

ACT Lesson Book

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SCHOOL SUBJECT
TUTORING

SAT/ACT
PREP

AP EXAM
REVIEWS

ACT- Introduction

- The ACT is an alternative to the SAT exam for college admission. Some students are better suited for the test questions found on the SAT, others are better suited for the test questions found on the ACT. Because of this fact, most colleges will accept scores from either the SAT or the ACT.
- The ACT differs from the SAT in a few key areas:
 - o The ACT does not penalize for wrong answers (no guessing penalty).
 - o The ACT does not have vocabulary questions (no sentence completion).
 - o The ACT has fewer sections -but they last longer (e.g. 1 hour math).
 - o The ACT has a science section (but it's mostly reading).
 - o The ACT includes some trigonometry questions in its math section.
 - o The ACT does not allow TI-89 calculators (for those in calculus).
- The main differences in the SAT, however, lies in the approach of the exam to testing you

The ACT is focused on what you learned in high school and as such will test you on the specific items you should have learned and will mirror a high school exam by making the speed very difficult and force you to go quickly. Learning to answer passages quickly will be very important.
- Our overall goal in this course is to teach you the best method to attack each question as well as give you enough exposure to the questions found on the ACT so that on test day you will feel comfortable enough to answer any question they give you.

ACT- English

- The ACT English section is the first section of the test. It involves 5 short passages with 15 questions each. These 75 questions must be answered within 45 minutes. This may seem overwhelming, but for the majority of students the English section is the most likely to be completed within the time limit.
- There are two types of questions in the English section -and the ACT will give you a subscore on each (as you have seen in your score from the practice ACT you have already taken). The first is *Usage/Mechanics*, the second is *Rhetorical Skills*.
 - o *Usage/Mechanics* are the questions that ask you to correct the underlined words or phrases.
 - o *Rhetorical Skills* ask about writing strategy and organization.

- Most students go into these questions looking for "which one sounds best?" Do not follow this same mistake. This not only will take more time than it needs to, but quite often what sounds best isn't grammatically correct.
 - o Example: Does this sound "bad" to you?
 - 1) Neither the President nor the Vice President are on time.
 - o Grammatically speaking, when you say "neither" the subject is now singular, and so the verb should be "is".
 - o This proves that you need to know the rules.

- The list of grammar rules you need to know are:

Subject Verb Agreement
 Verb Tense
 Parallelism
 Pronoun/Antecedent Agreement
 Fragment
 Run-on
 Misplaced Modifier
 Diction
 Redundancy

Comma
 Semicolon
 Apostrophe
 Colon
 Dash

- Subject Verb Agreement

To disguise the subject from the verb the ACT will use the appositive and prepositional phrases:

- Verb Tense Agreement

Closely look at all other verbs in the rest of the passage

- Parallelism

Parallelism is found whenever two or more parts of a sentence are being compared against each other.

- Pronoun/Antecedent Agreement

Ambiguous pronoun - when it is unclear what it is referencing

Mismatched pronoun - when pronoun & antecedent don't match

I vs. me (and who vs. whom)

- Fragment

A sentence fragment is missing a verb:

- Run-on

Two complete sentences separated only by a comma

- Misplaced Modifier

When the introductory phrase of a sentence lacks the subject of a sentence, the next word is the missing subject.

- Diction

The ACT will test if a word is an appropriate word for the sentence or if there is a better word.

- Redundancy

As far as ACT is concerned, shorter is better.

