \)

Thus, the ratio of the difference in mean score to the difference in mean time is the desired estimator for a pair of groups. Generalizing to the \( n \)-group case, the slope of mean score on mean time is the desired estimator.

Figures 1-5 show for the analytical score and for each analytical item type subscore the relationship between average analytical test preparation time and test performance. Each data point represents the average test score, or item type subscore, and the average preparation time for all the candidates in a particular treatment condition. The average times were computed from the responses of candidates who returned questionnaires. Item type subscores have been converted to z-scores to facilitate comparisons among item types. The linear regression equation for the analytical score is \( \text{GRE-A} = 426.0 + 30.74T \) (\( N = 10, r = .94, p < .01 \)) where \( T \) is the average number of hours of preparation. For the item type subscores, the equations are as follows:

(1) Analysis of explanations = 11.16 + 2.38T (\( N = 10, r = .92, p < .01 \))

(2) Logical diagrams = 5.54 + 0.96T (\( N = 10, r = .88, p < .01 \))

(3) Analytical reasoning I = 4.77 + 0.09T (\( N = 10, r = .40, p = \text{n.s.} \))

(4) Analytical reasoning II = 1.90 + 0.06T (\( N = 10, r = .49, p = \text{n.s.} \))

Thus, average preparation time was significantly related to average analytical score and to performance on each of two analytical item types, but not on either of the two subtypes of the third analytical item type. The strong linear relationships do not suggest diminishing returns within the range of times considered here.

Although the correlations between preparation time and test performance were not significant for either of the analytical reasoning item subtypes, the relationship was in the positive direction for both subtypes. However, this relationship very likely reflects only that the analytical reasoning
Figure 1. Relationship of average GRE analytical scaled scores to average time spent in preparation.
Figure 2. Relationship of average GRE analysis of explanations subscores to average time spent in preparation.
Figure 3. Relationship of average GRE logical diagrams subscores to average time spent in preparation.
Figure 4. Relationship of average GRE analytical reasoning I subscores to average time spent in preparation.
Figure 5. Relationship of average GRE analytical reasoning II subscores to average time spent in preparation.
items follow the logical diagrams items in the separately timed fourth section of the test. Improvements in performance on the logical diagrams items, possibly through greater efficiency in responding to them, would enable examinees to devote more time to solving (and hence correctly answering) the analytical reasoning items that complete the test section.

Examinees' Reactions to Preparation Materials

For specific item types. Examinees were asked to indicate the item type for which preparation materials were most helpful (control-group examinees were asked to indicate the item type for which materials would have been most helpful). Nearly half (46.5%) of all candidates named the analysis of explanations type; 28.5 percent indicated logical diagrams; and 16.5 percent said analytical reasoning. Thus, this pattern is consistent with the actual effects on item subscores. Furthermore, the more materials examinees had received, the more likely they were to nominate analysis of explanations and the less likely to name analytical reasoning. Of the group that got all materials, 57.4 percent said the materials were most helpful for analysis of explanations items; only 11.3 percent thought they were most helpful for analytical reasoning.

Perceived effects. Candidates were asked to estimate the effects of the preparation materials on (a) reducing nervousness, (b) increasing analytical scores, and (c) improving speed in answering questions. Because they had not received any special preparation materials, control-group candidates were asked to estimate the probable effects of such material. Responses were on a four-point scale, ranging from helped (1) not at all, (2) a little, (3) some, and (4) a lot.

The not-encouraged control group gave the following average ratings: reducing nervousness (M = 2.29, SD = 1.01), increasing scores (M = 2.96; SD = .80), improving speed (M = 3.20; SD = .85). Thus, after they had taken the test, control-group candidates, who received no special preparation materials, sensed that, on the average, special materials would have some effect on GRE analytical scores and a somewhat greater effect on speed in answering questions, but considerably less effect on nervousness. However, all but one of the other nine treatment groups rated the actual effect on nervousness as somewhat higher than the control group expected. The two most positive groups had both been encouraged, one receiving an additional practice test (M = 2.80, SD = 1.05) and the other receiving all available materials (M = 2.77, SD = 1.01).

With respect to effects on test scores and speed in responding to questions, none of the treatment groups were, in actuality, as favorably disposed towards the materials as the control group's expectations would suggest. Means ranged from 2.23 to 2.79 for increasing test scores and from 2.49 to 3.17 for improving speed. Again, examinees who received all materials gave the highest ratings for both of these effects, and encouraged groups gave uniformly higher ratings than not-encouraged groups. Overall, the ratings for actual effects were systematically higher for each group.
with respect to improving speed than for either reducing nervousness or increasing scores, which received nearly identical average ratings.

Perceptions of specific materials. When asked to rate each of the specific preparation materials they had received, candidates gave comparably high ratings to all materials. On a four-point scale with values of (1) not at all helpful, (2) not too helpful, (3) somewhat helpful, and (4) very helpful, specific materials received the following average ratings: two sample analytical tests (M = 3.32, SD = .68 and M = 3.45, SD = .64), two sets of explanations to test questions (M = 3.43, SD = .70 and M = 3.50, SD = .68), and hints or strategies for analytical questions (M = 3.45, SD = .72). The GRE Information Bulletin received a lower, though still high rating (M = 3.04, SD = .70). Thus, test takers were very favorably disposed towards all the special materials we sent, rating each of them about equal in helpfulness.

To get another indication of reactions to the materials, candidates were asked if they would send for additional materials of these sorts under three different cost conditions: (a) if free of charge, (b) if $2 or less, and (c) if more than $2. Large majorities of candidates indicated they would request additional sample tests (86.3%), additional explanations (89.8%), and additional hints or strategies (90.9%). At a cost of up to $2, these percentages dropped to 46.4 percent, 57.3 percent, and 56.5 percent, respectively, but even at a cost of more than $2, significant percentages of candidates indicated that they would send for the materials (13.5%, 14.4%, and 18.5%, respectively). Because the question was phrased in terms of additional materials, beyond what candidates had already received, the percentages were generally somewhat higher for groups that had not received particular materials than for groups that had.

Summary and Discussion

Various special test preparation materials were designed for the analytical section of the GRE Aptitude Test and mailed, in accordance with a randomized experimental design, to samples of GRE candidates. The materials included extra practice tests, explanations to practice test questions, and hints or strategies for answering each analytical item type. Approximately half the candidates were encouraged to use the materials available to them; the remaining candidates were not given any encouragement.

GRE test takers had quite favorable reactions to each of the special preparation materials, which resulted in higher GRE analytical scores. The higher scores stemmed from improved performance on two analytical item types--analysis of explanations and logical diagrams--but not on either of the two subtypes of the third analytical item type called analytical reasoning. This finding does not guarantee, of course, that some other preparation would not have affected performance on the third item type.
Overall, the largest effects were associated with encouraging candidates to use the preparation materials that were available to them. For each of five treatment levels, candidates who were encouraged to use the materials reported spending more time preparing for the analytical section of the test. Generally, the more materials candidates received, the greater the amount of time they spent preparing for the test. Thus, receiving preparation materials apparently acted in a manner similar to encouragement. A strong positive relationship was observed between the average GRE analytical scores of the various preparation groups and the average time spent preparing for the test.

Some differences were noted between the effectiveness of the various treatment components. None, however, had as large an impact on analytical test scores as encouragement to prepare. An extra practice test was the next most effective of any of the treatment components, followed by strategies for answering analytical questions. Explanations for sample questions were, by and large, ineffective. Again, time may have been involved in these differential effects. For instance, completing the extra 50-minute practice test probably required more time than reading the explanations of correct answers.

As a result of the findings, the following conclusions were drawn:

1. Two of the four analytical item types found in the GRE Aptitude Test from 1977-1981 were found to be susceptible to improvement through special preparation. This finding is consistent with the results of a previous study of the effects of direct, face-to-face preparation of GRE candidates (Swinton & Powers, 1982).

2. The formal instructional nature of the special preparation did not appear to be a critical factor, however, in the improved performances on the susceptible item types. Self-study of the same materials had comparable effects on analytical scores. The effect (66 points) noted in the earlier instructor-based intervention that entailed seven hours of direct contact was only slightly greater than the 53-point difference in this study between the analytical scores of control-group candidates and those of the encouraged candidates who received all materials. This 53-point differential was associated with an average of slightly less than four hours of preparation, according to examinees' reports.

3. Time appeared to be the critical variable involved in higher analytical scores. Doing something seemed more important than any particular strategy. This notion is consistent with Messick and Jungeblut's (1981) finding of definite regularities between the size of SAT score effects associated with coaching and the amount of student contact time entailed in coaching
programs. Unlike Messick and Jungeblut (1981), however, we did not note diminishing returns, probably because of the more restricted range of average times considered here.

4. The effects observed in this study were highly specific. The special analytical preparation materials acted only on the analytical scores, not on verbal or quantitative scores, and only on particular analytical item types. These results suggest that increased familiarization with particular item formats, one of which was quite complex and both of which used fixed-response formats, was responsible for the effects rather than any more generalizable test-taking skills. That the feedback provided in explanations of test answers had little effect suggests that higher analytical test scores probably did not result from improvements in analytical abilities, but rather from heightened test sophistication.

Implications

If, as we suspect, the findings of this study generalize to other complex item formats, then the implications are clear for testing practice. Although extremely complex formats should probably be avoided in tests like the GRE Aptitude Test, there may be some circumstances in which the measure ent of complex abilities may require novel, and perhaps relatively complicated, item formats. For some kinds of measurement, complex fixed-format items of the kinds found coachable here may be easier to develop, since they do not require a new set of plausible incorrect options for each test question. If somewhat complex questions are to be used, examinees should be made aware of these complexities in preexamination familiarization materials, as is now the standard practice for most major testing programs, including the Graduate Record Examinations. But perhaps further steps should be taken to encourage examinees to use the materials available to them, by stressing the importance of becoming familiar with, especially, any complex item formats. The results of this study suggest that the effort directed by candidates towards test familiarization can be rather easily influenced by strategies like those used here and that this effort may pay off in higher scores. Thus, at least for prospective graduate students, who may generally be expected to be capable of independent study, the potential problem of equal access to effective test preparation may be rendered less critical. Whether or not these findings generalize to other candidate groups, or even to all GRE candidates, remains unanswered, as does the question of whether these results also apply to other test item types.

In contrast to numerous other studies of the effects of special test preparation, this study begins to unravel experimentally the effects associated with particular components of test preparation. The components
were found to be differentially effective, but the common feature underlying each component was thought to be time on task, i.e., time spent preparing, which was strongly related to analytical test scores. The final implication is that certain item types may require more preexamination familiarity than others and that, with this knowledge, examinees may effectively undertake preparation on their own. The problem of equity for these item types seems to be not one of candidates' differences in their ability to purchase special instruction from knowledgeable instructors, but rather one of candidates' awareness of (and willingness to meet) the need to devote time to test familiarization. The present study suggests, however, that the two item types found to be susceptible here may require excessive preparation, thus penalizing candidates who lack the time or the motivation to prepare.
References


APPENDIX A

1. Sample Analytical Test 1
2. Explanations to Sample GRE Analytical Test 1
3. Sample Analytical Test 2
4. Explanations to Sample GRE Analytical Test 2
5. Tips for Answering GRE Analytical Questions
SAMPLE ANALYTICAL TEST 1

(Section III and Section IV)
Sample Questions

1. Zimmer stole the books before the inspection system began.
   The answer to this question of average difficulty is A, because the statement is inconsistent with the information given in the situation and the result. According to the situation, the inspection system was initiated at the beginning of the fall term, and, according to the result, Zimmer stole the books during that term.

2. Zimmer dropped the books out of a second-story window into a clump of bushes and retrieved them after she left the building.
   Since the statement could be true given the information in the situation and the result, this statement is consistent with the information given, so the correct answer is not A. The next option to be considered is B. The statement is a possible explanation of the result, since Zimmer could have avoided the inspection system in this way. This question is an easy one.

3. During the term, if Zimmer carried a bookbag out of the library entrance door during regular hours, an inspector was supposed to check it.
   This statement is not inconsistent with the information given, so the correct answer cannot be A. Although the statement brings to mind two possible explanations of the result (that Zimmer removed the books after regular hours, or that a negligent inspector failed to check her bag), it does not actually state either of these possibilities. Therefore, the correct answer cannot be B. At this point, in fact, one might be tempted to conclude that the statement weakens a possible explanation of the result (an explanation stating that Zimmer stole the books by hiding them in her bookbag) and might therefore decide that D is the correct answer. However, according to the directions, the next option to be considered is C. The statement can be deduced from the information given since it is stated that inspectors had been ordered to search for concealed library books in bookbags. The correct answer to this question is therefore C.

4. The library had at one time kept two carbon copies of each checkout slip.
   This statement is not inconsistent with the information given, is not a possible explanation of the result, cannot be deduced from the information given, and does not support or weaken a possible explanation of the result. Information about the system used in the past is not relevant to any explanation of the result, so the correct answer is E.

5. The doors to the library fire escapes are equipped with alarms bells set off by opening the doors.
   This statement is not inconsistent with the information given, and it is not a possible explanation of the result. It cannot be deduced since it is not necessarily true given the information in the situation and the result. The correct answer is D because the statement weakens a possible explanation of the result. For instance, an explanation stating that Zimmer dropped the books from a fire escape to a confederate below would be unlikely if it were known that the fire escape doors could not be opened without setting off an alarm.
LOGICAL DIAGRAMS

Directions: In this part, you are to choose from five diagrams the one that illustrates the relationship among three given classes better than any of the other diagrams offered.

There are three possible relationships between any two different classes:

indicates that one class is completely contained in the other, but not vice versa.

indicates that neither class is completely contained in the other, but the two do have members in common.

indicates that there are no members in common.

Note: The size of the circles does not indicate relative size of the classes.

