GRE Preparation

General

- **Learn from your mistakes!** Dissect your thought process and work from there!
    - What mistake did you make?
    - Why did you make it?
    - How did you make it?
- Ask **what's the trap** on every single problem? The same traps repeat again and again!

Verbal

Sentence completion

- **Come-up with one 'simple' word that fills the blank**
    - Break down the long sentence in your own words. Only ignore content like names and facts (e.g., in italics)
    - Find the 'qualifier' phrase in the sentence that helps to narrow down the definition (e.g., by describing it or drawing a parallel/contrast). Pick a word to match this.
        - **Determine if blank has +/- connotations**
        - **Take into account sentence single/double/time/perception shifts.**
        - **Avoid false shift words!**
    - The answer should match your 'simple' word, **by definition**
    - Use this technique to **eliminate bad answers**
    - **Never choose a word that 'kinda' works**
    - Plug words back in **at worst-case to validate answer**
    - **Avoid trap words -** words that might relate to the "content" of the text, but not relevant for the particular 'blank'
    - **Don't try to impute meaning - e.g., 'far afield' to represent something other than it's core definition**
- **Identifying unknown words**
    - **Roots:** Are there any similar syllables that you can leverage?
        - **E,g,, intransigent for 'not moving'**
    - **Prefixes:** Are there any prefixes that you can leverage? E.g., dispassionate based on displeased etc.
        - Note: There are edge-cases (e.g., invaluable = very valuable
- In the 'pick two similar words' section
    - **Remove non-synonyms and identify the pairs (meaning + connotation)**
    - **Plugging in word shouldn't change meaning of passage**

        - **Sense-check: Are the two words you have picked synonyms (in context - if you add both words in, does they both match a simpler word?)**
            YN_aN_b -> YN_a or YN_b or N_aN_b
            Y_aY_bN -> Y_aN, Y_bN, Y_aY_b

        - concentrate on ensuring the words **have pairs** in addition to ensuring they are correct in context- e.g., hobbled / hamstrung / scrapped - scrapped, while relevant, **is the odd-one-out!**
        - Look for exact similarities in meaning
- Two-blank / Three-blank questions:
    - Traps:
        - Phrases / words in sentences superficially connected to wrong answers
        - Answer choices that are similar and *almost* fit
        - **Pick truly clear (unambiguous) fits**
        - **Make sure the picked blanks refer to the correct subject** (e.g., may be relevant to sentence, but not relevant to the subject of the blank) **and the blank really refers to the qualifier phrase in the text** (e.g., does word X really mean that Y?)
    - Read the entire paragraph - put blanks in context of the entire paragraph, and not sentences just around it. **Predict answer-choices first!**
    - Blanks sometimes depend-on each other - **understand connections between blanks, write-out all options** and identify **most appropriate choice based on answers available**
        - Use + / - to help narrow down
        - **Opposites should be 'direct' opposites - e.g., focus vs. digression**
        - **If narrowed down to two-choices, pick option that is most relevant to the context. Double-check the third option is not more appropriate**
    - Solving tough triple-word sentences:
        - Paraphrase meaning and decode hard words
        - Fill-in blanks with temporary words
        - Fill-in blanks with chosen woods and sense-check
        - Focus on words you *do-know*
        - Read everything!
        - **In worst-case, solve last blank first and work back**

Reading comprehension

- **Key-tricks:**
    a. Ways of eliminating answers:
        - **Potential vs. definite** in answers (definite often pushes it too far)
            - **Do not pick the most extreme / negative / complex**

- **Faux wording at end of sentence -** e.g., is 'X' but answer refers to 'Y'
- **Specificities in the title** - e.g., are you talking about a specific quote in the passage? Use this to filter-out answers.
- **Double-check interpretation of qualifier** if one option is vague vs. another option is "caught-out" by qualifier, e.g., does "if not previously occupied" in-reality mean "empty". Does "graphic" = photo or visual
- Check whether **explicit references exist to the text**. **If fretting for a long-time on very specific details (e.g., tone), select and move-on**

b. Mark answers with an 'X' if they are **categorically wrong** and a '?' if not enough information is available
   - If need to 'jump', select answer where 'jump' is minimal

c. In ***except*** questions, the answer may not even appear in the text.
   - Check whether content appears first before trying to argue a way through. **Don't overthink**

d. In ***main point*** questions:
   - **High-level topic - 1 -** e.g., not 'thermodynamics', but 'thermodynamics as applied to pistons'
   - Pay attention to plurals etc. Is it about one item or multiple items? **Don't just bias to the first sentence of text**
   - Double-check it covers big topics in text - if not, then got to **high-level topic** (see summary you have written)

e. In ***purpose*** questions:
   - Work-back from the "conclusion" of the text - the point is not "just" to cover the content as described in the text

f. In ***similar word*** questions:
   - Check if the replaced word has **explicit context / backing in sentence -** e.g., does it really imply 'ignorance' or are you projecting?

