ASVABer AFQT Study Guide

Sections Covered:
Testing Strategy & Preparation
Paragraph Comprehension
Word Knowledge
Mathematics Knowledge
Arithmetic Reasoning

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ASVABER PRACTICE SYSTEM

HOW TO GET THE MOST FROM THIS SYSTEM

Congratulations, you are one step closer to increasing your score on the ASVAB.

This practice system [which includes this guide book, paper practice tests and online practices tests] was put together for the specific purpose of helping you increase your score by improving your testing strategy, technique, confidence and subject knowledge.

We suggest you do things in the following order to get the most benefit in the least amount of time.

STEP 1: BENCHMARKING

Take an AFQT Practice exam to “benchmark” yourself. You want to get a feel for the test and identify your strengths and weaknesses. Record your answers to the following questions below.

1. Did you finish each section in the allotted time? If not, on which ones were you short?
2. How many did you get right on each section? AR ____ MK ____ WK ____ PC _____
3. What was your AFQT Score _____
4. How did you feel about your answers when you had to guess?

If you already took the free exam, try to record the answers above and move on to step 2.

STEP 2: GUIDE BOOK REVIEW

Read the entire guide book once all the way through. Pay particular attention to the Strategy and Preparation sections. If you are fuzzy on math, go over the practice problems and examples that we provided multiple times and make sure you clear on the basic formulae and problem solving techniques. Remember, one of the 4 choices on a multiple choice test is correct; all you have to do is figure out which one.

STEP 3: SUBJECT REVIEW & AFQT OPEN BOOK TEST

Recognizing the question type and figuring out your approach is probably the hardest thing to do under the time constraint. We want you to take an open book test without the time constraint so you
can get comfortable with the question format and the process of breaking down the question for the best approach to answer correctly.

**STEP 4: AFQT ONLINE PRACTICE TEST**

Take your second online practice exam and record the results like you did the first time. Make sure you review the time management and multiple choice strategy guides before you start. Decide on your blind guess answer. Get your scratch paper ready and get started.

1. Did you finish each section in the allotted time? If not, on which ones were you short?
2. How many did you get right on each section? AR ____ MK ____ WK ____ PC ____
3. What was your AFQT Score _____
4. How did you feel this time about your answers when you had to guess?
5. Which areas did you improve on?
6. Which areas did you do worse on?

**STEP 5: FULL LENGTH PRACTICE TEST**

By now, you should be finishing every section without a problem and your confidence level should be pretty high. You should know how to deconstruct a question and figure out exactly what they are asking.

Review your weakest subjects again before you get started. The full length test will be different. It is much longer and the AFQT subjects come in a different order. General Science is the first test.

Remember your time management strategy and multiple choice techniques.

1. Did you finish each section in the allotted time? If not, on which ones were you short?
2. How many did you get right on each section? AR ____ MK ____ WK ____ PC ____
3. What was your AFQT Score _____
4. How did you feel this time about your answers when you had to guess?
5. Which areas did you improve on?
6. Which areas did you do worse on?
# Table of Contents

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>How to Get the Most from This System</td>
<td>2</td>
</tr>
<tr>
<td>ASVAB Testing Strategy &amp; Preparation</td>
<td>6</td>
</tr>
<tr>
<td>ASVAB Essential Time Management Strategy</td>
<td>6</td>
</tr>
<tr>
<td>How to Master Multiple Choice Questions</td>
<td>7</td>
</tr>
<tr>
<td>How to Win at Word Problems</td>
<td>8</td>
</tr>
<tr>
<td>Top Five Mistakes and How to Avoid Them</td>
<td>9</td>
</tr>
<tr>
<td>Test Day Preparation</td>
<td>10</td>
</tr>
<tr>
<td>Paragraph Comprehension</td>
<td>11</td>
</tr>
<tr>
<td>The Paragraph Comprehension Question Format</td>
<td>11</td>
</tr>
<tr>
<td>How to Approach</td>
<td>12</td>
</tr>
<tr>
<td>Paragraph Comprehension Attack Plan</td>
<td>13</td>
</tr>
<tr>
<td>Find the Main Idea</td>
<td>14</td>
</tr>
<tr>
<td>Detail Questions – Finding Specific Content</td>
<td>15</td>
</tr>
<tr>
<td>Inference Questions</td>
<td>16</td>
</tr>
<tr>
<td>Determine the Meaning of a Word in Context</td>
<td>17</td>
</tr>
<tr>
<td>Word Knowledge</td>
<td>19</td>
</tr>
<tr>
<td>The Word Knowledge Question Format</td>
<td>19</td>
</tr>
<tr>
<td>How to Approach</td>
<td>21</td>
</tr>
<tr>
<td>Word Knowledge Resources</td>
<td>22</td>
</tr>
<tr>
<td>How Words Are Put Together</td>
<td>23</td>
</tr>
<tr>
<td>Mathematics Knowledge</td>
<td>27</td>
</tr>
<tr>
<td>What to Expect</td>
<td>27</td>
</tr>
<tr>
<td>Topic</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>HOW TO APPROACH</td>
<td>28</td>
</tr>
<tr>
<td>BASIC MATH TERMS AND OPERATIONS</td>
<td>29</td>
</tr>
<tr>
<td>WORKING WITH FRACTIONS</td>
<td>30</td>
</tr>
<tr>
<td>WORKING WITH DECIMALS</td>
<td>31</td>
</tr>
<tr>
<td>WORKING WITH PERCENTS (%)</td>
<td>32</td>
</tr>
<tr>
<td>WORKING WITH ROOTS &amp; EXPONENTS</td>
<td>33</td>
</tr>
<tr>
<td>AVERAGES AND PROBABILITY</td>
<td>34</td>
</tr>
<tr>
<td>ALGEBRA</td>
<td>35</td>
</tr>
<tr>
<td>SOLVING FOR AN UNKNOWN</td>
<td>35</td>
</tr>
<tr>
<td>PRIME FACTORIZATION</td>
<td>36</td>
</tr>
<tr>
<td>SOLVING INEQUALITIES</td>
<td>37</td>
</tr>
<tr>
<td>FACTORING AN EQUATION</td>
<td>37</td>
</tr>
<tr>
<td>LINES AND ANGLES</td>
<td>38</td>
</tr>
<tr>
<td>CALCULATING AREA &amp; VOLUME OF COMMON SHAPES</td>
<td>39</td>
</tr>
<tr>
<td>TRIANGLES</td>
<td>45</td>
</tr>
<tr>
<td>SAMPLE MK QUESTIONS AND SOLUTIONS</td>
<td>46</td>
</tr>
<tr>
<td>ARITHMETIC REASONING</td>
<td>49</td>
</tr>
<tr>
<td>WHAT TO EXPECT</td>
<td>49</td>
</tr>
<tr>
<td>HOW TO APPROACH</td>
<td>49</td>
</tr>
<tr>
<td>CONVERSIONS AND UNITS OF MEASURE</td>
<td>50</td>
</tr>
<tr>
<td>SAMPLE AR QUESTIONS AND HOW TO SOLVE THEM</td>
<td>51</td>
</tr>
</tbody>
</table>
ASVAB TESTING STRATEGY & PREPARATION

Many people are intimidated by standardized tests because they do not know these basic strategies for success that will absolutely increase your score. We are going to help you avoid the common mistakes that people make and how to use a few tricks to increase your chances for selecting the right answer even if you do not know exactly which one it is.

In this chapter, we will discuss:

1. The Essential Time Management Strategy
2. How to Master Multiple Choice
3. How to Win at Word Problems
4. Top 5 Mistakes on the ASVAB
5. Test Day Preparation

ASVAB ESSENTIAL TIME MANAGEMENT STRATEGY

Time is your biggest enemy on the ASVAB. Do not let STRESS and FEAR get the best of you. Follow my instructions on this tip and time will not be a factor on test day.

The time limit they give you for each question is not unreasonable if you keep moving through the test. The problem comes in when you spend too much time on a hard question and you panic near the end because you don’t have enough time to finish.

This is why it is very important to take AS MANY PRACTICE TESTS AS YOU CAN under the same time constraints as the official test. The more practice you get, the more comfortable you will be with the time constraints. When you are comfortable, you are not stressed and you think more clearly.

Keep an eye on the clock. If you are taking the CAT-ASVAB, you can look at the computer screen; it will be counting down your remaining time. If you are taking the paper test, you need to wear a watch or make sure you can clearly see the clock on the wall at the testing center.

Pay attention to your pace. Do not let time expire on you with unanswered questions. At some point, you may have to pick up the pace. Check yourself at the half way mark to make sure you are on target. If you have 25 questions and 11 minutes to complete like the General Science test, you should be on 12 or 13 with 5 minutes left.

Use your scratch paper at the beginning of every subtest to write down which question you should be on at the half way point. Make adjustments on your pace from there.
Have a “go to guess answer”. If you get to 1 minute left and you still have 5–10 questions to complete, consider using your standard guess answer. Decide in advance of the test what your “blind guess” answer will be and stick with that if you get into a situation where you have to speed through questions because of a time constraint. If your blind guess answer is C, then put all C’s in on the questions that you have to blind guess on.