Example: Birds, robins, trees

The correct answer, (A), shows that one of the classes (trees) has no members in common with the other two. (No trees are either birds or robins, and no birds or robins are trees.) (A) also shows that one of the two remaining classes (robins) is completely included in the other class (birds).

The five possible choices for the sample problems are given below.

6. Nuts, pecans, forks

One of the classes (pecans) is completely contained in another (nuts). That is, all pecans are nuts, but the category of nuts includes other kinds of nuts as well as pecans. The third class (forks) has no members in common with either of the other two classes. Therefore, the correct answer is (C).

7. Adult women, infants, black-haired people

Since two of the classes (adult women and infants) have no members in common, the correct answer must include two circles that do not overlap. Black-haired people may be adult women, and adult women may be black-haired people, but neither class is completely contained in the other. The same is true of the relationship between infants and black-haired people. The correct answer is therefore (D), which shows that, while two of the classes have no members in common, each of them has some members in common with the third class.

ANALYTICAL REASONING

Directions: Each question or group of questions is based on a passage or set of statements. In answering some of the questions it may be useful to draw a rough diagram. Choose the best answer for each question and blacken the corresponding space on your answer sheet.

Questions 8–9

8. Which of the following represents the relative order of the notes from the lowest to the highest?

(A) XYWT
(B) YXWVT
(C) WYTXV
(D) YWVTX
(E) YXYWVT

The answer to this relatively easy question can be determined by reading the six given statements and understanding the relationships among them. The relationships may be clarified by drawing a simple illustrative diagram: T

V
X
W
Y

The diagram shows the relative order of the notes; since the question asks for the order from the lowest note to the highest, the correct answer is (B).

9. Which of the following statements about an additional note, Z, could NOT be true?

(A) Z is higher than T.
(B) Z is lower than Y.
(C) Z is lower than W.
(D) Z is between W and Y.
(E) Z is between W and X.

Since W and X are a half tone apart (statement 4), and since a half tone is assumed to be the smallest possible interval between notes (statement 1), Z cannot be between W and X. The correct answer is therefore (E). The question can also be answered by referring to the diagram.
Questions 10-11

(1) You cannot enter unless you have a red ticket.
(2) If you present a blue form signed by the director, you will receive a red ticket.
(3) The director will sign and give you a blue form if and only if you surrender your yellow pass to him.
(4) If you have a green slip, you can exchange it for a yellow pass, but you can do so only if you also have a blue form signed by the director.
(5) In order to get a red ticket, a person who does not have a driver's license must have a blue form signed by the director.
(6) You can get a yellow pass on request, but you can do so only if you have never had a green slip.

10. The above procedures fail to specify
(A) whether anything besides a red ticket is required for entrance
(B) whether you can exchange a green slip for a yellow pass
(C) the condition under which the director will sign the blue form
(D) how to get a red ticket if you have a yellow pass
(E) whether it is possible to obtain a red ticket if you do not have a driver's license

To answer this question, it is necessary to determine what information is NOT given. The information in options (B), (C), and (E) is given in statements 4, 3, and 5, respectively. The information in (D) is provided by statements 3 and 2 taken together. Statement 1, the only statement that specifically mentions a requirement for entrance, does not say that a red ticket is the only requirement for entrance. The correct answer therefore is (A).

11. Which of the following people can, under the rules given, eventually obtain a red ticket?

I. A person who has no driver's license and who has only a green slip
II. A person who has no driver's license and who has only a yellow pass
III. A person who has both a driver's license and a blue form signed by the director

(A) I only  (B) II only  (C) I and II only
(D) II and III only  (E) I, II, and III

The answer to this moderately difficult question requires combining information from several of the given statements. The rules specify only one way of obtaining a red ticket—the presentation of a blue form signed by the director (statement 2). The person described in III, therefore, can obtain a red ticket by presenting the blue form. The person described in II can obtain the blue form by surrendering the yellow pass and then presenting the blue form to obtain a red ticket. The person described in I, however, as one who does not have a driver's license, must have a signed blue form in order to get a red ticket (statement 5). The director will sign the blue form and give it only to someone who surrenders a yellow pass (statement 3). Since this person has only a green slip, he or she cannot get the yellow pass neither on request (statement 6) nor by exchanging his or her green slip for a yellow pass (statement 4). Therefore, a person who has no driver's license and who has only a green slip cannot obtain a red ticket. The correct answer is (D), II and III only.

Turn the page and begin work on the sample test, allowing yourself 25 minutes for Section III and 25 minutes for Section IV.
Directions: For each set of questions, a fact situation and a result are presented. Several numbered statements follow the result. Each statement is to be evaluated in relation to the fact situation and result.

Consider each statement separately from the other statements. For each one, examine the following sequence of decisions, in the order A, B, C, D, E. Each decision results in selecting or eliminating a choice. The first choice that cannot be eliminated is the correct answer.

A Is the statement inconsistent with, or contradictory to, something in the fact situation, the result, or both together?
If so, choose A.
If not,
B Does the statement present a possible adequate explanation of the result?
If so, choose B.
If not,
C Does the statement have to be true if the fact situation and result are as stated?
If so, the statement is deducible from something in the fact situation, the result, or both together; choose C.
If not,
D Does the statement either support or weaken a possible explanation of the result?
If so, the statement is relevant to an explanation; choose D.
If not,
E If not, the statement is irrelevant to an explanation of the result; choose E.

Use common sense to decide whether explanations are adequate and whether statements are inconsistent or deducible. No formal system of logic is presupposed. Do not consider extremely unlikely or remote possibilities.

Set 1
Situation: As far back as anyone can remember, logs were floated down the river every year in the summer months to the lumber mills in the southern part of the state of Quinnipiac. Even old-timers like eighty-year-old Bob, who had been in the lumber business all his life, thought that was the best way. In recent years, however, the river has become polluted with the insecticide sprayed on the trees, and environmentalists have observed that the insecticide is fatal to fish in the river. Environmentalists, determined to stop pollution of water, air, and land, campaigned vigorously to have the lumber industry use some other means of transportation. In 1975, for the first time, the logs were sent south by truck.

Result: Air pollution in the area increased.

1. The river flows into the ocean within five miles of the lumber mills.
2. So many trucks were needed to transport the logs that the air became polluted from their exhaust fumes.
3. In 1974, the logs were floated down the river.
4. Before 1975, there were fish killed by the insecticide in the river.
5. The environmentalists' primary complaint, prior to 1975, concerned the level of air pollution near the river.
6. Because gasoline-powered saws were used to cut logs into smaller pieces that could be carried by truck, the amount of sawdust and fumes in the air increased.
7. When the logs were floated down the river, the insecticide got into the water.
8. Once the river was no longer filled with logs, it became popular for motorboating, and the exhaust from the motorboats polluted the air.
9. The river flows south to north for its entire length.
10. By 1975, pollution control devices were required by the state of Quinnipiac for all motor vehicles.

Set 2
Situation: After serving two terms in the state legislature, Joan Deeker decided to devote more time to writing. However, she knew that it would be difficult to find a job related to politics that would provide both sufficient income and time to write. Since leaving college, she had constantly been involved in politics, first in city elections and then in her own campaigns. She had introduced a number of liberal social programs and was popular with voters. Since she was likely to win if she ran again, she was also concerned that her not running might hurt her party. When she learned that an appointment in political science at a local university was going to be offered to her and that Louise Jones, a highly qualified candidate, was willing to run in her place, she announced her decision not to run for reelection.

Result: That fall, Joan ran for election to her third successive four-year term in the state legislature.

11. The leaders of Joan's party convinced her that she could best serve the party by remaining in the legislature and devoting some of the time she had spent on committee work to writing her book.
12. The university appointment in political science was a special one intended to bring people with practical rather than academic experience to the university.
13. Joan’s last two terms in the legislature had been separated by a period of eight years.

14. When Joan learned that her teaching schedule at the university would allow little time for writing, she decided to run for reelection.

15. Prior to the election, Louise Jones suffered serious business reverses.

16. Louise Jones pleaded guilty to charges of tax evasion, and the leaders of the party convinced Joan that she was the only candidate who could win the election.

17. Joan’s social legislation had passed by a wide majority.

18. Joan’s decision not to seek reelection was based on her personal goals.

19. The state constitution did not prohibit members of the state legislature from running for more than two terms.

20. An organization of teachers had sent an investigating committee to the local university to look into charges that the university’s policies governing academic freedom were repressive.

Set 3

Situation: At least once each summer during the ten years since their house had been built, Thelma and Raymond Ashe discovered an inch or two of water in their shift, and the house almost collapsed. The damage was never serious, the Ashes worried about the potential for damage if a major storm should lead to more severe flooding. Therefore, they had a waterproofing compound applied to the cement walls and floor of the basement, with extra attention to cracks and holes. Then they had extra concrete added to the outer walls of the foundation. Finally, they had a trench dug around the house and out from it to carry water away from the foundation.

Result: During a torrential rain lasting three days, the basement remained dry, but the house and basement shifted, and the house almost collapsed.

21. The weather bureau, in predicting the storm, had underestimated its severity.

22. During the storm, water pressure on the outside of the cellar walls forced water into the basement through a crack that was only partially filled with waterproofing.

23. The trench was not lined with paving or concrete.

24. A storm such as the three-day rain was likely to occur in the area only once every fifty years.

25. Water carried away from the house by the trench eroded a portion of a hillside just below the house and caused a landslide.

26. Either the waterproofing or the extra concrete sealed the place or places where water had previously entered the basement.

27. The waterproofing and concrete reinforcement made the house, which was undermined by water, into an unstable boat.

28. The soil in which the cellar was built was sandy.

29. A creek near the Ashes’ house overflowed at a curve and flooded a low-lying area just below the house.

Set 4

Situation: The aircraft carrier USS Hornet was about to begin launching aircraft off the coast of Virginia under conditions of excellent visibility and calm seas. In order to take full advantage of the slight wind, its captain decided to turn right 40 degrees to head his ship directly into the wind. Hornet’s aircraft rescue escort, the destroyer USS Johnson, was at the time steaming on a parallel course 500 yards to the right of Hornet. If Hornet turned 40 degrees to the right without changing speed and Johnson maintained its present course and speed, the two ships would definitely collide. At the appropriate time, Hornet began its turn and signaled Johnson to maneuver to get out of its way. To avoid collision, Johnson’s captain ordered that the engines of his ship be slowed down to reduce Johnson’s speed by 10 knots.

Result: Hornet turned right, rammed the smaller Johnson, and crushed that ship’s left side.

30. Johnson’s captain ignored the signal from Hornet.

31. In issuing his orders, Johnson’s captain failed to take into account the time lag between slowing the engines and reducing the speed of the ship, so that his orders, though carried out, were ineffectual.

32. When their courses were parallel, both ships were heading due north.

33. Because its captain’s orders concerning the speed of the engines were misunderstood, Johnson did not slow down.

34. Most ship collisions occur under conditions of low visibility.

35. The wind, pushing both ships from the rear, had a greater effect on the larger Hornet and increased its speed.

36. In order to avoid a previously unnoticed small boat, Hornet’s captain ordered a sharper right turn than he had at first intended to make and by doing so nullified the effect of Johnson’s change in speed.

37. Some experienced engine-room personnel from Johnson had been left in port for special training.

38. Hornet’s change of course was intended to facilitate the launching of aircraft.

39. Johnson’s captain always spoke in a loud, clear voice.

40. Johnson’s captain had had five previous destroyer commands.
Directions: In this part, you are to choose from five diagrams the one that illustrates the relationship among three given classes better than any of the other diagrams offered.

There are three possible relationships between any two different classes:

- \( \bigcirc \bigcirc \) indicates that one class is completely contained in the other, but not vice versa.
- \( \bigcirc \bigcirc \bigcirc \) indicates that neither class is completely contained in the other, but the two do have members in common.
- \( \bigcirc \bigcirc \bigcirc \bigcirc \) indicates that there are no members in common.

Note: The size of the circles does not indicate relative size of the classes.

Example:

Birds, robins, trees

(A) \( \bigcirc \bigcirc \bigcirc \) (B) \( \bigcirc \bigcirc \bigcirc \bigcirc \) (C) \( \bigcirc \bigcirc \bigcirc \bigcirc \)

(D) \( \bigcirc \bigcirc \bigcirc \bigcirc \) (E) \( \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \)

The correct answer, (A), shows that one of the classes (trees) has no members in common with the other two. (No trees are either birds or robins, and no birds or robins are trees.) (A) also shows that one of the two remaining classes (robins) is completely included in the other class (birds).

Questions 1–7 are based on the following diagrams.

(A) \( \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \) (B) \( \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \) (C) \( \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \)

(D) \( \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \) (E) \( \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \)

8. Males, females, girls
9. Waitresses, uncles, bird-watchers
10. Sharks, mackerel, creatures that live in water
11. Students who play in a band, tenth graders, candidates for student government office
12. Gliders, engine-powered craft, motorboats
13. Scientists, moviegoers, biologists
14. Biplanes, airplanes, supersonic jetliners
15. People who work with wood, carpenters, sculptors

Questions 8–15 are based on the following diagrams.

(A) \( \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \) (B) \( \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \) (C) \( \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \)

(D) \( \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \) (E) \( \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \)

1. Cacti, plants, minnows
2. Married women, females, clerical workers
3. Dishonest persons, males, doctors
4. Owls, ravens, feathered creatures
5. Lions, sparrows, birds
6. Musicians, violinists, ice hockey fans
7. People, dentists, Americans

GO ON TO THE NEXT PAGE
Directions: Each question or group of questions is based on a passage or set of statements. In answering some of the questions it may be useful to draw a rough diagram. Choose the best answer for each question and blacken the corresponding space on your answer sheet.