g. In ***which role*** questions:
   - Check the sentence to **see if it explicitly matches with the option**. Does it *really* justify the methodology, or are you reading into it?
   - **evidence =~= support,** but **summarize =/= support**

h. In ***parallel*** questions
   - Avoid metaphors that **have the same theme** as the passage

- **Active reading**

a. Note down 'shifts' in the content - e.g., however, recently scientists found … etc.
b. **Purpose** - What does the passage aim to do? E.g., argue a point, explain a concept, analyse two different viewpoints
c. **Main idea** - What is the passage about? What is the focus (e.g., high-level or something specific)?
d. **Structure** - How is the passage structured? E.g., hypothesis, describe methods, results and implications. **Write-own main idea of each paragraph when reading through - 5-8 words**

e. **Tone** - What is the tone of the passage? Positive or negative? How positive or negative?
f. **Ignore detail** - Only read detail that is relevant to purpose / main idea / structure / tone
    - First / Last sentences of paragraph
    - Sentences with some 'transition' words (e.g., not 'for example' etc.)

- **Guide to answering questions:**
    a. **Paraphrase question to simplify it**
    b. **Predict answer to question before reading answers**
    c. **INCORRECT ANSWERS:** Is the answer choice blatantly incorrect?
    d. **IRRELEVANT ANSWERS:** Does the answer contain content that is valid to the passage? **Is this content valid to the question? Trick answers will mention:**
        - **Something discussed elsewhere in passage as 'true' but not relevant to the question**
        - **Something that is 'common sense' but not substantiated in text**
    e. **QUALIFIED ANSWERS:** IIf there are multiple final answers, are there any **qualifiers** in the answer that render it incorrect? Is there anything that can help you split **A from B?**
        - **What is the 'trick' word? E.g., Melville passage - inclusion of the word 'genre' which is a step too far**
        - **Look out for 'only' etc.**
    f. **LEAP ANSWERS:** Does the answer **require a leap-of-faith** from what is detailed in the passage?
        - **Avoid generalisation - take 'baby steps' away from passage**
    g. **SENSE CHECK:** Ensure a correct level of **substantiation in the passage** - does a sentence categorically detail this answer?
        - **Is there a condition under-which the answer needs to be right? E.g., this would be true if….**
- **Select word in sentence**
    a. Treat it like a 'text completion' and **come-up with your own word**. Important: Resist the urge to plug in answer choices!
    b. The choice you pick **must be a dictionary definition** of the word in quotation marks
- **Primary purpose questions flaws**
    a. **Too general / vague answers - it's not topic X, it's topic X as embodied by example / deep-dive Y**
    b. Too specific answers (e.g., only relevant to one part of paragraph)
    c. Mentions something not in passage
    d. 'Rotten spot' - e.g., bad qualification
    e. Answer that is closest to your answer is probably the best one!
- **Inference questions**
    a. Inference answers are inescapably true, based on the information available in the text (will share close similarities with text).

b. **Check for the presence of 'all'** - if *not* extreme and backed-up in passage, then likely to be true
    - **True 'if' = Incorrect, True 'because' = Correct**
    - **Paraphrases of passages** are *not* inferences. **Inferring with common sense** is also not an inference
c. **If there is an extra unknown in answer - e.g., if this is also true, then answer is correct - INCORRECT (answer must definitely hold true)**

- **Identify the structure questions -** Summarise + simplify highlighted text. Understand how this relates to sentence before and sentence after
- **Elements of the argument**
    a. A leads to B, C leads to D -> A only leads to D if B = C. Spot the **'gaps'**!
    b. Think of the **unstated assumption before going through answer choices**
    c. For assumptions, **negating the assumption should break the conclusion**

Writing

General tips

- **Timings**
    - Brainstorm and outline (3 mins)
    - Intro and thesis statement (3 mins)
    - Write the body + examples (20 mins)
    - Write conclusion (2 mins)
    - Edit (2 mins)
- Use link words - **meanwhile, of course, ultimately**