HOW TO MASTER MULTIPLE CHOICE QUESTIONS

Every question on the ASVAB is multiple-choice with 4 possible answers A, B, C or D. So with a blind guess, you have a 25% (1 in 4) chance of picking the right answer out of thin air. Eliminate 1 wrong answer and you have a 33% chance (1 in 3) of picking the right answer. Eliminate 2 wrong answers and you have just increased your chances to 50/50. That should be quite encouraging once you understand a few things about how the test designers usually come up with the answers.

Here are a few general guidelines for multiple-choice answer sets. Keep these in mind and you will dramatically increase your chances of picking the right answer on a multiple-choice question. But also understand this is a deductive reasoning process which takes practice to develop. You are under a time constraint with the ASVAB so get as much practice as you can.

1. If two answers contradict each other, one of them is usually correct.
2. If two answers are really similar to each other, neither is typically correct.
3. There is usually at least one answer that is really far off the correct answer.
4. Look for keyword traps like always, never, everyone, no one. Answers that contain these types of absolutes are typically incorrect.
5. Look for long answers, especially on paragraph comprehension. The longer answers are very often correct.
6. Do NOT look for patterns of correct choices. You could see five C’s be the correct in a row and that would mean nothing. Do not disqualify something you think is correct just because you think that option has been used too many times.
HOW TO WIN AT WORD PROBLEMS

Most people panic when they see a word problem but we are going to show you how to attack any word problem with total confidence.

**Step 1: Read the question, determine exactly what they are asking.**

In example 2 below, I could have asked you how much further one person traveled than the other. I could have asked you how far they would have been apart if they are travelling opposite directions. I could have asked you what time they would have met each other, etc. etc.

**Step 2: Write down the data, deconstruct the words into an equation or drawing**

Every word problem has one or more underlying equations or formulae that will be used to determine the answer. If the question involves shapes, draw the shape. If it involves probability, write down the ratios. If it involves distance, speed or time, write down the variables in the equation.

**Example 1:** A circle with radius 3.5" is bordered by a square. What is the area of the square?

In this case, you draw a circle with a square around it and a radius of 3.5".

Now you can easily see that the length of the square is twice the radius of the circle which is 7 and that makes the area of the square 49"

**Example 2:** John and Lucy are on opposite ends of the 400 mile highway driving towards each other. If John leaves at 1:00 and drives at 60 mph while Lucy leaves at 12:00 and drives at 50 mph, how far apart are they at 4:00.

In this case, start by drawing a line segment with lucy and john at opposite ends.

John 400 miles Lucy

Then write the time/distance equation Time x Speed = Distance. For John 3 x 60 = 180 miles

For Lucy, 4 x 50 = 200 miles. And since they are going towards each other add their distance together and take it out of the total line segment. 400 – 200 – 180 = 20 miles apart.
TOP FIVE MISTAKES AND HOW TO AVOID THEM

Mistake #1 – Changing your answer – DO NOT CHANGE YOUR ANSWER ONCE YOU RECORD IT. You will not have this option if you are taking the CAT-ASVAB but you will if you are taking the traditional paper ASVAB. Studies show that when people change their answers, they are changing the right answer to the wrong answer nearly 75% of the time.

Mistake #2 – Not Answering a Question – Believe it or not, some people fail to provide any answer at all on some questions. The biggest reason is, of course, running out of time but that is no excuse for not answering a question. You get ZERO points for a blank answer. To avoid being in this situation, apply our time management strategy and our multiple choice strategy and if all else fails go to the blind guess answer. In the allotted time, you should be able eliminate at least 1 or 2 of the answer choices which significantly raises your chances of picking the right answer.

Mistake #3 – Answering the Wrong Question – Many people get a in a rush and do not read the question properly which makes them answer the wrong question. For example, on the Word Knowledge test, they may ask you to find the synonym or the antonym of a given word. Both answers will be in the choices but if you look for the antonym on a synonym question, you will get it wrong but think you got it right because you did not read the question properly. Our practices tests throw a lot of those curve balls at you to give you plenty of practice.

Mistake #4 – Falling for Familiar Facts – Chances are good that you will run into a question in which you do not recognize some of the answer choices but one of them is a common or familiar fact that most people would know. It may or may not be the right answer but DO NOT choose it just because it is familiar. This is a common trap of the ASVAB testers. Use your elimination strategy and see if it makes sense or not.

Mistake # 5 – Failure to Properly Prepare and Prioritize – DO NOT underestimate the importance of the ASVAB. Most branches of the military have provisions for retaking the test but the restrictions are pretty narrow and you may have to wait up to 2 years. That being said, you MUST give it your absolute BEST SHOT on the first try. And while there are 9 total subtests, only 4 are used to determine your enlistment eligibility. You MUST focus on AR, MK, WK and PC first and foremost when studying and practicing. Take SEVERAL practice tests under real testing conditions. That is why you have unlimited access to the testing center for 90 days. Lastly, read the Test Day Preparation section of the this guide and make sure you are in top mental and physical condition to take the test.
TEST DAY PREPARATION

All of this makes a much bigger difference than you might think. It’s very important that you stack everything in your favor when it comes to taking the official test. I personally believe that you should treat every practice test as if it were the official test but that is up to you.

Here is what you need to do starting the night before taking the ASVAB.

1. Get plenty of restful sleep. You want your mind and body to be fully rested on test day. Do not stay up all night studying for the test. Give yourself a break, cramming will not help at this point but it could hurt by making you tired and anxious.

2. DO NOT drink any alcohol the day before, night before or day of the test. Alcohol is proven to impair abstract thinking capability and you will need all your wits about you when taking the test.

3. If you have time the day before and or the day of the test, get some exercise.

4. Know your driving route to the test and plan on getting to the testing center 15–20 minutes early. This is important. They do not care about your excuses for being late. Adjust for traffic if necessary.
PARAGRAPH COMPREHENSION

The Paragraph Comprehension test is composed of 15 questions and you are only given 13 minutes to finish the entire subtest. You have 52 seconds to answer each of the questions. That’s plenty of time if you are properly prepared and follow the approach laid out in this guide.

<table>
<thead>
<tr>
<th>Total Questions</th>
<th>Total Time (mins)</th>
<th>Time Per Question (secs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>13</td>
<td>52</td>
</tr>
</tbody>
</table>

THE PARAGRAPH COMPREHENSION QUESTION FORMAT

You will be given a passage which could consist of a single sentence, a single paragraph or multiple paragraphs. There are four types of questions they could ask and multiple questions could pertain to the same passage. The four question types are below.

1. Find the main idea
2. Detailed questions; Finding specific content
3. Drawing an inference
4. Determine the meaning of a word in context
HOW TO APPROACH

The Paragraph Comprehension test is designed to indicate how well you understand what you read under the pressure of a time constraint. Fast readers do have a slight advantage but just because you read fast does not mean you understand well enough to answer questions. Follow the steps below and you will breeze right through this part of the test even if you are not the fastest reader in the world.

Example 1

Questions 4,5 & 6 are based on the following passage:

Emily Post was an authority on etiquette. Born on October 3, 1873, she was educated at home and in private schools. She met her husband, Edwin, at a ball during her "coming into society" period. Emily Post was a unique writer who wrote with a special purpose. Her primary topic was to instruct individuals on proper etiquette. What is etiquette? Etiquette is a standard of behavior, often with rules, regarding how individuals should conduct themselves in various situations. She started writing in order to earn needed income, and she wrote several articles and stories on subjects such as interior decorating and fiction stories. One of her publishers requested that she write about etiquette, so in 1922 she produced Etiquette in Society, in Business, in Politics, and at Home. This piece became the standard for a long-time focus on the subject. It was the base set of "rules" for proper behavior. Some modifications were made as customs changed through the years, although the base concepts were consistent. The book went through 90 printings.

4) The main idea of this passage is?
   a. How Emily Post invented etiquette
   b. How Emily Post wrote about etiquette
   c. The top 5 rules of etiquette
   d. How etiquette effects women

   From this passage, we can infer that?

5) a. Etiquette in Society, in Business, in Politics and at Home was very successful
   b. Emily Post died at the age of 90
   c. Emily's book stood the test of time
   d. Both A & C are correct

6) How old was Emily Post when she wrote her famous piece about etiquette?
   a. 22 or 23
   b. 49 or 50
   c. Not evident from this passage
   d. In her "coming into society" years
PARAGRAPH COMPREHENSION ATTACK PLAN

You only have 52 seconds per question and that includes reading time. The type of question dictates how you will read the paragraph.

1. **It is absolutely critical that you read the question first** [not including the answers] and then the passage.
   
   a. Looking at the example, we can see that we have 3 questions pertaining to the same paragraph. That tells us that we have almost 2 ½ minutes to work with.
   b. Question 4 asks us to find the main idea, Question 5 asks for an inference and Question 6 asks how old Emily Post was when she published her work.
   c. These questions indicate what we should be looking for in the passage.