Questions 16–17
In order to remodel her house, Joan has hired a plumber, a brickmason, an electrician, and a painter. The plumber is available only on Monday morning, all day Tuesday, and on Wednesday afternoon. The brickmason is available only on Monday afternoon, Wednesday morning, and all day Friday. The electrician is available only all day Wednesday, Thursday, and Friday. The painter is available only all day Tuesday and on Friday morning.

16. One of the workers asks to spend an entire day working alone in the house. Joan can grant this request, without losing any of another worker’s available time, if the worker making the request is the
(A) plumber and the day is Monday
(B) painter and the day is Tuesday
(C) plumber and the day is Wednesday
(D) electrician and the day is Thursday
(E) brickmason and the day is Friday

17. The painter will need only half a day to do the job required, but cannot begin until all the other workers have finished. If the work begins on Monday, what is the earliest possible time the painter could begin?
(A) Tuesday afternoon
(B) Wednesday morning
(C) Thursday afternoon
(D) Friday morning
(E) Friday afternoon

Questions 18–20
Recent studies which prove that one may induce violent behavior in rats by crowding them together lend support to the view that the rising rate of violent crime in the cities is the result of crowding.

18. The argument above makes which of the following assumptions?
I. Rising rates of violent crime are a national catastrophe.
II. Conclusions about human behavior may be drawn from rat behavior.
III. It is not inhumane to do psychological experiments on rats.
(A) I only  (B) II only  (C) III only
(D) I and II only  (E) I and III only

19. The argument would be strengthened by pointing out that
(A) rats are often a serious health problem in the city
(B) controversy exists over how to compute crime figures
(C) only one breed of rat was tested in the studies
(D) nonviolent crime is also on the rise
(E) a similar study of elephants produced a similar result

20. The argument would be weakened by pointing out that
(A) the urban crime rate has increased whereas crowding has decreased
(B) a blue-ribbon commission has been studying the causes of violence
(C) numerous independent studies confirmed the effects of crowding on rats
(D) many crimes are not reported to the police
(E) government rat-control measures have become increasingly effective

Questions 21–23
(1) Two men (George and Dave) and four women (Betsy, Ann, Ellen, and Carla) are seated around a circular table with ten seats.
(2) No two people of the same sex are sitting in adjacent seats.
(3) Carla sits next to George.
(4) Ellen sits between George and Dave and next to each of them.
(5) There is an empty seat next to Dave.
(6) There are fewer than three empty seats between Betsy and Ann.

21. Which of the six statements repeats information available elsewhere in the set of statements?
(A) (2)  (B) (3)  (C) (4)  (D) (5)  (E) (6)

22. If the number of empty seats between Ann and the next person on her right is added to the number of empty seats between Ann and the next person on her left, the sum must be either
(A) one or two  (B) one or three  (C) two or three
(D) two or four  (E) three or four

23. Leonora takes a seat at the table, and she does not sit next to another woman. If no one has moved to accommodate her, it must be true that
(A) Leonora sits next to Dave
(B) Leonora sits next to George
(C) there is one empty seat between Leonora and Ann
(D) there is one empty seat between Leonora and Betsy
(E) there are two empty seats between Ann and Betsy

Questions 24–25
If people continue to reproduce at their present rate, the earth’s population will double in 35 years. Therefore, it is not enough for us in the United States to keep our population from growing; we must decrease our birth rate.

24. The argument above is based on the assumption that
(A) the present world population is at an optimum size
(B) most Americans are anxious to decrease the birth rate
(C) government regulation of population growth is inevitable
(D) doubling the earth’s population is undesirable
(E) the population explosion is unmanageable
25. The argument presented would be strongest if it were true that
(A) the birth rate in the United States has been steadily rising
(B) infant mortality in the United States has been steadily decreasing
(C) a drop in the birth rate of the United States would significantly affect world population
(D) the United States has already decreased its population more than has any other country in the world
(E) the population of the United States has doubled in the past 35 years

Questions 26–30
Professor Green is choosing a four-member research team from graduate students F, G, and H and undergraduate students W, X, Y, and Z. There are to be at least two graduate students on the team. Student F refuses to work with student Y. Student G refuses to work with student W. Student Y refuses to work with student Z.

26. If student Y is chosen, which of the following must be the other members of the research team?
(A) F, G, and X  (B) G, H, and W  (C) G, H, and X
(D) G, H, and Z  (E) H, W, and X

27. If student Z is chosen and student F is rejected as a member of the research team, which of the following must be the members of the research team?
(A) G, H, W, and Z  (B) G, H, X, and Z
(C) G, H, Y, and Z  (D) G, X, Y, and Z
(E) H, W, X, and Z

28. If student G is chosen and student H is rejected as a member of the research team, which of the following statements must be true?
I. Student X is chosen.
II. Student Z is chosen.
(A) I only  (B) II only  (C) Either I or II but not both
(D) Both I and II  (E) Neither I nor II

29. Which of the following must be true?
I. Students W and Y never work together.
II. Students X and Y always work together.
III. If student W works, student H works.
(A) I only  (B) I and II only  (C) I and III only
(D) II and III only  (E) I, II, and III

30. Which of the following must be true?
I. If student F works, student Z works.
II. If student F does not work, student W does not work.
III. If student F does not work, student H works.
(A) I only  (B) III only  (C) I and II only
(D) I and III only  (E) II and III only

STOP

IF YOU FINISH BEFORE TIME IS CALLED YOU MAY CHECK YOUR WORK ON PARTS A AND B OF THIS SECTION ONLY. DO NOT WORK ON ANY OTHER SECTION IN THE TEST.
How to Score Sample Analytical Aptitude Tests

Your answers to the test questions will yield "raw" analytical ability scores directly, and these raw scores may be converted to GRE "scaled" score ranges.

To determine your raw scores on the sample test, compare your answers with the answer key below and count the number of right and wrong responses in each section. There is no need to count the questions you omitted because they do not affect your scores.

The analytical sections of the test, Section III and IV, provide five optional answers for each question, and the raw score is the number of right answers minus one-fourth of the number of wrong answers. For example, if you had 49 right responses and 17 wrong responses in Sections III and IV, your raw analytical ability score would be 49 minus one-fourth of 17 or 44.75, which rounds to 45, the nearest whole number.

Use the table at right to find the ranges of GRE scaled scores that correspond to the ranges within which your analytical raw score falls. Thus, the raw analytic ability score of 45 (in the above example) corresponds to a scaled score range of 520 to 650. Note that the analytical ability scaled score range is obtained from the table, by using the sum of the raw scores for Sections III and IV.

When you take the GRE Aptitude Test, your scores are likely to differ from the scores you obtained on the sample test. Individuals perform at different levels at different times for reasons unrelated to the test itself. In addition, test scores may differ because sample test conditions can at best only imperfectly simulate the conditions that will prevail in an actual test administration.

After you have scored your sample test, analyze your performance with a view to improving your performance on the Aptitude Test you will actually take in the future.

- Did the time you spent reading directions make serious inroads on the time you had available for answering questions? If you become thoroughly familiar with the directions in the sample test, you will be able to spend less time reading directions in the actual test.

- Did you run out of time before you reached the end of a section? If so, could you pace yourself better in the actual test? Remember, not everyone finishes all sections and accuracy is also important.

Look at the specific questions you missed. In which ones did you suffer from lack of knowledge? Faulty reading of the question? Faulty reasoning? Awareness of causes of error may enable you to avoid some errors when you actually take the Aptitude Test.

### GRE Sample Analytical Aptitude Test 1 Conversion Table*

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*Approximately 99 percent of those taking recent forms of the Aptitude Test earned analytical ability scores below 730.

### ANSWER KEY Sample Analytical Test 1

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</table>
EXPLANATIONS TO SAMPLE GRE ANALYTICAL TEST 1

(Test Included in the GRE Information Bulletin)
Explanations to Analytical Questions in the GRE Sample Aptitude Test 1 (Section III)

Set 1

1.E. The fact that the river flows into the ocean within five miles of the lumber mills is not relevant to explaining why air pollution increased. A far-fetched reason why this fact might be relevant to explaining the result is that trucks may be more polluting over short distances than long ones because they tend to require tune-ups (which might be neglected) when they travel over short distances. However, this reason contains too much conjecture to be plausible or relevant.

2.B. The many trucks needed, and the exhaust they produce, would seem to adequately explain the air pollution increase.

3.C. This statement can be inferred (deduced) from the statements in the situation that trucks were not used until 1975 and that "as far back as anyone could remember" logs were floated down the river.

4.C. The statement is neither inconsistent with anything stated nor does it explain the result. However, it can be deduced from the facts that "the river has become polluted with the insecticide sprayed on trees" and that "the insecticide is fatal to fish."

5.A. This statement, that environmentalists' major complaint was air pollution, would seem to be inconsistent with the sequence of events in the situation. No one concerned primarily with air pollution would be likely to take steps that would increase exhaust from trucks.

6.B. The fact that more sawing was done, thus producing more sawdust and fumes, would seem to be a possible adequate explanation of the increase in air pollution.

7.C. This statement can be deduced from the situation in which it is stated that the river has become polluted with insecticides sprayed in trees.

8.B. An increase in motorboating (and therefore an increase in exhaust) could possibly explain the increased air pollution.

9.A. This statement clearly contradicts the information given in the situation that states that the logs were sent south by truck. Thus, in order to float the logs south, the river could not flow north for its entire length.

10.D. The fact that pollution control devices were required by 1975 would weaken considerably any explanation stating that the increased air pollution was caused by increased traffic. Therefore, it would also weaken statement #2 as an explanation.
11.B. The statement presents a possible adequate explanation for Joan's running for election again. By convincing her that she should devote to her writing some of the time she normally would spend on committee work, the party could very well have persuaded her to run, since the passage suggests that Joan wished to "devote more time to writing."

12.E. The nature of Joan's appointment at the university is not relevant to explaining why she changed her mind and decided to run for reelection, especially since she had been offered the appointment before she had initially decided not to run.

13.A. The statement that Joan's two terms were separated by eight years contradicts the result that Joan was elected to her third successive term.

14.B. Learning that her teaching schedule would allow little time for writing is a possible adequate explanation of Joan's deciding to run for election again, since the situation suggests that she was interested in a job providing both sufficient income and time to write.

15.D. Although the fact that Louise Jones, who was willing to run in Joan's place, suffered serious business reverses does not adequately explain why Joan ran again, it does support the possible explanation that her business reverses made Louise Jones unwilling to run in Joan's place, thus possibly making Joan the only qualified candidate.

16.B. Louise Jones' inability to run, making Joan the only qualified candidate, is an adequate explanation of the result. The situation states that Joan was "concerned that her not running would hurt the party," suggesting the possibility that party members could appeal to her loyalty and persuade her to run.

17.E. The fact that her social legislation passed easily is not relevant to explaining Joan's reconsidering to run for election. Only some unlikely factor could make this fact relevant to the result. For example, if Joan did not like challenges, the fact that her legislation passed easily might be relevant to her seeking reelection. However, this is not very likely.

18.C. That her decision not to seek reelection was based on her personal goals clearly follows (is deducible) from the statement that she wanted "to devote more time to writing," a personal goal.

19.C. This statement can be deduced from the fact that Joan did in fact run, and was re-elected for a third term.
20.D The fact that the university's policies on academic freedom were under investigation supports the explanation that the university appointment became less attractive because of the suspicion of a repressive policy. Joan may, therefore, have reconsidered accepting the appointment, thus removing a previously attractive alternative to running for reelection.

* * *

Set 3

21.E The weather bureau's faulty forecast has no bearing on why the house shifted and collapsed, although, of course, the actual severity of the storm itself could certainly be relevant.

22.A The statement that there was a partially filled crack (that was instrumental in the collapse) contradicts the fact that the waterproofing compound was applied with "extra attention to cracks and holes."

23.D A failure to line the trench supports the explanation that the trench was not capable of performing the job for which it was intended, i.e., to carry water away from the foundation. Thus, excess water pressure could have resulted, causing the collapse.

24.E How often such severe storms occur is irrelevant to explaining the collapse of the house. The severity may be relevant, but not the frequency.

25.B The fact that water was carried away from the house to a hillside, which subsequently eroded to cause a landslide, would seem to be a possible adequate explanation of both the dry basement and the house's collapse.

26.C That either the waterproofing or the concrete sealed the leaks is deducible since the basement now remained dry after a severe storm and since the only materials used to seal the cracks were the waterproofing compound and the concrete.

27.B This "unstable boat theory" could be a possible adequate explanation. The fact that the reinforcement seemed to prevent the leaks, keeping the basement dry, but possibly diverting the water under the house, would seem to support the "boat" theory.

28.D The fact that the house was built on sand, which is more susceptible to shifting than other types of soil, would support an explanation of the following kind: that the water was diverted under the house, causing the slightly unstable sand to shift. The fact that the house was built on sand does not itself adequately explain the house's shift and subsequent collapse, since the sand would first have to become wet in some manner (e.g., by a diversion of water resulting from the new trench or from the application of waterproofing).
29.D. The fact that a nearby creek overflowed and flooded an area just below the Ashe's house is relevant to the possible explanation, for example, that this flooding creek caused the hillside to erode. Knowing that the creek overflowed does not provide quite enough information to adequately explain the fact that the house collapsed.

* * *

Set 4

30.A. The statement that Johnson's captain did not heed the signal from the Hornet contradicts the fact that he did order that the Johnson's engines be slowed.

31.B. This statement is a possible adequate explanation of the collision of the ships. The passage states that the ships would definitely collide if the Johnson maintained its present course and speed. An ineffectual order would do nothing to prevent the collision.

32.E. The direction of travel (north) is not relevant to explaining the collision. As long as the two ships' orientation remained the same, the same result would be expected regardless of the direction of travel.

