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July 25, 2011

MEMORANDUM

TO: Legislative Education Study Committee

FR: Kevin Force, JD

RE: COMMITTEE REQUEST: NATURE AND CONTENTS OF THE ARMED SERVICES VOCATIONAL APTITUDE BATTERY

During the June 2011 interim meeting of the Legislative Education Study Committee (LESC), Dr. Peter Winograd presented a study about the 12th grade in New Mexico. In that presentation, Dr. Winograd indicated that, according to a 2010 study, 23 percent of US high school graduates could not pass the Armed Services Vocational Aptitude Battery (ASVAB) for acceptance into the US Army, whereas 28 percent of New Mexico graduates do not pass the exam. In the discussion following the presentation, one committee member expressed concern over the comparatively high rate of failure of New Mexico graduates who attempt the ASVAB, and another requested greater detail about what the examination comprises. This staff memo and its three attachments are a response to that request.

Introduction

According to sources, the ASVAB is administered as either a computer or traditional "paper and pencil" examination, depending upon where an examinee takes the exam. Most ASVAB testing is conducted at military entrance processing stations (MEPS), where the exam is administered by computer. If an examinee does not live near a MEPS, the test may be administered at a military entrance test (MET) site, where the exam is given in the paper and pencil format. Whether an examinee takes the computerized ASVAB (CAT-ASVAB) or the

paper and pencil ASVAB (P&P-ASVAB), which differ slightly in method of examination, number of questions, and time limits, should not significantly affect the outcome. Both exams are composed of several tests that are designed to measure aptitude in four domains: Verbal, Math, Science and Technical, and Spatial (see Attachment 1, *ASVAB Sample Questions*). Those subtests that deal with examinees' abilities in the Verbal and Math domains are used to generate the Armed Forces Qualification Test (AFQT) score, which is then used to determine an examinee's enlistment eligibility. The tables in Attachment 2, *ASVAB Composition and Testing*, illustrate the tests included in each of the exams, as well as the number of questions and time limits for each test.

P&P ASVAB (see Attachment 2, Table 1)

The P&P-ASVAB is a traditional examination, in which everyone takes the same set of questions at the same pace. Applicants are permitted to review their answers on the P&P version but they may not return to an earlier section or proceed to the next test until instructed to do so. If an examinee runs out of time on the P&P-ASVAB, it is advantageous to fill in random guesses for the remaining questions, as there is no penalty for guessing.

CAT-ASVAB (see Attachment 2, Table 2)

The CAT-ASVAB is an adaptive test, meaning that the test adapts to suit the ability level of the applicant being examined. Each question is selected by the computer from a pool of appropriate questions. After each question is answered, the computer will advance to a more difficult or less difficult question, depending on whether the examinee answered the previous question correctly.

Those persons taking the CAT-ASVAB may complete the examination at their own pace, independent of where other applicants might be in the tests. Unlike the P&P-ASVAB, however, the CAT-ASVAB does not allow answers to be reviewed or changed once they have been submitted. If an examinee is running out of time, it is best to continue trying to answer the questions as accurately as possible, as the CAT-ASVAB penalizes guessing.

Scoring the ASVAB and the Armed Forces Qualification Test

Each ASVAB subtest is scored and a "final ability estimate" is calculated based on the applicant's answers as well as any potential penalty for unanswered items or incorrect guesses, depending upon which version of the ASVAB the examinee took. Each final ability estimate is then converted to a standard score, with a fixed mean of 50.

All examinees also receive a score for the AFQT, which is based on the standard scores for the four subtests that examine one's abilities in the Math and Verbal domains: Arithmetic Reasoning, Math Reasoning, Word Knowledge, and Paragraph Comprehension. The AFQT score indicates the percentage of examinees in a reference group that scored at or below that particular score. For current AFQT scores, the reference group is a sample of 18- to 23-year-old young people who took the ASVAB as part of a national norming study conducted in

1997.¹ Thus, an AFQT score of 90 indicates that the examinee scored as well as or better than 90 percent of the nationally representative sample of 18- to 23-year-old youth. AFQT scores are then divided into categories, as illustrated in Attachment 3, *Armed Forces Qualification Test Scoring*, Table 1.