- Comma

Provides a pause or a break in a sentence, exaggerate it

- Semicolon

Acts as a period

- Apostrophe

The apostrophe followed by an "s" indicates ownership

There are a few exceptions

- Colon

Can be used for a list or a definition

- Dash

Parenthetical in nature

Rhetorical skills questions

- Transition words

Ask “how” are two sentences connected

- Questions with words

Don't be lazy, just don't

- Rearranging or adding sentences

Look for grammatical context clues

ACT-Math

- The Math section of the ACT is a beast. There is no easy way around it. You have 60 minutes to answer 60 questions. That is a long time to be working on math. Fortunately the ACT math is less tricky than the SAT math. Unfortunately the ACT math also includes trigonometry. You can't have everything.
- There are three category of questions on the ACT Math section
 - 1) Pre-Algebra/Elementary Algebra (40%)
 - 2) Intermediate Algebra/Coordinate Geometry (30%)
 - 3) Plan Geometry/Trigonometry (30%)
- The key to the ACT math is know your rules, know your formulas, know your math

Numbers, Sequences, Factors

Integers: $\dots, -3, -2, -1, 0, 1, 2, 3, \dots$

Rationals: fractions, that is, anything expressible as a ratio of integers

Reals: integers plus rationals plus special numbers square roots and π

Order Of Operations: PEMDAS
(Parentheses/Exponents/Multiply/Divide/Add/Subtract)

Arithmetic Sequences: each term is equal to the previous term plus d (difference)

Example: $d = 4$ and $t_1 = 3$
gives the sequence 3, 7, 11, 15, \dots

Formula: $a_n = a_1 + d(n-1)$

Geometric Sequences: each term is equal to the previous term times r (ratio)

Example: $r = 2$ and $t_1 = 3$
gives the sequence 3, 6, 12, 24, \dots

Formula: $a_n = a_1 \times r^{(n-1)}$

Factors: the factors of a number divide into that number without a remainder
Example: the factors of 52 are 1, 2, 4, 13, 26, and 52

Multiples: the multiples of a number are divisible by

that number without a remainder

Example: the positive multiples of 20 are 20, 40, 60, 80, ...

Percents: Percents are “out of 100”

Example: 75% of 300 is what?

$$\text{Solve } x = (75/100) \times 300 \text{ to get } 225$$

Example: 45 is what percent of 60?

$$\text{Solve } 45 = (x/100) \times 60 \text{ to get } 75\%$$

Average: $\text{sum} / (\text{number of terms}) = \text{average}$

$$\text{sum} = \text{average} \cdot (\text{number of terms})$$

mode = value that appears most often

median = middle value in the list

$$\text{median of } \{3, 9, 10, 27, 50\} = 10$$

$$\text{median of } \{3, 9, 10, 27\} = (9 + 10)/2 = 9.5$$

Fundamental Counting Principle:

If an event can happen in N ways, and another, independent event can happen in M ways, then both events together can happen in

$N \times M$ ways. (Extend this for three or more: $N_1 \times N_2 \times N_3 \dots$)

Powers, Exponents, Roots

$$\mathbf{x^a \cdot x^b = x^{a+b}}$$

$$\mathbf{(x^a)^b = x^{ab}}$$

$$\mathbf{x^0 = 1}$$

$$\mathbf{x^a/x^b = x^{a-b}}$$

$$\mathbf{(xy)^a = x^a \cdot y^a}$$

$$\mathbf{\sqrt{xy} = \sqrt{x} \cdot \sqrt{y}}$$

$$\mathbf{1/x^b = x^{-b}}$$

$$\mathbf{(-1)^n = +1, \text{ if } n \text{ is even;}}$$

$$\mathbf{-1, \text{ if } n \text{ is odd.}}$$

Factoring

$$(x + a)(x + b) = x^2 + (b + a)x + ab \quad \text{“FOIL”}$$

$$a^2 - b^2 = (a + b)(a - b) \quad \text{“Difference Of Squares”}$$

To solve two linear equations in x and y : use the first equation to substitute for a variable in the second. E.g., suppose $x + y = 3$ and $4x - y = 2$.

The first equation gives $y = 3 - x$,

so the second equation becomes $4x - (3 - x) = 2 \Rightarrow 5x - 3 = 2 \Rightarrow x = 1, y = 2$.

Functions

A function is a rule to go from one number (x) to another number (y), usually written

$$y = f(x)$$

The set of possible values of x is called the domain of $f()$, and the corresponding set of possible values of y is called the range of $f()$. For any given value of x , there can only be one corresponding value y .