33.B. A misunderstanding of the captain's orders about reducing the ship's speed could have resulted in an inadequate adjustment (or none at all), thus adequately explaining the inevitable collision.

34.E. The statement is irrelevant to the explanation of the crash because the accident occurred under "conditions of excellent visibility."

35.A. The statement contradicts the fact that the Hornet had turned to head "directly into the wind."

36.B. Given the orientation of the two ships, a sharper right turn could quite possibly have nullified the effect of the Johnson's slowing down, thus allowing the crash.

37.D. The fact that experienced engine-room staff had been left behind does not itself adequately explain why the collision happened. However, it is relevant to any explanation that the crash occurred because of a misunderstanding of, or a failure to carry out, the captain's orders. Presumably, the fact that less experienced staff would be working in the engine room would support this explanation.

38.C. The statement can be deduced or inferred from the fact that the Hornet was "about to begin launching aircraft" and that she turned "to take full advantage of the slight wind."

39.D. That the Johnson's captain always gave orders loudly and clearly would weaken any explanation that his orders were not heard (or were not heard clearly) and thus were not followed (or were followed incorrectly).
40.D. The fact that the Johnson's captain had had five previous destroyer commands (and was thus experienced) weakens the explanation that he made a faulty judgment (because of lack of experience) and ordered a course of action that was insufficient to avoid the crash.
Explanations to Analytical Questions in the GRE Sample Aptitude Test 1 (Section IV, Part A)

1.D. The correct diagram shows that all cacti are plants, but that no plants or cacti are minnows and no minnows are plants (or cacti). The minnows circle does not intersect the plants circle because any minnow is logically excluded from the category of plants. It is logically impossible to be a cactus but not a plant, so the cacti circle is completely contained in the plant circle.

2.C. The diagram shows that all married women are females, that females and married women can be clerical workers, and that clerical workers can be females and married women. Even if the last married female clerical worker quit her job yesterday, there is no logical reason that a married woman cannot be a clerical worker, so the diagram must have a space to show this possibility.

3.E. Males can be doctors and/or dishonest persons. Likewise, doctors can be males and/or dishonest and dishonest persons can be males and/or doctors. There also could be males who are neither dishonest nor doctors, doctors who are neither males nor dishonest, and dishonest people who are neither doctors nor males. Even if there did not happen to be any dishonest doctors, there is no logical reason that they cannot exist, so the dishonest persons and the doctors areas must overlap to show this possibility. The most common error is to forget that an object can be in many classifications at the same time. Just because an individual is a male, this does not mean he can't also be a doctor, or dishonest.
4.B.

All owls and all ravens are feathered creatures, but there are no feathered creatures that are both owls and ravens.

5.D.

All sparrows are birds, but no lions are birds, and no birds are lions.

6.C.

All violinists are musicians (although not all musicians are violinists). Some musicians (and also some violinists) could be ice hockey fans.

7.A.

All dentists and all Americans are people and some (but not necessarily all) dentists are Americans.

8.E.

All girls are females, but some females are not girls (e.g., women), and no one is both a male and a female.
9.B.

No one is both an uncle and a waitress, but there can be some waitresses as well as some uncles who watch birds. However, neither all uncles nor all waitresses are necessarily bird-watchers. Likewise, not all bird-watchers are either waitresses or uncles.

10.C.

All sharks and all mackerel live in water (there are, of course, other creatures that also live in water). However, no creature that lives in water is both a shark and a mackerel.

11.D.

Students who play in a band can be tenth graders or candidates for student government office or both. Likewise, tenth graders can either play in a band or be candidates for student office or both. Also, candidates could play in the band or be tenth graders or both.

12.E.

All motorboats are engine-powered crafts (there are also other engine-powered crafts that are not motorboats), but no gliders are engine-powered.
13.A.

All biologists are scientists (others, e.g., chemists, are also scientists). Scientists and biologists could also go to the movies. But there are also some moviegoers who are not scientists.

14.C.

All biplanes and all supersonic jetliners are airplanes, but no biplane is a jetliner, and no jetliner is a biplane.

15.A.

All carpenters work with wood, as do some sculptors (some sculptors do not necessarily work with wood). Some sculptors may also be carpenters.
10.

Explanations to Analytical Questions
in the GRE Sample Aptitude Test 1
(Section IV, Part B)

16.-17. A diagram such as the following may be quite helpful here. Numbering each of the information statements may also be useful. The dimensions of the problem that stand out (and could form the basis of a diagram) are jobs (plumber, etc.) and days of the week. The next step would be to complete the chart as follows, successively entering each bit of information given in the statements.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.m.</td>
<td>p.m.</td>
<td>a.m.</td>
<td>p.m.</td>
<td>a.m.</td>
</tr>
<tr>
<td>Plumber</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Brickmason</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Electrician</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Painter</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

The checkmarks (X) indicate the times at which each of the various workers is available.

16.D. Elimination of choices by looking at the completed diagram can be used to answer this question. Choice A is incorrect because the plumber is available only half a day on Monday. Choice B is incorrect because, although the painter is available all day Tuesday, in order for him to be alone the plumber's available time (all day Tuesday) would be lost. Choice C is incorrect because the plumber is available for only half a day on Wednesday. Choice D is correct because the electrician is available Thursday, but no other worker is available then, so no one's time can be lost. Choice E is incorrect, although the brickmason is available all day Friday, he would take up the available time of both the electrician and the painter.

17.D. The painter can come for a half day at three times: Tuesday morning, Tuesday afternoon, or Friday morning. However, if all the other workers are to complete their work first, the painter cannot come on Tuesday because the electrician will not have completed his task. Hence, the painter must come on Friday morning.

18.B. The argument does not make any judgments about the seriousness of the rise in crime (e.g., whether it is a catastrophe). Hence assumption I is not made.

Assumption II that conclusions about human behavior can be drawn from rat behavior is made. The phrase "lend support to the view" suggests that conclusions are being drawn.

Assumption III about the humaneness of experiments on rats does not underlie (is not necessary to make) the argument.

19.E. Since the acceptance of the argument depends on one's willingness to generalize the results of studies from one species (rats) to another (humans), the argument would be strengthened by demonstrating the same results for another species (elephants).
20.A. The fact that the urban crime rate has, in fact, increased while crowding has decreased would very strongly weaken the argument, which states in part that the rising crime rate is the result of crowding.

21.-23. The information given in statements (1) to (6) can be represented in a diagram as follows:

![Diagram](image)

The first concrete piece of information for the construction of the diagram comes from statement (1) that there are ten seats. The next comes from statement (3) that Carla sits next to George, and the next from (4) that Ellen is between George and Dave and next to each. Next, from (5) there is an empty seat next to Dave. At this point everyone has been seated except Betsy and Ann. Since all the concrete information given has been entered on the diagram, it may now help to read each of the questions.

21.E. Statement (6) repeats information given elsewhere in the statements. From statements (1), (3), (4), and (5) we have the information that has been entered on the diagram. We also know from (2) that neither Ann nor Betsy is sitting next to Carla. Hence, this seat must be empty and can be so designated on the diagram. Thus, there have to be fewer than three seats between Ann and Betsy.

22.C. We know that there are several possible ways to seat Ann and Betsy without violating the rule that they cannot sit in adjacent seats, since they are of the same sex (without loss of generality, we can assume that Ann is to the right of Betsy). Numbering the seats 1-4, the permissible seating patterns are:

<table>
<thead>
<tr>
<th>Seat</th>
<th>Seat</th>
<th>Seat</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Ann</td>
<td>1 Ann</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2 Ann</td>
<td>2</td>
</tr>
<tr>
<td>3 Betsy</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4 Betsy</td>
<td>4 Betsy</td>
<td>4</td>
</tr>
</tbody>
</table>

For each of the three possible patterns, it can be verified that the total number of empty seats between Ann and the person on her right and on her left is either two or three.
23.A. We know that, regardless of which of the three ways Ann and Betsy are seated, Lenora cannot be in seats 1, 2, 3, or 4 if she is not to be next to Ann or Betsy, thus following the "same sex" rule. In addition, for the same reason, she cannot sit in the empty seat next to Carla. Thus the empty seat next to Dave is the only remaining choice.

24.D. The argument that we must decrease the U.S. birth rate rests on the assumption that doubling the earth's population is not desirable. This is implicit in the conclusion that we must do even more than keep our population from growing.

25.C. The argument is for reducing the U.S. birth rate, the assumption being that this would affect the world population growth rate. If this assumption were true, it would certainly strengthen the argument.

26.–30. Again, a diagram might help here, although a formal chart seems somewhat less useful for this problem. Some shorthand notation might help, however, to designate the combinations of students that are not permitted (i.e., G, W, and Y).

26.C. We know that Y is an undergraduate who cannot be teamed with either F or Z. Thus the three remaining members of the team must come from G, H, W, or X. Since the team is to have two graduate students, we must pick the only two graduate students left, G and H. Thus we could have either Y, G, H, and W, or Y, G, H, and X. However, we noted above that G and W could not be put together. Therefore, Y, G, H, and X must be the team.

27.B. If graduate student F is rejected, we must again choose the two remaining graduate students, G and H, in order to satisfy the rule of having two graduate students on the team. Thus picking Y we could have the following teams:

(1) G H Z W
(2) G H Z X
(3) G H Z Y

However, combination (1) is not permitted because, checking back, GW is not allowed. Likewise (3) is out because YZ is not permitted. Hence, (2) is the correct combination.

28.D. If H is rejected, we must have the other two graduate students, F and G. Thus we could have a number of combinations as follows:

(1) F G W X
(2) F G W Y
(3) F G W Z
(4) F G X Y
(5) F G X Z
(6) F G Y Z
However, all but one, (5), of the six combinations has one of the nonpermissible pairings FY, GW, or YZ. Therefore, the only two members that can be paired with F and G are X and Z. Hence, both statements I and II must be true.

29.C. First, assume that W and Y may work together. Then, the following combinations would be possible if we are to pick two graduate students from F, G, and H.

(1) W Y F G
(2) W Y F H
(3) W Y G H

However, all three combinations contain at least one nonpermissible pairing (FY and/or GW). Thus, W and Y may never work together and I is true.

Next, we know from question 28 that X and Z work together with two graduate students, G and F. Thus, X does not always work with Y, so II is not true.

Next, we know that if W works, then graduate student G does not work, since GW is not permissible. Thus, the other two graduate students, F and H, must work with W, so III is true. Hence, I and III only are true.

30.E. First, the only thing we appear to know in regard to I is that if F works, then Y does not, but we do not necessarily know if Z works. Hence, I does not seem to be true necessarily. (We can confirm this by finding a permissible combination containing F but not Z. The combination F G H X is one such combination.)

Next, if graduate student F does not work, we know that the other two graduate students, G and H, must work. When G works, however, W does not, because GW is not permissible. Hence, II and III only must be true.
SAMPLE ANALYTICAL TEST 2
(Section III and Section IV)
SECTION III
Time—25 minutes
40 Questions

Directions: For each set of questions, a fact situation and a result are presented. Several numbered statements follow the result. Each statement is to be evaluated in relation to the fact situation and result.

Consider each statement separately from the other statements. For each one, examine the following sequence of decisions, in the order A, B, C, D, E. Each decision results in selecting or eliminating a choice. The first choice that cannot be eliminated is the correct answer.

A Is the statement inconsistent with, or contradictory to, something in the fact situation, the result, or both together?
   If so, choose A.
   If not,

B Does the statement present a possible adequate explanation of the result?
   If so, choose B.
   If not,

C Does the statement have to be true if the fact situation and result are as stated?
   If so, the statement is deducible from something in the fact situation, the result, or both together; choose C.
   If not,

D Does the statement either support or weaken a possible explanation of the result?
   If so, the statement is relevant to an explanation; choose D.

E If not, the statement is irrelevant to an explanation of the result; choose E.

Use common sense to decide whether explanations are adequate and whether statements are inconsistent or deducible. No formal system of logic is presupposed. Do not consider extremely unlikely or remote possibilities.

GO ON TO THE NEXT PAGE.
Situation: From 1960 to 1970, Bartsville's two major newspapers, the Sun and the Bugle, competed vigorously for dominance of the local newspaper industry. Although both papers constantly sought out and claimed increasing circulation in all parts of the city and in its suburbs, both papers maintained about the same circulation, and their combined circulation remained constant. The Sun, owned by a conservative newspaper syndicate from out of state, was most popular in the city's outlying suburbs. The Bugle, locally owned, circulated most heavily in the older, less-affluent inner city, including the Spanish-speaking west side. Both papers cost 50 cents on Sundays and 20 cents on other days. The Sun, the city's only picture newspaper, featured photojournalism.

Result: By 1974, the Bugle's circulation had risen to 130,000 and the Sun's had fallen to 85,000.

1. **The Bugle was not a picture newspaper in 1965.**
2. **From 1970 to 1974, the Sun alienated large numbers of its readers by changing its editorial policies to reflect the views of small interest groups.**
3. **The Bugle's circulation rose even though the paper's management had made only sporadic efforts to increase it.**
4. **The Sun is trying to regain its previous strength through an innovative circulation campaign.**
5. The Sun was taken over in 1972 by a local publisher who was new to the newspaper business and could not maintain an efficiently operating organization.
6. Both the Sun and the Bugle rely on advertising for financial survival.
7. Unlike many United States cities, Bartsville in 1974 supported two competing major newspapers with equal circulations.
8. From 1960 to 1970, the newspapers claimed more circulation than they actually had.
9. Some drivers of newspaper delivery trucks were on strike for four weeks during 1974.
10. Prior to 1970, price was not an important factor in the race between the two newspapers for dominance in the local market.

GO ON TO THE NEXT PAGE.
SUMMARY OF DIRECTIONS:

For each statement, examine the following sequence of decisions, in the order A, B, C, D, E. The first choice that cannot be eliminated is the correct answer.