Performance on all of the ASVAB subtests is used to determine an applicant's best job in military service, whereas the AFQT score is used to determine eligibility for enlistment in the various branches of the US military. Each branch of the military sets its own enlistment standards, including the minimum acceptable AFQT score (see Attachment 3, Table 2).

¹ National norming studies for the ASVAB Testing Program typically are conducted every 15-20 years. The current national norms for the ASVAB were implemented in 2004. A nationally representative sample consisting of about 6,000 American youths aged 18-23 was utilized in the creation of the norms. These young people were identified from a screening of over 90,000 housing units, as part of the Profile of American Youth 1997 (PAY97) study. In the summer and fall of 1997, the CAT-ASVAB was administered to these study participants, and their performance was used to develop new norms for the ASVAB. Prior to 2004, ASVAB norms were based on the 1980 Profile of American Youth Study. For more information on ASVAB scoring and norming, see *Development and Evaluation of the 1997 ASVAB Score Scale*, Daniel O. Segall, Defense Manpower Data Center, July 2004. (http://www.official-asvab.com/docs/1997score_scale.pdf)

ASVAB Sample Questions

General Science (Science/Technical)

Question 1. Air is less dense than water because

- A. it is lighter.
- B. its molecules are further apart.
- C. its molecules are closer together.
- D. it moves more quickly and easily.

Question 2. 100° C is equal to

- A. 32° F.
- B. 100° F.
- C. 200° F.
- D. 212° F.

Arithmetic Reasoning (Math)

Question 1. If the tire of a car rotates at a constant speed of 552 times in one minute, how many times will the tire rotate in half-an-hour?

- A. 276
- B. 5,520
- C. 8,280
- D. 16,560

Question 2. One in every 9 people in a town vote for party A. All others vote for party B. How many people vote for party B in a town of 810?

- A. 90
- B. 720
- C. 801
- D. 819

ASVAB Sample Questions

Word Knowledge (Verbal)

Question 1. **Antagonize** most nearly means

- A. embarrass.
- B. struggle.
- C. provoke.
- D. worship.

Question 2. **Wilted** most nearly means

- A. left.
- B. limp.
- C. budding.
- D. requested.

Paragraph Comprehension (Verbal)

Question 1. The eastern part of Texas will ambush the senses of all who enter it with preconceptions of sand and cacti around every bend. It has a look and atmosphere that does not fit the boots-and-saddle image of the state.

The author implies that the look and atmosphere of east Texas does NOT resemble that of the

- A. marshlands.
- B. mountains.
- C. seashore.
- D. desert.

Question 2. A thin transparent layer of oxide protects the metal titanium against corrosion. The same thin layer attracts artists interested in making their art with the help of technology. By using heat or electricity, an artist can thicken the oxide layer and thereby turn the metal a range of vivid colors.

ASVAB Sample Questions

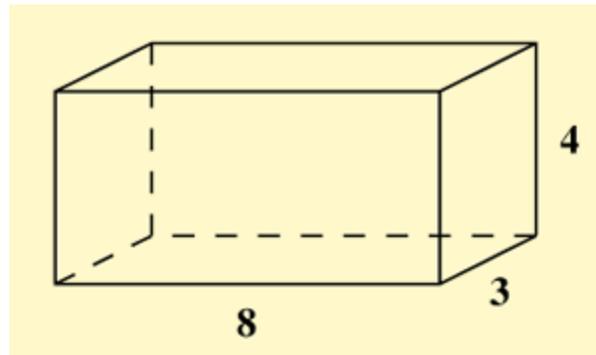
According to the passage, some artists work with titanium because it

- A. is transparent.
- B. does not corrode.
- C. generates its own heat.
- D. can assume a variety of colors.