Logarithms

Logarithms are basically the inverse functions of exponentials. The function $\log_b x$ answers the question: b to what power gives x ? Here, b is called the logarithmic “base”. So, if

$y = \log_b x$, then the logarithm function gives the number y such that $b^y = x$.

$$\log_3 \sqrt{27} = \log_3 \sqrt[3]{3^3} = \log_3 3^{3/2} = 3/2 = 1.5. \text{ Similarly, } \log_b \mathbf{b^n} = \mathbf{n}.$$

A useful rule to know is: $\log_b xy = \log_b x + \log_b y$.

Complex Numbers

A complex number is of the form $a + bi$ where $i^2 = -1$. When multiplying complex

numbers, treat i just like any other variable (letter), except remember to replace powers

of i with -1 or 1 as follows (the pattern repeats after the first four):

$$\begin{aligned} i^1 &= i \\ i^2 &= -1 \\ i^3 &= -i \\ i^4 &= 1 \end{aligned}$$

For example, using “FOIL” and $i^2 = -1$: $(1 + 3i)(5 - 2i) = 5 - 2i + 15i - 6i^2 = 11 + 13i$.

Lines (Linear Functions)

Consider the line that goes through points $A(x_1, y_1)$ and $B(x_2, y_2)$.

$$\text{Distance from } A \text{ to } B: \quad \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\text{Mid-point of the segment } \overline{AB}: \quad \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

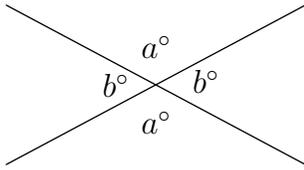
$$\text{Slope of the line:} \quad \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}}$$

Point-slope form: given the slope m and a point (x_1, y_1) on the line, the equation of the line is $(y - y_1) = m(x - x_1)$.

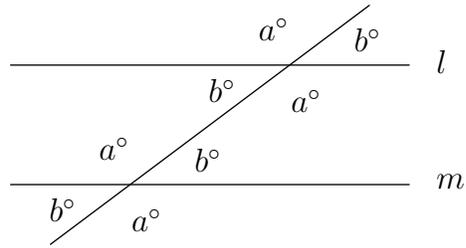
Slope-intercept form: given the slope m and the y -intercept b , then the equation of the line is $y = mx + b$.

To find the equation of the line given two points $A(x_1, y_1)$ and $B(x_2, y_2)$, calculate the slope $m = (y_2 - y_1)/(x_2 - x_1)$ and use the point-slope form.

Parallel lines have equal slopes. Perpendicular lines (i.e., those that make a 90° angle where they intersect) have negative reciprocal slopes: $m_1 \cdot m_2 = -1$.



Intersecting Lines

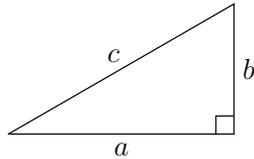
Parallel Lines ($l \parallel m$)

Intersecting lines: opposite angles are equal. Also, each pair of angles along the same line add to 180. In the figure above, $a + b = 180$.

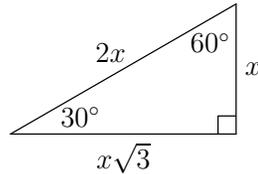
Parallel lines: eight angles are formed when a line crosses two parallel lines. The four big angles (a) are equal, and the four small angles (b) are equal.

Triangles

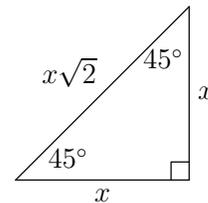
Right triangles:



$$a^2 + b^2 = c^2$$

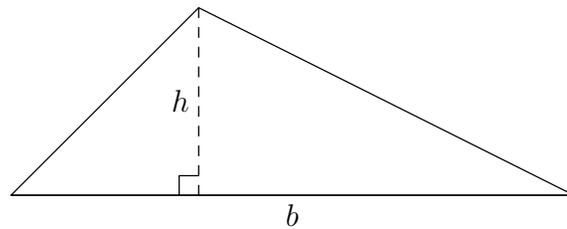


Special Right Triangles



A good example of a right triangle is one with $a = 3$, $b = 4$, and $c = 5$, also called a 3–4–5 right triangle. Note that multiples of these numbers are also right triangles. For example, if you multiply these numbers by 2, you get $a = 6$, $b = 8$, and $c = 10$ (6–8–10), which is also a right triangle.