2. Read the passage carefully with the questions in mind. Think of the answer as information is presented.
   
   a. Writers typically state the main idea of a paragraph in the first or last sentence.
   b. You were asked to determine Emily's age so be on the lookout for dates or any part of a sentence that mention age.
   c. You cannot draw an inference on the passage until you have read the entire passage and examined the answer choices to see which is most appropriate so leave Question 5 for last.

3. Read all the answers for each question carefully before making your decision. **Use the tips for each question type provided in the rest of this section.**
   
   a. In this case, the first sentence definitely reveals the main idea of the passage. Emily Post is an authority on etiquette. The rest of the paragraph supports the idea that she was famous for writing about etiquette. It does not say she invented etiquette or the number of rules in her book or that etiquette was only for women.
   b. In this case, you get Emily's birth date in the second sentence. She was born in 1873. Later in the passage, it says that she published a piece in 1922 that went on to become the standard for a long time focus on the subject and that it went through 90 printings. That makes Emily 49 or 50 when the piece was published her most famous piece.
   c. After reading the entire passage and looking at the choices, you could logically infer that *Etiquette in Society, in Business, in Politics, and at Home* was very successful since it went through 90 printings. However, selecting A before reading all the choices would be a mistake. Having been through 90 printings over several years, the piece has also stood the test of time so option C is also correct which makes D the correct answer for this question. The passage never mentions when Emily died.
FIND THE MAIN IDEA

The following are sample questions that indicate you are supposed to find the main idea.

1. The main idea of the passage is _________
2. The best title for this passage is _________
3. The statement best supported by this passage is _________
4. This passage is mainly about _________
5. The central point of this passage is _________

The main idea is very often stated in the first or last sentence and is supported by thoughts and statements throughout the passage. This approach is referred to as the Thesis. First the writer tells you WHAT he believes and then tells you WHY he believes it.

If the main idea does not standout in the first or last sentence, you will usually find it after a “switch word” like but, however, although, yet or though. In this case, the writer sets up the main point with contrasting information and then changes direction to make his point.

For example: “but this was not always the case” OR “however, the balance of power shifted after the War of 1812”

ELIMINATION CLUES

If you are looking to eliminate an answer choice, consider the following clues about incorrect answers.

1. The answer is too general or too detailed
2. The answer contradicts the passage
3. The answer uses extreme words like always, never, none, every or only
DETAIL QUESTIONS – FINDING SPECIFIC CONTENT

A detailed question is easy to spot. You will be asked to identify What, Why, Where, When or How about something related to the passage. You could be asked to solve a problem based on information given in the passage or identify which of the choices were not mentioned in the passage. Consider the following Question Examples referring to the passage about Emily Post.

1. How old was Emily Post when she published her most famous piece?
2. Which of the following was NOT mentioned in the article?
3. How much was Emily paid to write articles?
4. According to the passage, what is etiquette?

Tips for Detailed Questions

1. The correct answer will usually be a paraphrase of something stated in the passage
2. Read the answer choices carefully and eliminate the ones that are too detailed, too broad or use extreme wording.
3. Look for pieces of information that pertain to the question as you read the passage. As in the question about how old Emily Post was when she published her most famous piece. You know from the beginning that any mention of dates could pertain to the answer. Her exact age was never mentioned so you have to calculate her age based on the dates provided in the context of her publishing. She was born in 1873 and published a most famous piece in 1922 which makes her 49 or 50 depending on which month she was born.
INFEREN CE QUESTIONS

An Inference Question can be stated several ways but in every case you will have to determine the answer based on information not directly stated in the passage. The answer is implied or suggested based on one or more sentences in the passage. Below are some examples of Inference Questions.

1. Based on the passage, one might conclude that ____________.
2. Which of the following most accurately expresses the how the author of this passage feels about politics?
3. If all the statements in the above passage are true, what must also be true?

The best strategy for an Inference Question is to read the passage based on the nature of the question looking for clues. If they are asking about a general conclusion or how the author feels about something, you will see common and reoccurring statements that indicate the answer. Most of the time, the process of elimination will help you clearly identify the correct choice. Refer the following example.

When the stock market crashed in 1929, the United States plummeted into the Great Depression. By the early 1930s, millions of people were out of work. Many of them were homeless and roaming the country looking for employment. The people needed a strong leader to bring about reforms and rebuild the people's faith in their government. They found this person in Franklin Delano Roosevelt. The first step he took was to establish The Federal Emergency Relief Administration. This program provided direct cash payments to the unemployed and created government jobs. It was instrumental in helping the people to regain their confidence in the economy. Next, he reformed banks. This started with a national banking holiday, and gave direct, immediate assistance to get them back to business. He also instituted The Federal Deposit Insurance Corporation to help the people have faith in banks again.

7) From this passage, we can infer that?

a. FDR was President during the time of the Great Depression
b. Banks were run by the government
c. Everyone was homeless in the 1930’s
d. The war caused the Great Depression

The correct answer for Question 7 above is easily found through the process of elimination. Option D is eliminated based on contradicting the passage. The first sentence indicates the Great Depression was caused by the stock market crash and not the war. Option C is eliminated based on extreme
wording. It says EVERYONE was homeless whereas the passage said MANY people were homeless. Option B states information outside the scope of the passage. Option A is the only one left and it is supported by the passage. It does not explicitly say that Roosevelt was President during the Great Depression but it does say he was the leader and that he established federal programs to get the economy back on track and restore confidence.

**Tips for Inference Questions**

1. Read the question carefully to determine which type of inference question is being asked.
2. Read the passage scanning for clues, facts, common threads and emphasis.
3. Rely heavily on process of elimination. Rule out choices which contradict the passage, go outside the scope of the passage or use extreme wording.

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**DETERMINE THE MEANING OF A WORD IN CONTEXT**

This type of question is probably the easiest from process point of view. You are asked to determine the meaning of a word as it is used in the paragraph. This means you can scan the paragraph and go straight to the word without getting too caught up in the details of the passage.

Very often the word will be one that can be used several ways having a different meaning depending on how it is used. The testers may put those different meanings as answer choices to throw you off so you still have to be very careful and follow the process outlined below.

**Tips for Word Meaning Questions**

1. Read the passage to find the sentence containing the subject word.
2. Read the whole passage quickly to determine the tone of the passage. It may have an influence on the context of the word.
3. Think of a replacement word that might make sense. Several choices may come to mind.
4. Read the answer choices; you may be able to eliminate one or two right off the bat.
5. Replace the subject word with the possible answers in the sentence from the passage.
6. Choose the one that makes the most sense in the context of the sentence and tone of the passage.
Example

John made his argument in front of the New York State Assembly. The tension in the air was palpable as delegates from both parties considered the importance of their vote on the referendum.

In the passage above, Assembly most nearly means:

a) Put together
b) Legislative body
c) Capital
d) Governor

You might normally think Assembly means “put together” but you can clearly eliminate Option A in this case because of the context. Option C & D sound good in the sentence but can be eliminated by definition. Option B makes the most sense because of the context suggested in the second sentence. You know that delegates from both parties are going to vote of the referendum which suggest that Assembly means legislative body in this case.
WORD KNOWLEDGE

The Word Knowledge test is composed of 35 questions and you are only given 11 minutes to finish the entire subtest. You have a little less than 20 seconds to answer each of the questions. That's plenty of time if you are properly prepared and follow the approach laid out in this guide.

<table>
<thead>
<tr>
<th>Total Questions</th>
<th>Total Time (mins)</th>
<th>Time Per Question (secs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>11</td>
<td>18.8</td>
</tr>
</tbody>
</table>

THE WORD KNOWLEDGE QUESTION FORMAT

Make sure you read the directions carefully before you start the test. They will tell you exactly what you are supposed to do. You are likely to run into one of two question formats in the Word Knowledge subtest and additional directions could be in the question itself.

1. Definition – identify the most correct definition of the subject word
2. Synonym – identify the synonym of the subject word used in the context of a sentence.

Each question could have its own instructions.

Example 1

Ambiguous most nearly means:

a) uneventful
b) daring
c) uncertain
d) specific

In Example 1, you are being asked to find the option that most closely defines the subject word. The correct answer is C. Very often they will try to confuse you by putting the correct “wrong” answer as an option. For instance, if you were rushing along and thought you were supposed to find the opposite of the subject word, you might have chosen D thinking it was correct.
**Example 2**

The word *most opposite* nocturnal is:

a) happy  
b) sad  
c) diurnal  
d) intelligent

In Example 2, you are asked to find the opposite of the underlined word. If you do not already know that nocturnal means "of or pertaining to the night", then you could use the process of elimination to arrive at the correct answer which is C. Options A and B are opposite each other but have nothing to do with the subject word. The opposite of intelligent is dumb or stupid which does not seem to relate to the subject word either. The only option left is C.

**Example 3**

His story was plausible.

a) believable  
b) ludicrous  
c) fantastic  
d) fiction

In Example 3, you are not given any specific directions in the question itself. However, instructions for questions like this were probably given at the beginning of the test. In cases where the underlined word is used in a sentence, you are to find the synonym. The correct answer is A.
HOW TO APPROACH

If your vocabulary is not all that deep and sophisticated, don’t worry. You are not alone and we have provided links to over 5000 practice words and different kinds of word knowledge testing sites in the next section. Just relax and remember you are dealing with a multiple choice test. One out of the four answers is correct and there are ways to figure that out even if you don’t know the exactly which one it is.