Mathematics Knowledge (Math)

Question 1. $\sqrt{\frac{27}{3}} =$

- A. $\sqrt{3}$
- B. 3
- C. 9
- D. 12

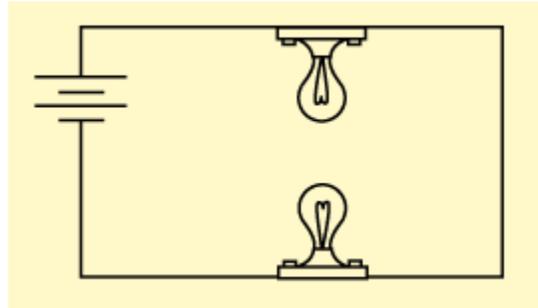


Question 2. The volume of the brick is

- A. 15
- B. 36
- C. 44
- D. 96

ASVAB Sample Questions

Electronics Information (Science/Technical)



Question 1. The circuit shown in the diagram contains a battery and two light bulbs. If one light bulb burns out, the other will

- A. no longer burn.
- B. continue to burn.
- C. flicker on and off.
- D. burn more brightly.

Question 2. Because solid state diodes have no filament, they

- A. don't work.
- B. are less efficient than tubes.
- C. require less operating power.
- D. require more operating power.

Auto Information (Science/Technical)

Question 1. Shock absorbers on a car connect the axle to the

- A. wheel.
- B. chassis.
- C. drive shaft.
- D. exhaust pipe.

ASVAB Sample Questions

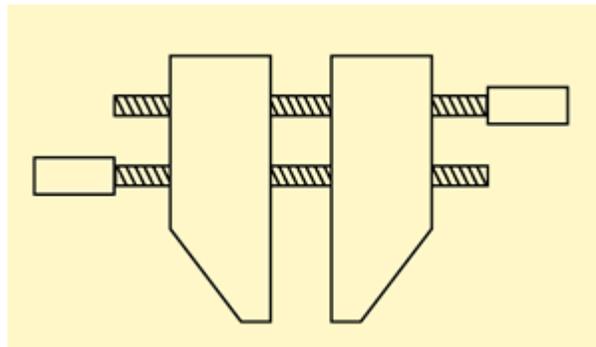
Question 2. If a car is driven mostly in a city so that the spark plug tip never gets hot enough to burn off excess carbons in the cylinder, then

- A. lower voltage should be applied to the spark plug.
- B. the tip should be pulled farther out of the cylinder.
- C. the tip should be pushed further into the cylinder.
- D. a thicker conductor in the plug must be used.

Shop Information (Science/Technical)

Question 1. Sanding blocks are used to

- A. prevent high spots and ridges on sanded surfaces.
- B. prevent dirt from collecting on the sandpaper.
- C. stretch the length of the sandpaper.
- D. prolong the use of the sandpaper.

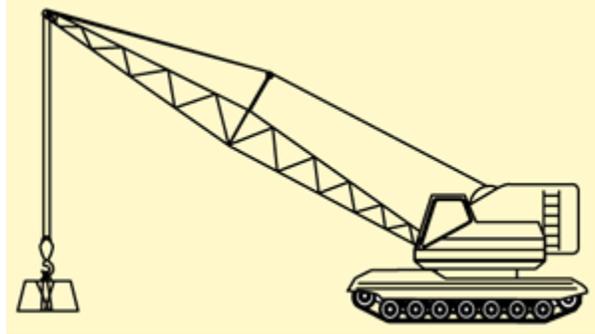


Question 2. The clamp shown is called a

- A. bar clamp.
- B. web clamp.
- C. spring clamp.
- D. parallel clamp.

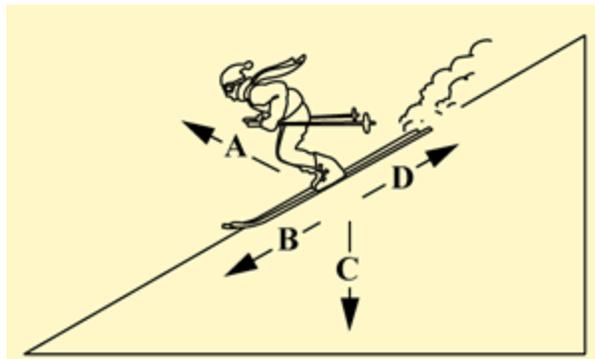
ASVAB Sample Questions

Mechanical Comprehension (Science/Technical)



Question 1. Extending the reach of this crane will shift its

- A. total weight.
- B. allowable speed.
- C. center of gravity.
- D. center of buoyancy.