All triangles:



$$\text{Area} = \frac{1}{2} \cdot b \cdot h$$

Angles on the inside of any triangle add up to 180° .

The length of one side of any triangle is always less than the sum and more than the difference of the lengths of the other two sides.

An exterior angle of any triangle is equal to the sum of the two remote interior angles. Other important triangles:

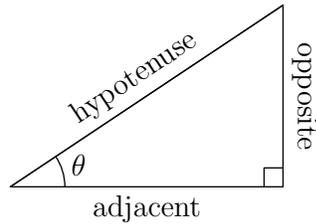
Equilateral: These triangles have three equal sides, and all three angles are 60° .

Isosceles: An isosceles triangle has two equal sides. The “base” angles (the ones opposite the two sides) are equal (see the 45° triangle above).

Similar: Two or more triangles are similar if they have the same shape. The corresponding angles are equal, and the corresponding sides are in proportion. For example, the 3–4–5 triangle and the 6–8–10 triangle from before are similar since their sides are in a ratio of 2 to 1.

Trigonometry

Referring to the figure below, there are three important functions which are defined for angles in a right triangle:



$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

“SOH”

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

“CAH”

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

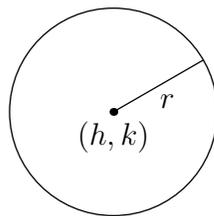
“TOA”

(the last line above shows a mnemonic to remember these functions:

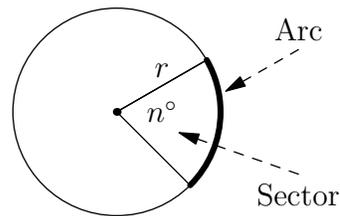
“SOH-CAH-TOA”)

$$\sin^2 \theta + \cos^2 \theta = 1.$$

Circles



$$\begin{aligned} \text{Area} &= \pi r^2 \\ \text{Circumference} &= 2\pi r \\ \text{Full circle} &= 360^\circ \end{aligned}$$



$$\begin{aligned} \text{Length Of Arc} &= (n^\circ/360^\circ) \cdot 2\pi r \\ \text{Area Of Sector} &= (n^\circ/360^\circ) \cdot \pi r^2 \end{aligned}$$

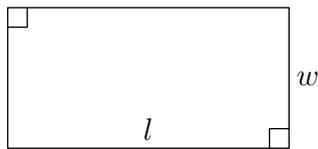
Equation of the circle (above left figure): $(x - h)^2 + (y - k)^2 = r^2$.

Another way to measure angles is with radians. These are defined such that π radians is equal to 180° , so that the number of radians in a circle is 2π (or 360°).

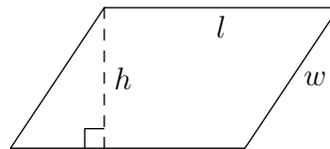
To convert from degrees to radians, just multiply by $\pi/180^\circ$. For example, the number of radians in 45° is 0.785, since $45^\circ \cdot \pi/180^\circ = \pi/4 \text{ rad} \approx 0.785 \text{ rad}$.

Rectangles And Friends

Rectangles and Parallelograms

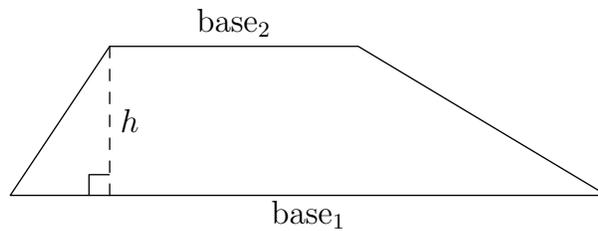


Rectangle
(Square if $l = w$)
Area = lw

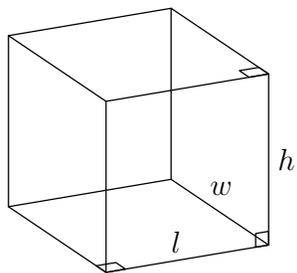


Parallelogram
(Rhombus if $l = w$)
Area = lh

Trapezoids (Optional):