Quotes

The only good is knowledge and the only evil is ignorance – **Socrates**
A people that value its privileges above its principles soon loses both – **Dwight D. Eisenhower**
In theory, there is no difference between theory and practice. But in practice, there is – **Yogi Berra**
A little inaccuracy can sometimes save a ton of explanation – **H.H Munro**
Any intelligent fool can make things bigger, more complex and more violent. It takes a touch of genius – and a lot of courage – to move in the opposite direction – **E. F. Schumacher**
A consensus means that everyone agrees to say collectively what no one believes individually – **Abba Eban**
Non-cooperation with evil is as much a duty as is cooperation with good – **Mohandas Gandhi**
Whatever government is not a government of laws, is a despotism, let it be called what it may – **Daniel Webster**

Good people do not need laws to tell them to act responsibly, while bad people will find a way around the laws – **Plato**
Far and away the best prize that life offers is the chance to work hard at work worth doing – **Theodore Roosevelt**
It is dangerous to be right, when the government is wrong – **Voltaire**
The will of the people is the only legitimate foundation of any government, and to protect its free expression should be our first object – **Thomas Jefferson**
No nation is fit to sit in judgment upon any other nation – **Woodrow Wilson (28th U.S President)**
The artist is nothing without the gift, but the gift is nothing without work – **Emile Zola**
The world is full of educated derelicts – **Calvin Coolidge**
A lie gets halfway around the world before the truth has a change to get its pants on – **Winston Churchill**
It's not the size of the dog in the fight, it's the size of the fight in the dog – **Mark Twain**
Life contains but two tragedies. One is not to get your heart's desire, the other is to get it – **Socrates**
If women didn't exist, all the money in the world would have no meaning – **Aristotle Onasis**
Men are not disturbed by things, but the view they take of things – **Epictetus**
As a rule, men worry more about what they can't see than about what they can – **Julius Caesar**

Issue

- **Thesis**
    - Choose your thesis: strongly agree / disagree, moderately agree / disagree
    - For moderate: have three points (2 one side, 1 on the other)
- **Structure:**
    - Introduction
        - **Hook** (generalisation anecdote, trend, quote): **introduces the topic**
        - **Shift to prompt** - shift introduction of your topic to the thesis being discussed
        - **Thesis** - State the thesis for our essay (**very important**)
        - **Outline** (structure of response) - e.g., "**For X reasons**"
    - Body
        - Topic sentence that introduces support idea
            - **Imperative!**
        - Example
            - Add a good example (from history / politics / economics). Worst-case hypothetical
        - Development / Explanation
            - What is implication of your example on your supporting idea
            - Why does this matter based on your thesis?
    - Conclusion
        - **If strong thesis**

        - Introduce a counterpoint from someone the other side might use to argue against your position. **But shoot this down!**
        - **Wrap-it-up**
    - **If medium theis**
        - Explain how issue is complex and there is no easy answer
        - Rephrase thesis and **wrap-up**

Argument

- **Logical fallacies**
    - **S - Similarity is assumed -** 50-65 years old in town X did Y, we should do the same to 50-65 years old in town Z. **Are these 50-65 years olds the same?**
    - **E - Extrapolation - Apples aren't oranges** - If it worked for X, it should work for Y - e.g., X = Y
    - **N - Numbers and percentages** - e.g., a number when it should be a %
    - **E - Evolution**- In 1985, ….; therefore we should do X
    - **C - Causation vs. correlation**- After we did X, we saw Y - we keep doing X
        - What cofounders Z affected this?
    - **A - Ambiguous language** - "In better shape", "In normal diet"
        - What must the argument do to make the language less vague - e.g., quantify, defining X terms
    - **S - Don't trust a survey** - According to the latest survey
- **Safety points**
    - **Propose further research** - Are there any viable alternatives to the proposed actions that could be helpful to investigate? Give examples - e.g.polling!
    - **Consider knock-on effects** of the proposed action - e.g., brand loyalty!
- **Structure**
    - **Introduction**
        - Rephrase main conclusion from argument
            - E.g., the argument states Y, which leads to Z
        - Identify author's evidence and/or premises - the main one
        - Thesis: **follow the specific task instructions.**
            - **Before this recommendation can be properly evaluated, three key questions need to be addressed?**
            - **<u>This should refer back to the task instruction</u>**
    - **Body paragraph**
        - Supporting idea (making sure to follow specific task instructions)
        - Example 1 (making sure to use 'maybe' language)
        - Example 2 (making sure to use 'maybe' language)
        - **Effect on conclusion if examples prove true**
            - If either of these scenarios have merit, then the conclusion drawn in the original argument is significantly weakened
    - **Conclusion**

