

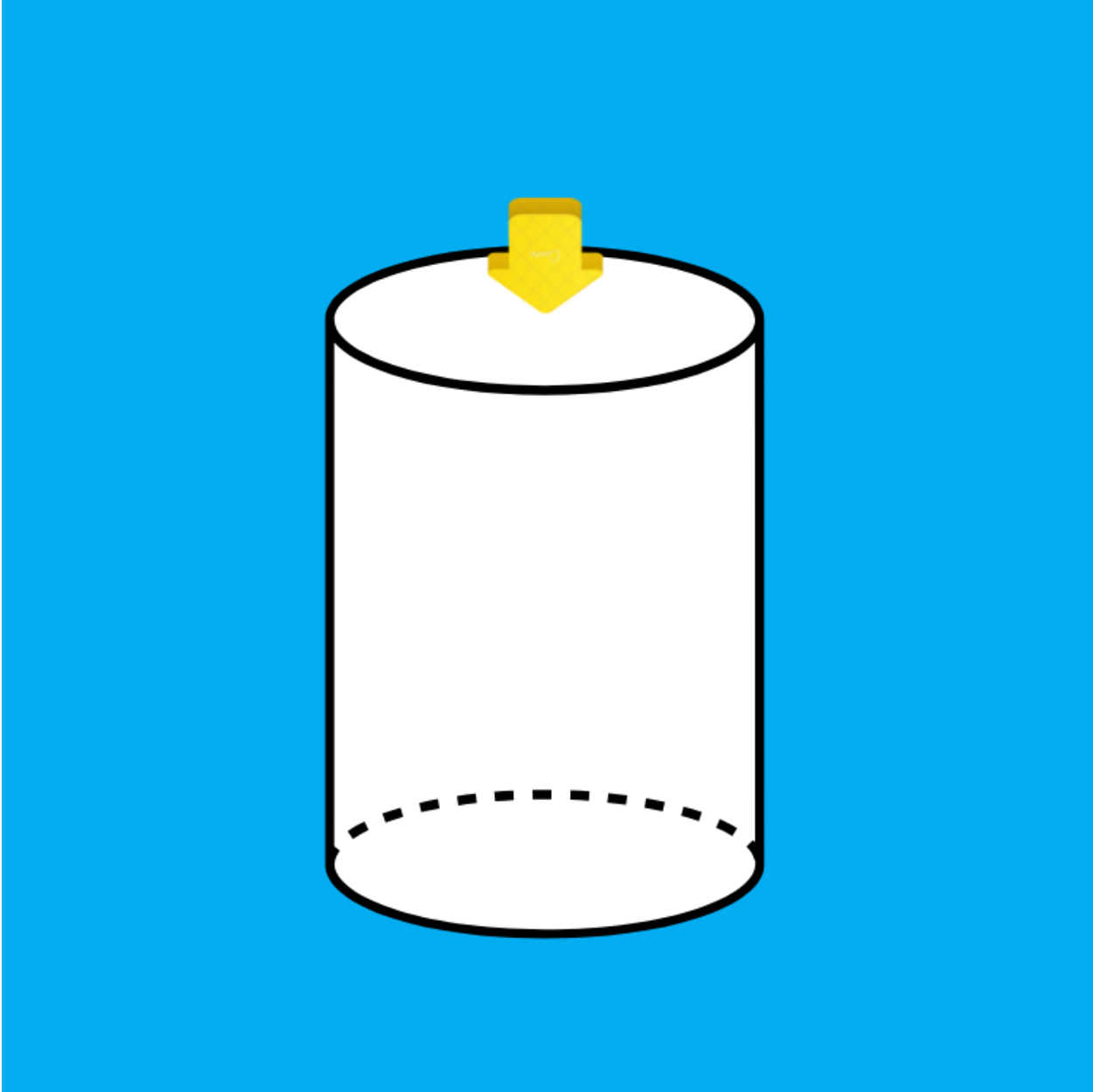
On the Perceptual Ability Test (PAT section) of the Dental Admission Test, you'll encounter six question types that assess your spatial and visual reasoning skills. One of these question types is top-front-end (TFE). Read on to learn all about TFE and to learn strategies that will help you master these questions!

## What to expect

On the Dental Admission Test (DAT), you will have a total of 15 TFE questions (#16–30 of the PAT section). This section will require you to look at a 2D image and imagine it in 3D.

Every 3D object has three views (perspectives from which we can visualize that object). These three views are the **top view**, **front view**, and **end (side) view**. Imagine a cylindrical can of soup. What if we viewed it from the top (looking down at the can)?

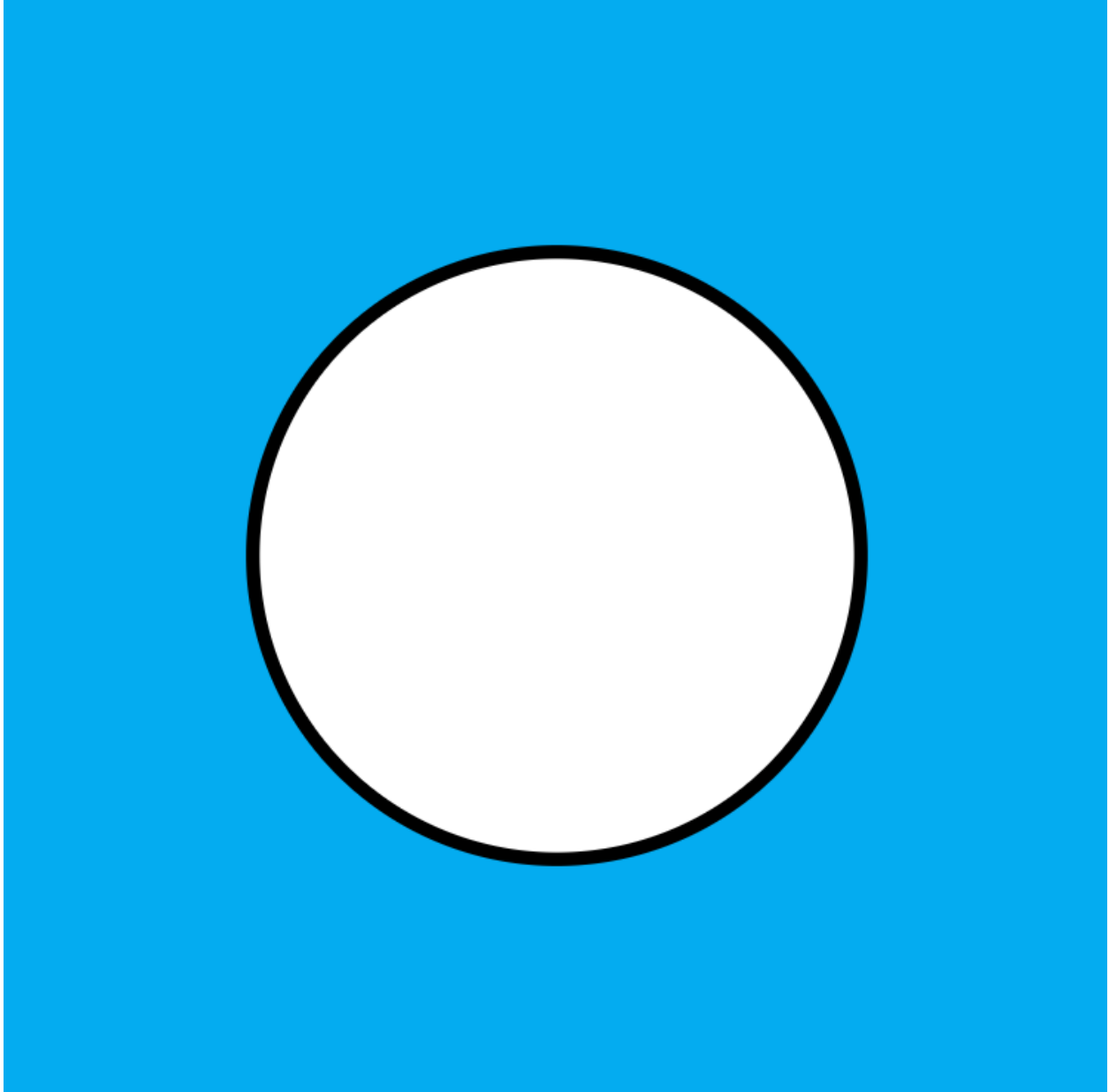




Top view indicated by the yellow arrow.