A  Is the statement inconsistent with, or contradictory to, something in the fact situation, the result, or both together?  
   If so, choose A.  
   If not,

B  Does the statement present a possible adequate explanation of the result?  
   If so, choose B.  
   If not,

C  Does the statement have to be true if the fact situation and result are as stated?  
   If so, the statement is deducible from something in the fact situation, the result, or both together; choose C.  
   If not,

D  Does the statement either support or weaken a possible explanation of the result?  
   If so, the statement is relevant to an explanation; choose D.

E  If not, the statement is irrelevant to an explanation of the result; choose E.
In an attempt to reduce air pollution, particularly the carbon monoxide produced by automobiles, transit officials in Jackson City implemented a plan to make the city's public transportation system more attractive and convenient. Nonpolluting electric trains and new buses with efficient antipollution devices were put into service. Bus routes were extended to all parts of the city, and subway stations were cleaned and repainted. The federal government provided part of the funds for the improvements, and a transit fare increase supplied the remainder.

In January 1977, one year after Jackson City's public transit system was improved, automobile use and air pollution levels in the city were higher than before.

11. The transit system improvements raised the morale of transit employees.
12. The transit system improvements were funded entirely by fare increases.
13. The higher fares caused a drop in the use of mass transit facilities and a substantial increase in the use of private automobiles.
14. The new electric trains contributed substantially to air pollution in Jackson City.
15. The state government refused to help Jackson City obtain funds to improve its mass transit system.
16. Several factories in Jackson City that had been emitting air pollutants were closed shortly after the transit system was improved.
17. The transit improvements included bus service for a larger proportion of the city than before.
18. Because of a shortage of low-sulphur coal, several new factories that began operating in Jackson City during 1976 were allowed to burn coal that substantially increased air pollution levels.
19. In the first nine months after Jackson City's public transit system was improved, there was a substantial decrease in the unemployment rate in the surrounding area.
20. Public protest against higher transit fares prevented the completion of the improvements.

Laura Pinanski had a gold watch that she usually wore every day, on her left arm. It was a family heirloom, and her sister envied her possession of it. One afternoon at work, Laura went to buy stamps at the mail room in the building where she worked. The mail room closed each day at three o'clock. As she was returning to her office, a woman she did not know asked her what time it was; Laura replied, "Quarter after three." After work, as Laura was waiting in the building's parking lot for the bus that she rode home each day, she stepped back quickly to avoid a car that was leaving the lot. She stumbled over a curb, hit her head on a rock, and became unconscious. The driver of the car did not see her fall, but Thomas Smith found her and telephoned for aid. Laura was taken by ambulance to a hospital.

When Laura awoke in a hospital room about 5:15 that evening, she was dismayed to find her watch missing.

21. The watch had been given to Laura by her mother.
22. Laura worked late that afternoon and left the building at a quarter of six.
23. Laura did not expect her watch to be missing when she awoke in the hospital room.
24. There was a wall clock in the hallway behind the stranger who asked Laura the time.
25. Laura's hospital roommate told Laura the time when Laura awoke in the hospital room.
26. Laura's co-worker, Gail Madison, complimented Laura on the watch during the early afternoon.
27. Before calling for aid, Thomas Smith took Laura's watch, as well as some money from her purse.
28. When Laura was admitted to the hospital, the hospital's usual procedure of removing jewelry and valuables from patients and putting the items in a safe was followed.
29. Laura's sister worked in the same building where Laura worked.
30. Laura was disoriented because of the blow to her head, and she forgot that she had left the watch for repair the previous day.
SUMMARY OF DIRECTIONS:

For each statement, examine the following sequence of decisions, in the order A, B, C, D, E. The first choice that cannot be eliminated is the correct answer.

A  Is the statement inconsistent with, or contradictory to, something in the fact situation, the result, or both together?  
   If so, choose A.  
   If not,

B  Does the statement present a possible adequate explanation of the result?  
   If so, choose B.  
   If not,

C  Does the statement have to be true if the fact situation and result are as stated?  
   If so, the statement is deducible from something in the fact situation, the result, or both together; choose C.  
   If not,

D  Does the statement either support or weaken a possible explanation of the result?  
   If so, the statement is relevant to an explanation; choose D.

E  If not, the statement is irrelevant to an explanation of the result; choose E.
Situation: In the valley of the Makumbi River, which flowed rapidly through dry plains and had several small tributary streams that partially dried up in summer, the residents were malnourished because their agriculture could barely support the population. They suffered from several diseases, with, however, only a low incidence of blood fluke, a debilitating and often fatal disease caused by a parasitical worm which enters the body through the skin. Most deaths resulted from chronic malnutrition. In an effort to improve the health of the people, an international project financed a network of irrigation canals in the valley. The water in the canals flowed sluggishly but provided an adequate supply of water throughout the growing season. The residents of the valley for the first time had enough food for themselves and a surplus to store for future years.

Result: Within five years, the rates of incapacitating illness and of death showed a considerable increase among residents of the Makumbi Valley.

31. After flowing eastward through the valley, the Makumbi River turns to flow northward to the ocean.

32. Water snails, hosts to the blood fluke in an early stage of its development, multiplied in the stagnant waters of the canals and spread its infective larvae to water used by the people.

33. The change in patterns of agriculture made larger settlements possible, in which the inadequate arrangements for the disposal of sewage facilitated transmission of the blood fluke disease to children playing in the streets.

34. Financing for the irrigation canals was arranged with the assistance of the World Bank, in cooperation with the government of the country in which the Makumbi River valley was situated.

35. Rainfall in the Makumbi Valley was generally low.

36. Within two years after the irrigation project was completed, there was a considerable growth of green algae and other vegetation in the canals.

37. The rate of death in the Makumbi Valley did not begin to increase until twenty-one months after the irrigation project was completed.

38. Throughout the year, the water in the canals flowed at the same rate as did the water in the Makumbi River.

39. The residents of the Makumbi Valley used the water of the canals for daily ritual ablutions required by their religion, and children rode the water buffalo into the canals daily.

40. The women of the valley no longer made the long trips to the Makumbi River that they had previously made to obtain drinking water but drew it from the canals.
Directions: In this part, you are to choose from five diagrams the one that illustrates the relationship among three given classes better than any of the other diagrams offered.

There are three possible relationships between any two different classes:

- Indicates that one class is completely contained in the other, but not vice versa.
- Indicates that neither class is completely contained in the other, but the two do have members in common.
- Indicates that there are no members in common.

Note: The size of the circles does not indicate relative size of the classes.

Example:

Birds, robins, trees

(A) (B) (C) (D) (E)

Sample Answer

The correct answer, (A), shows that one of the classes (trees) has no members in common with the other two. (No trees are either birds or robins, and no birds or robins are trees). (A) also shows that one of the two remaining classes (robins) is completely included in the other class (birds).
Questions 1-8 are based on the diagrams below.

1. Horses, stallions, hyenas
2. Compact cars, automobiles, bicycles
3. Guitars, banjos, musical instruments
4. Antiques, automobiles, guns
5. Males, aunts, Japanese Americans
6. Ballerinas, naturalized citizens, females
7. Aunts, bank robbers, criminals
8. Those under fifty years old, bachelors, men under thirty years old who have never married

GO ON TO THE NEXT PAGE.
Questions 9-15 are based on the diagrams below.

9. Males, cats, dogs
10. Nuns, priests, schoolteachers
11. Cooks, males, men over thirty years of age
12. Hostesses, nieces, females
13. Beverages, bottled products, fruit drinks
14. Mosquitoes, insects, things that fly
15. Coins, United States money, United States dimes
Part B
(Suggested time—19 minutes)
15 Questions

Directions: Each question or group of questions is based on a passage or set of statements. In answering some of the questions it may be useful to draw a rough diagram. Choose the best answer for each question and blacken the corresponding space on your answer sheet.

Questions 16-18

The East-West roads of New City are laid out regularly, with a distance of one-half mile from one to the next.

Dwyer Road is 1/2 mile north of Exeter Road.
Truro Road is 1 mile south of Exeter Road.
Monroe Road is 1 mile south of Truro Road.
Elm Road is 1 mile south of Monroe Road.
Jupiter Road is 1/2 mile north of Elm Road.
Exeter Road is 1/2 mile north of Dwyer Road.

16. An additional road, Cromwell, could be in any of the following locations EXCEPT

(A) 1/2 mile north of Exeter
(B) 1/2 mile north of Monroe
(C) 1/2 mile south of Elm
(D) 1 mile south of Dwyer
(E) 1 mile south of Truro

17. Which road is farthest from Truro Road?

(A) Elm  (B) Exeter  (C) Jupiter
    (D) Dwyer  (E) Monroe

18. What is the distance between Dwyer Road and Monroe Road?

(A) 1 mile
(B) 1 1/2 miles
(C) 2 miles
(D) 2 1/2 miles
(E) 3 miles

19. Rita’s patient said that he was a better doctor than she was, since he and his wife took two teaspoons of bicarbonate of soda in a glass of orange juice every night before retiring, and neither had had a cold in over a year.

Rita may best counter her patient’s claim by pointing out that

(A) neither bicarbonate of soda nor orange juice is a medicine, so any effect they might have would be only temporary
(B) no one else has ever prevented colds by taking bicarbonate of soda and orange juice
(C) since he does not have a medical degree, he has no right to treat his wife
(D) other factors may have prevented the patient and his wife from catching colds during the past year
(E) not all illnesses respond to the same treatment

20. There is no reason to rule out the possibility of life on Uranus. We must, then, undertake the exploration of that planet.

The argument above assumes that

(A) life exists on Uranus
(B) Uranus is the only other planet in the solar system capable of supporting life
(C) Uranian life would be readily recognizable as life
(D) the search for life is a sufficient motive for space exploration
(E) no one has previously proposed the exploration of Uranus

GO ON TO THE NEXT PAGE.
Questions 21-24

All M's are Q's.
All F's are Q's.
All Q's are F's or M's, but not both.
Some Q's are Y's.
Not all Y's are Q's.
All W's are Y's.

21. Which of the following can be inferred from the statements above?
   (A) Some Y's are M's.
   (B) All W's are M's.
   (C) All W's are F's.
   (D) All W's are either M's or F's.
   (E) Some Y's are either M's or F's.

22. Which of the following is NOT possible, given the statements above?
   (A) Some W's that are M's are also F's.
   (B) Some Q's that are F's are also W's.
   (C) Some Q's that are W's are also M's.
   (D) Some Y's are not F's.
   (E) Some W's are M's.

23. If a W is an M, it must also be
   (A) a Y only
   (B) a Q only
   (C) an F only
   (D) an F and a Q
   (E) a Y and a Q

24. If no W is a Q, which of the following can be inferred?
   (A) All Y's are Q's.
   (B) No Y is an F.
   (C) All Y's are W's.
   (D) Some Y's are W's and not M's.
   (E) Some W's are M's and not Y's.

25. Little girl to her mother: "I won't drink that milk, because it will give me a headache. I got a head- ache every time I drank milk last week."

   The argument above is most like which of the following arguments?
   (A) The scarcity of precious metals predicted by the study demonstrates a need for conserva- tion of natural resources.
   (B) The manuscript cannot be the work of Remigius of Auxerre, because all scholars date it later than his lifetime.
   (C) The symptoms are caused by plutonium, for each person in the sample who was exposed to plutonium later exhibited the symptoms.
   (D) If John cannot drive a car, he will not be able to drive a truck.
   (E) The patient's nausea must have been caused by toxic substances in the elderberry wine he drank.

26. In announcing the planned elimination of 215 daily subway train runs, the transit authority chairman said, "We have not received a single complaint from the public about the previous cuts of 640 runs a day."

   Which of the following can be validly inferred from the authority's failure to receive complaints?
   I. The public will not complain about the new cuts.
   II. The public felt that the transit authority would not respond to complaints about the previous cuts.
   III. The previous cuts were justified because of declining ridership.

   (A) I only    (B) II only    (C) I and II    (D) I and III    (E) Neither I, II, nor III
Questions 27-30

Disease X is caused only by contaminated food, mosquito bites, or contact with someone who has the disease, but none of these exposures necessarily causes the disease.

There is a three-day interval, from the time of exposure to disease X to the first appearance of the symptoms, during which an infected person is contagious.

Mike was bitten by a mosquito on Monday.
Mike met with Joe on Tuesday.
Joe ate contaminated food on Monday and Wednesday.
These were their only possible exposures to disease X.
All these events occurred within one week.

27. If Joe developed disease X as a result of eating contaminated food, which of the following statements must be true?
   I. Joe first exhibited the symptoms of disease X on Thursday.
   II. Mike will get disease X.
   III. Joe first exhibited the symptoms of disease X on Saturday.
   
   (A) I only
   (B) II only
   (C) III only
   (D) Either I or II but not both
   (E) Either I or III but not both

28. If Joe first exhibited the symptoms of disease X on Saturday, which of the following statements must be true?
   I. Joe was contagious when he met Mike.
   II. Joe developed disease X as a result of eating contaminated food.
   III. Mike gave disease X to Joe when they met.
   
   (A) I only
   (B) II only
   (C) III only
   (D) I and II only
   (E) II and III only

29. If Mike first exhibited the symptoms of disease X on Thursday, which of the following statements must be true?
   I. Mike may have given disease X to Joe on Tuesday.
   II. Mike developed disease X as a result of being bitten by the mosquito.
   III. If Joe developed disease X, it resulted from eating contaminated food or meeting with Mike.
   
   (A) II only
   (B) I and II only
   (C) I and III only
   (D) II and III only
   (E) I, II, and III

30. If Mike first exhibited the symptoms of disease X on Friday, which of the following statements must be true?
   I. Joe first exhibited the symptoms of disease X on Thursday.
   II. Mike got disease X as a result of being bitten by the mosquito.
   III. Mike was infected on Tuesday.
   