It will take some practice to develop these skills under the pressure of a timed test but you can do it. Follow these guidelines and your score will improve without a doubt.

1. Read the directions carefully to make sure you know what is being asked and what you are supposed to do for that particular question.

2. Read all the choices carefully and do not make a rush decision because something is familiar to you. That could be the exact trap they want to fall into.

3. If you do not know the answer, start the process of elimination.

   a. Start with the subject word. If you don’t know the meaning, look for clues in the root, prefix or suffix (refer to the How Words are Put Together section of this guide to learn more about roots, prefixes and suffixes)

   b. Is the subject word a noun, adjective or adverb? Chances are the answer will be the same type. You can probably eliminate the choices that are not the same type.

   c. If the word is used in a sentence and you are supposed to find the synonym, try replacing the subject word with each of the choices. One or two choices should be easily eliminated with this approach.

   d. Eliminate similar choices. Quite often, the tester will include two choices are very similar to each other in meaning. Most of the time, you can eliminate both choices.

   e. Positive or Negative? Is the tone of the subject word positive or negative? If it is a positive word and you are supposed to find the synonym then the answer will also be positive in nature. You can eliminate the choices that have a negative tone. If the subject word is positive and you are looking for the antonym, then you can eliminate the choices with a positive tone.
WORD KNOWLEDGE RESOURCES

Here are some links to various sites around the Internet that will help you with building your Word Knowledge.

http://www.freevocabulary.com/
This site actually gives you 5000 words with definitions for FREE. You can view the words right on the site or download the PDF.

http://www.vocabtest.com/
This site is great because it gives you the ability to create your own Synonym or Antonym practice test. Here is an example of how to create one.

Click on the Seniors box under the grade level section

Check

Choose which kind of practice you want and it will create the test for you.
HOW WORDS ARE PUT TOGETHER

PREFIXES

A prefix is a letter or group of letters placed at the beginning of a word to change its meaning and make a new word. Learning a few prefixes can open the door to a powerful vocabulary.

BELOW ARE TEN COMMON LATIN PREFIXES.

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Meaning</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>ad-</td>
<td>to, towards</td>
<td>adjoin, adverb</td>
</tr>
<tr>
<td>com-</td>
<td>with, together</td>
<td>commotion</td>
</tr>
<tr>
<td>de-</td>
<td>down</td>
<td>depress, deform</td>
</tr>
<tr>
<td>dis-</td>
<td>away, apart</td>
<td>disagree, dishonest</td>
</tr>
<tr>
<td>ex-</td>
<td>out</td>
<td>exchange, excavate</td>
</tr>
<tr>
<td>in-</td>
<td>in, into</td>
<td>inscribe, inhabit</td>
</tr>
<tr>
<td>in-</td>
<td>not</td>
<td>inflexible, indecent</td>
</tr>
<tr>
<td>pre-</td>
<td>before</td>
<td>premature</td>
</tr>
<tr>
<td>pro-</td>
<td>forward</td>
<td>proclaim</td>
</tr>
<tr>
<td>re-</td>
<td>again, back</td>
<td>recover, return</td>
</tr>
</tbody>
</table>

BELOW ARE FIVE COMMON GREEK PREFIXES.

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Meaning</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>a-</td>
<td>not, without</td>
<td>atypical, asexual</td>
</tr>
<tr>
<td>apo-</td>
<td>off, away</td>
<td>apology, apostrophe</td>
</tr>
<tr>
<td>epi-</td>
<td>beside, upon</td>
<td>epigraph, epidermis</td>
</tr>
<tr>
<td>para-</td>
<td>beside</td>
<td>paragraph, paraphrase</td>
</tr>
<tr>
<td>syn-</td>
<td>together, with</td>
<td>synthesis, synonym</td>
</tr>
</tbody>
</table>
## SUFFIXES

A suffix is a letter or group of letters placed at the end of a word to change its grammatical function, tense, or meaning. Suffixes can be used to create a verb from a noun or adjective or an adjective from a verb, for example. They can change a word’s tense as well; “–ed” can make a present–tense verb into a past participle, for instance. They can even change a word’s meaning; the suffix “–ette,” for example, can make a word into its diminutive: “kitchen” becomes “kitchenette.”

### BELOW ARE TEN POWERFUL SUFFIXES.

<table>
<thead>
<tr>
<th>Suffix</th>
<th>Meaning</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>–ate</td>
<td>to make</td>
<td>alienate, regulate</td>
</tr>
<tr>
<td>–en</td>
<td>to make</td>
<td>weaken, moisten</td>
</tr>
<tr>
<td>–ism</td>
<td>the quality or practice of</td>
<td>absolutism, baptism</td>
</tr>
<tr>
<td>–ation</td>
<td>the act or condition of</td>
<td>allegation, affirmation</td>
</tr>
<tr>
<td>–ty</td>
<td>the state of</td>
<td>modesty</td>
</tr>
<tr>
<td>–er</td>
<td>one that does or deals with</td>
<td>worker, teacher</td>
</tr>
<tr>
<td>–an</td>
<td>one that does or deals with</td>
<td>comedian, historian</td>
</tr>
<tr>
<td>–al</td>
<td>resembling or</td>
<td>natural, accidental</td>
</tr>
<tr>
<td>pertaining to full of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>–ous</td>
<td>full of</td>
<td>perilous</td>
</tr>
<tr>
<td>–able</td>
<td>capable of being</td>
<td>reversible</td>
</tr>
</tbody>
</table>
ROOTS
One of the quickest and most effective ways to improve your vocabulary is by learning to recognize the most common Latin and Greek roots, since any of them can help you define a number of English words.

BELOW ARE THE COMMON LATIN ROOTS.

<table>
<thead>
<tr>
<th>Root</th>
<th>Meaning</th>
<th>Example</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ag</td>
<td>act</td>
<td>agent</td>
<td>representative</td>
</tr>
<tr>
<td>cad, cas</td>
<td>fall</td>
<td>cadence</td>
<td>rhythmic flow</td>
</tr>
<tr>
<td>cap, cept</td>
<td>take, hold</td>
<td>receptive</td>
<td>container</td>
</tr>
<tr>
<td>ced, cess</td>
<td>go</td>
<td>recessive</td>
<td>tending to go back</td>
</tr>
<tr>
<td>cid, cis</td>
<td>kill, cut</td>
<td>incision</td>
<td>cut, gash</td>
</tr>
<tr>
<td>clud, clus</td>
<td>shut</td>
<td>seclusion</td>
<td>separation from others</td>
</tr>
<tr>
<td>cred</td>
<td>believe</td>
<td>credible</td>
<td>believable</td>
</tr>
<tr>
<td>cur (r), curs</td>
<td>run</td>
<td>concur</td>
<td>agree (i.e., run together)</td>
</tr>
<tr>
<td>fer</td>
<td>bear</td>
<td>odoriferous</td>
<td>yielding an odor</td>
</tr>
<tr>
<td>her, hes</td>
<td>cling</td>
<td>adhere</td>
<td>clinging, stick</td>
</tr>
<tr>
<td>ject</td>
<td>throw</td>
<td>projection</td>
<td>jutting out, protrusions</td>
</tr>
<tr>
<td>leg, lect</td>
<td>read</td>
<td>legible</td>
<td>easily readable</td>
</tr>
<tr>
<td>pel (l), puls</td>
<td>drive</td>
<td>repulse</td>
<td>repel (i.e., drive back)</td>
</tr>
<tr>
<td>pon, posit</td>
<td>put</td>
<td>postpone</td>
<td>defer</td>
</tr>
<tr>
<td>port</td>
<td>carry</td>
<td>portable</td>
<td>movable</td>
</tr>
<tr>
<td>rupt</td>
<td>break</td>
<td>abrupt</td>
<td>sudden, quick</td>
</tr>
<tr>
<td>scrib, script</td>
<td>write</td>
<td>inscription</td>
<td>engraving, writing</td>
</tr>
<tr>
<td>sect</td>
<td>cut</td>
<td>dissect</td>
<td>cut apart</td>
</tr>
<tr>
<td>sent, sens</td>
<td>feel</td>
<td>sensitive</td>
<td>tender</td>
</tr>
<tr>
<td>sequ, secut</td>
<td>follow</td>
<td>sequel</td>
<td>result</td>
</tr>
<tr>
<td>spect</td>
<td>look</td>
<td>prospect</td>
<td>outlook, expectations</td>
</tr>
<tr>
<td>sta, stat</td>
<td>stand</td>
<td>stable</td>
<td>fixed, firm</td>
</tr>
<tr>
<td>tang, tact</td>
<td>touch</td>
<td>tactile</td>
<td>tangible</td>
</tr>
<tr>
<td>termin</td>
<td>end</td>
<td>terminate</td>
<td>abolish, end</td>
</tr>
<tr>
<td>tract</td>
<td>pull, draw</td>
<td>tractor</td>
<td>vehicle that pulls</td>
</tr>
<tr>
<td>ven, vent</td>
<td>come</td>
<td>convene</td>
<td>assemble (i.e., come together)</td>
</tr>
<tr>
<td>vert, vers</td>
<td>turn</td>
<td>invert</td>
<td>overturn</td>
</tr>
<tr>
<td>vid, vis</td>
<td>see</td>
<td>provident</td>
<td>having foresight</td>
</tr>
<tr>
<td>vinc, vict</td>
<td>conquer</td>
<td>invincible</td>
<td>unconquerable</td>
</tr>
<tr>
<td>volv, volut</td>
<td>roll, turn</td>
<td>evolve</td>
<td>develop</td>
</tr>
</tbody>
</table>
### Below Are Common Greek Roots.