We'd see a circle:

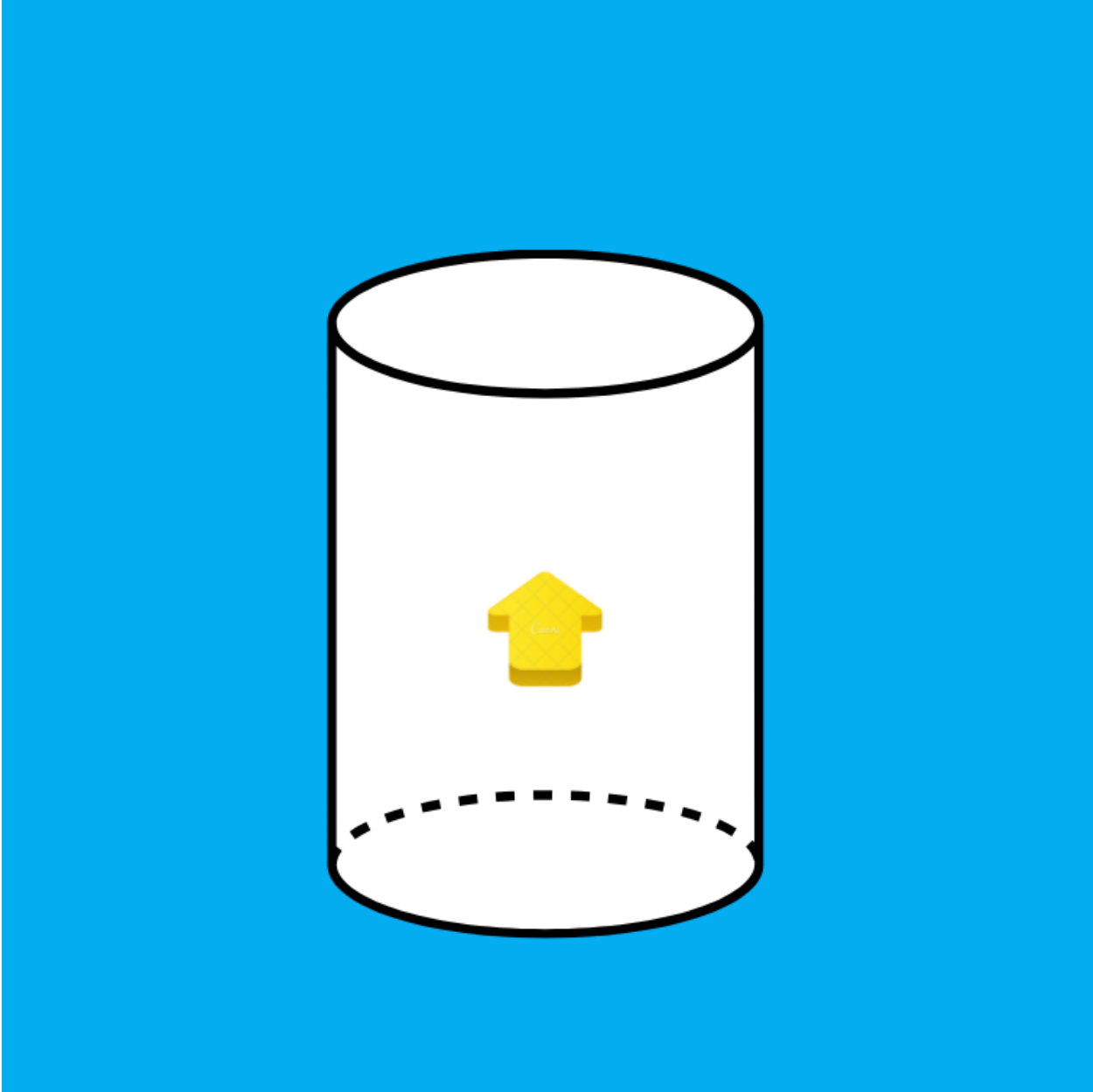




Top view of a cylindrical 3D solid (in our example, a can of soup).

What if we viewed it from the front?

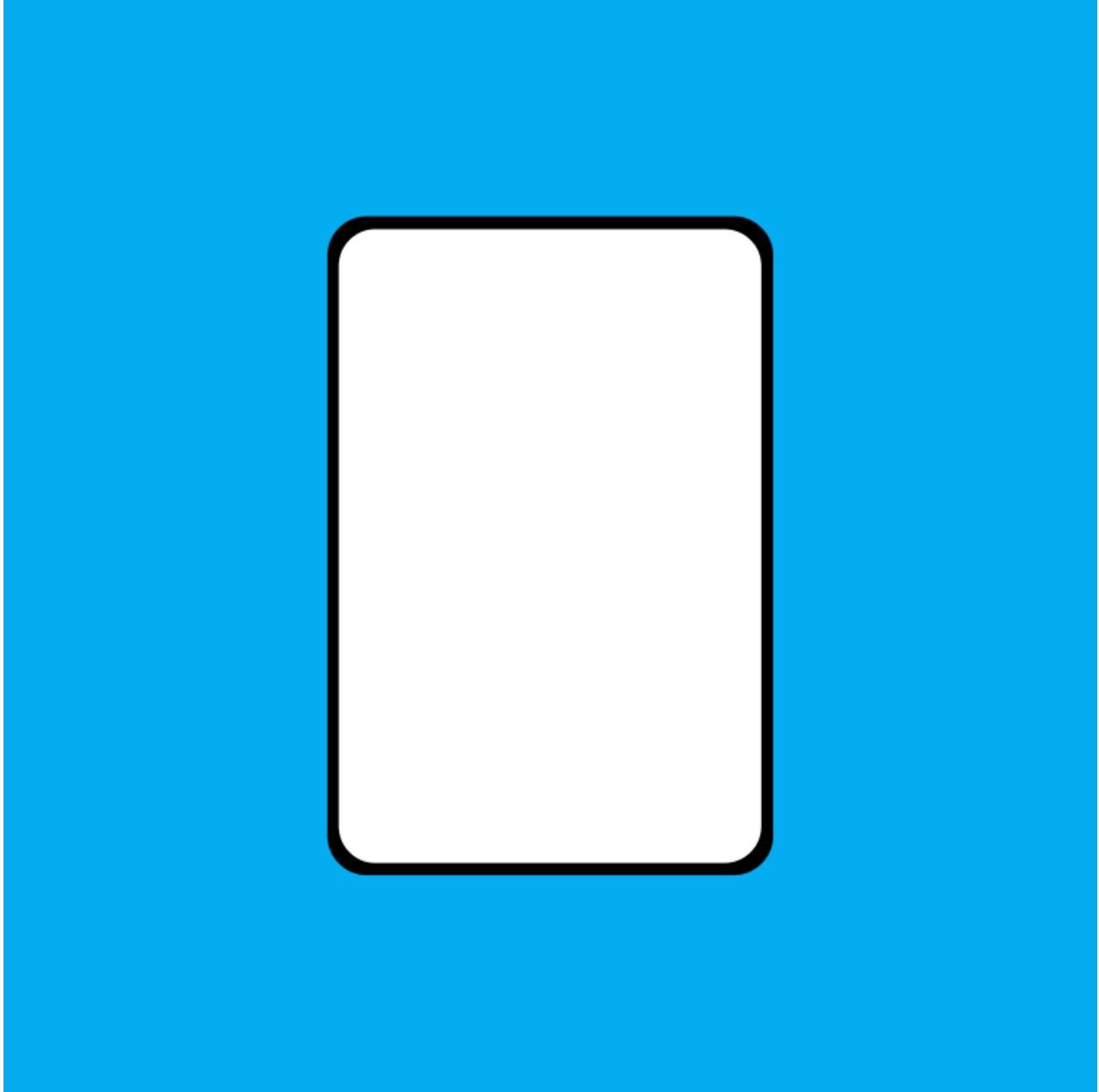




Front view indicated by the yellow arrow.