- Statement that the argument, as it stands now, is flawed
    - Because the argument makes several unwarranted assumptions, it fails to make the convincing case that X
- Request for more evidence
    - To be more compelling, the author needs to provide evidence for the three questions identified above and, only then, would we be able to evaluate...
- **Statement of how evidence will help evaluate the argument more effectively**
    - **See above**

Math

- **Important notes:**
    - **Read the question!**
    - 1 is not a prime number, 2 is a prime number
    - Do not calculate standard deviations!
    - Divisors include *everything* - not just prime factors
        - # of divisors - apply pigeon-hole principle to prime factors.
        - Make sure to add 1 to the exponent (e.g., *don't* use it)
        - When counting divisors, not '0' divides into any number 0 times!
    - **Backsolve if you find yourself arriving in a cubic scenario**
        - **Start with middle number and then go up or down depending on answer**
    - **The diagrams are misleading** - if angles/lengths aren't specified, there is no assumption that they mimic what exists in the diagram
        - **When copying diagrams, check that you are noting relations down correctly - e.g., AC = DE**
    - **Plug-in to guess and move-on! (especially for QC questions)**
        - **Try 1 / 0**
        - **Try -1 / 1**
        - **Try large number vs. small number**
        - **(Do this if you have to choose between multiple options and you want to avoid solving a quadratic)**
- **Estimation questions:**
    - If answers in multiple choice are very far apart, then estimate!
    - If numbers are too close, use a calculator and do not estimate!
- **Maths tricks:**
    - LCM of P and Q = P*Q/GCF(P, Q)
    - Divide by 5 - **divide by 10 and multiply by 2**
    - Square multiple of 5:

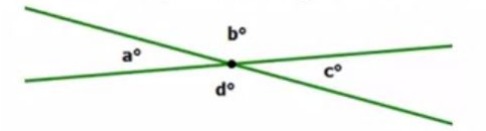
        - 75 = (7*8) * 100 + 25 = 5625
        - 115 = (11*12) * 100 + 25 = 13225
    - (n+1)^2 = n^2 + (n+1) + n => 49 = 36 + 6 + 7, 41^2 = 1600 + 40 + 41
        - 84^2 = 85^2 - 85 - 84 = 7225 - 169 = 7056
    - Doubling trick - factor out multiples to make calculations easier
    - **Break-up large numbers into their prime factors**
        - e.g., 1.2E10 = 2**11 * 3*1 * 5*9
    - **Memorize factorials**
        - 1! = 1, 2! = 2, 3! = 6, 4! = 24, 5! = 120, 6! = 720
    - **Spotting primes**
        - Divisible by 3 - (add all numbers - divisible by 3?)
        - Divisible by 5 - ends in 0 or 5
        - Divisible by 7? (Multiple of 7 < 70, 77, 84, 91, 98)
        - 30-60-90 triangle: R, 2R, sqrt(3)R
    - **Note:**
        - **Square of sum**
        - **Square of difference**
        - **Difference of two squares:** e.g., **x^2 - y^2 = (x+y)(x-y)** when being asked to calculate x+y or similar
    - Standard triangles:
        - **3,4,5**
        - **5,12,13**
        - **8,15,17**
        - **2, 1, sqrt(3)**
        - **sqrt(2), 1, 1**
    - **Number of multiples of x between a,b = (a-b)/x**
- **Inequalities**
    - You CAN'T multiple out denominators in an inequality if it contains a **variable** (no guarantee on it being positive or negative!)
- **Remainders** - X % K = D -> Then D is a factor of **X-K**
- **Perms and combinations:**

$$nCr = \frac{n!}{(r!)((n-r)!)}$$

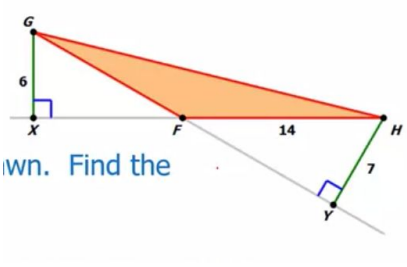
    -
    - **Remember 1, 4, 6, 4, 1** - (Choose for 4)
        - Note: Use combinations for picking **X slots from Y -** Y might be different to the number of items available (e.g., slots in missing 5-digit number question)
        - For permutations, calculating the total number - determine the number of options (**remember no choice is an 'option'**) and multiply
- **Series**

- **Arithmetic series**
    - Total sum = n/2(2a + (n-1)*d) = n/2*(a_1 + a_n)