<table>
<thead>
<tr>
<th>Root</th>
<th>Meaning</th>
<th>Example</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>aster, astro</td>
<td>star</td>
<td>asterisk</td>
<td>star-shaped mark</td>
</tr>
<tr>
<td>chrom</td>
<td>color</td>
<td>chromatic</td>
<td>pertaining to color</td>
</tr>
<tr>
<td>chron, chrono</td>
<td>time</td>
<td>synchronize</td>
<td>occur simultaneously</td>
</tr>
<tr>
<td>cosmo</td>
<td>world</td>
<td>cosmopolitan</td>
<td>citizen of the world</td>
</tr>
<tr>
<td>dem</td>
<td>people</td>
<td>democracy</td>
<td>government by the people</td>
</tr>
<tr>
<td>meter</td>
<td>measure</td>
<td>thermometer</td>
<td>instrument that measures</td>
</tr>
<tr>
<td>onym</td>
<td>name, word</td>
<td>pseudonym</td>
<td>a fictitious name</td>
</tr>
<tr>
<td>path</td>
<td>feeling</td>
<td>apathy</td>
<td>absence of feeling</td>
</tr>
<tr>
<td>phob</td>
<td>fear</td>
<td>claustrophobia</td>
<td>fear of enclosed places</td>
</tr>
<tr>
<td>phon</td>
<td>sound</td>
<td>cacophony</td>
<td>harsh, discordant sound</td>
</tr>
<tr>
<td>psycho</td>
<td>mind</td>
<td>psychology</td>
<td>science of the mind</td>
</tr>
<tr>
<td>soph</td>
<td>wisdom</td>
<td>sophistry</td>
<td>subtle, tricky reasoning</td>
</tr>
</tbody>
</table>
MATHEMATICS KNOWLEDGE

WHAT TO EXPECT

The *Mathematics Knowledge* test is composed of 30 questions and you are only given 36 minutes to finish the entire subtest. You have almost 1 minute to answer each of the questions. That’s plenty of time if you are properly prepared and follow the approach laid out in this guide.

<table>
<thead>
<tr>
<th>Total Questions</th>
<th>Total Time (mins)</th>
<th>Time Per Question (secs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>24</td>
<td>57 seconds</td>
</tr>
</tbody>
</table>

The Mathematics Knowledge (MK) test is designed to test your general knowledge of math in the areas of general arithmetic, algebra and geometry at a high school level. The questions are typically in the form of an equation you have to solve or a short simple word problem.

You will get one or two questions on a variety of mathematical concepts. For example, you may be asked to solve a single variable algebra question, then a geometry question, then a number in a series question, then a definition question.

If it has been a while since your high school math class, you will want to brush up on the basic concepts covered in this chapter.

NOTE: If you do not know the basic concepts of algebra and geometry, you will need to spend some focused time on those subjects with a tutor or teacher of some sort. It is beyond the scope of this program to teach algebra and geometry to someone who has no basis or prior exposure. This document is simply meant to refresh your memory and give some guidance on testing techniques that will help you on the ASVAB.
HOW TO APPROACH

You want to approach the Mathematics Knowledge (MK) exam as preparation for the Arithmetic Reasoning (AR) exam. The MK exam is about knowing the subject of math which includes all of the formulae and mechanics of solving equations.

The AR exam is about applying you knowledge at a higher level to solve problems that require reasoning capability and may involve one or more different math calculations to arrive at the answer.

So make sure you spend some quality time with the MK section of this document so that you are prepared for the AR section.

The AR exam will be comprised mostly of word problems.
# BASIC MATH TERMS AND OPERATIONS

Here are the math terms and operations you need to know to be successful in the both ASVAB math exams. You will have to be able to ADD, SUBTRACT, MULTIPLY and DIVIDE each type of number below.

First we will tell you what they are and then we will take each one individually and review how to perform the required operations.

<table>
<thead>
<tr>
<th>Type of Number</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole Numbers</td>
<td>ordinary counting numbers</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>Integer</td>
<td>Positive or negative Whole Numbers</td>
<td>-1, 1, 0, 2, -2</td>
</tr>
</tbody>
</table>
| Fractions            | One or more equal parts of a number. The number of top is the numerator and the number on bottom is the denominator. You can have mixed number fractions and improper fractions. Improper fractions are always greater than 1 and can be converted to a mixed number. | Normal fraction 2/3  
Mixed fraction 3 ¾  
Improper Fraction 9/7  
9/7 as a mixed number is 1 2/7 |
| Positive/Negative Numbers | Numbers that are greater and less than 0                                 | -1, 1.5, 0, 2.5, -2      |
| Even/Odd Numbers     | An Even number is any number that is a factor of 2.  
An Odd number is any number that is not a factor of 2 | Even number 2, 4, 6, 328  
Odd Numbers 1, 3, 5, 7, 297 |
| Decimals             | Numbers expressed in a “base-10” numeric system. Each digit to the right of a decimal is divided again by 10 | 1.2 expressed as a fraction is 1 and 2/10  
1.24 expressed as a fraction is 1 and 24/100 |
| Percents (%)         | Way of expressing a number as a fraction of 100 (per cent meaning "per hundred" in Latin). | 24% means 24/100  
36% means 36/100  
1.5% means 150/100 |
| Roots                | are the inverse operation of exponents                                      | $\sqrt{25} = 25^{1/2} = 5$ |
Exponents are a way of indicating that a quantity is to be multiplied by itself some number of times. In the expression $2^5$, 2 is called the base and 5 is called the exponent.

You will also need to be familiar with:

<table>
<thead>
<tr>
<th>Type of Number</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratios</td>
<td>a relationship between two numbers of the same kind usually expressed as “a to b” or a:b</td>
<td>3 to 4 or 3:4</td>
</tr>
<tr>
<td>Factors</td>
<td>Factors are the numbers you multiply together to get another number to get a product</td>
<td>In $5 \times 6 = 30$, 5 and 6 are factors and 6 is the product</td>
</tr>
<tr>
<td>Multiples</td>
<td>The result of multiplying by an integer (a positive or negative whole number or zero).</td>
<td>Example: $4 \times 5 = 20$, 20 is a multiple of 4 and also of 5</td>
</tr>
<tr>
<td>Prime Numbers</td>
<td>a whole number that can only be divided by 1 and itself without ending up with a mixed number</td>
<td>2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43 and so on</td>
</tr>
<tr>
<td>Factorial</td>
<td>denoted by $n!$, is the product of all positive integers less than or equal to $n$</td>
<td>$5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$, $3! = 3 \times 2 \times 1 = 6$</td>
</tr>
</tbody>
</table>

**WORKING WITH FRACTIONS**

Remember, the number on top is the numerator and the number on bottom is the denominator. Also, it is always a good idea to simplify a fraction before starting a problem.

For example, $\frac{2}{6}$ simplifies or reduces to $\frac{1}{3}$.

**ADDING AND SUBTRACTING FRACTIONS WITH THE SAME DENOMINATOR**

Adding and subtracting fraction with the same denominator is just like adding or subtracting any number.
For example \( \frac{1}{3} + \frac{1}{3} = \frac{2}{3} \)

### ADDING AND SUBTRACTING FRACTIONS WITH THE SAME DENOMINATOR

When you are adding and subtracting fractions with the same denominator, you can simply add or subtract the numerators and keep the denominator the same.

For example:

\[
\frac{2}{3} + \frac{3}{4} = \frac{8}{12} + \frac{9}{12} = \frac{17}{12}
\]

which could also be expressed as a mixed number \(1 \frac{5}{12}\)

### MULTIPLYING FRACTIONS

When multiplying fractions, multiply the numerators and denominators against each other.

For example:

\[
\frac{2}{3} \times \frac{3}{4} = \frac{6}{12} = \frac{1}{2}
\]

### DIVIDING FRACTIONS

When dividing fractions, invert the denominator of the fraction you are dividing by and multiply.

For example:

\[
\frac{2}{3} \div \frac{3}{4} = \frac{2}{3} \times \frac{4}{3} = \frac{8}{9}
\]

### MULTIPLYING AND DIVIDING MIXED NUMBERS

When multiplying a mixed number, convert it to an improper fraction first and use the same approach of multiplying regular fractions.