   (A) II only
   (B) III only
   (C) I and III only
   (D) II and III only
   (E) I, II, and III

STOP

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON PARTS A AND B OF THIS SECTION ONLY.
DO NOT WORK ON ANY OTHER SECTION IN THE TEST.
How to Score Sample Analytical Aptitude Tests

Your answers to the test questions will yield "raw" analytical ability scores directly, and these raw scores may be converted to GRE "scaled" score ranges.

To determine your raw scores on the sample test, compare your answers with the answer key below and count the number of right and wrong responses in each section. There is no need to count the questions you omitted because they do not affect your scores.

The analytical sections of the test, Section III and IV, provide five optional answers for each question, and the raw score is the number of right answers minus one-fourth of the number of wrong answers. For example, if you had 49 right responses and 17 wrong responses in Sections III and IV, your raw analytical ability score would be 49 minus one-fourth of 17 or 44.75, which rounds to 45, the nearest whole number.

Use the table at right to find the ranges of GRE scaled scores that correspond to the ranges within which your analytical raw score falls. Thus, the raw analytic ability score of 45 (in the above example) corresponds to a scaled score range of 550 to 590. Note that the analytical ability scaled score range is obtained from the table, by using the sum of the raw scores for Sections III and IV.

When you take the GRE Aptitude Test, your scores are likely to differ from the scores you obtained on the sample test. Individuals perform at different levels at different times for reasons unrelated to the test itself. In addition, test scores may differ because sample test conditions can at best only imperfectly simulate the conditions that will prevail in an actual test administration.

After you have scored your sample test, analyze your performance with a view to improving your performance on the Aptitude Test you will actually take in the future.

Did the time you spent reading directions make serious inroads on the time you had available for answering questions? If you become thoroughly familiar with the directions in the sample test, you will be able to spend less time reading directions in the actual test.

Did you run out of time before you reached the end of a section? If so, could you pace yourself better in the actual test? Remember, not everyone finishes all sections and accuracy is also important.

Look at the specific questions you missed. In which ones did you suffer from lack of knowledge? Faulty reading of the question? Faulty reasoning? Awareness of causes of error may enable you to avoid some errors when you actually take the Aptitude Test.

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*Approximately 99 percent of those taking recent forms of the Aptitude Test earned analytical ability scores below 760.

ANSWER KEY
Sample Analytical Test 2

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<td>20. A</td>
<td>40. D</td>
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</table>
EXPLANATIONS TO SAMPLE GRE ANALYTICAL TEST 2
(Section III and Section IV)
1. From 1960 to 1970, the Sun was the city's only picture newspaper. Therefore it is **deducible** (C) that the Bugle was not a picture newspaper in 1965, which is in the period 1960 to 1970.

2. Changing editorial policies alone would only support an explanation, but the statement that this change in fact alienated (caused to withdraw) a large number of readers prior to 1974 constitutes an adequate explanation (B) of the Sun's circulation drop.

3. According to the situation, both papers **constantly** sought out increased circulation. This contradicts (A), the statement that the Bugle's efforts to increase it were only sporadic.

4. Nothing that the Sun is doing now can have been a **cause** of earlier decreased circulation. Beginning an innovative campaign does not contradict the fact that the past circulation efforts were vigorous, and is certainly not deducible from anything in the situation, although it is not a surprising reaction to the result. The statement is therefore irrelevant (E) to an explanation.

5. The fact that the local publisher was new to the newspaper business would only support an explanation. The statement that the efficiency of the Sun's operation therefore could not be maintained seems to be enough to make this statement an adequate explanation (B). One could argue that loss of efficiency might affect only profits, and not circulation, but the inefficiency here is attributed to the entire organization. Note that the distinction between presenting a possible explanation and merely being relevant to a possible explanation may be a rather fine line, and that the result does have to be strictly deducible from a statement for that statement to be a possible explanation.

6. Although this statement is true of most newspapers, it is not deducible from the given information. Neither does it contradict anything in the situation or result. Since it affects both papers equally, it is irrelevant (E) to explaining differences in circulation.

7. This statement contradicts (A) the result, which states that the Bugle's circulation was almost 50 percent larger than the Sun's in 1974.
8.C. Unless the papers began the decade claiming less circulation than they had (an unlikely possibility), constant claims of increasing circulation coupled with actually constant circulation make it deducible (C) that the claims were exaggerated.

9.D. This statement is relevant (D) to an explanation. It does not say how many drivers struck nor even which newspaper they delivered, so it is certainly not enough to constitute an adequate explanation. Even if the drivers were the Sun's entire delivery force, additional information concerning reasons that the customers did not later return to the Sun would be required for an adequate explanation of the result.

10.C. Since we are told that both papers cost the same amount until 1970, we can deduce (C) that price was not an important factor. We cannot conclude this for periods prior to 1960, but the period discussed is the period after 1960.

***

Set 2

11.E. This is possibly true. It is, however, neither deducible from nor contradictory to the given information, and has no particular relationship to automobile use or air pollution. It is therefore irrelevant (E) to an explanation.

12. A. The last sentence in the situation states that a transit fare increase supplied only part of the funds, contradicting (A) statement 12.

13.B. Since the situation tells us that the pollution of principal concern was produced by automobiles, anything that caused increased automobile use would also cause increased pollution, and the statement that the fare increase was sufficient to cause such an increase makes this an adequate explanation (B) of the result.

14.A. Hypothetical links to increases in power-station fuel pollution, not mentioned in the situation, would be an example of using an extraneous possibility to trip oneself up on this question. The situation says the trains were non-polluting, so in this circumstance they were non-polluting, and that contradicts (A) statement 14.
15. E. The fact that only federal and local funds were used neither implies nor contradicts a refusal of help from the state government. The source of funding is irrelevant (E) to increased pollution.

16. D. An explanation based on factories causing pollution directly or indirectly through increased commuter automobile traffic is weakened if such factories closed. This statement is thus relevant (D) to such an explanation.

17. C. The statement that bus routes were extended to all parts of the city means that it must be true or deducible (C) that bus service became available to a larger proportion of the city.

18. B. This would explain higher pollution levels, and could explain greater automobile use by workers, so it is a possible explanation (B). Note that although statement 16 is almost the opposite of 18, 16 can only weaken any reasonable explanation of the result, and thus was not itself an explanation.

19. D. A decrease in unemployment implies more commuter traffic, but does not necessarily imply more automobile use or pollution unless we also know that the workers did not travel by public transportation. Statement 19 supports (D) an explanation, but does not itself present enough information to be an explanation.

20. A. The result states that the system was improved in January, 1976. The statement that the completion of the improvements was prevented is inconsistent (A) with this information.

***

Set 3

21. E. The fact that the watch was a family heirloom does not allow us to conclude that it was Laura's mother who gave her the watch. Since this statement is neither deducible, contradictory, nor related to an explanation, it is irrelevant (E).

22. A. Laura was in the hospital room by 5:15, according to the result. This contradicts (A) her remaining at work until 5:45. The fact that she was waiting for her usual bus is not itself a contradiction of her having worked late unless we know how often the busses run.
23.C. The result states that she was dismayed to find the watch missing. This implies (C) that she did not expect it to be missing.

24.D. The fact that Laura could have told the time without her watch at 3:15 does not prove that she didn’t have it then. It does make this explanation plausible, and strengthens (D) any explanation requiring that she was not wearing it that day, while at the same time weakening (also D) the explanation that it was removed from her person after the accident.

25.E. This is irrelevant (E) to any explanation, since the watch was already missing by this time.

26.D. This statement plays a role opposite to that of statement 24, weakening (D) explanations requiring that Laura was not wearing the watch that day, and strengthening (also D) explanations that assume it was taken from her.

27.B. This is clearly a sufficient explanation (B) for the disappearance of the watch, and is not inconsistent with the statement or the result.

28.B. Like 27, this is also a sufficient explanation (B). (Note that although answers of a given type are positioned randomly, there is nothing to prevent two of one type from appearing consecutively.)

29.D. This proves nothing, but, taken with the fact that we are told her sister envied the watch, makes it more plausible that her sister might have seized the opportunity and the watch. Since it strengthens an explanation without actually establishing it, this statement is rated (D).

30.B. This also represents an adequate explanation (B). The fact that it is inconsistent with statements 26, 27, and 28 is not a factor, since each statement is to be considered independently (ignored when dealing with subsequent statements).

***

Set 4

31.E. This direction of river flow is neither contradicted by nor deducible from anything in the situation or result. It does not relate to any reasonable hypothesis concerning illness, and so is irrelevant (E).
32.B. This is consistent with the information given, and, would be an adequate explanation (B) of increasing illness and deaths despite adequate food supplies.

33.B. This also gives a mechanism by which the result could have come about, consistent with the situation, and is a possible adequate explanation (B). Larger settlements or inadequate sewage disposal alone would have supported such an explanation, but the statement goes beyond those circumstances to indicate how the result came about.

34.E. This is not inconsistent with, nor implied by, the information that the canals were financed by an international project. A conspiracy of water-poisoners opposed to the World Bank is too remote from the given situation, and so 34 is irrelevant (E).

35.C. The "dry plains," "streams that dried up in the summer," and a supply of water that was adequate "throughout the growing season" for the first time make it deducible (C) that rainfall was generally low.

36.D. The growth of vegetation in the canals does not itself explain increasing disease, but does support the possibility of the growth in the canals of other life forms, such as snails or bacteria, which might be inimical to health. This statement supports (D) such explanations.

37.D. The almost two-year delay in onset of health problems argues against any explanation involving drinking water poisoned by chemicals in the canal beds, and makes slower-developing organic processes, such as 32 or 33, more likely (D). Note that a statement can be relevant to a class of possible explanations, rather than to only a specific one.

38.A. The waters of the Makumbi flowed rapidly. The water in the canals flowed sluggishly. The statement that they flowed at the same rate is inconsistent (A) with this information.

39.D. This almost sounds like an explanation. However, in the absence of a causal mechanism, such as information that water buffalo host human parasites which enter the skin (it is not stated here that residents drank the water), the statement is only relevant (D) to an explanation, rather than constituting an explanation itself.

40.D. Like 39, this makes an explanation based on polluted or infected water more likely, but does not give a source of any such toxin. It is also relevant (D), but does not qualify as an explanation without other information.
Logical diagrams. Note: The large number of consecutive pairs of questions with the same answer in these two sets is accidental. It could occur on the form you take, but don't count on it.

1.A.

Stallions must be horses, so we need one circle contained in another. Hyenas cannot be horses (or stallions) so the third circle must not intersect the other two.

2.A.

Automobiles include all compact cars, and bicycles do not overlap with either class. Automobiles here have the same relation to the other two classes as horses do in question 1.

3.E.

Guitars are not banjos, but both are included within musical instruments, so we need two non-intersecting circles (guitars and banjos) completely inside a third (musical instruments).
4.B.

Automobiles are not guns, so we need two non-overlapping circles. The class of antiques includes some automobiles and some guns, but there are automobiles and guns that are not antiques, and there are antiques that are neither guns nor automobiles, so a third circle must intersect the other two, but have some portion outside of both. We might imagine a figure like this:

but remembering that the size of the circles does not represent the size of the classes.

5.B.

It is logically impossible for an aunt to be a male, so we need two non-intersecting circles. Japanese Americans may be males or aunts but need not be either, so a third circle should overlap each of the other two, but have a region not overlapping either. This is the same relationship as in question (4).

6.D.

By definition, all ballerinas are females. The diagram must thus have one circle completely enclosed in another. Naturalized citizens may or may not be ballerinas, and may or may not be females, so a third circle should cut the other two, but have a region outside of both. (C) is incorrect, because it would imply that it is logically necessary for all ballerinas to be naturalized citizens. There must be a place in the diagram for ballerinas who are not naturalized citizens.
This is a trap for stereotypic thinkers. Your aunt may not be a criminal, but there is no logical reason to prevent somebody's aunt from knocking over the First National. Resist the temptation to choose (A), and notice that although bank robbers are by definition criminals, aunts may or may not be criminals, and if they are, may or may not be bank robbers. Thus the circle for aunts should intersect the other two.

Men under thirty years old who have never married must be bachelors, but not all bachelors are under thirty. We need one region completely within another. Men under thirty who have never married are also certainly under fifty years old, so the small region must also be included in the third circle (those under fifty). We might be tempted to look for a diagram like this: \( \bigcirc \), until we remember that there are also bachelors under fifty who are not under thirty (the shaded area) \( \bigcirc \) and identify (C) as the correct diagram.
9.B.

The classes of cats and dogs do not overlap. Some cats are females and some aren't. Some dogs are females and some aren't. We need two non-intersecting circles (cats and dogs) overlapped by a third circle which has a region for those males that are neither cats nor dogs.

10.B.

The class of nuns includes no priests. Again, we need two circles with no points in common. The class of school teachers includes some but not all nuns, and some but not all priests, and also includes individuals who are in neither of the other two classes.

11.D.

Men over thirty are certainly males, so one circle must be completely contained in another. Cooks may or may not be males, and if they are males, may or may not be over thirty. Thus the circle representing cooks must intersect the other two, but have a region outside of both. (D) is the only diagram with a circle inside another and with a third circle cutting across both.
10.

12.C.

Both hostesses and nieces must be females, so we need two circles completely inside a third. There are just three possibilities:

```
Nieces   Hostesses
      □ □
      □ □
```

but only the third of these appears among the choices.

In fact, hostesses may or may not be nieces, so the first two of the above diagrams would be incorrect even if they did appear among the choices, although they might make us think a little longer. As it is given, this question can be answered very quickly without worrying about the relationship of hostesses and nieces to each other.