We'd see a rectangle:

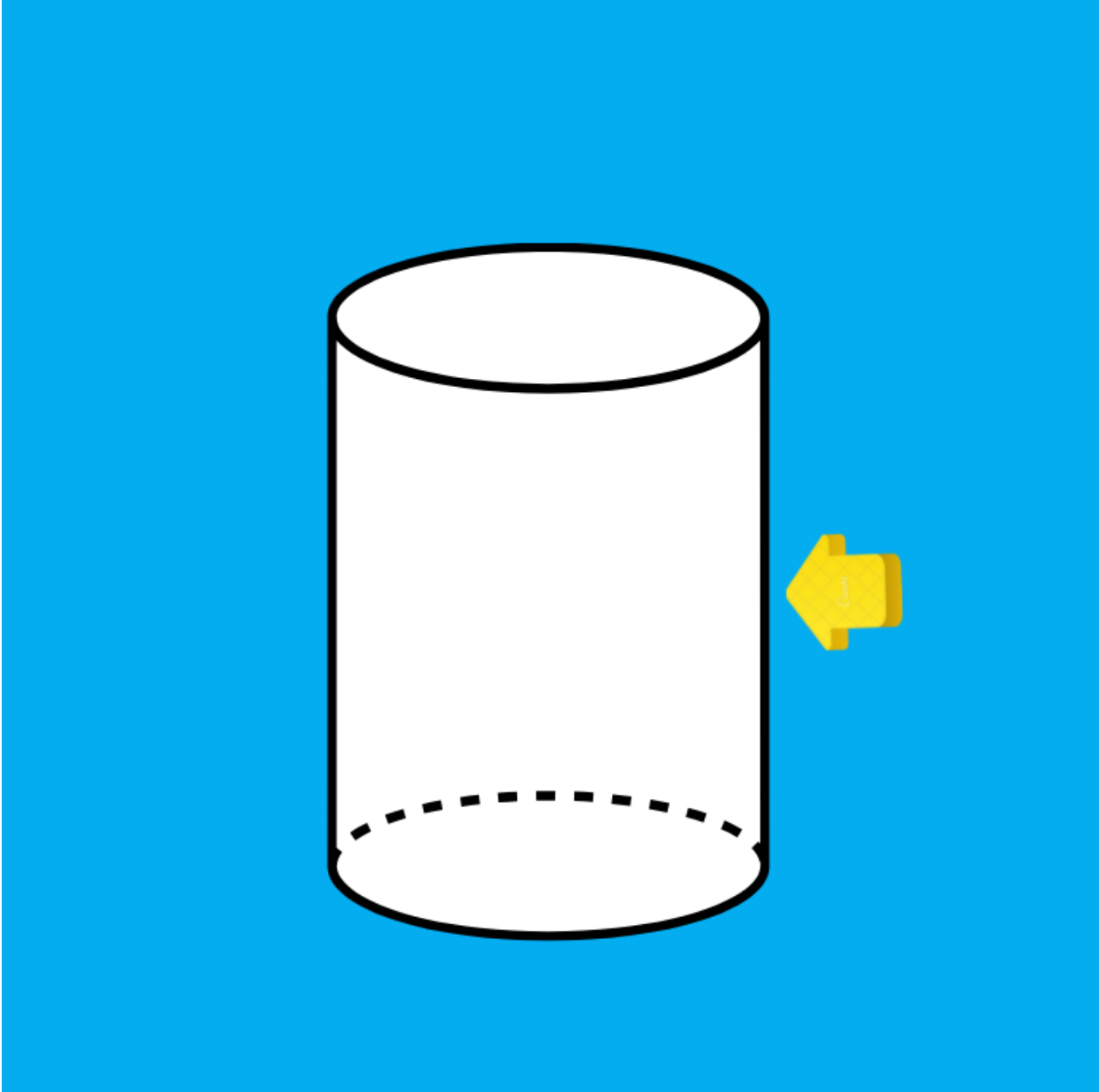




Front view of a cylindrical 3D solid.

Finally, what if we viewed it from the end (side)?

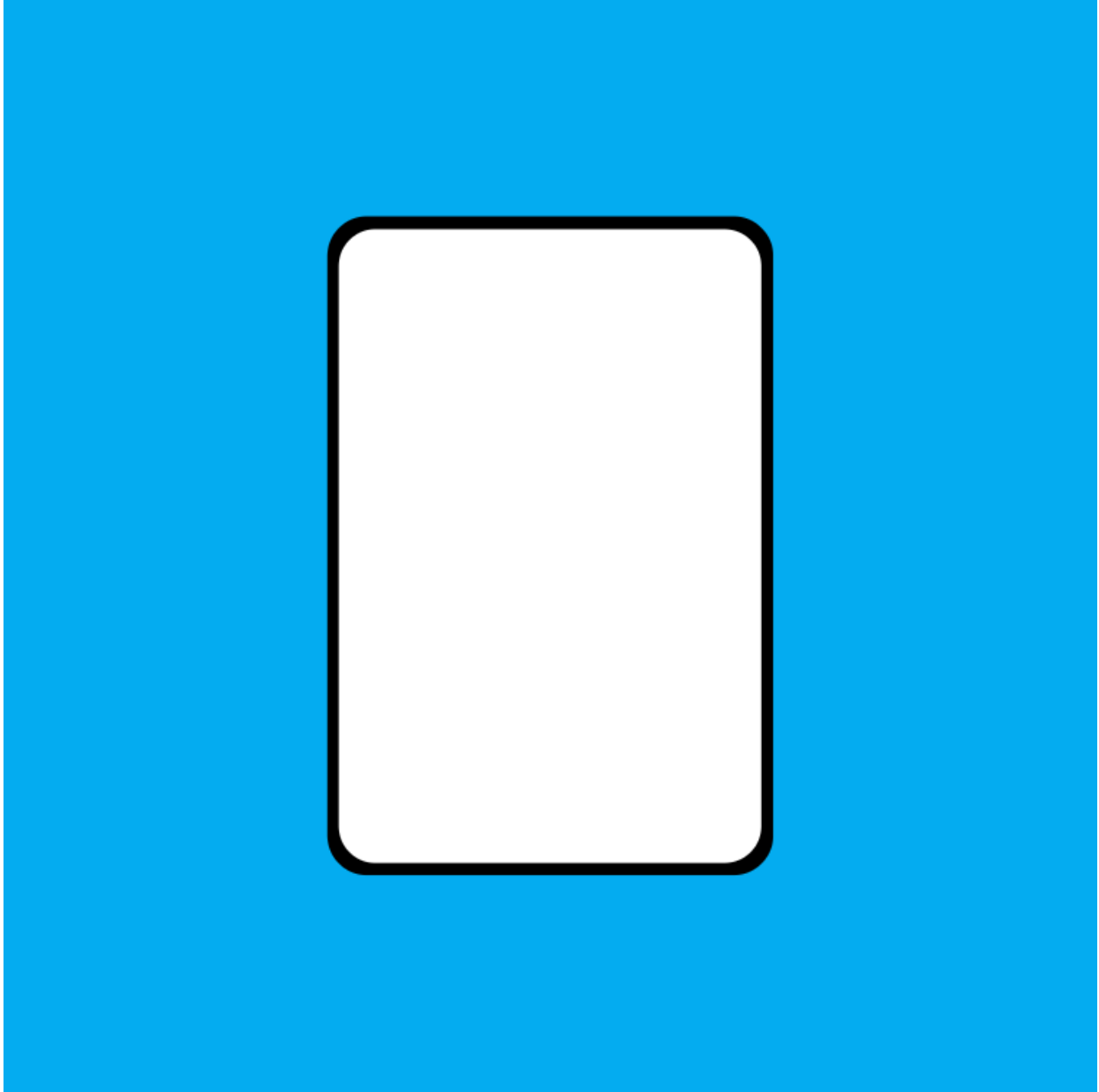




End view indicated by the yellow arrow.

Again, we would see a rectangle:

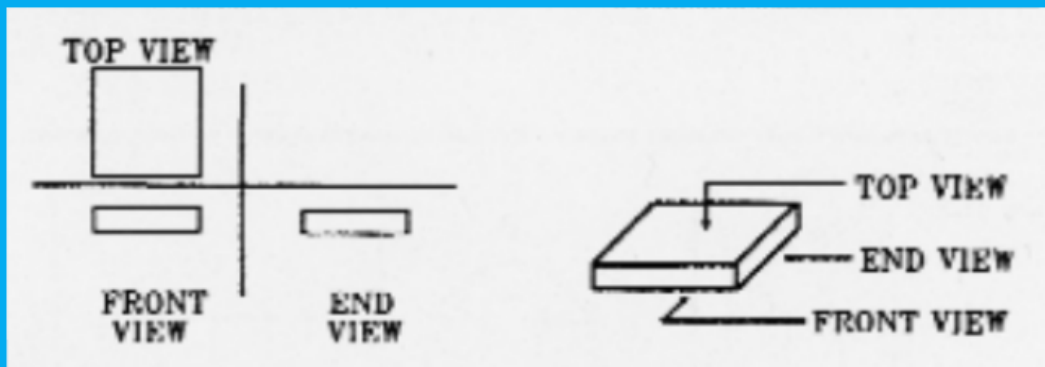




End view of a cylindrical 3D solid. In this case, the end view matches the front view.