For example:

\[
1 \frac{2}{3} \times 4 \frac{3}{4} = \frac{5}{3} \times \frac{19}{4} = \frac{95}{12}
\]

For example:

\[
1 \frac{2}{3} \div 1 \frac{3}{4} \text{ converts to } \frac{5}{3} \div \frac{7}{4} = \frac{5}{3} \times \frac{4}{7} = \frac{20}{21}
\]

### WORKING WITH DECIMALS

Decimals use the “Base 10” numeric system. Which means that numbers to the left of the decimal are whole numbers and numbers to the right of the decimal are fractions of 10 for each digit.

For example 1.6 is \(1 \frac{6}{10}\) and 2.45 is \(2 \frac{45}{100}\)
When you multiply a number by 10, you move the decimal one place to the right.

For example \(0.6 \times 10 = 6\) and \(10 \times 0.26 = 2.6\)

Likewise, when you multiply a number by 100 you move the decimal 2 place to the right and when multiplying by 1000 you move it 3 places to the right.

This is because of the Base 10 system…you move the decimal one to the right for every 0 in the multiplier. 10 has one zero, 100 has 2 zeros, 1000 has 3 zeros and so on.

When you divide a number by 10, you move the decimal one place to the left and the same Base 10 principle applies. 10 is one place to the left, 100 is 2 place to the left and so on.

For example \(0.6 \div 10 = 0.06\) and \(0.26 \div 100 = 0.0026\)

Decimals with 2 places can be expressed as a percent

For example \(0.25 = 25\%\)

WORKING WITH PERCENTS ( % )

Percents are fractions whose denominator is 100. Any number can be expressed as a percent by putting it over 100.

For example \(30\% = \frac{30}{100}\) or \(125\% = \frac{125}{100}\)

Adding and subtracting percents is really easy. For example, \(30\%-10\% = 20\%\)

Multiplying Percents works the same as multiplying fractions.

For example \(30\% \times 20\% = \frac{30}{100} \times \frac{20}{100} = \frac{600}{10000}\) which reduced is \(\frac{6}{100}\) expressed as a decimal is 0.06

Percents can also be expressed as decimals and fractions:

For example: \(\frac{1}{2} \div 25\% = \frac{1}{2} \div 0.25\) or \(\frac{1}{2} \div \frac{25}{1}\) which is calculated as \(\frac{1}{2} \times \frac{1}{0.25} = \frac{1}{0.5} = 2\)
WORKING WITH ROOTS & EXPONENTS

An exponent, also referred to as “power” is the number that appears after a number and slightly higher to the right. The number is the base and the exponent is the raised number.

For example: \(2^3\) is stated as 2 to the 3rd power or 2 is the base and 3 is the exponent. \(2^3\) could also be stated as 2 cubed.

The value of a number with an exponent is the number multiplied by itself the number of times of the exponent. So \(2^3\) is \(2 \times 2 \times 2 = 8\)

When you are multiplying numbers that have the same base, you can add the exponents.

For example \(2^2 \times 2^2\) is \(2^4\) or \(2 \times 2 \times 2 \times 2 = 16\)

A root is expressed with the radical symbol \(\sqrt{\phantom{0}}\)

The square root is a number that when multiplied by itself produce the given number.

For example \(\sqrt{16}\) is 4 because \(4 \times 4 = 16\) another example would be \(\sqrt{64}\) is 8

The cube root is a number that when multiplied by itself 3 times produces the given number.

The cube root is expressed as \(\sqrt[3]{8}\) which = 2 because \(2 \times 2 \times 2 = 8\)

These types of numbers can also be referred to as radical numbers and you may be asked to simplify a radical number on the ASVAB.

This is how you would do that: to simplify \(\sqrt[3]{32}\) I would try to express 32 as a number with a perfect square such as 16. So \(\sqrt[3]{32}\) could also be expressed as \(\sqrt[3]{16} \times 2\) which could then be reduced as \(4\sqrt[3]{2}\)

You can add or subtract radicals that have the same number inside the radical sign.

For example: \(4\sqrt{2} + 5\sqrt{2} = 9\sqrt{2}\) however, \(4\sqrt{2} + 5\sqrt{3}\) cannot be combined.

To multiply or divide radicals, you multiply or divide the numbers outside the radicals and multiply or divide the numbers inside the radical.
For example: \(4\sqrt{2} + 5\sqrt{3} = 20\sqrt{6}\) and \(8\sqrt{10} ÷ 4\sqrt{2} = 2\sqrt{5}\)

To take the **square root of a fraction**, you convert it to square of the numerator over square of the denominator and solve from there.

For example: \(\sqrt{\frac{81}{100}}\) would be converted to \(\frac{\sqrt{81}}{\sqrt{100}}\) or \(\frac{9}{10}\)

**NOTE:** It would help you to memorize some of the common perfect square. Below is a table of perfect square.

<table>
<thead>
<tr>
<th>Number</th>
<th>Square Root</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>36</td>
<td>6</td>
</tr>
<tr>
<td>49</td>
<td>7</td>
</tr>
<tr>
<td>64</td>
<td>8</td>
</tr>
<tr>
<td>81</td>
<td>9</td>
</tr>
<tr>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>121</td>
<td>11</td>
</tr>
<tr>
<td>144</td>
<td>12</td>
</tr>
<tr>
<td>169</td>
<td>13</td>
</tr>
<tr>
<td>196</td>
<td>14</td>
</tr>
<tr>
<td>225</td>
<td>15</td>
</tr>
</tbody>
</table>

**AVERAGES AND PROBABILITY**

The formula for **average** is \(\text{sum of terms} \div \text{number of terms}\) for example: the average of 4, 6 and 8 is \(\frac{18}{3}\) because the sum of 4, 6 and 8 is 18 and there are 3 numbers so there answer is 6.

**Probability** is expressed as a ratio or fraction and it is the likelihood of something to happen give a particular set of circumstances. The formula is \(\frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}\) for example: if you wanted to know the probability of randomly choosing a spade from a deck of cards that had 14 spades, 14 hearts, 14 clubs and 14 diamonds, it would be \(\frac{14}{56}\) or \(\frac{1}{4}\) which is 25%.
ALGEBRA

There are several common aspects of algebra you should brush up on for the ASVAB. Below is a list of problems that you should be able to solve.

1. Solving an equation with a single variable
2. Factoring an equation
3. Prime Factorization
4. Solving Inequalities

The one thing you need to remember is that algebra problems are stated in terms of both sides being equal. When trying to solve an algebra problem, you apply the same operation to both sides of the equation.

It is also important to follow the order of operations which is PEMDAS which stands for Parenthesis, Exponents, Multiplication, Division, Addition, Substraction

SOLVING FOR AN UNKNOWN

When solving an algebra equation, you **isolate the variable you are solving for on one side and everything else on the other side**. In the example below, you want to get to x=something.

For example: \(3x=24\)

To solve this, you would divide both sides by 3 to get the value of \(x\). So \(x=\frac{24}{3}\) or \(x=8\)

To solve \(2x+16 = 24\) you would start by subtracting 16 from both sides to get \(2x=8\), then you would divide both sides by 2 to get \(x=8\).

To solve \(x^2=9\) you would take the square root of both sides to get \(x=3\).

In addition and subtraction, you can combine like terms, for example: \(3x + 4x = 14\) could be expressed as \(7x=14\) but you cannot combine terms that are not like. For example \(3a + 2b\) does not equal \(5ab\). Likewise, you cannot combine \(3a + 3b^2\) does not equal \(6ab^2\)

In multiplication and division, you can multiply and divide terms that are different by multiplying the numbers against each other and the variable against each other.

For example: \((4a)(9c) = (4\times9)(a \times c) = 36ac\)
PRIME FACTORIZATION

"Factors" are the numbers you multiply together to get another number:

In the equation $2 \times 3 = 6$  2 and 3 are factors.

"Prime Factorization" is finding which prime numbers you need to multiply together to get the original number.

Here is an easy example:

What are the prime factors of 12?

It is best to start working from the smallest prime number, which is 2, so let's check:

\[12 \div 2 = 6\]

But 6 is not a prime number, so we need to factor it further:

\[6 \div 2 = 3\]

And 3 is a prime number, so: \[12 = 2 \times 2 \times 3\]

As you can see, every factor is a prime number, so the answer must be right – the prime factorization of 12 is $2 \times 2 \times 3$, which can also be written as $2^2 \times 3$

Here is a harder example:

What is the prime factorization of 147?

Can we divide 147 evenly by 2? No, so we should try the next prime number, 3:

\[147 \div 3 = 49\]

Then we try factoring 49, and find that 7 is the smallest prime number that works: \[49 \div 7 = 7\]

And that is as far as we need to go, because all the factors are prime numbers.

\[147 = 3 \times 7 \times 7 = 3 \times 7^2\]
SOLVING INEQUALITIES

An inequality equation looks like $3a + 5 > 2a + 10$

Since all the numbers and variable are positive, you solve it just like you would any other equation by isolating the variable you are solving for on one side and everything else on the other.

Start by subtracting 5 from both sides to get $3a > 2a + 5$

Then subtract 2a from both sides to get $a > 5$

The trick, however, comes in when you have a negative involved like $-6a > 12$

When you divide by a negative, you have to reverse the direction of the sign.