13.D.

```
Beverages
  □ □
  □ □
```

Fruit drinks are all beverages, but not all beverages are fruit drinks. We need one circle inside another. Bottled products need not be beverages, but fruit drinks and other beverages sometimes come in bottles. The circle representing beverages should intersect each of the first two, but should have a space outside of both. Diagram (D) is the only one satisfying these conditions.
14.E.

All mosquitoes are insects. We need a circle completely inside another. All mosquitoes fly, and so do some but not all other insects. The circle representing flying things should completely contain the mosquito circle, but intersect the larger circle representing insects.

15.E.

U.S. money may or may not be coins, but U.S. dimes are both coins and U.S. money. We need two intersecting circles for coins and U.S. money. The region for U.S. dimes that are both coins and money must be in the intersection of the coin and money circles, but since there are U.S. coins which are not dimes (e.g., Anthony dollars), U.S. dimes should be within the overlapping region without filling it. Note that we can either begin with the inclusion relationships (all U.S. dimes are coins and all U.S. dimes are money), as we did in question 14 (with mosquitoes instead of dimes), or with the overlapping relationship, as we did in question 15. Either approach leads us to the same result.
12.

Explanations to Analytical Questions
in the GRE Sample Aptitude Test 2
(Section IV, Part B)

16-18 Drawing a diagram here will greatly simplify the problem. First, draw a set of lines to represent streets, showing that each is 1/2 mile apart. Then place the first two streets mentioned as follows (Note that the placement is arbitrary, since we do not know how many streets there are):

\[
\begin{array}{c}
\text{North} \\
\hline
\text{Dwyer} \\
\hline
\text{Truro} \\
\hline
\text{1/2 mile} \\
\hline
\text{East} \\
\hline
\text{West} \\
\hline
\text{South} \\
\end{array}
\]

Next place each remaining street according to the information given in each of the remaining statements. Each can be placed in relation to Dwyer and Truro. (You may have to add lines if you haven't allowed for enough streets in your first set of lines.)

When all the information is included in the diagram, it should show the streets in the following pattern:

\[
\begin{array}{c}
\text{Exeter} \\
\hline
\text{Dwyer} \\
\hline
\text{Truro} \\
\hline
\text{Monroe} \\
\hline
\text{Jupiter} \\
\hline
\text{Elm} \\
\end{array}
\]

16.E. A road could be built in any of the locations except one mile south of Truro, a location that is occupied by Monroe Road.

(Cont'd.)
17.A. It can be easily seen that Elm is farthest from Truro Road (2 miles).

18.B. Monroe Road is three streets (and therefore 1-1/2 miles) from Dwyer Road.

19.D. Rita's patient assumes that because one factor (drinking orange juice and bicarbonate of soda) coincides with a condition (lack of colds), that the factor causes the condition. There may, however, be other factors (such as mild weather or proper exercise) that also coincide with the lack of colds and, therefore, could also explain the good health of Rita's patient.

20.D. Of the choices given, the argument assumes only that the possibility that life exists on Uranus is sufficient to warrant its exploration. The argument makes no assumptions about the actual existence of life on Uranus, the probability of its existence, its form, or any previous plans for its exploration.

21-24 One way to approach the problem is to represent the information given by a set of overlapping circles. The first two statements, "All M's are Q's" and "All F's are Q's," can be shown as follows:

```
Q's
F's
M's
```

Note that we draw the most general case for M's and F's, showing them to be possibly overlapping.

The next statement, "All Q's are F's or M's, but not both," can be shown by blacking out certain areas as the statement suggests; i.e., no Q's are outside the M and F circles, and none are in both the M and F circles as follows:

```
Q's
F's
M's
```
The next statement, "Some Q's are Y's," can be shown by adding another circle representing Y's. Note that this circle is drawn to overlap with each of the other three circles.

We know at this stage that there is something in either region 1 or region 2 or in both, but not necessarily in any other region.

The final statement, "All W's are Y's," can be shown by another circle that is completely within the Y circle and overlaps the F and M circles as shown below. Note that, although we know there is something in either region 1 or 2, we do not know exactly where, i.e., whether it is inside or outside the W circle.

21. E. The statement, "Some Y's are either M's or F's," is the only statement (of the choices given) that can be inferred from
the set of statements (and the overlapping circles that represent them). Choice A, that "Some Y's are M's," is not necessarily true because we know only that something is in either region 1 or region 2. Choice B, that "All W's are M's," is not necessarily so, because some W's could be either Y's or F's. For the same reasons, Choice C, that "All W's are F's," and Choice D, that "All W's are either M's or F's," are not necessarily true.

22.A. "Some W's that are M's are also F's" is not possible, because, as given, no M's are F's. Each of the other statements could be true and can be verified by referring to the diagram. Remember that we know for certain only that something exists in either region 1 or region 2 or both, but we do not know exactly where. Thus each of the other statements could be true.

23.E. If a W is an M, it must also be a Y and a Q. The region where the W and M circles overlap is completely within both the Q circle and the Y circle.

24.D. If no W is a Q, then the diagram becomes:

![Diagram showing overlapping circles for Y's, W's, Q's, F's, and M's.]

The only statement that can be inferred is that "Some Y's are W's and not M's." This assumes, of course, that there are both Y's and W's. The fact that none of the other choices is necessarily true can be verified by looking at the diagram above. For example, Choice A, "All Y's are Q's," cannot necessarily be inferred because there may be Y's outside the Q circle.

25.C. The two arguments are parallel. One is that everytime milk is drunk, then headaches result. The other is that everytime plutonium is present, then certain symptoms result.
26.E. Neither I, II, nor III can be validly inferred.

Statement I assumes that because no complaints were received about previous cuts, then no complaints will be received about new cuts. However, we do not know, for example, whether these cuts were ones affecting more riders or whether they were more important runs (e.g., during rush hours) that might be related to the number of complaints.

Statement II, that the public felt the transit authority would not respond to complaints, cannot be validly inferred from the authority's failure to receive complaints. It may have been the case that the public, in fact, agreed with the need for the previous cuts.

Statement III, that the cuts were justified because of declining ridership, cannot be inferred. The passage mentions nothing at all about the number of subway riders.

27-30 This is a problem where a diagram may or may not be useful. One possible diagram is a calendar to keep track of the events.

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<td>Mike</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>(MB)</td>
<td>meets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joe</td>
<td></td>
<td>Joe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(CF)</td>
<td>(CF)</td>
<td></td>
<td></td>
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</tbody>
</table>

MB = mosquito bite
CF = eats contaminated food

27.E. If Joe develops disease x from contaminated food, which he has eaten on two occasions, then we know he will have the first symptoms on either Thursday or Saturday, three days after eating the contaminated food on Monday and Wednesday. We do not know on which of the two days symptoms appear, so I or III must be true, but we can't say that I only must be true, nor can we say that III only must be true. Mike may get the disease because he has been bitten by a mosquito or because he has been exposed to Joe on Tuesday (provided that Joe has developed the disease from eating contaminated food on Monday, in which case he would be contagious during the three days from Monday through Wednesday). However, neither mosquito bites nor contact with a person who has the disease necessarily causes it. Thus we do not know with certainty whether Mike will get the disease, only that there is the possibility. Thus Choice E, I or III, is correct.
28.B. Statement I cannot be true. If Joe were contagious when he met Mike on Tuesday, then he would have had to have contracted the disease the day before (Monday) on which he ate contaminated food. In this case his first symptoms would appear three days later on Thursday, not Saturday, as the question states.

Statement II must be true. If Joe got the disease from Mike, it would have appeared on Friday. He must have caught it on Wednesday, so he must have developed the disease from eating contaminated food.

Statement III is not true. If Joe had the first symptoms on Saturday, he must have been exposed on Wednesday, but he met Mike on Tuesday. Therefore, Mike could not have given the disease to Joe. Thus, only Statement II must be true.

29.E. Statement I must be true. If Mike first exhibited the symptoms on Thursday, then he would have had to have been exposed three days earlier on Monday, in which case he would have been contagious from Monday through Thursday, during which time he came into contact with Joe (on Tuesday). Thus Mike may have given the disease to Joe then.

Statement II must be true. Since to have developed the disease on Thursday, Mike had to be exposed on Monday, when he was bitten by the mosquito.

Statement III must be true. Because eating contaminated food or meeting with Mike (a contagious person) were Joe's only exposures to the disease (he was not bitten by a mosquito), he must have developed it from one of these sources. Thus, all three statements must be true.

30.C. If Mike first had symptoms on Friday, he must have been infected three days earlier on Tuesday, when he met Joe. (Thus Statement III must be true.) Also, Joe must therefore have been contagious on Tuesday, which means that he got the disease from eating contaminated food on Monday (not on Wednesday, his only other day of exposure). Joe would, therefore, have had his first symptoms three days later on Thursday. Thus Statement I must be true.

Statement II cannot be true. If Mike developed the disease as a result of the mosquito bite on Monday, he would have shown the first symptoms on Thursday, not Friday.
TIPS FOR ANSWERING GRE ANALYTICAL QUESTIONS
Tips for Analysis of Explanations Questions

1. **Know the directions ahead of time.** You will save much valuable time on the test. The directions for the Analysis of Explanations (p. 21 in the 79-80 Information Bulletin) questions are rather long and unusual. Each item involves a situation, a result, and a series of statements. Each statement is to be rated A through E, with the 5 letter ratings having the same meanings throughout all 40 questions. We strongly suggest that you become very familiar with these directions and their corresponding letter choices before you take the test. At the very least, read them over several times, noting the key words in each choice as follows:

<table>
<thead>
<tr>
<th>Choice</th>
<th>Key Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>inconsistent with (contradictory to)</td>
</tr>
<tr>
<td>B</td>
<td>possible adequate explanation</td>
</tr>
<tr>
<td>C</td>
<td>deducible from</td>
</tr>
<tr>
<td>D</td>
<td>relevant to an explanation</td>
</tr>
<tr>
<td>E</td>
<td>irrelevant to an explanation</td>
</tr>
</tbody>
</table>

2. **Note in the directions which choices refer to both the situation and the result and which refer primarily to the result.**

3. **Remember that you are to consider the choices in sequential order.** Consider each choice, asking if it can be eliminated. The first choice that cannot be eliminated is the correct answer. The sequence is outlined in the GRE Information Bulletin. You could answer several items incorrectly by failing to use this sequential process. For example,
2. A particular statement might indeed be irrelevant to an explanation of the result (choice E), but it might also be deducible from something in the situation or result (choice C). In this case choice C (to be considered first) would be correct. Even if a statement strikes you as obviously irrelevant, always check to see that it is not inconsistent or deducible.

4. Consider each statement separately. Don't allow a previous statement to influence your consideration of a subsequent one. That is, don't confuse any previous statement with the situation or result. The only exception is that previous statements may give you ideas as to what might be possible adequate explanations of the result.

5. Try to think of some obvious explanations of the result before you read the statements. If you encounter a statement that is similar to an explanation that occurred to you, then you've probably hit on an adequate one.

6. Probably the most difficult decision you will have to make is in deciding between choice B (a possible adequate explanation) and choice D (either supports or weakens a possible explanation). Don't be overly concerned; other examinees are undoubtedly having similar difficulty. Remember that in order to be "B," the statement by itself must adequately explain the result, not just make an explanation rather likely. Because it must give a complete explanation, a B-choice is not likely to be short. Other statements, including D-choices, may also be long. On the other hand, a D-choice statement needs only to either support or weaken an explanation. In the event that you do pick
3. D for a statement, you should be able to think of the adequate explanation that is either supported or weakened by the statement, and of what element is still needed to make the explanation conclusive. (We should note also that a D-choice could strengthen one explanation and at the same time weaken another one.)

7. Don't use extremely remote possibilities. The test developers are not so devious as to include possibilities that would be envisioned by only a very small percentage of students. Consider only the information given in the situation and do not conjecture earthquakes, tidal waves, or plague epidemics unless there is evidence in the situation to suggest that they took place.

8. Remember to take the practice Analysis of Explanations questions under timed conditions, allowing yourself no more time than you will have on the test. This should give you a good idea of your efficiency in answering these questions.
Tips for Logical Diagram Items

1. Learn the meanings of the three basic diagrams that will form the base of all of the answer choices you will encounter on the test. They are:

Indicates that one class is completely contained in the other, but not vice versa. It is logically impossible to be in the first class and not in the second.

Indicates that neither class is completely contained in the other, but the two can have members in common. It is logically possible to be in both classes as well as to be in only one.

Indicates that there are no members in common. It is logically impossible to be in both classes.

2. Remember that the size of the circles in the diagrams does not indicate the relative size (the number of members) of the classes. For example, the following two choices (A and B) are equivalent.

3. When answering the questions, first imagine a diagram that you think best represents the relationship between the three classes given. Then look for this diagram among the choices, selecting the one that is most similar.

4. Remember that the circles represent classes of things, not the things themselves.
6. Tips for Logical Diagram Items

5. Remember that the order of the classes does not necessarily correspond to the order of the circles. For example, the first class mentioned does not need to be represented by the first circle in the diagram. Look for any classes that can't intersect, and for any that must be contained in another, and find the diagram that represents those relationships in any order.

6. If you have difficulty, sketch your own diagram and find it among the diagrams shown, but don't spend more than six minutes on the whole section.

7. The most common error is to choose non-overlapping circles for classes that aren't logically exclusive. Remember that being a needlepointer does not logically exclude a person from also being a football player.
Examples of Classes and the Logical Diagrams Representing Them

1. None of the classes have members in common.
   Example: Birds, Fish, Trees

2. Two classes have members in common, but neither one has any member in common with the third set.
   Example: Ballerinas, Mothers, Fathers
   Ballerinas who are mothers (or mothers who are ballerinas)

3. Two sets have no members in common, but both are within a larger class.
   Example: Brothers, Sisters
   People who are neither brothers nor sisters (i.e., only children) (Cont'd.)
Examples of Classes and the Logical Diagrams Representing Them

4. 