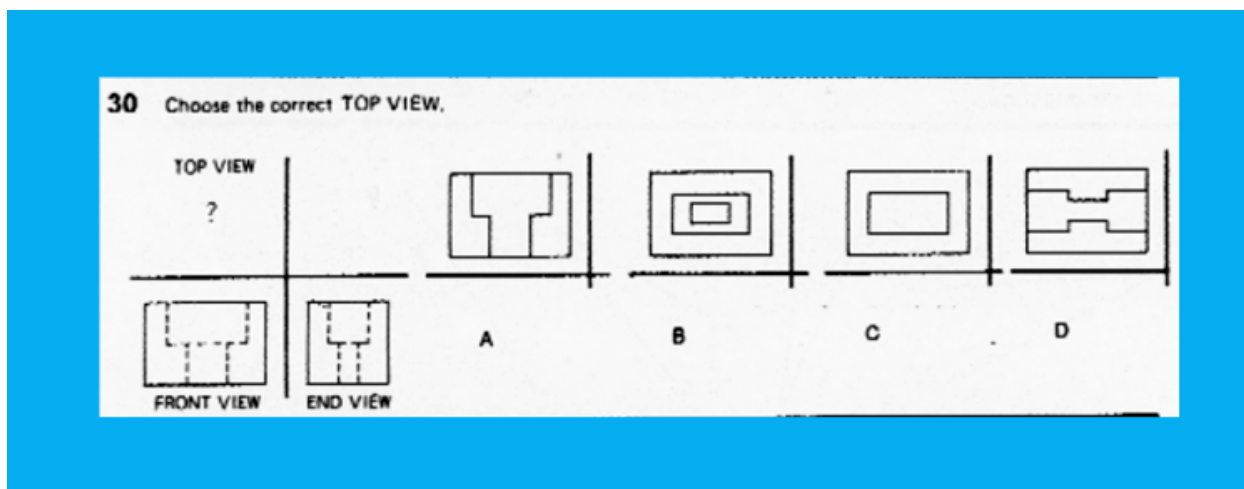
Still a little bit uncertain about what top, front, and end views mean? Here's another example:





Top, front, and end views for a block-shaped object. Source: [ADA's 2007 DAT Sample Test Items](#).

In the TFE section, you will be presented with **two of the three possible views** for an assortment of objects. These views will be presented in a grid like the one shown above. Based on these two views, **your goal is to determine what the third view — the view not shown — would look like.** You'll have four multiple choice answers to choose from on this section. Here's an example of a real TFE question you might see on the DAT:



Sample TFE question. Source: [ADA's 2007 DAT Sample Test Items](#). (By the way, the answer is B.)

TFE is typically one of the more challenging question types for DAT-takers (at least initially), but don't let this intimidate you! Once you understand the rules of the TFE section and learn the strategies, your ability to spot the correct answer will increase.

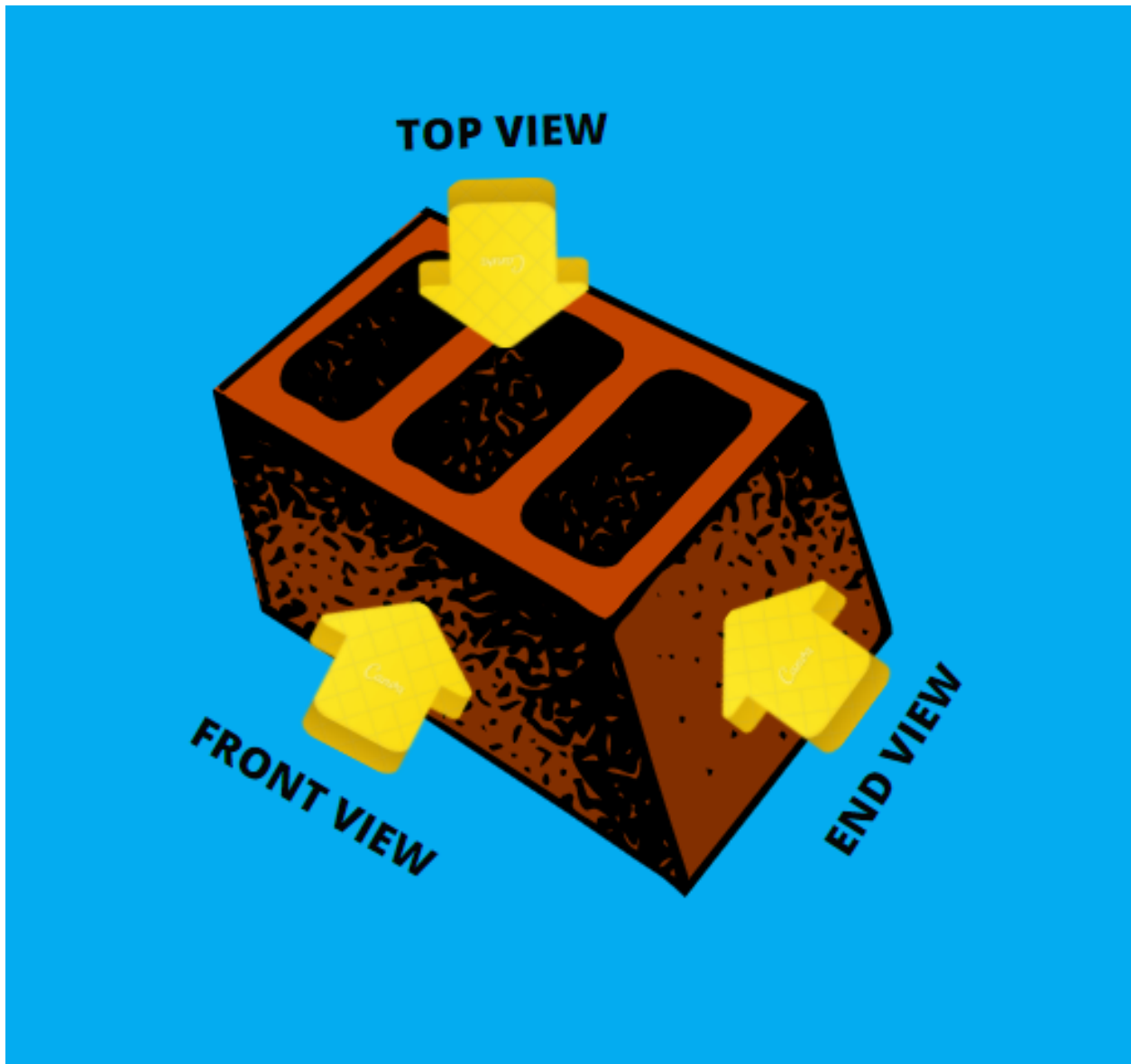
## The rules

- **Solid lines versus dashed lines.** In the TFE section, you will see a mix of solid lines and dashed lines. **Solid lines** represent features of the object that

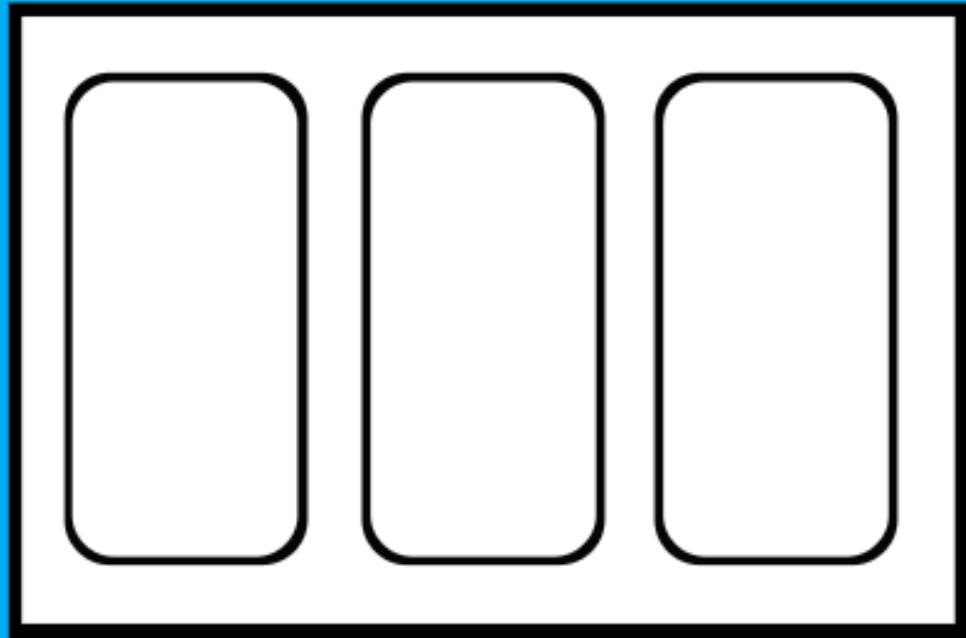




are **directly visible** from a certain view. **Dashed lines** represent features of the 3D object that are **hidden** from a certain view. Let's work with the following 3D solid (one you're probably familiar with — a brick) as an example.