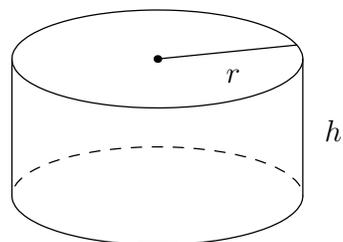


$$\text{Area of trapezoid} = \left(\frac{\text{base}_1 + \text{base}_2}{2} \right) \cdot h$$

Solids (Optional)

Rectangular Solid

$$\text{Volume} = lwh$$



Right Cylinder

$$\text{Volume} = \pi r^2 h$$

ACT- Reading

- The ACT Reading section contains 4 passages with 10 questions each (Prose Fiction, Humanities, Social and Natural Sciences). You have 35 minutes to answer these questions. That doesn't seem like a lot of time, and it isn't. You will have to improve your reading ability. The best way to do this is to practice. Try reading the newspaper before school, or pick up a book to read outside of school. The College Board recommends that you read 30 minutes everyday on a book outside of school. But since we all know you're not going to do that, let's figure out how to do the best we can on this ACT Reading:
- The biggest issue that students have with the ACT is reading is timing. In order to get through all 4 passages you will only have 8 minutes and 30 seconds to read a passage and answer its 10 questions. That leaves two areas that time can be lost - reading the passage & answering the questions.
- To get through the passage faster the main goal is to eliminate the zoning out that plagues students and causes them to reread and reread and reread paragraphs. The goal is to focus the largest percentage of the brain, as possible, on the passage. There are many methods to do this: underline, annotating, active reading, etc. What we have found that works the best is to write a word next to each paragraph, or section of text, that provides the main focus of that section. This forces the brain to not only read but also to analyze and thereby increase the attention given.
- The next area that time can be lost is on the questions. There are a few ways they can be lost here: (1) not knowing an answer and being forced to go back to the passage and reread large portions of text and by (2) not fully understanding questions and needlessly flipping back and forth between questions and passage.
 - To know more of the passage before going to the questions it's helpful to start thinking like a test maker and as you read anticipate what questions might be asked. You should look for: (1) lists of items, (2) quotations, and (3) transitional or key words
 - To limit the needless waste of time of flipping back and forth it's essential to understand the question before you even think of looking back in the passage for guidance.
- There are some students for whom the timing of all 4 is actually impossible. In this event then you should practice and perfect the ability to do the 4th passage (Natural Science) in only 5 minutes (or less if needed). This is done by not reading the passage and instead going straight to the questions and attacking those with line numbers first.

ACT- Science

- One of the most notable differences between the ACT and SAT exams is the Science section of the ACT. Fortunately for some, and I'm sorry to tell those future scientists of America, the ACT Science section does not require you to be good at science in any way, shape or form. It merely tests your ability to read actively and answer questions off of graphs. That's it.
- You have 35 minutes to answer 40 from three passage formats (of which there are 7 total passages). The three formats are: *Data Representation*, *Research Summaries and Conflicting Viewpoints*.
- *Data Representation* passages consist of an introductory paragraph and data in form of a table, a graph or a figure. You do not need to read the paragraph at all, because the information in it can be unnecessary, confusing, and really just a waste. Just go straight to the questions.
- There are two main types of questions: informational and interpretive.
 - o Information questions simply require you to locate information within the table, the graph or the figures.
 - o Page 195 #18-20
 - o Interpretive questions require you to find a trend within the data in order to: determine a trend, extend the data to a further unknown point, or locate an unknown sample within the existing data.
 - o Page 195 #21 & 22
- As you can see, there was no real knowledge of biology, chemistry or physics needed in order to answer these questions.
 - o On Page 191 what is the difference from Figure 1 & Figure 2? If you notice this as you go through the passage it will allow you to find the answer to #8 faster than if you didn't notice the difference.
 - o Let's answer the questions for pages 190 & 191 together. Where should we go to find the answers to each of the questions? *Return to the passage for answers*
- *Research Summaries* section. It consists of an introductory paragraph and then anywhere between 2 and 4 studies or experiments. Each usually has its own data/ results in the form of a table, graph or figure (although sometimes it may not).
- As with the *Data Representation* questions, you should NOT begin by reading the introductory paragraph.
- Now it is time to examine the questions:
 - o Some of the questions within the *Research Summaries* section look very similar to the *Data Representation* questions and can be answered in the same way.
 - #12, 13, 16
 - o Other questions require you to understand the purpose of each experiment. In this even you should go back and quickly read it then (or more likely you should focus on the headers of the tables and graphs).
 - #14, 15
 - o The hardest questions require you to understand a procedure. It is only when confronted with one of these questions that you need to read a procedure very slowly and carefully in order to understand what is going on.
 - #17

