Excellent question — these timestamp columns in the **Olist orders table** are among the most insightful for analyzing **delivery performance, logistics efficiency, and customer experience**.

Let’s go through each timestamp carefully, and then we’ll discuss **which measures (KPIs)** you can derive from them.

**1. order\_purchase\_timestamp**

**Meaning:**

* The exact date and time when the customer placed the order on Olist’s marketplace.
* It marks the **start of the order lifecycle**.

**Example:**  
2017-09-04 21:15:19

**Use in analysis:**

* Track **order volume trends over time** (daily, weekly, monthly sales).
* Identify **peak purchasing hours** or **seasonality**.
* Calculate **time-to-approve** or **time-to-deliver** starting from this timestamp.

**2. order\_approved\_at**

**Meaning:**

* The timestamp when the **payment was confirmed/approved** by the payment system.
* There might be a delay between purchase and approval due to payment verification or failures.

**Example:**  
2017-09-04 21:20:39

**Possible measure:**

* **Payment approval time**  
  [  
  \text{payment\_approval\_time} = \text{order\_approved\_at} - \text{order\_purchase\_timestamp}  
  ]  
  → Measures the efficiency of the payment process.

**3. order\_delivered\_carrier\_date**

**Meaning:**

* The date when the **seller handed the order to the carrier** (shipping company).
* Marks the **start of the shipping process**.

**Example:**  
2017-09-06 15:43:17

**Possible measures:**

* **Fulfillment time (seller handling time)**  
  [  
  \text{fulfillment\_time} = \text{order\_delivered\_carrier\_date} - \text{order\_approved\_at}  
  ]  
  → How long sellers take to prepare and ship an order after payment approval.

**4. order\_delivered\_customer\_date**

**Meaning:**

* The actual **date when the customer received the order**.
* Marks the **end of the delivery process**.

**Example:**  
2017-09-10 10:50:32

**Possible measures:**

* **Shipping time**  
  [  
  \text{shipping\_time} = \text{order\_delivered\_customer\_date} - \text{order\_delivered\_carrier\_date}  
  ]  
  → How long carriers take to deliver after pickup.
* **Total delivery time**  
  [  
  \text{total\_delivery\_time} = \text{order\_delivered\_customer\_date} - \text{order\_purchase\_timestamp}  
  ]  
  → End-to-end delivery time from customer order to receipt.

**5. order\_estimated\_delivery\_date**

**Meaning:**

* The **expected delivery date** promised to the customer at checkout.
* Used to measure delivery performance and customer satisfaction.

**Example:**  
2017-09-12 00:00:00

**Possible measures:**

* **Delivery delay**  
  [  
  \text{delivery\_delay} = \text{order\_delivered\_customer\_date} - \text{order\_estimated\_delivery\_date}  
  ]  
  → Positive = late delivery, Negative = early delivery.  
  This is crucial for **on-time delivery rate (OTD)** analysis.

**6. Summary of derived metrics**

| **Metric Name** | **Formula** | **Insight** |
| --- | --- | --- |
| **Payment Approval Time (hours)** | order\_approved\_at - order\_purchase\_timestamp | Efficiency of payment system |
| **Fulfillment Time (days)** | order\_delivered\_carrier\_date - order\_approved\_at | Seller’s preparation and dispatch speed |
| **Shipping Time (days)** | order\_delivered\_customer\_date - order\_delivered\_carrier\_date | Carrier delivery performance |
| **Total Delivery Time (days)** | order\_delivered\_customer\_date - order\_purchase\_timestamp | End-to-end delivery performance |
| **Delivery Delay (days)** | order\_delivered\_customer\_date - order\_estimated\_delivery\_date | On-time vs delayed delivery |
| **On-Time Delivery Rate** | % of orders delivered on/before estimated date | Delivery reliability |
| **Order Frequency per Customer** | Count of orders per customer over time | Customer retention & loyalty |
| **Purchase Hour/Day/Month Trends** | Extracted from purchase timestamp | Seasonal & behavioral insights |

Would you like me to show a **Python code example** to calculate all these metrics step by step using your Olist orders dataframe?