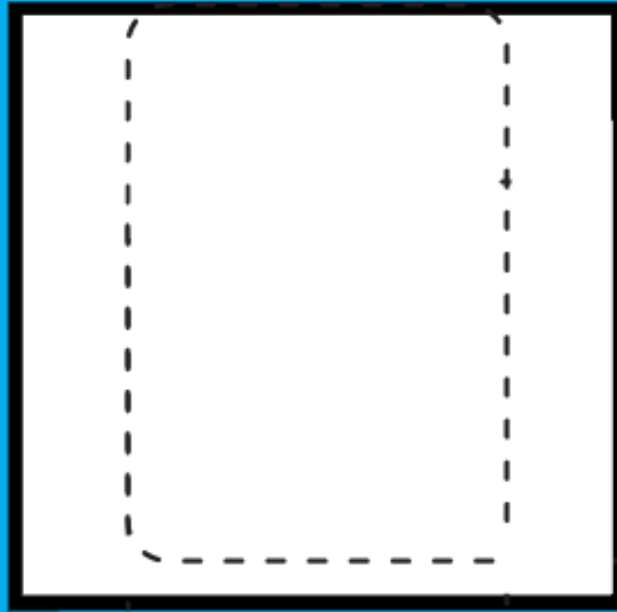
This brick has three holes cut out from the top. Imagine that these holes are all the same size and that they go *almost* all the way through to the bottom of the brick. Looking down at the brick, from the top view, these cut-outs would be DIRECTLY visible. Therefore, the top view would look something like this, with solid lines:



Top view of the brick shown above. The solid black lines represent the three cut-outs in the top of the brick. Again, these lines are solid because these holes are directly visible from the top view.

Now, imagine if we viewed the brick from the side. These cut-outs would NOT be directly visible. Therefore, the side view would look something like this, with dotted lines:





Side view of the brick. The dashed black lines represent the three cut-outs in the brick, which go almost all the way to the bottom. These lines are dashed because the holes are NOT directly visible from the side view, but are part of the brick's overall structure.

In the side view above, note that we only see *one* dashed cut-out because the three cut-outs in the brick are all the same size and would overlap from the side view.

- **Overlapping solid and dotted lines.** So, what if a directly visible feature overlaps with a hidden feature from a certain view? In this case, **the directly visible feature will “win out.”** Therefore, this feature will be represented by a solid line from that view.

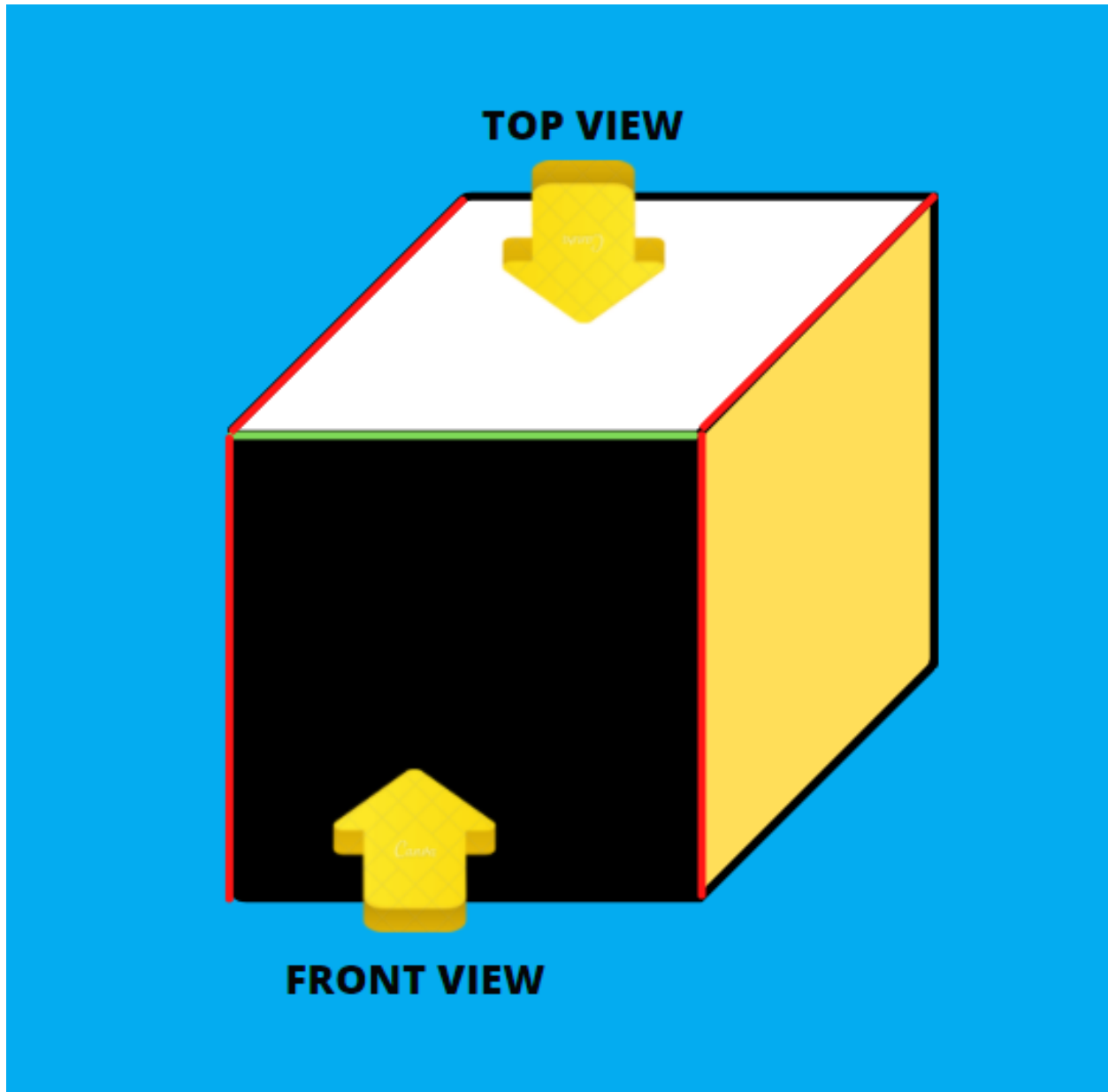
Again, if this seems confusing, don't worry! You will get the hang of it with more exposure to TFE questions. Now that we've covered most of the basics, let's discuss some strategies.



## The strategies

- **Practice makes perfect. It's true for every PAT question type!** With time and practice, you will be able to visualize how the 2D TFE illustrations relate to their corresponding 3D figures. Do practice sets, including the TFE practice tests on [CrackDAT.com](https://www.crackdat.com) (being sure to pay attention to the explanations for the questions you miss or guess on), and [download the CrackDAT app](#) to practice and review in your spare time. You will improve your speed and accuracy as you familiarize yourself with TFE, so set aside at least 10–15 minutes each day to practice and learn from your mistakes, and don't give up!
- **Really understand how the top, front, and end views relate to each other.** Remember: in reality, all the different “views” connect with each other to form the 3D object. Let's think about this using a cube as an example. First, we'll think about how the **top view and front view** relate to each other.