- **Geometry**
    - Angles
        - A = C, B = D
        - lines cross, four angles are formed

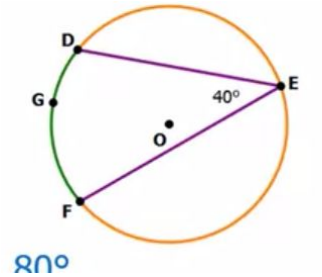


        -
    - **Triangles:**
        - **Possible to determine area given length of a, b, c**
        - Equilateral triangles are **also isosceles** (special case)
            - Triangles can have multiple ‘shapes’ even if 1-2 dimensions are known (e.g., **angle can be small or large**). Important for ‘sufficiency’ questions
        - Extending base of triangle to calculate altitude (and area) - can be used to find interesting properties of triangle

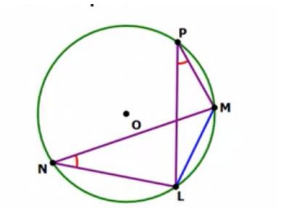


        -
        - Other important lines to note:
            - Altitude (as defined above - used to find area)
            - Perpendicular bisector - every point on bisector of AB is equidistant from A and B
            - Median bisector - divides opposite side in half (note: angle not divided in half)
            - Angle bisector - divides angle in half (note: opposite side not divided in half)
        - Triangle inequality: **|a-b| < |c| < |a+b|**
        - Triangles are ‘similar’ if they share the same angles
        - If **Right-triangle, think pythagoras**
    - **Quadrilaterals**
        - Area of rhombus / parallelogram: A = bh where h is the ‘altitude’
        - For a trapezium, A = mean(b1, b2)*h
        - Consider splitting apart ‘slanty’ shapes in right-triangles to simplify the area calculation

    - Isosceles trapezoids **share the same angle** if both ‘slants’ are the same length (hence isosceles)
    - **Length bounded: a + b + c <= d**
- **Polygons**
    - For an n-sided shape, we can draw (n-3) diagonals, resulting in (n-2) triangles, to produce **(n-2)*180** total sum of angles
    - **Rhombus area = side-length * altitude**
    - **Bisecting the shape** splits internal angles in **half**
    - **Octagon** - Supplement of internal angle is 45 degrees
    - **Hexagon** - Supplement of internal angle is 60 degrees
- **Circles**
    - Chords connect any two points on edges
    - The arc of two chords is **2* the angle between two chords**

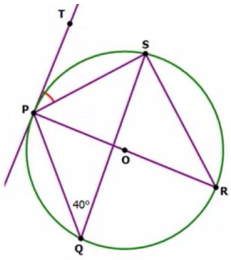


    - 80°
    - If there are a set of chords that produce a line of same length as DF above, then this chords have the same arc angle
    - Inscribed angles sharing the same arc or chord are equal



    - An angle inscribed in a semi-circle (opposite the diameter) = 90 degrees
    - The angle between tangent and radius = 90 degrees

Practice problem:
Given that ∠PQS = 40°, and PT is tangent to the circle at P, ∠TPS equals which of the following?



∠PRS = 40°
∠PSR = 90°
∠SPR = 50°

∠TPO = 90°
∠TPS = (∠TPO) – (∠SPR) = 90° – 50° = 40°

- **Probability**
    - If question uses ‘mutually exclusive’ / ‘independent’, or relates to coins/cards/die, or mentions P(A) = X, P(B) = Y - use algebraic rules

    - Else: use combinations (unless the list length < 3)
- **Quantitative comparison questions**
    - Do not calculate the answer to the question if you do not have to! Estimation + comparison is just enough!
    - Is the question asking for **an integer or a decimal? How would that affect the answer of the comparison question?**
    - Determine if comparison can be simplified to make answers easier
        - **Cross-multiply** to simplify problem
        - Add / divide terms on both sides to simplify problems
    - Inequality:
        - Addition / Subtraction on both sides of inequality preserves order
        - Multiplication / Division by **positive** number preserves order of inequality
        - Multiplication / Division by **negative** number reverses order of inequality
        - If the variable is not know to be positive - then you **cannot multiply and/or take square roots etc.**
            - Note: Cube (roots) preserve inequality order
        - Expressing something as **a perfect square** is easier than applying quadratic formula - e.g., x**2 + 16x + 67 = (x+8)**2 + 3
    - Calculate worst-case **of value** (e.g., any triangle of length 6, 4 will have largest area it 0.5 * 6 * 4 = 12)