So you end up with $a < \frac{-12}{-6}$ which is $a < -2$

You can plug it back in to the formula to check it out. $-6 \times -2 = 12$ so anything less than $-2$ would be correct.

If exponents are involved, you add the exponents of of numbers with like bases or variable.

For example: $(8a)(3ab) = (8 \times 3)(a \times a \times b)$ or $24(a^{1+1} \times b)$ or $24a^2b$

FACTORING AN EQUATION

You might be asked to express binomials like $(y+3)(y+7)$ as a quadratic expression:

To do this, you would use the **FOIL method** which stands for First, Outer, Inner, Last

So you multiply the first $y$ times $y$ and 7 and then 3 times $y$ and 7 to look like this:

$y^2 + 7y + 3y + 21$ and then you combine the like terms to get $y^2 + 10y + 21$

So the final equation would look like $(y+3)(y+7) = y^2 + 10y + 21$
When they ask you to factor an equation, they will give you the quadratic expression and ask you to convert it into polynomials which is just the reverse of the FOIL method.

Taking the same equation $y^2 + 10y + 21$, we would factor as follows:

Start by adding the parentheses and breaking the first variable $y^2$ into its base $(y)(y)$

Then you consider which two numbers when added together would equal 10 and when multiplied would equal 21. The answer is 3 and 7 and since the $10y$ is positive, 3 and 7 will both be positive.

The answer is $(y+3)(y+7)$

If the binomial were $(y+3)(y-7)$, the quadratic expression would be $y^2 + 3y - 7y - 21$ or $y^2 - 4y - 21$

**LINES AND ANGLES**

You can count on getting some questions that involve lines and angles. These types of questions will be easy after you remember a few things about angles and intersecting lines.

For example, when two lines intersect as shown below, opposite angles are congruent and the angles of a straight line $= 180$ degrees. So if angle A was $45^\circ$ then Angle D would equal $135^\circ$ as would angle C. Likewise, angle B would equal $45^\circ$.

You will probably see a question that gives you intersecting lines with the measurement of one angle and they ask you to calculate the others.

<table>
<thead>
<tr>
<th>Vertical Angles</th>
</tr>
</thead>
<tbody>
<tr>
<td>A pair of angles is said to be vertical (also opposite and vertically opposite, if the angles are formed from two intersecting lines and the angles are not adjacent. They all share a vertex. Such angles are equal in measure and can be described as congruent.</td>
</tr>
<tr>
<td>In the figure to the left, two lines intersect to create two (2) pairs of vertical angles. One pair consists of angles A and B; the second pair consists of angles C and D.</td>
</tr>
</tbody>
</table>
Supplementary Angles
Supplementary angles are pairs of angles whose measures add up to 180 degrees.

Complimentary Angles
A pair of angles are complementary if the sum of their measures is 90 degrees.

CALCULATING AREA & VOLUME OF COMMON SHAPES

Square:

\[ \text{Perimeter} = s + s + s + s = 4 \times s \]
\[ \text{Area} = s^2 \]

Squares have 4 equal sides that are all parallel and every angle is 90° or a right angle.
The sum of all the angles in a square is 360°
<table>
<thead>
<tr>
<th><strong>Rectangle:</strong></th>
<th>Rectangles are also comprised of 4 right angles and opposing sides are equal length and parallel to each other.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Rectangle Diagram" /></td>
<td>Area = ( l \times w )</td>
</tr>
<tr>
<td>Perimeter = ( l + l + w + w = 2 \times l + 2 \times w )</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Parallelogram:</strong></th>
<th>A parallelogram is just like a rectangle but none of the interior angles are 90°. Opposing sides are equal in length and parallel to each other.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Parallelogram Diagram" /></td>
<td>Area = ( b \times h )</td>
</tr>
<tr>
<td>Perimeter = ( a + a + b + b = 2 \times a + 2 \times b )</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Rhombus:</strong></th>
<th>A rhombus is just like a square in that all the sides are equal length but a rhombus has no right angles.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Rhombus Diagram" /></td>
<td>Area = ( b \times h )</td>
</tr>
<tr>
<td>Perimeter = ( b + b + b + b = 4 \times b )</td>
<td></td>
</tr>
</tbody>
</table>
A triangle has 3 sides. A special section is dedicated to triangles below.

**Triangle:**

![Triangle Diagram]

- Perimeter = \(a + b + c\)
- Area = \((b \times h)/2\)

A trapezoid has 4 sides with two sides parallel and two sides not parallel. It has no right angles.

**Trapezoid:**

![Trapezoid Diagram]

- Perimeter = \(a + b + c + d\)
- Area = \(\frac{(a + b)}{2} \times h\)
A circle is a continuous line equidistant around a center point.

The distance from the center to the outside is called the radius.

The distance from outside to outside through the center is called the diameter.

The length around the whole circle is called the circumference or perimeter.

Diameter is equal to twice the radius.

A cube is a 3-dimensional square.

Volume = $a^3 = a \times a \times a$
<table>
<thead>
<tr>
<th>Cylinder:</th>
<th>A cylinder is a 3 dimensional circle with a flat top and flat bottom.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Cylinder Diagram" /></td>
<td><img src="image2" alt="Cylinder Diagram" /></td>
</tr>
<tr>
<td>Volume = $\pi \times r^2 \times h$</td>
<td></td>
</tr>
<tr>
<td>$\pi = 3.14$</td>
<td></td>
</tr>
<tr>
<td>$h$ is the height</td>
<td></td>
</tr>
<tr>
<td>$r$ is the radius</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sphere:</th>
<th>A sphere is a 3 dimensional circle.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Sphere Diagram" /></td>
<td><img src="image4" alt="Sphere Diagram" /></td>
</tr>
<tr>
<td>Volume = $(4 \times \pi \times r^3)/3$</td>
<td></td>
</tr>
<tr>
<td>$\pi = 3.14$</td>
<td></td>
</tr>
<tr>
<td>$r$ is the radius</td>
<td></td>
</tr>
</tbody>
</table>
### Rectangular Solid

Volume = \( l \times w \times h \)

- \( l \) is the length
- \( w \) is the width
- \( h \) is the height

### Cone

Volume = \( \frac{\pi \times r^2 \times h}{3} \)

- \( \pi = 3.14 \)
- \( r \) is the radius
- \( h \) is the height

### Pyramid

Volume = \( \frac{B \times h}{3} \)

- \( B \) is the area of the base
- \( h \) is the height
In an **equilateral triangle** all sides have the same length.

In an **isosceles triangle**, two sides are equal in length. An isosceles triangle also has two angles of the same measure; namely, the angles opposite to the two sides of the same length.

In a **scalene triangle**, all sides are unequal. The three angles are also all different in measure. Some (but not all) scalene triangles are also right triangles.

Triangles can also be classified according to their internal angles, measured here in degrees.

**A right triangle** (or right-angled triangle, formerly called a rectangular triangle) has one of its interior angles measuring 90° (a right angle). Right triangles obey the Pythagorean theorem: the sum of the squares of the lengths of the two legs is equal to the square of the length of the hypotenuse: $a^2 + b^2 = c^2$, where $a$ and $b$ are the lengths of the legs and $c$ is the length of the hypotenuse.

- Triangles that do not have an angle that measures 90° are called **oblique triangles**.
- A triangle that has all interior angles measuring less than 90° is an **acute triangle**.
- A triangle that has one angle that measures more than 90° is an **obtuse triangle**.
SAMPLE MK QUESTIONS AND SOLUTIONS

1) Which is NOT true about rectangle:
   a. All angles add up to 360°
   b. All angles are right angles
   c. The right side is perpendicular to the left side
   d. Opposing sides are parallel

Solution:
1. C is the correct answer because the right side and left side of a square are parallel to each other.
2. D is the correct answer because all sides of an equilateral triangle are the same length.

2) Side A and B of an equilateral triangle are both 4”, how long is side C?
   a. 16”
   b. 8”
   c. 44”
   d. 4”

Solution:
1. B is the correct answer because Y² can be written as Y x Y
2. D is the correct answer because the formula for area of a circle is \( \pi r^2 \) and the radius is \( \frac{1}{2} \) the diameter. \( 6 \times 6 = 36 \) so you are left with \( 36 \pi \)
5) \( \sqrt{100x^2} = \)
   a. 10X  
   b. 1000  
   c. 10x^2  
   d. None of the above

6) A cube has 4 inch sides, what is the volume of the cube?
   a. 64 square inches  
   b. 64 cubic inches  
   c. 64 centimeters  
   d. 64 oz

Solutions:

5. C is the correct answer. The square root of 100 is 10 and the \( x^2 \) is not included in the radical sign. If it had been included, A would have been the right answer.

6. B is the correct answer. The formula for volume of a cube is \( x^3 \) so \( 4 \times 4 \times 4 = 64 \) and the unit of measure is cubic inches.