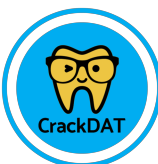




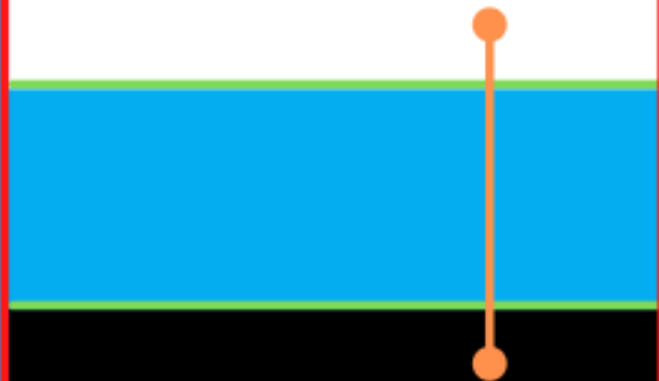
Notice the **green line** — it represents a shared edge between the top view and front view. Thus, the **BOTTOM EDGE** of the top view lines up with **TOP EDGE** of the front view.

Also notice the **red lines** — they represent the LEFT and RIGHT edges of these views, which line up. Thus, the **LEFT and RIGHT edges** of the top view and front view line up.

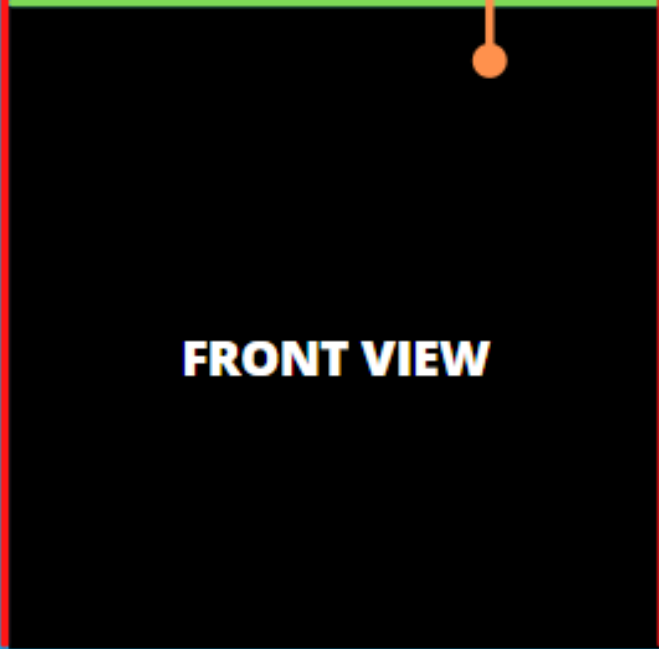
Fortunately, because of the way the TFE section is organized, the top view is always drawn on top of the front view. So, all we have to do to relate the top view to the front view is look straight up and down. If we see a feature represented somewhere in the top view — say, where the **orange dot** is, in the image below — all we have to do is look **STRAIGHT DOWN** from that point to see where the corresponding feature should appear in the front view.



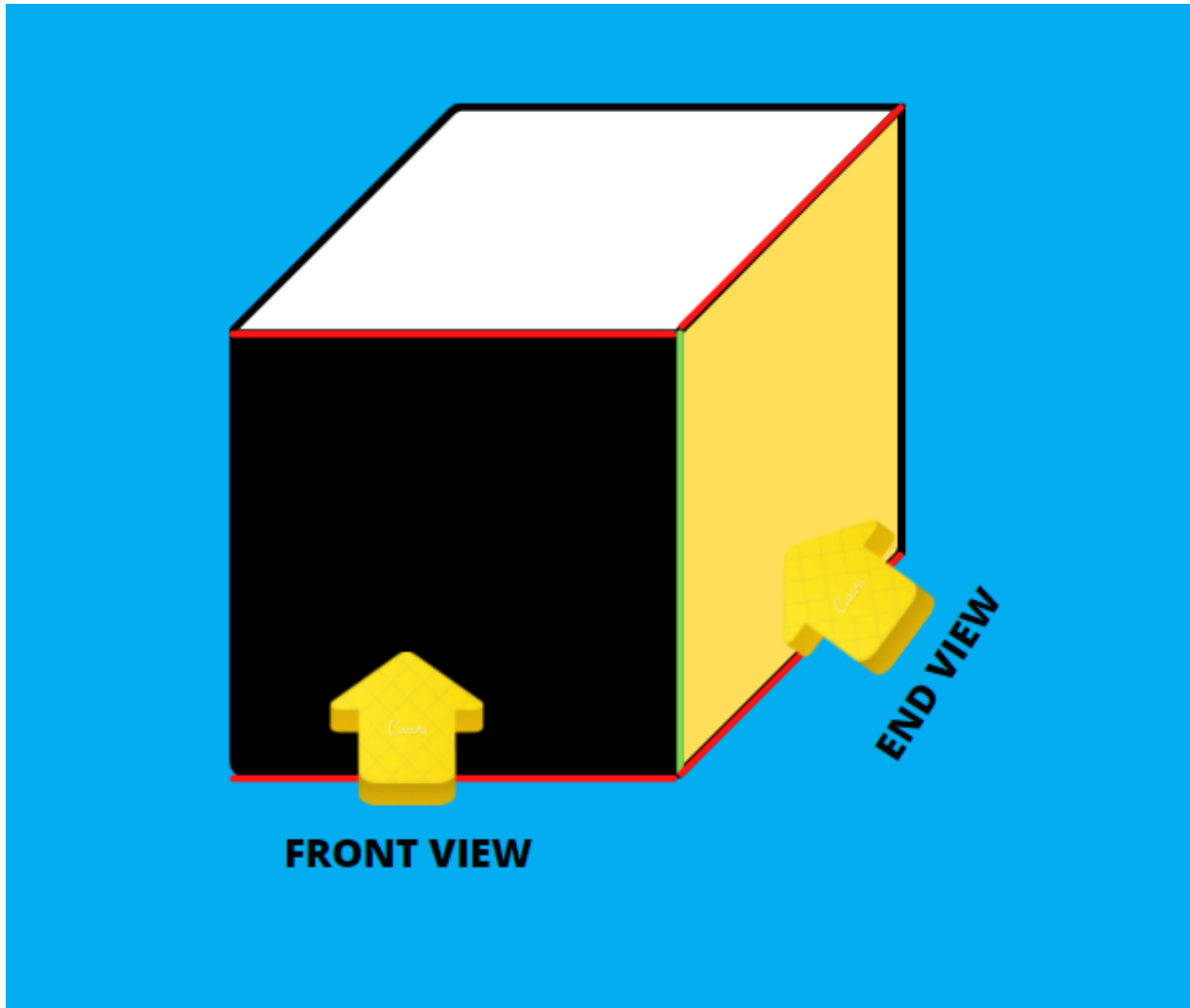
**TOP VIEW**



**FRONT VIEW**



Next, let's relate the **front view** and **end view**.