Example:

- Vegetables
- Green Vegetables
- Green Leafy Vegetables

All members of one class are completely within another class which is completely within another class.

5. 

Example:

- Women
- Mothers
- Sisters

Two classes have some members in common and both are contained in a larger set.

6. 

Example:

- Teachers
- Unmarried People
- Bachelors who Teach Mathematics

Two classes have some members in common and a third class is made up of members who are in both of these other classes.

(Cont'd.)
Examples of Classes and the Logical Diagrams Representing Them

7. Some members are common to all three classes, some are common to every pair of classes, and some are common to only one.

Example:

People who are healthy, wealthy, and wise.

People who are healthy, wealthy, but not wise.

8. One class has members in common with each of two other classes that have no members in common.

Example:

Senior Citizens Runners Teenagers

9. One class is completely within another class and a third class has no members in common with either one.

Example:

Motorized Vehicles Ford Cars Rickshaws

(Cont'd.)
Examples of Classes and the Logical Diagrams Representing Them

10. Two classes have some members in common and a third class is completely within one of these, but has no members in common with the other.

Example:

Clear days in July

Rainy days

Summer Days

11. One class is completely within another one. A third class has some members in common with both sets, but also has some members not in either of the sets.

Example:

Teenage Girls

Teenage girls who reside in Texas

Females

Texas residents

END
Tips for Analytical Reasoning Items

1. Many people find it useful to draw a diagram, a chart, or a graph to represent the set of statements. However, whereas some problems may be readily diagrammed, others may not. All can be answered by systematic checking of the rules and their implications. A diagram may help you keep track of the possibilities and make some implications clear.

2. Simplify the statements as much as possible, using your own style of shorthand. For example, if a series of names is mentioned, abbreviate them. It may also help to underline key words in statements.

3. Identify the relevant dimensions of the problem. This will often enable you to draw your chart or diagram. For example, a problem containing events and the days of the week on which they occur can be represented by a calendar-like diagram whose dimensions are days and events as follows:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bread</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pay</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The chart can then be filled in with the information given in the problem.

4. Although a chart or diagram may be helpful, don't spend too much time drawing an elaborate or comprehensive one. Sometimes even a partial chart can be quite valuable in eliminating incorrect choices.

5. You may need to draw different types of charts or diagrams for different types of problems. Several types are illustrated below and in the solutions to example problems.
Tips for Analytical Reasoning Items

6. **In some problems you don't need to figure out exactly where every element must be in order to answer the questions.** In cases with several possible outcomes, check each possibility to see if the statement is true. For example, it is not necessary to know *exactly* where either Ann or Betsy is seated to answer Question 22 of Section IV, Part B in the Sample GRE Analytical Test 1 in the 1979-80 GRE Information Bulletin. In fact, not enough information is given to decide which of six possible pairs of seats they do occupy. Enough information is given, however, to answer the question.

7. **Don't worry if a problem is not readily diagrammable or if you cannot quickly think of a completely appropriate diagram.** In such cases, it may be easier to check each possibility directly against each "rule."

Some types of diagrams are shown below.

A. **Tables or charts**

For example, a store has certain sizes and colors of a particular dress in stock (red and yellow in size A, and blue in size C).

<table>
<thead>
<tr>
<th>Size</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Red</td>
</tr>
<tr>
<td>A</td>
<td>X</td>
</tr>
<tr>
<td>B</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>

B. **Diagrams showing relationships**

For example, A is much taller than B, B is slightly taller than C.

Or, X sits next to Y, but not next to Z, at a table.
C. Lists of possibilities

For example, three three-person committees can be formed by choosing people from a group of five. If two persons (Joe and Carol) must be included in each group, the possibilities are:

Joe, Carol, and Bill
Joe, Carol, and Bob
Joe, Carol, and Jean

D. Tree or branch diagrams

For example, if A is chosen, then C or D is chosen. If C is chosen, then either G or H is chosen. If B is chosen, then either E or F is chosen.

E. Overlapping circles

For example, if all A's are B's and some B's are C's, what must be true?

One strategy is to draw the most general diagram, allowing the circles to overlap as much as possible. The most general diagram for the example above is:

From the information given we know that the circle representing A's must not be outside the circle representing B's. We also know from the statement "some B's are C's" that the circles representing B's and C's must overlap. To make the situation as general as possible, we draw the C circle so that it also overlaps with the A circle. We know only that there is some B that is a C. That is, that there is something in either region 1 or in region 2 shown in the diagram, or in both of these regions. We do not know for certain whether there is anything in any of the other regions. Because we do not know if region 3 is empty, it may or may

(Cont'd.)
Tips for Analytical Reasoning Items

8. Some problems may be represented by more than one possible diagram. Don't waste time trying to determine which one is best. Any one way of representing the relationships will do. For example, membership could be represented by a list, a table, a Venn diagram, or a tree as shown below. Consider the representation of two-person committees from a group of four people: John, Tom, Sue, and Rose.

List: John, Tom  
John, Sue  
John, Rose  
Tom, Sue  
Tom, Rose  
Sue, Rose  

Note. Be sure you have generated the entire list of possibilities. This may become impractically long in some problems, however.

<table>
<thead>
<tr>
<th></th>
<th>John</th>
<th>Tom</th>
<th>Sue</th>
<th>Rose</th>
</tr>
</thead>
<tbody>
<tr>
<td>John</td>
<td>--</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Tom</td>
<td>--</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Sue</td>
<td>--</td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Rose</td>
<td></td>
<td>--</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. A table like this is considerably more difficult to draw for three or more member groups. Be sure not to count both John, Tom and Tom, John if order doesn't matter.

Venn diagram:

Note: Each circle or box places each person in a two-person group. There are two , two , and two , making six combinations. This procedure is probably impractical for large numbers of elements.
Tips for Analytical Reasoning Items

Tree:

John
  Tom Sue Rose
  Tom Sue Rose
      Sue Rose

Again be careful to avoid double counting.

9. Consider doing first the problems that seem to you to be most doable or diagrammable, leaving the most time-consuming questions or sets of questions for last.
APPENDIX B

Suggestions for Using GRE Analytical Preparation Materials
Suggestions for Using GRE Analytical Preparation Materials

Materials Enclosed

- Sample GRE Analytical Test 1

Suggestions

- Read the material in the front of the Sample GRE Analytical Test 1 booklet, including the sample questions, and then take this test under timed conditions.

- After the allotted 50 minutes have expired, note the number of questions you have reached and then complete the remaining questions in the test.

- Score the test and analyze your performance according to the instructions on the last page of the Sample GRE Analytical Test.

- Before the examination on June 14, review the test directions for each of the three analytical question types.
Suggestions for Using GRE Analytical Preparation Materials

Materials Enclosed

- Tips for Answering GRE Analytical Questions
- Sample GRE Analytical Test 1
- Explanations to Sample GRE Analytical Test 1

Suggestions

- Read the Tips for Answering GRE Analytical Questions.
- Read the material in the front of the Sample GRE Analytical Test 1 booklet, including the sample questions, and then take this test under timed conditions.
- After the allotted 50 minutes have expired, note the number of questions you have reached and then complete the remaining questions in the test.
- Score the test and analyze your performance according to the instructions on the last page of the Sample GRE Analytical Test.
- Consult the Explanations to Sample GRE Analytical Test 1 for explanations of any questions that you answered incorrectly or any others that you found particularly troublesome.
- Before the examination on June 14, review the test directions for each of the three analytical question types.
Suggestions for Using GRE Analytical Preparation Materials

Materials Enclosed

- Tips for Answering GRE Analytical Questions
- Sample GRE Analytical Test 1
- Explanations to Sample GRE Analytical Test 1
- Sample GRE Analytical Test 2
- Explanations to Sample GRE Analytical Test 2

Suggestions

- Read the material in the front of the Sample GRE Analytical Test 1 booklet, including the sample questions, and then take this test under timed conditions.

- After the allotted 50 minutes have expired, note the number of questions you have reached and then complete the remaining questions in the test.

- Score the test and analyze your performance according to the instructions on the last page of the Sample GRE Analytical Test.

- Consult the Explanations to Sample GRE Analytical Test 1 for explanations of any questions that you answered incorrectly or any others that you found particularly troublesome.

- Read the Tips for Answering GRE Analytical Questions.

- Repeat the procedures listed above for Sample GRE Analytical Test 2, taking this test first under timed conditions, and then completing it after time expires. Score the test and analyze your performance. (Needless to say, you may want to defer taking the second test for at least a day or two after taking the first one.)

- Before the examination on June 14, review the test directions for each of the three analytical question types.
APPENDIX C

Letters to Candidates

(A) Letter of encouragement to the Bulletin only encouraged group

(B) Letter of encouragement to all other encouraged groups

(C) Nonencouraging cover letter for not encouraged groups
Dear Candidate:

We are writing to a sample of people, including you, who have registered to take the GRE Aptitude Test on June 14, 1980. Our purpose is to request your involvement in a study of the effectiveness of the enclosed materials for preparing for the analytical portion of the Graduate Record Examinations (GRE).

In the fall of 1977 the GRE program introduced an additional component to its Aptitude Test—-a section designed to measure analytical or logical reasoning. Because the questions are new, some candidates may not be familiar with them, even though all candidates receive a sample test. To study the effects on test scores by becoming familiar with the new question types, the enclosed materials were used by GRE candidates in a test preparation course. The candidates reacted favorably to them, and found them a useful way to become familiar with the new question types.

More important, however, is the fact that we found evidence that the students who used these materials received higher scores on the analytical part of the test. The principal reason for these results appeared to be that, instead of looking at the sample test casually, the students practiced until they became very familiar and comfortable with the questions, instructions, and formats. Since it is impractical to offer each candidate such face-to-face preparation for the test, we are exploring a more efficient way to provide similar preparation to all candidates.

To emphasize their importance, we have reprinted the portions of the GRE Information Bulletin that are most relevant to preparing for the analytical section of the test and are mailing them to samples of candidates. After the test, you will receive a brief questionnaire asking about your use of, reactions to, and suggestions about the materials. We believe that there is nothing about practice with these new analytical questions that individual candidates cannot undertake themselves, since no special study of logic or formal reasoning is needed. Hence, we are enclosing materials that we encourage you to use. We believe that study of these materials will enable you to enter the testing situation with more confidence, less apprehension, and a better chance of achieving a score that is indicative of your true ability.

Thank you and good luck on the test next month.

Sincerely,

Donald E. Powers
Spencer S. Swinton
Project Directors

DEP:SSS:cr
Enclosures
(A)
Dear Candidate:

We are writing to a sample of people, including you, who have registered to take the GRE Aptitude Test on June 14, 1980. Our purpose is to request your involvement in a study of the effectiveness of the enclosed materials for preparing for the analytical portion of the Graduate Record Examinations (GRE).

In the fall of 1977 the GRE program introduced an additional component to its Aptitude Test—a section designed to measure analytical or logical reasoning. Because the questions are new, some candidates may not be familiar with them, even though all candidates receive a sample test. To study the effects on test scores by becoming familiar with the new question types, tips and suggestions for approaching the new types were developed. These materials were used with the sample test by GRE candidates in a 7-hour preparation course. The candidates reacted favorably to them, and found them a useful way to become familiar with the new question types.

More important, however, is the fact that we found evidence that the students who used these materials received higher scores on the analytical part of the test. The principal reason for these results appeared to be that, instead of looking at the sample test casually, the students practiced until they became very familiar and comfortable with the questions, instructions, and formats. Since it is impractical to offer each candidate such face-to-face preparation for the test, we are exploring a more efficient way to provide similar preparation to all candidates.

We have assembled the materials used in the course and are mailing them to samples of candidates. After the test, you will receive a brief questionnaire asking about your use of, reactions to, and suggestions about the materials. We believe that there is nothing about practice with these new analytical questions that individual candidates cannot undertake themselves, since no special study of logic or formal reasoning is needed. Hence, we are enclosing materials that we encourage you to use. We believe that study of these materials will enable you to enter the testing situation with more confidence, less apprehension, and a better chance of achieving a score that is indicative of your true ability.

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Sincerely,

Donald E. Powers
Spencer S. Swinton
Project Directors

DEP:SSS:cr
Enclosures
Dear Candidate:

We are writing to a sample of people, including you, who have registered to take the GRE Aptitude Test on June 14, 1980. Our purpose is to request your involvement in a study of the effectiveness of the enclosed materials for preparing for the analytical portion of the Graduate Record Examinations (GRE).

We have assembled some materials that you may wish to use in your preparation for the test, after which you will receive a brief questionnaire asking about your use of, reactions to, and suggestions about the materials.

Thank you for your cooperation.

Sincerely,

Donald E. Powers
Spencer S. Swinton
Project Directors

Enclosures

(C)
Dear GRE Candidate:

The GRE Aptitude Test date (June 14) is fast approaching. If you haven't already done so, perhaps we can persuade you to take a look at the GRE Analytical Test preparation materials we mailed you recently. Although we can't guarantee it, our research strongly suggests that there's a good chance you'll benefit from using these materials.

Good luck with your preparation and with the test on June 14.

Sincerely,

Don & Spence
Educational Testing Service

A Short Analytical Test

Where would you be most likely to find the following symbol?

(A) At the Olympic games
(B) On a bottle of Ballantine beer
(C) On a mouseketeer's head
(D) On the GRE Analytical Test

If you picked any choice except (D), then perhaps we can persuade you to take a look at the GRE Analytical Test preparation materials we mailed you recently, if you haven't already done so. Although we can't guarantee it, our research strongly suggests that there's a good chance you'll benefit from using these materials.

Good luck with your preparation and with the test on June 14.

Sincerely,

Don & Spence
Educational Testing Service