7) Which of the following statements is correct?
   a. \( A^2 + B^2 = C^2 \)  
   b. All quadrilaterals are rectangles  
   c. All rectangles are quadrilaterals  
   d. A & C are correct

8) The square below borders a circle with radius of 2 centimeters. What is the area of the square in millimeters?
   a. 1600  
   b. 800  
   c. 80  
   d. 160

Solutions:

7. D is the correct answer. A is the Pythagorean Theorem and all rectangles do in fact have 4 sides which also makes them a quadrilateral. A trapezoid is also a quadrilateral but it is not a rectangle.

8. A is the correct answer. If the radius of the circle is 2 centimeters then the diameter is 4 centimeters which means the side of the square is also 4 centimeters. Multiply centimeters by 10 to get millimeters and you get 40. The area of a square is \( L \times W \) or \( 40 \times 40 \) which is 1600 millimeters.
9) The compliment of a $30^\circ$ angle is?
   a. $15^\circ$
   b. $45^\circ$
   c. $60^\circ$
   d. $120^\circ$

10) Solve for $X$: $\frac{x}{3} - \frac{x}{6} = 2$
   a. 12
   b. 24
   c. 18
   d. 6

Solutions:

9. C is the correct answer. Angles that are complimentary add up to 90 so the compliment of 30 is 60
10. A is the correct answer. You can use substitution $\frac{12}{3} - \frac{12}{6} = 4 - 2 = 2$ or you can use algebra to solve the equation. Start by multiplying both sides by 6 to get $\frac{6x}{3} - \frac{6x}{6} = 12$ which reduces to $2x - x = 12$ or $x = 12$
ARITHMETIC REASONING

WHAT TO EXPECT

The *Arithmetic Reasoning* test is composed of 30 questions and you are only given 36 minutes to finish the entire subtest. You have a little more than 1 minute (72 seconds) to answer each of the questions. That’s plenty of time if you are properly prepared and follow the approach laid out in this guide.

<table>
<thead>
<tr>
<th>Total Questions</th>
<th>Total Time (mins)</th>
<th>Time Per Question (secs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>36</td>
<td>72 seconds</td>
</tr>
</tbody>
</table>

You can expect mostly word problems on the Arithmetic Reasoning test and you will have to apply the math operations you learned in Mathematics Knowledge.

HOW TO APPROACH

Solving word problems is something you get better at with practice but there are a few techniques that will help you develop the skills necessary to do well on the ASVAB. The problems are not all that difficult but the pressure of the time working against you makes most people panic.

Follow these steps and you will not have to worry. You will be able to use scratch paper for this one which you will definitely need.

1. Read the entire problem completely/
2. Figure out exactly what they are asking.
3. Write down the data and draw the shape if one is described in the problem.
4. Setup your formula and solve it

If you just do not know the formula or how to solve for what they are asking, you can try two things.

1. Back solving & Process of Elimination
2. Plug in the answers – this is where you plug the answers into the formula to see if it makes sense.
CONVERSIONS AND UNITS OF MEASURE

Questions that involve conversion of one unit to another are quite common on the ASVAB. Here are some common conversions you will need to know.

1 cm = 2.54 inches

1 meter = 100 cm or 1000 mm

1 lb. = 16 oz

1 ton = 2000 lb

1 pint = 2 cup

1 qt. = 2 pints

1 sq. ft. = 144 sq. in.

1 ft. = 12 in.

1 yd. = 3 ft

Celsius: Multiple by 1.8 (\(=\frac{9}{5}\)), +32 = Fahrenheit

Fahrenheit: −32, multiple remainder by \(\frac{5}{9}\) = Celsius
SAMPLE AR QUESTIONS AND HOW TO SOLVE THEM

The best guidance we can give you on Arithmetic Reasoning is to take you through a series of practice questions and show you the technique, logic and math operations used to solve them. The questions are first followed by the solutions.

PRACTICE QUESTIONS

1) What is the length of vacant lot with a perimeter of 360 feet if its length is three times greater than its width?
   a. 135 feet
   b. 153 feet
   c. 720 feet
   d. 45 feet

2) If the normal body temperature in Celsius is 37 degrees, what is its counterpart in the Fahrenheit scale?
   a. 98.6 degrees
   b. 66 degrees
   c. 90.86 degrees
   d. 89.60 degrees

3) Two pumps are available for filling a gasoline storage tank. If used alone, Pump A, can fill the tank in 5 hours while Pump B, if used alone, takes 3 hours to fill the tank. If they are used simultaneously, how long will it take to fill the tank?
   a. 1 1/8 hours
   b. 1 7/8 hours
   c. 7 7/8 hours
   d. 7 1/8 hours

4) A wedding planner needs 8 strips of ribbon, each 1 meter and 75 centimeters. If the ribbon is sold only by meter, how many meters of ribbon must the wedding planner buy?
   a. 17
   b. 16
   c. 15
   d. 14

5) A private establishment charges $10.25 parking fee for the first 4 hours and $2 per additional hour. How much will a family pay if they left the car at the parking lot for 13 hours?
   a. $22.50
   b. $22.85
   c. $28.50
   d. $28.25

6) After winning in the race, a runner received $500. He paid $98.5 to his coach, spent $258.75 for his thanksgiving treat and saved the rest. How much percentage of his prize went to his savings?
   a. 25.8%
   b. 2.58%
   c. 2.85%
   d. 28.5%
SOLUTION EXPLANATIONS

Question 1:
What is the length of vacant lot with a perimeter of 360 feet if its length is three times greater than its width?

a. 135 feet
b. 153 feet
c. 720 feet
d. 45 feet

Solution:
1. Upon reading the question you discover that they are asking for the length of a vacant lot.
2. You also notice that they give you a formula which includes the perimeter and the width so you know you are dealing with a rectangular lot.
3. You draw a rectangle and assign the values:
4. You write the formula $3x + x + x + 3x = 360$ or $8x = 360$
5. Solve for $x$ by dividing both sides by 8 to get 45

Question 2:
If the normal body temperature in Celsius is 37 degrees, what is its counterpart in the Fahrenheit scale?

a. 98.6 degrees
b. 66 degrees
c. 90.86 degrees
d. 89.60 degrees

Solution:
The formula for converting Celsius to Fahrenheit is: °C $\times \frac{9}{5} + 32 = °F$

1. If you don’t already know that the normal body temperature is 98.6 then you can solve the equation
2. Convert 37 to a fraction and multiply $\frac{37}{1} \times \frac{9}{5}$ to get $\frac{333}{5}$ which converts to a mixed number of $66 \frac{3}{5}$ or 66.6
3. Add 32 to 66.6 and you get 98.6
Question 3:
Two pumps are available for filling a gasoline storage tank. If used alone, Pump A, can fill the tank in 5 hours while Pump B, if used alone, takes 3 hours to fill the tank. If they are used simultaneously, how long will it take to fill the tank?

a. 1 1/8 hours  
b. 1 7/8 hours  
c. 4 hours  
d. 7 1/8 hours

Solution:
1. This can be solved 2 ways; first as an average problem or 2nd as an algebra problem.  
2. If two things take different times to do the same thing, you can average them to get combined performance.  
3. The average of 5 and 3 is 4 because 5 + 3 is 8 and you divide by 2 which equals 4.  
4. C is the correct answer

As an algebra equation:

1. you are looking time to full which you write down as T  
2. write the formula from the data they give you which is 1t = 5 hours and 1t=3 hours  
3. you combine like terms to get 8 hours = 2t  
4. solve for t by dividing both sides by 2 and you get 4 hours = t  
5. C is the correct answer

Question 4:
A wedding planner needs 8 strips of ribbon, each 1 meter and 75 centimeters. If the ribbon is sold only by meter, how many meters of ribbon must the wedding planner buy?

a. 17  
b. 16  
c. 15  
d. 14

Solution:
1. By reading the question you know that you have to end up with meters because that is the unit of length the ribbon is sold in.  
2. You convert the size she needs into meters by restating 1 meter 75 centimeters as a meter which is 1.75  
3. Then multiply by 8 to get 14  
4. D is the correct answer
**Question 5:**

A private establishment charges $10.25 parking fee for the first 4 hours and $2 per additional hour. How much will a family pay if they left the car at the parking lot for 13 hours?

a. $22.50  
b. $22.85  
c. $28.50  
d. $28.25

**Solution:**

1. The family was there for 13 hours so they will pay both some money at both rates.
2. The first rate is $10.25 for 4 hours so we start with $10.25
3. They were there an additional 9 hours at $2 per hour so we add $18 to $10.25 to get $28.25
4. D is the correct answer

**Question 6:**

After winning in the race, a runner received $500. He paid $98.5 to his coach, spent $258.75 for his thanksgiving treat and saved the rest. How much percentage of his prize went to his savings?

a. 25.8%  
b. 2.58%  
c. 2.85%  
d. 28.5%

**Solution:** Unless you are really quick at long division, this question might give you a problem. The best way to solve this one is through back solving and process of elimination.

1. If you deduct the $98.50 and $258.75 from the $500 you get $142.75 left over.
2. Looking at the answers you can eliminate b and c right off the bat because you know that 3% of $500 is $15 and you have $142.75.
3. Next you notice that 25% of $500 is $125 and 30% of $500 is $150
4. $142.75 is closer to $150 than $125 so you choose D which is the correct answer.