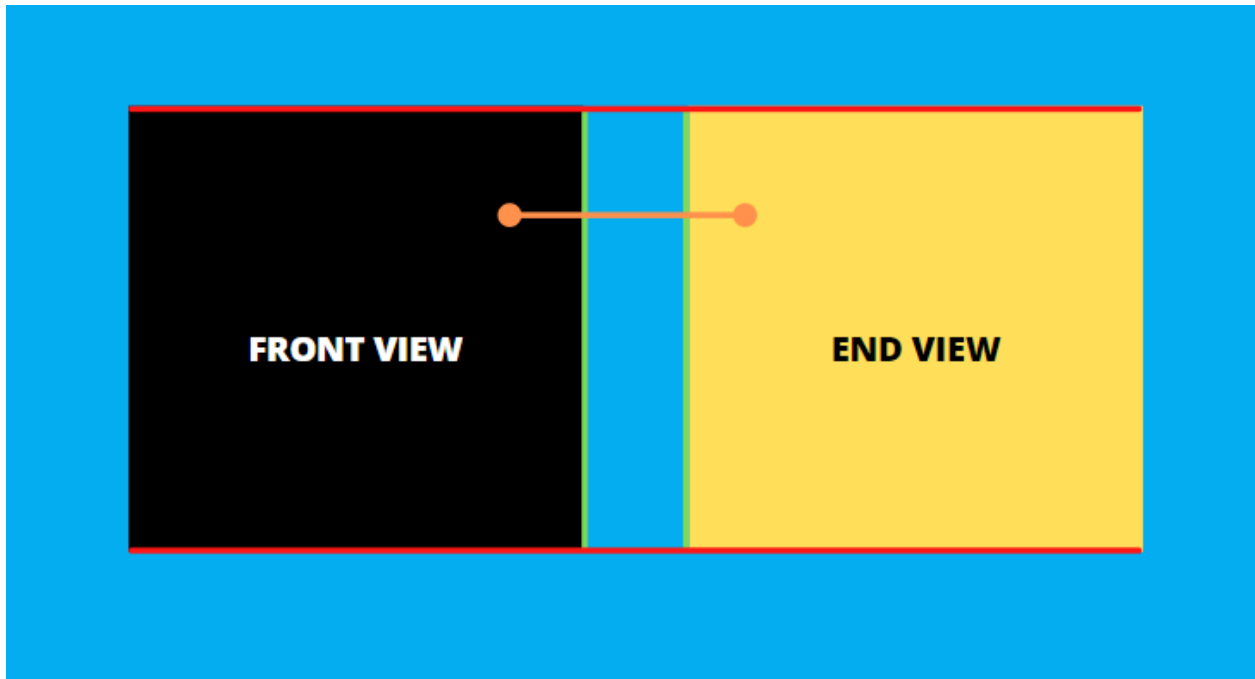


Notice the **green line** — it represents a shared edge between the front view and end view. Thus, **the RIGHT EDGE of the front view lines up with LEFT EDGE of the end view.**

Also notice the **red lines** — they represent the TOP and BOTTOM edges of these views, which line up. Thus, **the TOP and BOTTOM edges of the front view and end view line up.**

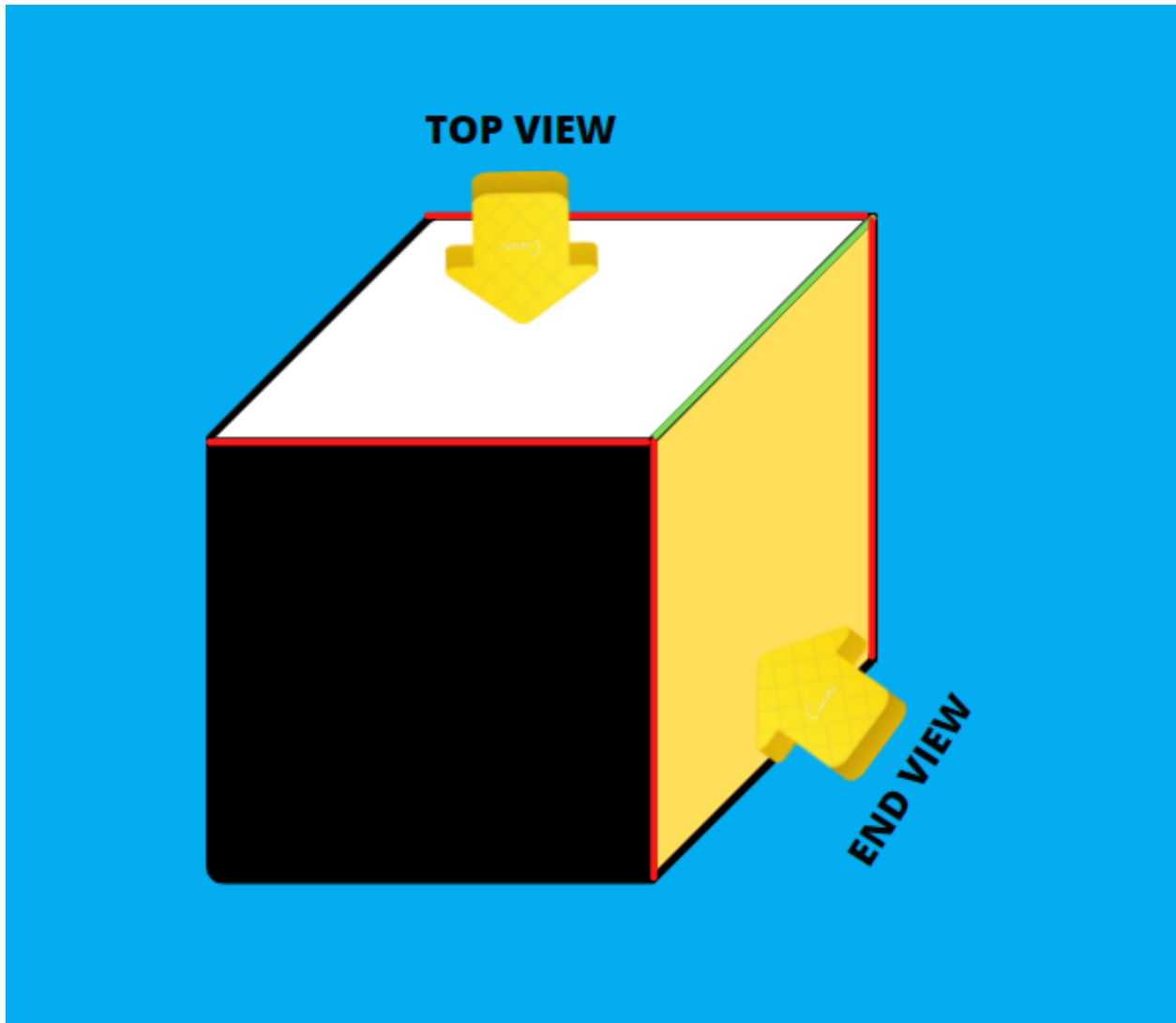
Fortunately (again), because of the way the TFE section is organized, the front view is always drawn side-by-side with the end view. All we have to do to relate these views is look left and right. If we see a feature represented somewhere in the front view — say, where the **orange dot** is, in the image below — all we have to do is look **DIRECTLY TO THE SIDE** from that point to see where the corresponding feature should appear in the end view.





Finally, let's relate the **top view and end view**. This is a bit more complicated.





Notice the **green line** — it represents a shared edge between the top view and the end view. Thus, the **RIGHT EDGE** of the top view lines up with **TOP EDGE** of the end view.

Also notice the **red lines** — they represent the edges of these views which line up. As you can see, the **TOP AND BOTTOM EDGES** of the top view line up with the **LEFT AND RIGHT EDGES** of the end view. This is pretty tricky to think about. Here's where the mental manipulation comes in. To make things easier, **mentally rotate the top view 90° clockwise**.