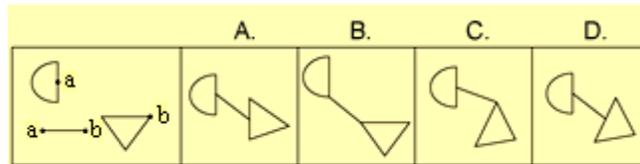


Question 2. In which direction does friction act on this skier?

- A.
- B.
- C.
- D.

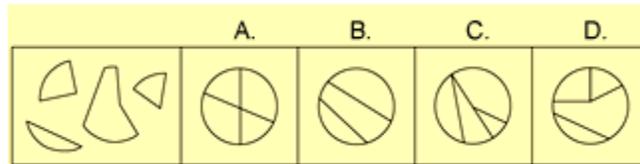
ASVAB Sample Questions

Assembling Object (Spatial)



Question 1. Which figure best shows how the objects in the left box will touch if the letters for each object are matched?

- A.
- B.
- C.
- D.



Question 2. Which figure best shows how the objects in the left box will appear if they are fit together?

- A.
- B.
- C.
- D.

Table 1. Pencil and Paper ASVAB (P&P-ASVAB)

Test	Description	Domain	Length	Time Limit
General Science	Knowledge of physical and biological science	Science/ Technical	25 questions	11 minutes
Arithmetic Reasoning	Ability to solve word problems	Math	30 questions	36 minutes
Word Knowledge	Choose correct meaning of a word in context and best synonym for a word	Verbal	35 questions	11 minutes
Paragraph Comprehension	Obtain information from written passages	Verbal	15 questions	13 minutes
Math Knowledge	Knowledge of high school mathematic principles	Math	25 questions	24 minutes
Electronics Information	Knowledge of electricity and electronics	Science/ Technical	20 questions	9 minutes
Auto/Shop Information	Knowledge of automobile technology, tools, shop terminology and practices	Science/ Technical	25 questions	11 minutes
Mechanical Comprehension	Knowledge of mechanical and physical principles	Science/ Technical	25 questions	19 minutes
Assembling Objects	Ability to determine how an object will look when its parts are assembled	Spatial	25 questions	15 minutes
Total			225 questions	149 minutes

Table 2. Computerized ASVAB (CAT-ASVAB)

Test	Description	Domain	Length	Time Limit
General Science	Knowledge of physical and biological science	Science/ Technical	16 questions	8 minutes
Arithmetic Reasoning	Ability to solve word problems	Math	16 questions	39 minutes
Word Knowledge	Choose correct meaning of a word in context and best synonym for a word	Verbal	16 questions	8 minutes
Paragraph Comprehension	Obtain information from written passages	Verbal	11 questions	22 minutes
Math Knowledge	Knowledge of high school mathematic principles	Math	16 questions	20 minutes
Electronics Information	Knowledge of electricity and electronics	Science/ Technical	16 questions	8 minutes
Auto Information	Knowledge of automobile technology	Science/ Technical	11 questions	7 minutes
Shop Information	Knowledge of tools, shop terminology and practices	Science/ Technical	11 questions	6 minutes
Mechanical Comprehension	Knowledge of mechanical and physical principles	Science/ Technical	16 questions	20 minutes
Assembling Objects	Ability to determine how an object will look when its parts are assembled	Spatial	16 questions	16 minutes

Total	145 questions	154 minutes
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Armed Forces Qualification Test Scoring

Table 1. AFQT Score Ranges	
AFQT Category	Score Range
I	93-99
II	65-92
IIIA	50-64
IIIB	31-49
IVA	21-30
IVB	16-21
IVC	10-15
V	1-14

Table 2. Minimum AFQT Scores by Service Branch	
US Military Service Branch	Minimum AFQT Score
Army	31
Navy (active duty)	35
Navy (reserve enlistment)	31
Air Force	36
Marine Corps	32
Coast Guard	40