- Finally, students, it is time for the portion of the science section that has the absolute least to do with science. In fact, you might be wondering why you're working on another reading problem in the middle of the science section. It's time for: *Conflicting Viewpoints*
- The first step of the *Conflicting Viewpoints* passage involves reading the introduction and determining what topic the sides are in conflict about. If it is a long introduction, there is a chance you may have a question or two on it, so if that's the case answer them now.
- The next step is to read the first viewpoint. As you go through, determine what the main argument of the viewpoint is and be prepared to analyze it.
 - At this point you are not to read the second viewpoint, but rather you are to proceed to answer any questions that deal with only the first viewpoint. This is done because you only have its opinion on your mind and you will not be confused between two opinions.
- Once this is done, you can now proceed with the same steps and questions for the second viewpoint by itself
- The final step is to answer the questions that are concerned with both viewpoints:

ACT-Writing

- The final and optional section on the ACT is the essay. Although the college you ultimately choose to attend may not require the Essay for admission, it is recommended that you prepare for and take the optional essay portion of the ACT exam because you do not want to limit yourself to only certain colleges, and one never knows which admission requirements could change between now and when you apply to colleges. With that said, how do you tackle the essay?
- The 3 steps to attack the ACT essay are:
 - 1) Pick a side in the argument
 - 2) Create great examples
 - 3) Address the counterargument
- Unlike the SAT essay, the ACT essay is already sufficiently narrowed. All you need to do is pick a side. It doesn't matter which side you pick, as long as you can argue for it. You can even pick an alternative position than the two provided - as long as you can prove your position. Let's look at the essay you wrote for your practice exam.
 - **Page 204**
- In order to prove your essay you need to use evidence. The best evidences for ACT essays are real life examples. Can't think of anything that happened to you that can be used, that's OK- make it up! The readers don't know you and don't know what's true or not. You can make the best examples for your essay that you can think of
 - As a class, what examples can you think of?
- Finally, you need to address the counterargument. You should reference the opponents argument and expose its weakness. Or you can choose to qualify your own argument and include some of the opposition's claims.
- **All of this is done during the PreWrite.**
 - This is the first 5-6 minutes of your 30 minute writing section. It is during this PreWrite that you will lay out your essay with it's (!)argument, (2)evidence, and (3)logic.
- Let's practice another PreWrite as a class:

Some high schools feel that students who live in areas with bus service should be banned from driving to and from school in cars. Proponents of this idea point to the carbon footprint created by hundreds of cars driving to the school everyday when the students could easily take the bus. Opponents say that if the school's teachers and staff aren't required to take the bus, then it is unfair to make the students following the new rule.

In your opinion, should high schools ban students' commuting to reduce pollution?

To access practice test scores please visit: www.ccprep.org/web
Username: your 4 digit # (e.g. 1234)
Password: your 4 digit # and your initials in CAPITAL LETTERS (e.g. 1234AB)
(if prefix is asked for, please enter: ccprep)