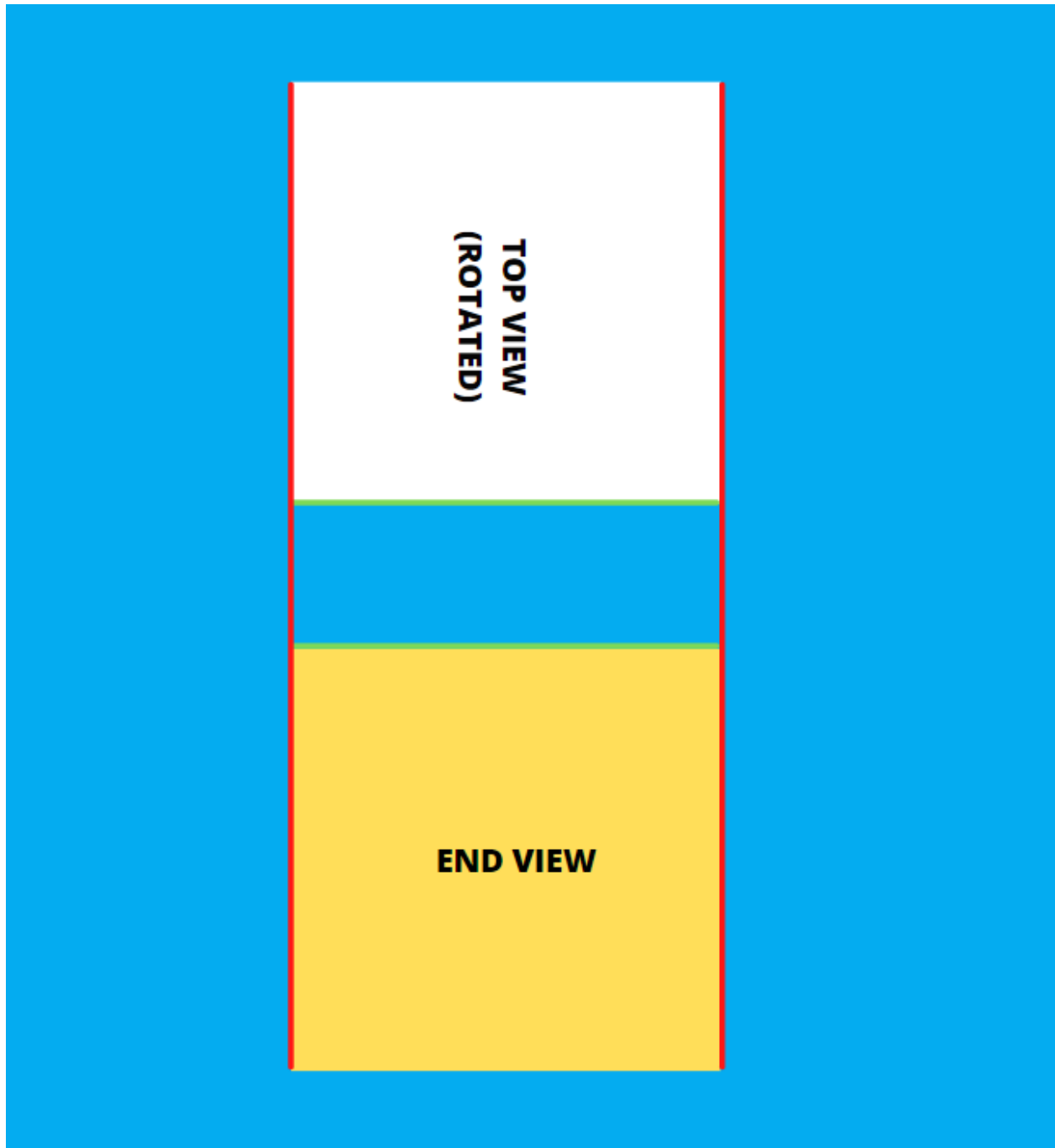


**TOP VIEW**



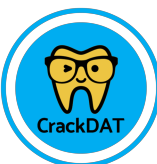
**ROTATE 90°  
CLOCKWISE,  
THEN IMAGINE  
STACKED ON TOP  
OF THE END VIEW**

**END VIEW**

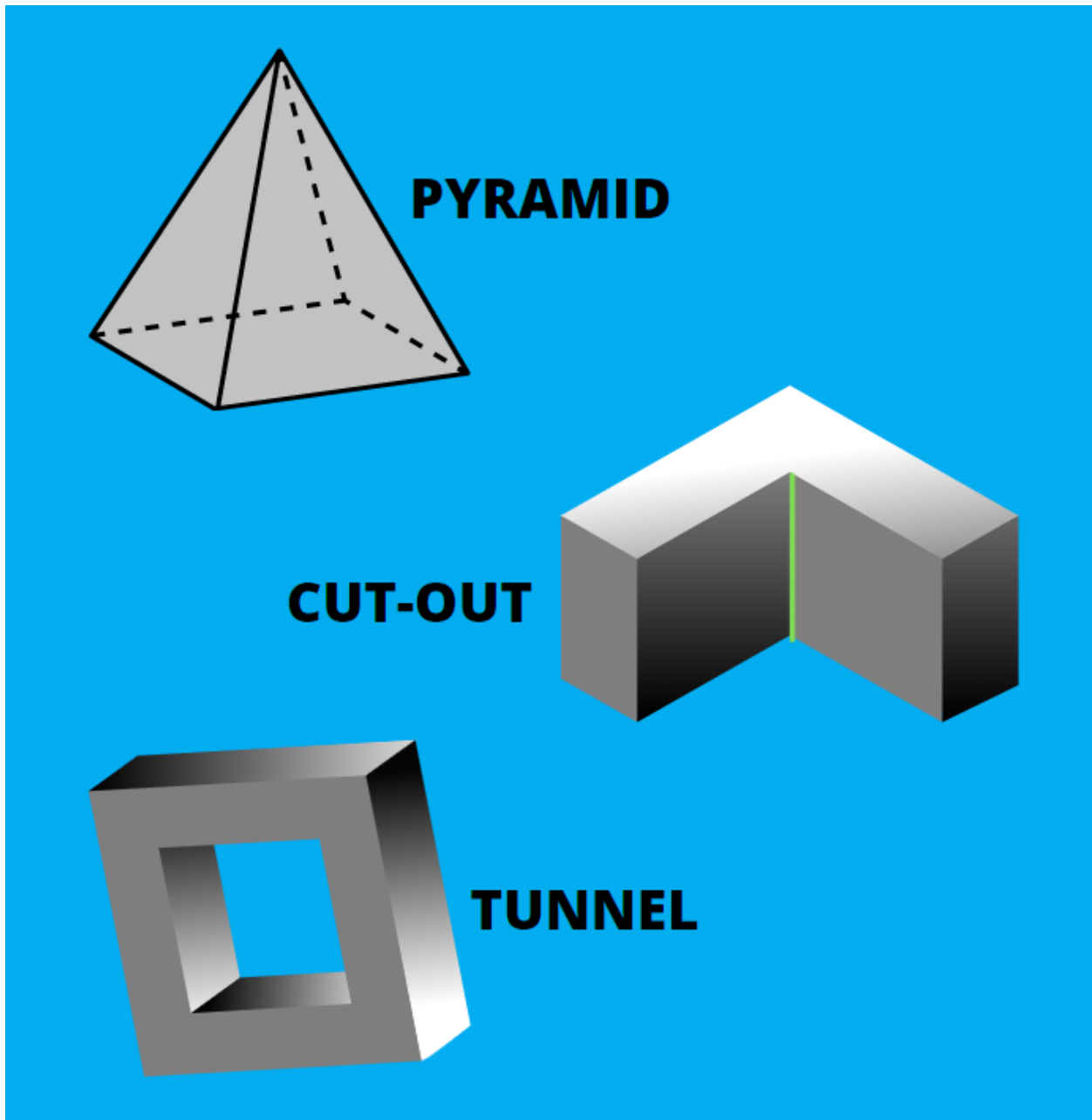


Now, with the top view rotated as shown, we can more easily relate these views. The sides line up (see how the red lines neatly match up, and the green lines are next to each other?), and we can look straight up and down to find corresponding features.

Remember, **understanding these relationships takes practice**. In time, you will have a clear understanding of how these views relate to each other, and you will understand how all are just complementary views of the same 3D object!



- **Familiarize yourself with common features.** Once you're comfortable with the basics of TFE, you can practice more complex questions. The objects in the TFE section may have some of the following common features:



The **pyramid** above looks like a triangle from the front and side views. From the top view, though, it looks like a rectangle.

The **cut-out** shape above looks like a rotated “L” from the top. From the front and end views, it looks like a rectangle (with a solid line indicating the directly visible edge, which is marked in green above).

The **tunnel** above looks like a slim rectangle (with dashed lines corresponding to the hidden feature) from the top and end views. From the front view, it looks like a square with a smaller solid-line square inside it (the smaller solid-line square corresponds to the directly visible tunnel).

These are just some examples of common TFE features. There are many more, including slopes/ramps and overhanging ledges. Understanding how different features look from the top, front, and end views is very helpful for mastering this section.

- **Relate TFE to the world around you.** What would the notebook on your desk look like if it were a TFE question? What about a drinking glass? A door? A stack of presents? It sounds silly, but once you start thinking about the world in this way, visualizing the questions in the TFE section will become increasingly second nature.
- **Use the answer choices to your benefit.** Remember, the TFE questions, like all questions on the DAT, are multiple choice. You don't need to be able to visualize the entire 3D object on your own. Instead, focus on ONE feature at a time and think about how it should look in the missing view. Use **process of elimination** every time you see an answer that is inconsistent with the two views shown. This approach will make the TFE questions much more manageable — all you have to do is find an error, no matter how small, in three of the answer choices, and you'll arrive at the correct answer.
- **Manage your time.** You can budget more time for the TFE questions since they require more time than the strictly 2D questions, like angle ranking. But don't dwell on a question if you're stumped — just mark it, take your best guess, and move on! Also, remember that speed comes with practice, so don't be discouraged if you need a lot of time per question at the beginning of your preparation.

TFE is all about practicing and developing the methods that work best for *you*. Practice the strategies above. Expose yourself to as many TFE questions as possible. You *will* notice improvement in time. Let us know if you have any questions in the comments.

Wishing you the best of luck in your PAT preparation!

